INVISIBLE CITY

A Multi-Sensory Approach to the Analysis of Urban Space

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Declaration

I, Alexandra Peca Amaral Gomes, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Abstract

This thesis explores the relationship between sensory stimuli and human behaviour in urban space. It seeks to understand how spatial conditions, mediated, and supported by sensory experiences, impact individual and social activities and how this learning might be applied to other cities.

This research aims to challenge the “visualism” of planning and urban design approaches and to examine the urban environment through a multi-sensory analysis, focusing on the non-visual senses, such as hearing, smell and touch. It is based on a qualitative case study approach focused on Bishopsgate, in the City of London, an area with a unique variety of urban spaces, compact morphology and land use.

This thesis contributes to knowledge in three principal ways: First, the use of “sensewalks” and “sensetalks” as innovative user-centred methods of data collection, enabling in-situ semi-structured interviews with the presence of the researcher. Second, the use of thematic analysis of verbal and semantic descriptions received from participants, establishes a baseline for the exploration. Finally, the creation of a framework of analysis based on the concept of “sensescapes” will facilitate the future exploration of the urban setting through its different dimensions. This framework not only creates a baseline for discussion but also establishes a tool for use in future urban development within the fields of environmental psychology, sensory analysis, urban design and spatial planning.

These contributions add to the academic literature and offer methods and techniques of analysis that may support future academic research, practice and policy. As planners and urban designers try to create better and healthier spaces, the analysis and production of urban “sensescapes” can be used as a tool in (re)designing the city in new ways that stimulate the senses – ultimately making the role of the non-visual senses more ‘visible’ in the urban setting.

Key words: sensescapes, multi-sensory, urban realm, language, urban planning, urban design, non-visual.

Impact Statement

The non-visual senses have been underexplored in the literature, practice and policy that are relevant to urban planning and design. However, these senses play a fundamental role in how the quality of public space is perceived, which, in turn, influences how space is used, namely the opportunities it provides to move through, stay, relax, and socialise. Consequently, this research aims at increasing awareness and public debate around the role of the non-visual senses in urban space.

The methods used in this investigation and the outputs it generates can add to the academic research in a variety of fields, from urban design and planning to urban health, and help inform decision making and practice. The dimensions of the concept of “sensescapes” and the framework of analysis can be adapted and used in practice by researchers, local authorities, or consultants in any geographical location. The methodology can be replicated, providing policy makers with tools that can help them to decide where to prioritize urban space interventions. The user-centred methods also allow higher levels of public engagement, which provides opportunities for knowledge exchange. This learning from the research can also be shared through teaching and academic activities (conferences, workshops, etc.), inspiring students or researchers to explore alternative approaches in the analysis of public space and integrate multi-sensory analysis in their academic work or future careers in urban planning and design. This may also generate continued, comparative or more in-depth research on the same themes.

The empirical-based research outputs and their dissemination will increase academic and public knowledge of the non-visual senses and stimulate debate about the relevance of their role in urban public space. The use of social media tools in the dissemination of the research can facilitate the communication of the main research messages to other geographical areas and to the general public, the aim being to encourage a more sensory-aware approach to the planning and design of spaces and ultimately promote more sensory-fitting

urban spaces with positive impacts on public space use, sociability, health and quality of life.

Finally, these methods and knowledge can also be applied in allied research fields, opening up prospects for developing other angles of the research (e.g. in neurodiversity, mental health or disability groups) and benefiting research partners, younger researchers and wider society in the longer term.

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1 Introduction

The constant noise of airplanes and cars in the background. People walking...You know what, you should ask people to close their eyes [in your sensewalks] (Interviewee JG).

1.1 The study, background and motivations

My academic background in urban studies and particularly my past professional experience as a development control planner in Lisbon first made me aware of the hegemony of vision, or the priority given to the visual sense over other senses when it comes to urban planning and design. Even if urban form impacts greatly on non-visual sensory perception, only noise complaints were being routinely considered by the planning system. Smell and touch, for example, were not integrated into the process and most methodologies of analysis were purely quantitative and strictly based on sound level measurements.

This inspired me to question the apparent indifference towards the remaining senses, which have been largely ignored except for some noise and odour nuisance studies. Finding the book *Sense of the City: An Alternate Approach to Urbanism* (Zardini 2005) sparked my curiosity on the subject and the idea to conduct more in-depth research in this field. That book uses illustrations to exemplify the non-visual challenges present in cities and demonstrates the complexity of the different sensory dimensions of urban life. These ideas and illustrations were fundamental inspirations for this research. As Zardini (2005) mentions in his book, cities and their designers need alternative approaches in order to address the challenges the book highlights; an “invitation” that I could not resist. Finally, my personal interest in street photography (a very visual form of art) has provided me with an enthusiasm for walking and exploring cities, further reinforcing my sense that smell, touch and sound are often forgotten when exploring urban life. While this dissertation doesn’t explore visual

perception, this interest was employed through the use of photography throughout the thesis to help describe the atmosphere at the chosen case study location[1].

All these factors contributed to my final decision to start an investigation on the "other side" of the urban environment through a more comprehensive and multi-sensory approach. As the non-visual senses are always there, even if we do not see them as demonstrated through Figure 1 – i.e., the sound of people's presence, the sound of the bus, traffic noise, exhaust fumes, etc.. As an urbanist, explorer, rambler, street user and commuter myself, I am particularly motivated by this important subject.

Figure 1: Urban elements stimulate sensory characteristics often invisible.

This dissertation will focus on the non-visual multi-sensory experience of public space, on the basis that "*sensory experiences are central to the design of urban built environments*" (Degen and Rose 2012, 3) and that public space is where most city life happens. People spend on average 5% of their time outdoors (Spence 2020a), but public space is the main stage for social interaction, social cohesion and integration. This demonstrates the importance of the study of urban environments from a multi-sensory perspective. An examination of how

[1] It would be interesting to explore the link between sight and other non-visual senses (e.g. hapticity from photography or even in film). However, this dimension will not be considered in this dissertation due to the nature of the research questions and aims of the investigation. It was, nevertheless, introduced as an opportunity for future research.

the senses mediate our contact with the world, framing the way we understand the environment that surrounds us and feel comfortable within it.

As one of the goals aims at influencing planning and design disciplines – practice and policy – the creation of a methodological approach felt as a fundamental tool for a better understanding of what makes one space feel different from another through the interplay of body, senses and urban environment. Consequently, this research creates a framework of analysis that can be adopted and adapted by academics and practitioners in future (re)development projects. Bringing the exploration of the relationship between sensory experience and the characteristics of the urban realm to the front of this investigation. Along with acquiring an understanding of how this relationship mediates the experience of different environments, interferes with the use of space, and ultimately facilitates a sense of place: "*The phenomenological approach conceptualizes place as a way of looking and sensing the world, as the experience marker of our existence*" (Rodrigues et al. 2019, 5). The challenge of such a complex research topic required it to be complemented with alternative research methods focused on the space user. In-situ semi-structured interviews allowed data to be collected on location, with the researcher and participants experiencing the same urban space at the same time. The examination of their verbal descriptions through semantic or psycholinguistic analysis[2] (Guastavino 2006; Saitis et al. 2017; Dubois 2000) meant that shared perceptions and sensory patterns could be identified. Visual methods, such as videos and photography, enabled a better contextualisation and depiction of the case-study area.

This research was driven by the conviction that sensory perception is a fundamental element to explore in urban design and planning studies (Lynch 1960; Jacobs 1961; Rapoport 1977; Whyte 1980; Gehl 1987). It recognises that

[2] "The psycholinguistic analysis of how people spontaneously describe their experience of (sensory) stimulations can be considered as one way to study these representations empirically. Instead of starting from physical properties of (the senses) or their sources to describe cognitive representations, semantic categories are identified first through the analysis of linguistic descriptions. Language can be seen as mediating between collective knowledge and individual representations conveyed in discourse" (Saitis et al. 2017, 2747).

most accounts of sensory urban experience are dominated by the visual sense (Devlieger et al. 2006; Howes 2003; Hutchison 2009; Adams et al. 2006; Dubois 2000), that they are often focused on only one sense, neglecting the comprehensiveness of the multi-sensoriality of space (Piga and Salerno 2017; Adams 2009; Agapito 2013), and concentrate on the negative aspects of the urban experience while disregarding the positive ones (Adams et al. 2006; Rapoport 1977; Carmona 2004). These are the main challenges tackled by this investigation, which explores the urban sensory realm through the experience of those using urban public space and, specifically, their spontaneous descriptions of the sensory context of Bishopsgate, London. These perspectives are supported and mediated through a review of the theory and literature on the senses, public space and urban design.

"*The approach to town-centre management has always been about sterilisation (…) We've become so unused to strong smells that we now have adverse reactions to them*" (King 2018). With these words, King demonstrates the growing movement to promote "sanitisation" or "purification" of cities in planning (Rodaway 1994; Classen, Davis, and Synnott 1994; Corbin 1994), a movement mostly linked to health and pollution, e.g. cleanliness, deodorisation related to ventilation control, sunshine, crowd control, personal space (see also sections 2.2 and 2.5). However, most of these elements are experienced as a result of the combination of senses and are not necessarily visual. Highlighting the importance of exploring how the non-visual senses are composed and interrelated, in order to understand how they relate to negative and positive individual perceptions of space and how they might impact the use of public space. At the same time, although not explored in this thesis, we are living in a period where technology and social media are expanding their role as mediators of space experience, increasingly narrowing the sensory experience of space to the limits of the visual realm. Technology, focused on virtual shared experiences (mostly visual or sound-related), restricts sensory comprehensiveness and the social experience of spaces. This growing context

of technological mediation, mostly mono or dual-sensory and dominantly visual[3] (although dependent on touch) also highlights an increasing need for non-visual sensory analysis and for a human-centred multi-sensory experience of public space.

The following chapters, and in particular the three analytical ones (Chapters 4, 5 and 6), will tackle this challenge by emphasising the importance of a multi-sensory analysis of public space with a user-centred methodological approach. This multi-sensory analysis is the starting point of a continuous and on-going research that aims at the creation of a transferable framework of analysis (Thwaites and Simkins 2005; Guastavino 2006; Dubois 2000). In an ideal situation, planners and designers would be able to assess the sensory impact of different design alternatives, enabling more confident decision - and policy making. Hence, the main motivation is the development of a methodology and tools that allow researchers, planners and designers a better understanding of how the urban realm mediates the human perception of space, as changing the urban environment results not only in spatial reconfiguration but also creates change in people's attachment to places. Within an expectation of understanding and improving the quality of the urban sensory environments, and highlighting the need for further research, the empirical work at Bishopsgate, London aims to provide a body of work that can inform subsequent research, practice, and policy – one that can be adapted, extended and developed in the future.

The relationships between the urban environment and the senses and between art and the senses are, however, very similar. In art, the characteristics of brushstrokes on a canvas, for example – the smell of the paint, the texture of the stroke, size, colour, etc. – provoke reactions and emotions in those who experience them. These characteristics are essentially multi-sensory. Some authors, for example, discuss how the "haptic" in film influences emotions (Marks 2000; Shonfield 2003; Barker 2009), emotions that emerge from seeing

[3] "*Screen-based tech is addictive because of vision's position in the hierarchy of our senses*" (VentureBeat 2020).

(mediated by vision) and not touching it physically. In synaesthesia, you often end up borrowing from the other senses and from previous sensory experiences, with texture or warmth being an example, and you put them into the visual. Because all the senses are interconnected and because visual is the dominant sense, people understand the meaning of what they see even if they are not feeling it directly. At the same time, artists such as Barbara Hepworth believe that sculpture (physical art) “needs to be touched to be experienced” (Francesca Ramsay 2020).

Similar discussions emerge in the environment of a town or city. The combination of the sensory stimuli can be seen as the brushstrokes on an urban canvas; the sensory stimuli create the “sensescapes”, a term based on “soundscapes” by Schafer (1969) and “Smellscapes” by Porteous (2006), and a new field within sensory urbanism, which, when perceived, also provoke reactions and emotions within an individual (Agapito 2013; Bruce et al. 2015; Diaconu et al. 2011; Adams 2008). In summary, just as with artwork, open spaces can be experienced and contextualised too. Therefore, thinking of sensescapes as metaphorical brushmarks on an urban background might help us to understand the variety of elements that should be considered and help us to recognise the need for contextual analysis. Starting from such an analogy potentially leads to a new approach and better design of urban space; supported by the study of people’s description of their own sensory experiences. It leads to an examination that evolves from the traditional focus on the negative aspects of sensory experiences, and quality control, to a comprehensive and balanced analysis of the sensory qualities of urban public space.

1.2 Aims and research questions

When exploring urban spaces, the visual dimension has been dominant (see section 2.5). A dominance that has been highlighted through the work of urban planners and designers such as Lynch (1960), Whyte (1980) and Cullen (1996). That same dominance has led most research methods to be based on visual observation and to focus on the analysis of the urban landscape rather than the

sensescape (Porteous 2006; Ingold 2004; Pallasmaa 2005; Degen 2008). Mostly relegating the non-visual senses to the analysis of the ambience or character of spaces (Degen 2008).

Consequently, the aims of this research are to: (1) go beyond the dominance of the visual in urban studies through conducting a multi-sensory analysis of space; (2) understand the characteristics of how we experience public space: our sensescapes; (3) investigate the built environment and human interaction through analysis of the sensescapes; and (4) support urban design and planning practitioners to (re)create more sense-appropriate urban spaces. Thus, the research questions and sub-questions that follow (Figure 2) are not only a way of addressing these specific aims but also form part of a strategy to expand ongoing discussions within the wider fields of urban design and planning.

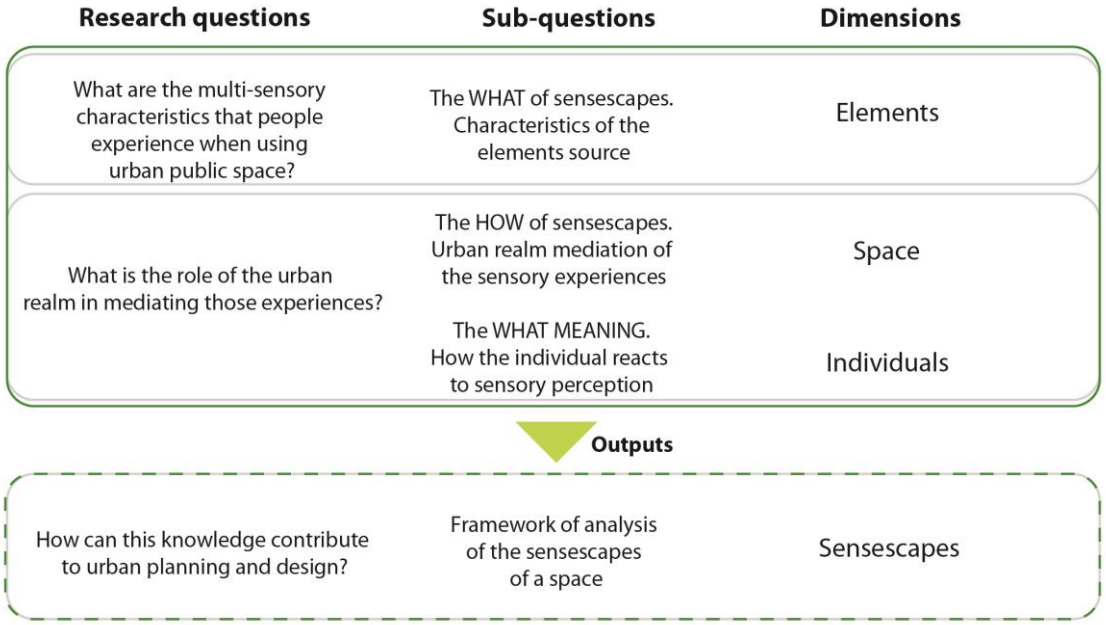

Figure 2: Introduction to the research questions.

The first question underpins the need for an exploration of the characteristics of the sensory experience of public urban space, focusing on the three non-visual senses that are recognised by the street user and relevant to urban planning and design (sound, smell and touch). This involves an investigation of the elements of the urban realm, their dimensions and the patterns that are unique or common to all the senses and the different spaces. From a methodology that

includes sensory immersive in-situ interviews, this thesis proposes adding to the discussion of what are sensescapes in all their forms, through a framework of analysis created to illustrate the different spatial, elements and individual (human) dimensions of the sensescapes of space (Lucas and Romice 2008; Dubois, Guastavino, and Raimbault 2006; Adams 2007; 2008; Wankhede and Wahurwagh 2017); a framework that can be used in the analysis of sensory environments (Thwaites and Simkins 2005; Guastavino 2006; Dubois 2000).

The second question aims to explore and describe the role of the urban realm in mediating the human experience of a space. It analyses the characteristics of the urban realm elements that emerge as sources, barriers or promoters of divergent sensory quality experiences and seeks to understand which types of elements, their relations, patterns and dimensions correlate to particular sensory experiences (Degen 2008; Gibson 1986; Raimbault and Dubois 2005; Vasilikou 2016). It will explore how the senses are composed and interrelated through a multi-sensory analysis. Aiming at creating a body of work that can be the base for further studies, while creating a framework of analysis that will help inform practice – even if it needs to be adapted and developed. It will rethink the way the concept of sensescapes is presented and disaggregated into different components – from their description to their structure, based on qualitative methods. Methods that engage with those that are affected by decision-making and the design of public space, namely street users.

This will help explain why some spaces are more appreciated by users than others and can, therefore, indicate which factors promote an identity of a space and a sense of place. This research also presents an exploration of the characteristics and levels of management of the different elements of these sensescapes (i.e. how easy they are to manipulate and change), helping planners and designers to understand the impact of specific interventions in the context of policy and practice and use this learning to support decision-making and prioritisation. To conclude, this investigation will explore the role of non-visual senses in urban studies and challenge the current visualism in this field (Howes 2003) by highlighting the relevance of non-visual sensescapes in the relation between the individual and the environment, therefore contributing to

the development of sensory studies as a field of research. This overarching objective will be addressed throughout the thesis.

1.3 Research focus

The research focus of this investigation is an exploration of human interaction with the urban environment through the senses, structured around the three research questions presented in the previous section (see Figure 2). To do this, however, a series of choices had to be made, all of which are explained in more detail in Chapter 3. As an example, the decision to exclude the visual sense from the research focus emerged naturally, as this sense is already the dominant sense in academic research and literature (Feld 2005; Zardini 2005; Urry 2002). The taste was also excluded, as individuals do not directly taste urban spaces. The senses that form the focal point of this investigation, therefore, are those that respond to sound, smell and touch (haptic).

Sensory experiences are central to the perception of the urban built environment and, consequently, should have a prominent role in the design of urban spaces, and in particular of public space, where most city life happens. However, visualism is deeply rooted in urban design and planning studies (Stokes, Matthen, and Biggs 2014; Feld 2005; Devlieger et al. 2006; Howes 2003; Hutchison 2009; Adams et al. 2006; Dubois 2000), and only recently have non-visual senses become part of the academic discussion around public space (with a few exceptions as referred in Section 2.4 and 2.5). Consequently, the study of the non-visual senses emerged as fundamental to a more comprehensive, and complementary exploration of how individuals understand the environment that surrounds them.

An important element is the classification of the senses. Section 2.2 explores Aristotle's classification of the five-sense sensorium. However, discussions on the capacity of the human being to perceive space through other senses are ongoing and include, for example, kinaesthesia, the sense of movement, and many others (Classen 1993; Spence 2020a). More recently scientists estimate a number that goes from ten to potentially 33 senses (Howes 2009; Dorothy 2014).

This investigation recognises the variety of scientific enumerations but rather than selecting one over another, it focuses on the basic five senses classification. This reflects the historical recognition of the five-sense classification as discussed in Sections 2.1 and 2.2 (other classifications are in constant revision); the limitations of the adopted qualitative methodology and notably the decision to interview street users and the challenges that would have represented in explaining the complexities of broader classifications of the senses (as discussed in Section 3.2.2); and finally, the need to limit the scope of the research in order to be able to deal with its multi-layered complexity in a suitably rigorous manner (Klement 2003). The challenge of using sense-based language in the analysis of urban spaces is explored in more detail in the three analytical chapters and, in particular, in Chapter 6.

The selection of sound, smell, and touch over vision, is clearly explained throughout this thesis, while taste was left out as it is not a variable to consider when exploring public space. People don't taste space directly even if there are references to how the other senses can affect taste, as argued by Pallasmaa (2005, 59) "*There is a subtle transference between tactile and taste experiences. Vision becomes transferred to taste as well; certain colours and delicate details evoke oral sensations. A delicately coloured polished stone surface is subliminally sensed by the tongue*" as explained in section 2.1. Consequently, this research will only focus on the analysis of three senses – sound, smell, and touch – though exploring, when possible, the intertwined nature of perception. This perspective has only, relatively recently gained attention from urban designers and planners.

Within the context of urban space, non-visual senses have received relatively little attention in the academic literature. However, inspired by the study of soundscapes initiated in the 1960s (Schafer 1969), there has been a recent upsurge of interest in sensory studies from a variety of disciplines. Mostly these have taken a mono-sensory analysis (i.e. of sound or smell or touch) with a focus on mitigating negative sensory experiences (Adams 2008), typically with little direct relation to design disciplines.

The haptic sense (touch) will include not only bodily sensations, such as temperature or feet comfort, but also mental sensations, for example as personal space and crowdedness.[4] Kinaesthetic experiences[5] (Carmona et al. 2003; Spinney 2006; Vasilikou 2016) were considered for inclusion in this investigation, although were later excluded from the analysis as most of the research interviews were conducted in-situ rather than on the move, even though participants walked from location to location within the case study area (sensewalks).

The first element to decide on was the scale of analysis. The selected scale is the street: the scale of urban public space where urban design is managed and all the senses are perceived (including touch), as "*one can catch a brief glimpse of others from a car or from a train window, but life takes place on foot. Only 'on foot' does a situation function as a meaningful opportunity for contact and information in which the individual is at ease and able to take time to experience, pause, or become involved*" (Gehl 1987, 72).

The second element to be determined was the nature of the object: open public space that is open to all and public in its broadest sense, and not associated with any property type. This open public space demonstrates its accessibility to the wider public by being outdoors and presenting no physical barriers. It includes all spaces where individuals can move freely through or could stay if they wanted; from streets and open squares to small green areas.

The methods of analysis were also a component of the project that needed to be considered. The nature and focus of the research required methods that would challenge the classical tools of sensory analysis, dominantly quantitative and still very much based on measurements (Raimbault and Dubois 2005; Adams et al. 2006). As Chapter 3 will explain in more detail, the research was designed to include qualitative methods that would go beyond observation and allow in-situ interviews (see section 3.2.1), promoting an immersive experience

[4] Crowdedness – personal space as a mediator of crowding. The size of personal space largely depends on individual and situational differences (Aiello et al. 1977; IResearchNet 2016).

[5] Kinaesthetic - an individual's awareness of the position and movement of the parts of the body.

for both researcher and participant (Adams 2008; Bruce et al. 2015). The aim here was to choose a method or methods that were user-centred, comprehensive in terms of capturing the multi-sensoriality of space, and that would allow for an extensive variation of sensory descriptions and qualities of space (Dubois, Guastavino, and Raimbault 2006; Adams 2007). Consequently, the adopted method included a set of in-location semi-structured interviews (sensetalks and sensewalks)[6] where participants and researcher are both present (see section 3.1). Sensetalks and sensewalks are part of an array of "*methodologies that may be harnessed towards articulating the social life of the senses inurbanity (…) in order to explicate the doing of sensory ethnography in urban contexts*" (Low 2015, 295).

The case-study area selected for the analysis is Bishopsgate in London. This is an area with a unique assortment of space types, constrained by major roads, which provide a limited walkable area. Walking routes were chosen with the aim of including a variety of urban morphological spaces with different land uses and occupation densities (footfall). This area was divided into different locations where all the interviews took place. These were selected according to their urban similarities and differences, to explore patterns, relations and dimensions of the sensory experiences (see section 3.3). Using thematic analysis, a method often used to analyse qualitative data (Dubois 2000; Dubois, Guastavino, and Raimbault 2006; Guastavino 2006; Bruce et al. 2015), participants' verbal data was studied, exploring the ways individuals expressed themselves and their particular choices of semantics and language. The participants themselves were ordinary 'able' street users. Neurodiverse groups, or groups with sensory loss and deficit were not a focus of this investigation, and subsequently were not discussed in the literature and methods, although their needs and experiences represent an important focus for academic research.

The selected participants included those already familiar with the space (residents and local workers) as well as those only passing by (visitors). These

[6] Based on the methodological approach from authors as Adams (2008); Bruce et al. (2015); Henshaw et al. (2009); Rubidge and Stones (2009) and Vasilikou (2016).

two groups allowed for a more wide-ranging set of answers. Finally, whereas desktop research was required throughout the whole investigation, the three core analytical chapters involved their own methodological approach, mostly based on a case-study analysis and interviews but also including observation, photography, and video (these were used later to complement the contextual space analysis).

This investigation will demonstrate that the new, and more inclusive, concept of sensescapes should be better integrated in urban planning and design. As "*senses interact*" (Turner and Pallaris 2017, 5), multi-sensory experiences are an important factor in how people use public space. However, the concept of multi-sensory sensescapes, even though discussed and developed through some of the most recent academic literature (Porteous 2006; Degen 2008; Agapito 2013), remains underexplored and the subject of ongoing debate. The concept is generally referred to in a simplified and insufficiently comprehensive way, and its definition is often restricted to the fluid panorama of perceptions in space (Landry 2006). Sensescapes are, however, the result of an interaction between humans and urban space; an interaction that is mediated through the senses. This interaction is one of the fundamental relationships in the definition and creation of different qualities of spaces. Therefore, the academic field is in need of more studies that explore, in a more complete way, the role of the urban realm in promoting different sensory experiences.

Consequently, this investigation will disaggregate the concept of sensescapes in its different components while creating a framework of analysis that can be used to fully explore the sensory characteristics of the Bishopsgate area. This study acknowledges the challenge of exploring a correlation between space and perception, and the impossibility of finding a cause-effect relation, since many other factors can and are contributing to different individual and group sensory experiences of public urban space (e.g. cultural, biological, climatic, etc.). Nevertheless, the investigation aims at creating a more focused discussion and a better understanding of the factors framing the sensory context in urban space.

As Spence (2020a, 14) mentions, "*research that has been published to date would appear to suggest that very often environmental cues influence us even when we are not consciously aware of, or thinking about them*". In recognition of this, therefore, the applied methods, with in-situ interviews, will induce awareness of those non-visual sensory experiences that are often not recognised or acknowledged due to their background characteristics and lack of attention or habituation to them on the part of the street user. This investigation seeks to demonstrate that the way people use public space is influenced by, but also influences, sensory experience – these two dimensions reveal the importance of the exploration of the sensescapes of urban space, and of making the non-visual senses more visible in planning and urban design.

1.4 Thesis outline

This thesis is organised as a total of seven chapters, along with a final appendix. It has three core analytical chapters (chapters 4, 5 and 6), preceded by the introduction (Chapter 1), the literature review (Chapter 2) that explain their relevance in the academic field and the methodology (Chapter 3) where the methodological approach, methods of data collection and analysis will be described and justified. The final chapter presents the conclusion, which provides a summary of the main outputs and future research opportunities (Chapter 7). The core analytical chapters have a strong spatial approach as these depend on the spatial context, but their outputs aim to act as inputs to the (re)creation and (re)design of any other space conditions. All the exploration of the sensory perception and the human–space relation is supported by the language and content analysis from the street interviews. A detailed description of all the chapters, along with an explanation of the rationale for their sequence and structure will be presented next.

Chapter 2, the literature review chapter, explores and evaluates the available literature in relation to the non-visual senses. It surveys the existing literature and theories on the senses and synthesises it in seven sub-sections. It also illustrates the historical evolution of the senses, some of the theories and the

limitations of planning and design in this regard. The first section, titled ‘The senses’, provides an overview of the importance of the senses and perception in human life and space. The second, ‘Purity and sanitisation’, introduces the hierarchy of the senses and the importance of “visualism” in Western urban society, illustrated in two different historical contexts. The third, ‘Discussing the philosophy of the senses’, looks into the discussion of some of the key concepts involving literature from many other disciplines, including psychology and philosophy. The fourth, ‘The good, the bad and the need for a referee’, will demonstrate why current planning policies are considered by some authors as incomplete, through the analysis of the human–environment relations. The next section, ‘Planning (and) the senses’, explores how the sensory question is addressed by some of the main authors and literature in planning and design. Finally, the section on ‘Sensescapes’ will illustrate how an emerging concept proposes a more comprehensive analysis of space in planning and design. This concept and its relevance within the urban studies field are the aims of this investigation, which starts with the analysis of the multi-sensory characteristics of what people experience when using urban public space, and finishes with the exploration of the role of the urban realm in mediating sensory experiences and human behaviour.

Chapter 3, the methodology chapter, explores in detail the full methodological process of the data collection and an overview of the analysis. This describes the selection of a user-centred qualitative method based on a mixed-method approach (mostly supported by in-situ semi-structured interviews) and the choice of the case-study area and data analysis methodologies, including a discussion of some of the challenges and opportunities they present. The selected approach promotes a total immersion of researchers and interviewees in the research areas and a fully embodied, multi-modal experience. This chapter is complemented by a short literature review and methodological overview relating to each of the three core analytical chapters. This introduction provides a more focused basis and inspiration for the specific chapter method of analysis. Furthermore, Chapter 3 will introduce the basic list and categorisation of the urban realm elements to be used on the sensescapes analysis of Bishopsgate (Table 3), which is the focus of the first section of the framework of

analysis, which relates to spatial characterisation and exploration of the urban context/space. Overall, this chapter introduces the methodology supporting the analysis of the sensescapes through its three dimensions: identification, mediation and impact. Each of these dimensions corresponds to one of the following core analytical chapters.

Chapter 4 is the first in a set of three analytical chapters that, together, aim to understand the concept of sensescapes, going beyond the simplicity of the existing definitions and frameworks. These three chapters will challenge current definitions and deconstruct the concept of sensescapes into its different dimensions, looking at the stimuli, space and the individual, in order to create a more comprehensive framework of analysis that can operationalise these dimensions. These dimensions of the sensescapes are established through in-situ descriptions of how people experience spaces through their senses – the language that they use to describe spaces articulates a clear connection between humans and their sensory perceptions. These descriptions establish the context of their experiences and provide the information necessary to create a framework of analysis of the urban sensory environment in Bishopsgate, London. This framework is not intended to be a complete, closed and finished structure, but rather a process that is as comprehensive, open and adaptable as possible, and presents a starting point for the exploration of the sensescapes in different geographies, times and spaces. Chapter 4 intends to respond to the first research question and explore what people experience when using urban public space. It will explore the cognitive and interpretative dimension of perception (Carmona et al. 2003) and, in particular, identify what it is that promotes the sensescapes of a place, focusing on the individual elements and their qualities. Its starting point is a simple framework of analysis in which the designation and quality of an element are the main categories used to describe a stimulus. The simplicity of this framework will be questioned, a detailed analysis of the descriptions and language used by the participants in their in-situ sensory responses will be undertaken, and the scope of the framework itself will be developed to ensure greater comprehensiveness. Inspired by the work of such authors as Dubois (2000), Dubois, Guastavino, and Raimbault (2006), Guastavino (2006) and Bruce et al. (2015), this chapter will demonstrate that

the language that people choose to use and the ways in which they express themselves can mean as much as the content of what they say. Consequently, verbal data emerges as a methodological finding that will also be used in the chapters that follow. This output (framework of analysis) is then used to explore and analyse the sensory environment of the Bishopsgate, London case-study area, investigating in more detail its different locations and the main elements that provoke the variety of stimuli perceived by the research participants in those places. Based on the number of references made to the sources and qualities of particular elements, a graphic visualisation has been created that facilitates the exploration of spatial patterns through each element's distribution and co-location. This sensory analysis follows the main categories outlined by the analytical framework (e.g. qualities, dominance, absence, etc.), namely the dimensions that mostly relate to the idea of fluidity of experience within a space (Figure 49). Consequently, it explores the qualities of the space and continuity of the stimuli or qualities experienced. The recognised elements will be categorised and clustered through the analysis of their nature, using the list of urban realm elements created in Chapter 3. Finally, this chapter will finish with a comparative analysis between the three senses (hearing, smell and touch), in which all elements from the analysis will be defined as intra-sensory or inter-sensory depending on the participants' descriptions and their relation (presence) to the different senses (see section 4.5.2).

Chapter 5 is the second of the three analytical chapters and focuses more on the question related to how the urban realm mediates sensory experiences. This chapter will explore the evaluative dimension of perception (Carmona et al. 2003) and seek to understand the role of space through the human–space relation, from the analysis of the sensory descriptions provided for three different sensory quality locations. This is based on the fact that "*perspective is aligned with the social-geographical notion of space, in which meaning and experience merge as a result of the interplay between people and their environment*" (Rodrigues et al. 2019, 6). It establishes an understanding of how sensory experiences are mediated by the urban realm and its characteristics, the reasons why particular space conditions seem to promote divergent space qualities (negative, neutral, or positive spaces) and the qualities that emerge

from the dominant qualifications of each of the space sensory experiences. The analysis of the verbal content, language and semantics of the participants' responses is, once again, the method of analysis used in this chapter. However, rather than trying to identify all the stimuli that are present in a location and their characteristics (as occurs in Chapter 4), this chapter explores the spatial patterns that seem to be promoting particular space qualities. This examination not only considers the analysis of the elements individually, and in combination, but also their relationship with space and the type of space use (a space to stay, pass by or avoid). An example of a pass by area is provided by one of the participants relating it to area O–P: "*Bishopsgate as it's very busy, with commuters. Crowding, people doing exactly the same everyday, that don't move much from their own direction apart from getting the bus!*" (Interviewee 14).

Building on Chapter 4, this chapter presents a more in-depth analysis of space, and introduces another dimension to the framework of analysis. It will add to the current understanding of the complexity of the sensescapes analysis, highlighting the need for a more comprehensive and cross-sensory investigation into how the urban realm mediates sensory experiences. As sensescapes have a fundamental role in the promotion of different qualities of space, with a strong impact on space use, the manageability of the elements creating these conditions emerges as a fundamental issue in urban planning and design. The chapter concludes with a table introducing a classification of the manageability levels for the different categories of elements within the urban realm (see Table 15), which can be used to inform decision making and prioritisation of particular elements when (re)designing public space.

Chapter 6 is the last analytical chapter. It explores how people react to the sensescapes and the impact of the stimuli on their individual perception and behaviour, in relation to the affective dimension of perception (Carmona et al. 2003). How participants describe their sensory perceptions, from the words they use to how they express the impact of the sensory event are some of the issues to explore in this chapter, as shown by this description where 'disgusting' and 'try to stay away' are an example: *"by Starbucks, there is a disgusting smell - I try to stay away from that area, but I have to walk past it everyday*" (Interviewee

43). It focuses on the individual meaning of the sensescapes of a space. The outputs of this chapter will add a final, and more human, dimension to the framework of analysis. This chapter progresses beyond the results of the two previous chapters, the analysis of the elements and sensory stimuli in space, into a more in-depth understanding of the relation between all these variables and the consequences for human behaviour. It delves into how people reflect the qualities of their experiences through their verbal outputs, the adjectives and expressions that they use, along with some behavioural patterns that emerge from their descriptions. The chapter confirms the importance of identifying the type of element and its characteristics, reinforces it through the implications these have for the individual experience (and also for research and practice in aspects of space use and behaviour), and seeks to highlight some of the policy implications presented by the sensescapes analysis. It offers a more methodological contribution on how to investigate descriptions of stimuli and acknowledge the different natures of the elements. This chapter builds on Chapter 5 in responding to the second research question and it adds the final piece to the framework of analysis. The diagram in Figure 3 reflects the conceptual process of the three chapters and the logic of their sequence. Shows the different dimensions to consider in this thesis: the 'What' with the exploration of the elements, the 'How' and how the elements mediate; and the 'Impact' of the sensory experience in the individual.

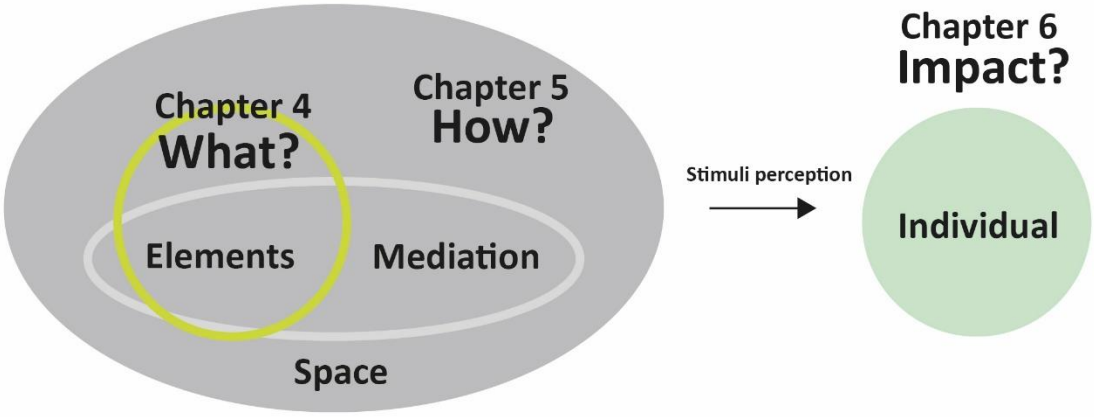

Figure 3: Analytical chapters – a conceptual diagram.

The strong methodological approach of this research is a primary enabling factor in revising simplified explorations of the sensescapes and creating a

more complex framework of analysis, one that includes reflections on the relationship between human–space and the senses. The complexity of the urban space as an object makes it impossible to control variables and therefore to explore possible correlations between these variables and an action–reaction analysis. This investigation is, nevertheless, a solid attempt to examine possible sensory relationships between elements and individuals when some qualities of the space are already known. The third research question is answered by the three main analytical chapters in synthesis; a combination that provides the full framework of analysis of the sensescapes of a place, and presents a structure that can be useful to researchers, practitioners and policy makers in urban sensory analysis, design and planning.

Chapter 7, the final and concluding chapter, highlights the main outputs from this research project, explains how the three analytical chapters respond to the main research questions, and identifies the main research gaps in the academic literature. In particular, for the latter, a critique of the dominance of the visual and highlighting the need for a multi-sensory analysis of space (in this case with the incorporation of the sound, smell and touch senses) and analysis of the positive together with the negative sensory qualities of space. This chapter ends with an introduction to some of the future research opportunities that emerge from the current research.

Finally, the Appendix introduces a set of tables supporting the analysis. The first table provides a short compilation of the key comparable characteristics of the different route locations, which can be used as a general overview of the case study area or as a basic structure for the core analytical chapters (Table 20). Next, a group of tables (Table 21 to Table 23) provide representative examples of the different phases of the coding process of the interviews.

To conclude, this research aims to create a body of work that can be the basis for further research, while helping inform planning and urban design practice, one that includes participant's engagement and collective sensory landscapes in decision-making. This uses the concept of sensescapes to support the development of sensory urbanism as a field of study, and a medium to help understand and research other fields.

2 The Need to Make Non-Visual Senses Visible

It smells like urine. I don't like it of course! It's a bit heavy and it reminds me of the dirtiness and filth in the city (Interviewee BB).

Too many people in London for me. People knocking to you, no regards, no manners. Just get out of my personal space! Attitude and arrogance in London. Main issue in London is the people! (Interviewee 10)

Yes, it's dead, on weekends. It feels deserted and depressing (Interviewee 36)

This chapter aims to review existing literature to illustrate the ways in which the non-visual senses have typically been dealt with in planning and urban design and highlight the need to make them "visible". Doing this it will help create a theoretical framework – supported by theories, hypotheses, and concepts – that will be used in the construction of the analytical chapters of the research. The initial section headed 'The senses', presents an overview of the senses and perception and their relevance to human life, from daily routines to urban-related issues. This is followed by 'Purity and sanitisation, a historical "blindness" against non-visual sensing', a historical overview of the nature of the senses, considering some interdisciplinary examples from sensory studies. This establishes a suitable background for considering past and current problems regarding the senses and the city and an exploration of some of the adapted solutions that appears in the next sections. The section 'Discussing the philosophy of the senses' helps determine the position about what a sense means to this work through the review of theoretical models from different authors. In 'The good, the bad and the need for a referee' the human–environment relationship is the baseline for a discussion of the concept of perception in empirical design. This is followed by a discussion of the positive and negative qualities of sensory perceptions and the way in which planning practice has been dealing with these – it considers the current "logical" solution of regulating the bad, defining the good and adopting registers and measures to

distinguish them. ‘Planning (and) the senses’, offers an introduction to some of the classical thinking in planning and urban design, regarding the senses and sensory stimuli in urban space. The section on ‘Sensescapes’ discusses the need to explore the “invisible” of the city (in opposition to the “visible”) and introduces the wider range of the “urban sensorium” (Nash and Carroll 2006). It is important to highlight that the idea of ‘making the non-visible senses visible’ introduced in this chapter it is not related to the intention of “visibility” as a quality that these senses should aspire to. It is aimed at raising awareness of the fact that these “invisible” senses are often as relevant, or more relevant to public space use, than the visual one. The study of these senses can add to the understanding of the urban environment in their own terms. Finally, this last section considers what currently exists beyond the visual in planning practice and analyses new approaches in planning (and some related areas) that look at the senses using a qualitative approach. Introducing the concept of sensescapes here demonstrates the need for greater and more comprehensive spatial and graphical representation of the senses. This part ends with an introduction to some of the most recent literature on multi-sensory planning and indications are given as to how these to frame the development of the current research.

2.1 The senses

Human beings have a multiplicity of senses beyond the five that are typically recognised. The numbers of these vary and even reach numbers as 33 different senses (Gray 2017). However, the five basic senses: touch, sight, hearing, smell, and taste are those most widely recognised by scientific and academic literature, but also by the layperson – a fundamental factor that informs this research. These senses, through their associated organs, provide information on the external environment and send information to the brain that helps the individual understand what is surrounding him or her (exteroceptive senses). Each sense has its own specific cells for selecting its own type of information and each sense has its own area in the brain where the information it collects is scrutinized (Robinson 1964). Senses mediate humans’ experience of space and

the fullest experience of the living world is only achieved through a combination of all senses (Rodaway 1994). While the human perceptual system highlights the potential of what the environment offers to the individual (Gibson 1966)[7], the way humans experience the urban environment also depends on their own innate capacities (Mach 1959) or "sensorial capabilities" (Adhitya and Tyler 2016, 63). Apart from kinaesthesia and body temperature, which were associated with touch in this investigation, other interoceptive senses, sensory signals received by the brain and derived from the internal body, such as pain and balance (particularly important for hearing), were not considered in this investigation.

Touch is the sense that consists of sensations communicated to the brain through the skin and therefore a sense of proximity. This is often related to textures but can also be more broadly linked to ideas of personal distance, temperature, etc. Sight is the sense perceived through the eye. This is often more limited at night when other senses usually compensate. Hearing works through the ear, where sounds are mostly perceived through vibrations (sound waves). Smell operates through the nasal cavity. Humans have 400 smelling receptors and a complex brain to analyse scents, and are able to detect more than one trillion scents (Lewis 2014). Finally, taste, is the gustatory sense that distinguishes salty, sweet, sour and bitter tastes. As the taste buds are mostly on the tongue and throat, taste will not be considered in this investigation of the senses in the urban environment. Nevertheless, it is worth noting that smell and touch (textures) often affect the way the brain perceives taste (Bradford 2017). Descriptions of additional senses can be found in neurological literature (Francis 2020) and variations of these exist for different people. There are also specific impairments related to the different senses which will not be covered in this analysis.

Humans are, therefore, multi-sensory, and the combination of the senses is the mechanism that has evolved to support survival in the natural world (Korte 2017; Franco, Shanahan, and Fuller 2017). However, with changes in lifestyles

[7] This theory is reflected in the concept of affordance (Gibson 1966).

and, for many people, a lifespan now largely spent indoors, adjustments to the sensory thresholds have occurred. "*We are currently experiencing 'a state of mismatch' between the ways our senses evolved and our current surroundings*" (Kara Hoover in Korte (2017)). The senses become atrophied or over-sensitive, producing such common reactions as stress, anxiety and depression (Francis 2020), but also in some cases reflecting positively on mood and memory. When outdoors, individuals not only experience smells, sounds, or textures but also related sensations, such as cold, hunger, expectation, nervousness and so on.

In terms of human activities, even in nocturnal environments humans are highly visual dependent (see also section 2.2 for a historical perspective). Sight drives more of the everyday aspects of human life. However, the modern lifestyle comes at a cost for human visual levels, with the extensive use of computers, smartphones and other similar activities contributing to eye and vision problems. Senses such as smell, which were a later adaptation in humans to aid survival and reproduction, are often linked to the identification of food and spoiled food or even to the selection of sexual partners (there are dating sites based on matching odours (Mufson 2016)). Smell is often related to changes in mental, social and physical health. Socio-spatial inequalities, demonstrated by different professional activities, levels of pollution, etc., are promoting sensory inequalities all over the world. Taste preferences and human predilections for particular flavours can also harm or help human health since diet and an adequate selection of foods is fundamental for human survival (Korte 2017). Touch and taste are senses of proximity whereas sight, sound and smell can be perceived at a distance. In broader terms, taste and touch demand a more active engagement from the person experiencing them (except for temperature-related haptic sensations), while vision, sound and smell may emerge passively even, without any particular action taken by the individual.

In the current understanding of the human senses, their integration and influence in the context of space use are still underexplored, in particular in the case of the non-visual senses (Zardini 2005). In most cases, multi-sensory research and practice to date have been focusing on buildings and indoor spaces, such as churches, hospitals or even commercial areas. Churches with their acoustics and music-driven ceremony (Sheridan and Van Lengen 2003;

Guillebaud and Lavandier 2019), hospitals and prisons with calming sounds to soothe their patients or inmates (Zanker and Glatt 1956; Bensimon, Einat, and Gilboa 2013), and cinemas with their popcorn smells attracting those who pass by (Spence 2020b) are only a few examples. The idea of signature scents for spaces (Spence 2020a; Albrecht 2013; Warnaby 2017), and new disciplines, such as sensory marketing and sensory branding, have emerged, all very much related to the hotel industry, which target all five senses to attract clients and keep them satisfied (El Hussein and Mohamed 2019; Tambourine 2015; Pawaskar and Goel 2014; Yozukmaz and Topaloglu 2016).

This dominance of architecture in sensory studies might relate to the fact that, on average, people spend 95% of their time indoors (Spence 2020a). Urban designers should follow this lead, and explore how the multi-sensory urban environment and atmospheres it creates affects its users – and in part that will depend on how individuals cognitively interpret and/or attribute the sources of the stimuli – so as to be able to create spaces that improve social, cognitive and emotional development rather than hampering it (Spence 2020a). Although the study of the senses in architecture is beyond the scope of this study, it is important to recognise the importance of sensory studies in interior design and the use of sensory techniques influencing human behaviour. By taking cues from architectural research a more sensory focussed analysis of public space might emerge.

What a space sounds like can provide important cues to its size, design and function. However, when considering sound, architecture, like planning, mostly focuses on avoiding or minimizing unwanted noise (Porteous 1996; Spence 2020a). The effects of loud background noises and noise distraction are architectural sensory elements that can also relate to urban environments. From another perspective, the use of nature sounds, such as running water, has been already translated from the architectural field to the urban space. The case of Paley Park in New York City, where a waterfall was installed to mask negative, unwanted traffic noise, is an example. Here, the availability of moveable chairs enables the park's users to sit as close to this source as they feel they need to and greenery along the sides further helps absorb unwanted noise (Spence 2020a).

The haptic elements of a space are important, although these are often ignored, even in architecture (Spence 2020a). In a building, physical contact often exists (especially at the point of entering and leaving), but in urban space that contact is more limited and often reduced to an experience of temperature changes and pavement types (Ingold 2004; Tewell, Bird, and Buchanan 2017; Paterson 2009). The personal space of an individual and how they may feel about crowds and the idea of touching others, which is often described as the invisible second skin, requires consideration when designing indoor and outdoor spaces (Worrall 2018; Graziano 2018; Hall 1969).

Within architecture, reflection on scents and odours has been mostly linked to seeking to eliminate negative odours or using scents for retail spaces (Davies, Kooijman, and Ward 2003) and specific facilities (e.g. hospitals). Lately, the relation between taste and smell has also been considered in the architecture of places where food is consumed. Smell is the most evocative of all the senses, with its strong relation to memory (Holl, Pallasmaa, and Gómez 2006; Bowring 2006; Willander and Larsson 2006). In relation to commercial activities, food and memory are also elements that can be analysed when exploring the sensory realm of public space (Henshaw 2013). Similarly to the influence of sound, with smell there are also underlying effects on behaviour. Some scents can attract or calm (e.g. aromatherapy or flowers in parks), provoke reactions that can be physical (e.g. disgust or delight), suggest the idea of cleanliness (e.g. citrus smell), or even mask odours (e.g. stronger odours are added to the environment to change or hide other odours). While sounds can also promote calmness or stress. The effects on the mood created by exposure to particular odours indoors have already been examined in research studies (Spence 2020a; Henshaw 2013), but a similar exploration of such impacts in outdoor spaces, and in particular urban environments, is still in the initial stages. The mapping of smell and smellscapes is an emerging dimension in academic literature (Henshaw 2013; Henshaw and Adams 2009; Henshaw and Bruce 2012). In regards to taste, if architecture itself can’t be tasted, the design of the building might nevertheless have an impact on how the flavour of food is perceived. Similarly in urban environments, pollution or light variations might affect the way food is tasted (Spence 2020a). Issues of cross-modality and

interactions between sensory modalities, are also essential to consider, reinforcing the argument to first understand the role of each of the senses, in modality-specific studies. Cases of visual feedback on the location of sounds, or of tactile compensation in the case of visual deprivation are some of the more common cross-modal interactions in urban studies (Marian, Hayakawa, and Schroeder 2021; Theeuwes et al. 2006; Rauschecker 2018).

In summary, although the impact of each sense should be acknowledged and analysed in isolation, it is their interaction that will determine the human response to the environment. This is because "*what we hear and smell, and what we think about the experience, is often influenced by what we see, and vice versa. The senses talk to, and hence influence, one another all the time, though we often remain unaware of these cross-sensory interactions and influences*" (Spence 2020a, 14). If the characteristics of the exploration of space are debated in the literature, the approach to take in that same exploration is also an important decision to make in sensory research. The in situ exploration allows a more phenomenological approach where the body is the extension of the context and allows for the comparison and awareness of rhythms in the process (Lefebvre 2004; Lucas 2009). As with Lefebvre's Rhythmanalysis, in situ analysis is a form of 'participant observation' as it includes the adjustment of the body and the senses and provides 'critical distance' and immersion (Vermeulen 2015). Passive subjects and control of variables might be important in some disciplines, but in urban design and planning it leads to a lack of fundamental elements of perception that can only be explored in location. A passivity that is criticized by Gibson (1966), who reflected a more active approach in his perceptual systems categorisation. This, together with his theory of affordances in design, has been influential in sensory research (Lucas and Romice 2010).

In urban analysis, a full awareness of that interaction can only be achieved in situ, even if people in urban environments are often not consciously aware or thinking about the senses (Spence 2020a). Malnar (2020, 146) explains that "*the point of immersing people within an environment is to activate the full range of the senses*" as human experiences of spaces are multi-sensory. Urban planning and design can be a reactive or proactive process. Rather than

responding to complaints and problems, urban designers could start designing for the senses at the outset, creating more immersive, engaging and memorable experiences (Spence 2020a), while making the non-visual senses more visible.

The next section will present a brief historical overview of how the non-visual senses came to be marginalised. It will provide a short introduction to some studies on the nature of the senses and discuss why in the past (and still today) some of the senses were considered disturbing and to be eliminated from the urban environment.

2.2 Purity and sanitisation. An historical "blindness" against non-visual sensing

The current focus of urban planning and urban design in dealing with noise and odour complaints and problems has led to the increasing "sanitisation" of cities. This approach goes back to the mid-eighteenth century when the historical process of sanitising the urban environment began. The transformation of the character of public space started with establishing regulations around street cleaning, paving streets and even garbage collection (Picker 2003) – the dominance of the visual aspect of the "hygienic" has been a constant factor in shaping cities right up to today. This section will explore the role that the senses had in characterising urban spaces in the past, in order to better comprehend the role they have now in current planning practice.

Sensory analysis in urban studies started with an initial discovery of the nature of each sense and the relationship that has with the whole body (a process of learning about human characteristics). Later, an understanding of the need of each sense was associated with the function it could perform in daily urban life. In the case of the non-visual senses, those functions became significantly enhanced during night-time (a process of exploring human characteristics). In the mid-19th century, the non-visual senses were then only seen for all the bad properties they represented, the negative impacts they could have on urban life and the perceived need for purity and sanitisation. A "blindness" to the positive role of the non-visual senses emerged as part of a process of "sensory

rejection". Table 1 introduces some of the key literature to expand in this section.

Table 1: Key literature on the historical blindness against the non-visual senses.

Time-frame periods	Senses assessment	Some examples
Nature of the senses by Aristotle (Synnott 1991)	Hierarchical	Superior vs. Primary
16th to the 18th century of Western history and literature (Ekirch 2006)	Functional Night-time role	Orientation, navigation, way posts
Mid-19th century (Picker 1999; 2003; Stallybrass and White 1986; Adams et al. 2007; Degen 2004)	Social hierarchies linked to pure or impure (sensations) Purity and dirt linked to fear and spatial order	"Regulation of touch" Music as a "kind of bodily infection" Pavements for feet comfort and dirt battle

In the past, since the Classical period in Ancient Greece, the study of the senses was mostly in relation to investigations of the body and not yet in relation to the city. Synnott (1991) shows that one of the first authors to understand the need for the sensorial in daily life and consider the usefulness of each sense in nature was Aristotle. The Greek philosopher, however, as others would in the future, devoted more time and attention to the visual sense. For Aristotle, there was a clear hierarchy in the senses and he privileged sight, the most developed of the senses. Above hearing and smell, which he considered greater than taste, he believed sight was superior to the sense of touch: "(…) *No doubt because it is so enlightening, so pure and so clear*!" (Synnott 1991, 63). Aristotle described touch as "*the primary form of sense*", however, believing it to be primary because it belongs to all animals and "*many animals have neither sight, hearing nor smell"* (in his view). Primary because, unlike other senses, touch requires direct contact (so does taste, he added, but taste is a form of touch) and consequently is essential not only for wellbeing but also for being (see also Aristotle (1984)). Synnott argues that, although subject to some small changes proposed by Hegel, the Aristotelian ranking of the senses persisted over the centuries. The reflex of this hierarchy in urban society

behaviour has remained almost unchanged throughout history – with the treatment of the non-visual senses in Western literature associated with the function they could perform in daily urban life, but mostly restricted to their night-time role.

Throughout Western history the role of the senses and perceptions in the experience of a city has been recorded in the literature that describes day-to-day life in urban space, although with sustained emphasis on the role of vision as a primary sense. The other senses, despite being seen as secondary, would, however, have a fundamental role during the night-time, when vision becomes noticeably limited, and the other senses are required to compensate for this. When there is an absence of light and, therefore, limits to vision (at a time when there was no regular public street lighting), it is necessary to rely on other senses in order to move in and around the city. When this happens, a clear qualitative appreciation of the senses is possible, and each sense is attributed a negative or positive role. References to excerpts from literature illustrating the role of the senses at night are collated in Roger Ekirch's[8] (2006) book *At Day's Close: A History of Nighttime* and are used here to illustrate the challenges and opportunities presented by the senses for night-time urban navigation during the 16th to the 18th century period.

"*The Yorkshire yeoman Adam Eyre vowed 'never hereafter to stay out in the night.' Afraid of robbers and the 'bad' night air, James Boswell resigned himself 'always to be at home early, in spite of every temptation'*"[9] (Ekirch 2006, 118). This first extract clearly demonstrates the impact of the lack of visual cues at night with fear and a sense of unsafety. Consequently, in order to move around the city during darkness, every help from the other senses was needed: "*Even smells could help to orient persons to their locations, all the more at night when noses grew more sensitive and odors lingered in the damp air*" (Faber, ed., Gay Works, 83 in Ekirch (2006, 134)). If smell was important, touch was too, as it would "*enable individuals to navigate at close quarters, warily shuffling their feet*

[8] Particularly his chapter titled 'Darkness Visible: Navigating the nightscape'.

[9] Reference to Dec.24, 1647, Yorkshire Diaries & Autobiographies in the Seventeenth and Eighteenth Centuries (Durham, Eng. 1886), 81–82.

as they advanced with outstretched arms". (…) "Has not wise nature strung the legs and feet / With finest nerves, design'd to walk the street? / Has she not given us hands to groap aright, / Amidst the frequent dangers of the night?" (Faber, ed., Gay Works, 83 in Ekirch (2006, 134)). Finally, the role of sound, both natural and human made, has been important in creating a sense of direction. We are told that individuals "*proceeded with great caution and deliberation, frequently stopping to look forward and listen. Where wind and rain, by their sounds, could help to reveal the contours of a landscape, familiar noises afforded welcome wayposts*" (Barber, 'Traveller', 39 in Ekirch (2006, 133)). Ekirch is only one of many authors exploring the experiences of walking in the nocturnal city (Dunn 2019; Dunn 2016; Beaumont 2014; 2021; Armengaud 2016; 2005). As Dunn (2016, 7) mentioned in his introduction, the nocturnal city is "*a place and time within which escape from the calibrations and shackles of the daytime is possible*". Highlighting that daytime and night-time influence in different ways people's perceptions and experiences.

Later on, during the Victorian age in London, the senses were often linked to the idea of promiscuity and lack of hygiene. The quest for purity and sanitisation would get stronger often in response to increasing problems between the lower and middle classes in London, leading to the creation of a "regulation of touch" (Picker 1999; 2003). Social issues, together with sensory overload from the high levels of industrialization in the city (e.g. The Great Stink of London in 1858) introduced new, although not good, perspectives to the haptic, visual and olfactory senses. Jenks demonstrates some of the relations to social issues found in populated city centres:

"*But since the promiscuity of public space was unavoidable, one must take all the greater effort not to touch any 'undesirable'. The 'more refined person' was to avoid even the slightest contact, so far as possible, with bodies and garments of other people (...) especially in the densely populated centres of the cities, like germs in an unhealthy body*" (Jenks 2004, 201).

Picker (1999) argues, however, that not only the role of touch but also the role of sound should have been noticeable at the time. In an industrial city such as London, where hearing conditions were changing, problems associated with

urban sounds were on the rise. Noise in London was increasingly present but still appears to a large extent to have been overlooked, given the absence of discussion of noise by authors such as Stallybras and White (1986). At the same time, social issues were also addressed through sensory sanitisation. When writing about Victorian (sound) professionals, Picker (1999) observes some of the challenges of sensory perception in urban streets and its link to social status:

"*Urban street culture posed a particular threat to these workers because, unlike members of the more established professions, they lacked a separate, official workplace that affirmed their vocational status. Indeed, their fierce assault on musical nuisances during this period represented more than merely another attempt by the middle classes to sanitize urban streets in the tradition of the 1839 Metropolitan Police Act*." (Picker 1999, 428)

Street music was at the time presented as "*horrible sounds*" (Adams et al. 2007; Picker 1999, 62) and sometimes even referred to as a "*kind of bodily infection*" (Adams et al. 2007; Picker 1999, 67). Concepts of purity and dirt were, at this time, emerging strongly and were inherently linked to fear and spatial order. Social hierarchies were played out in space through the employment of negative or positive sensory associations which would define who and what was pure or impure (Degen 2004).

"*Dirt offends against order. Eliminating it is not a negative movement, but a positive effort to organize the environment. (...) There is nothing fearful or unreasoning in our dirt-avoidance: it is a creative movement, an attempt to relate form to function, to make unity of experience. If this is so with our separating, tidying and purifying, we should interpret primitive purification and prophylaxis in the same light*" (Douglas 2002, 2).

Edward T. Hall (1969), when discussing the concept of dirt in modern society, has commented that the extensive use of deodorants and the need for the suppression of smell in the USA has led to, once more, a sensation of cleanliness, purity and, as a result, a land of olfactory blandness. Such a sensation may promote a notion of power and control but at the same time it creates a feeling of sameness and undifferentiated spaces, essentially depriving

people of some of the richness and variety of modern urban life that they might otherwise experience. In contrast with the discussion above regarding the important functions that odour performed in the past, Ekirch (2006), Hall (1969) observed that odour was being increasingly ignored and its importance suppressed by modern society. In other senses too, even basic, daily-used products, such as boots and shoes, were created to control sensations (in this case through the feet) by reducing the sense of touch (Ingold 2004). In urban areas the sensory relationship between ground surface and individual (and therefore touch) has been weakened and controlled: in the USA, as in other countries, special pavements have been adopted as a means of greatly improving foot comfort for pedestrians as well as dealing with dirt in streets (El-Khoury 1996; Holley 2003).

Stallybrass and White (1986) and Douglas (2002) connect impurity and dirt mainly with the visual and tactile senses. Picker (1999), who criticizes the absence of hearing in urban studies, writes about the relationship between sound and order in the urban environment. All these authors, however, only present the negative aspect of sensorial experiences. They focus on the elimination of unwanted sensory experiences in order to regulate and control urban surroundings and construct pure and clean environments (Degen 2004). Indeed, the positive side of sensorial experiences, together with any more comprehensive study of how the senses interrelate, has been overlooked in the majority of current literature. This has consequences for the study of the urban environment and urban planning. As Mags Adams and her colleagues suggest in their study of sound and soundscapes (Adams et al. 2006), this absence may be explained by the difficulties of acknowledging, recording and evaluating perceptions of some senses and of positive sensescapes: "*It is very plausible that such issues would be rejected in a system where scientific rationality dominates*" (Adams et al. 2006, 2389). Some scholars, such as E. T. Hall (1969), underline that a more positive (or less negative) and comprehensive understanding of the role of the senses can help improve urban life. In the northern European tradition, most Americans have cut themselves off from a powerful communication channel: olfaction. Hall highlights that cities lack both

olfactory and visual variety and consequently lack the sense of life and reflections of daily living.

"*Anyone who has walked along the streets of almost any European village or town knows what is nearby. During World War II in France I observed that the aroma of French bread freshly removed from the oven at 4.00am could bring a speeding jeep to a screaming halt. (…) In the typical French town, one may savour the smell of coffee, spices, vegetables, freshly picked fowl, clean laundry, and the characteristic odour of outdoor cafes. Olfactions of this type can provide a sense of life; the shifts and the transitions not only help to locate one in space but add zest to daily living*" (Hall 1969, 47).

In the nineteenth century, a balcony on a building was a place from which one could gaze out to the city but not be touched, where one could participate in the crowd and yet be separated from it. The prevalence of skyscrapers in the development of the modern city is, again, a good example of how this intention to minimise touch and promote visibility has continued to develop (Robins 1996, 20); an idea that continues to be pursued today. The concept of dirt from Douglas's work is fundamental to understanding the context and reasons behind the ideas of sensory sanitation. To Douglas (2002), there is no absolute dirt as dirt can't be seen outside a system of classification within which it seems not to fit, a rejection from the normal scheme of classifications and consequently a relative term. The concept of dirt is therefore socially constituted rather than absolute and suggests a relationship between orderliness and cleanliness. Anomalous or ambiguous objects are seen as dirty only by not easily "fitting" into established categories, an "imposed system" to make sense of the world. Consequently, dirt directly threatens the perceptual and social structure, transforming everything that is anomalous and ambiguous into disgusting, disruptive, and dangerous objects. Sanitisation occurs when social discomfort is "fixed". Eradicating dirt, as Douglas mentions, "is not a negative movement, but a positive effort to reorganize the environment" (Douglas 2002, 2). As seen through the examples introduced above, transgressions are punished by political decree or trivial sanctions and the label "dirt" assigns a negative connotation that is often served to condemn publicly and outline what is acceptable and what is not.

After a historical introduction to the nature of the senses, from the hierarchy of their roles to their importance in night-time walkability or their role in establishing a social order in the Victorian ages, the next section will review the work of some key psychology and philosophy authors reflecting on the relation between sense–perception, and their conceptualisation in this thesis.

2.3 Discussing the philosophy of the senses

The discussion of what is a sense, what perception means and how to explore the human–environment interaction is part of a comprehensive and complex discussion that involves literature from many other disciplines, including psychology and philosophy. This section will use selected authors from these fields to show that complexity, summarise some of the existing arguments and explore the different dimensions to consider in a multi-sensory investigation.

In a multi-sensory investigation, it is fundamental to understand the difference between sense, sensing and perception. Sensory perception is the human mechanism that allows the senses to recognise information from the surrounding environment. Smell, taste, hearing, touch, and vision are those considered by most authors and known to the public, but since Aristoteles (see section 2.2), many authors have considered other senses. Sensing is the result of the impact of a stimulus on specialised neurons. When sensory information is recognised by the sensory receptor that results in a sensation. In public space, sensory receptors are constantly aware and collecting information from the environment. However, it is the interpretation of that same information that shapes the way individuals interact with their surroundings. That interpretation is related to perception, a psychological process (Spielman et al. 2014; McLeod 2018).

Perception as a term comes from the Latin word “percipere”, to feel, to comprehend and, according to the majority of the available dictionary definitions, it involves awareness through the senses (Rodaway 1994; Rapoport 1977; Potter 1985). Perception is the final step in a series of three distinct phases that a human proceeds through when assessing his or her environment: evaluation, cognition and perception (Rapoport 1977; Potter 1985). Or as

Rodaway (1994) presents it, perception is a mental insight, or a sense made up of a range of sensory information, with memories and expectations involved. Perception is undoubtedly, therefore, an activity (Rodaway 1994; Tuan 2001), a process that requires interaction between the one who perceives and the thing that is being perceived. Perception reflects the way sensory information is organised, interpreted, and experienced, and as Merleau-Ponty (1962) argues, interpreting the world through the body is a complex and essential task: "*All my knowledge of the world, even my scientific knowledge, is gained from my own particular point of view, or from some experience of the world without which the symbols of science would be meaningless*" (Merleau-Ponty 1962, ix). With the body being the privileged medium for that same experience. To this author science is secondary when compared with the experience of the world, and for that reason science ends up being a simple explanation of the world. An idea that draws from Gestalt theory founded by Max Wertheimer, Wolfgang Köhler, and Kurt Koffka, from which Merleau-Ponty sees the indeterminate and contextual aspects of the perceived world as a positive phenomenon that cannot be eliminated from a complete account.

As Merleau-Ponty (1962), sees it, Sensation is the basic unit of perception and is distinct from a stimulus which he defines as the external trigger for a sensation. To this author "*perception does not give me the truth like geometry but presences*"(Merleau-Ponty 1964, 14). Sensations were experienced presences, and these presences were soon referred to by cognitive psychologists and philosophers as an "embodied mind" (Varela, Thompson, and Rosch 1991) or a "body in the mind" (Feld 2005). To Merleau-Ponty, sensing in contrast with knowing, is the vital communication with the world that makes it a familiar place to live. Sensing exists as a form of "*co-existence*" and "*communion*" of the body and the world, in a situated and ambiguous state (Merleau-Ponty 1962, 246).

According to Merleau-Ponty on philosophy, Sennett on history, and Pallasmaa on architecture, perception is experienced through the body and the body is multi-sensual. Sennett argues that public space is currently conceived as a transitory space, a space devoid of sensory and bodily interactions between those who use it. A vital characteristic to transform what he defines as public

“dead public space” into the public realm (Sennett 2017, 12). As sensory deprivation is often linked to an increasingly sterile and segregated urban environment (Sennett 1996). These interactions should be inherent to society, as they help define the sense of place and the feeling of being at home (Lefebvre 2010). “*I experience myself in the city, and the city exists through my embodied experience. The city and my body supplement and define each other. I dwell in the city and the city dwells in me*” (Pallasmaa 2005, 40). Different theories of perception start with questions about elements of the surrounding environment and the way these are perceived. Thus, the role of the senses in an embodied and emotional experience of place underlines the need for a more sensuous analysis of the urban realm and society, one that is not defined by one discipline but that can draw from and incorporate different perspectives.

An expansion of the field of sensory studies was taken up by Howes (2013) who examines how the senses have become the aim and means of inquiry from different humanities and social sciences disciplines, from history to anthropology or geography. This ranges from changes of focus on different senses through time (see section 2.2), to the concept of embodiment in anthropology, and the use of one’s own body to write about sensuous experiences (Ingold 2000; Pink 2007; Howes 2003). Also their impact on social attitudes, interaction and everyday life, through sociological studies based on Georg Simmel’s work (1903), to geography and the analysis of the role of the senses mediating the perception of space and contributing to individual and collective senses of place (Tuan 2001; Rodaway 1994; Porteous 1996) supporting the emergence of the concept of sensescapes in urban studies.

Another important factor in the analysis of the human–environment relationship relates to how the senses are considered. If Aristoteles introduced the five senses and their hierarchy, for Gibson (1966) the senses were understood as perceptual systems. They are contextualised and contextual, as perception needs the environment and happens within the environment (Ingold 2000; Lucas and Romice 2008). In his system (Gibson 1966, 50) understands the olfactory and the gustatory sense as chemical senses and the haptic system as mechano-receptors and possibly thermo-receptors. Exploring some separately and others in combination. In his book The Five Senses (2008), Serres reacts to

the sensory poverty of contemporary studies. He advocates that a sense should be seen as the primary mode of the relationality through which an experience is produced (Tucker 2011a). At the same time, he criticizes the rational split of the senses. He sees the sensory experience as mixed and mingled. As a sense includes an essence of the other and they are together as mingled bodies. Consequently, Serres also goes beyond the simple analysis of the senses to explore their potential and their use in the promotion of an organic engagement with the world (whether built or even social). Where the body is seen, not simply as an extended object, but a transitory experience that can recreate itself through the senses. While many authors in planning and urban design often look into the senses separately, Serres, argues that considering the senses individually could damage any investigation; in effect advocating for a multi-sensory approach, where authors consider how the different senses affect each other. However, at the same time that he shows how the senses interconnect, and the need to analyse them in a relational way, he also separates the senses in his own work. As with Gibson (1966), in his chapter “Tables” (Serres 2008, 152), taste and smell are considered at the same time, through the example of the appreciation of a bottle and sight is reflected in his chapter “Visit” (Serres 2008, 236), but more from a perspective of voyaging and it becomes related to the direction (Pearce 2010). Skin is considered a common site of the senses and is mentioned as the “common sense” (Serres 2008, 81).

To further understand the role of the senses, Merleau-Ponty (1962), defines phenomenology as the investigation of essences, including the essence of perception and consciousness. To this author, phenomenology is a method of describing the human experience and the perceptual contact with the world. “*A matter of describing, not of explaining or analysing*” (Merleau-Ponty 1962, viii). Leading other authors to see phenomenology as a philosophy that sees facts as the basis for the analysis of the interaction of man and the world (Lucas and Romice 2010). Consequently, the description of sensations in a place and time can provide a more comprehensive image of the experience of a place (see Chapter 6), while the exploration of the stimulus can influence space design (see Chapters 4 and 5). The analysis of sensations at various locations can

help understand patterns related to spatial characteristics, which can lead to the understanding of the co-location and distribution of stimuli.

If the link between the sensory stimulus and the consequent human reaction is one debate, the conditions and characteristics of this link emerge as another debate in the literature. For authors such as William James (2017), the relations between elements are at least as real as the elements themselves. The world should be described as it is experienced preceding any reflection on the mental processes (Mullane 1973), in an approach defined as radical empiricism. To James, the senses are experienced as both an objective response to stimuli within a particular context, and an interpretative-associative experience. He argues that individual original experiences are objective and only after reflection do these become developed. That experiences are part of habits that then lead to actions and reactions. The habits begin in early life and with time help reduce the consciousness individuals dedicate to their actions. Therefore, the earlier the habit the better for the "nervous system" (Radman 2012). The closer an object is recognised through its basic qualities or attributes, such as a colour or temperature (cold or hot) the more the individual's mind reaches a pure sensation (acknowledgement), contrasting to the relational recognition of the object through measurements, comparisons, or functionality, which then leads to perception, with a lower influence of sensation (knowledge). This idea is then also translated into space.

When James defends that the first perceptions of space are unordered and that the order is then provided by the mind (James 2017), interest and attention are major elements of James's psychology. An object is seen as a group of qualities that are of interest to an individual and that consequently are given a substantive name. While the reality is the relation to emotional and active life, where the product of an interest is real. Therefore, an object that attracts attention is an active element in all consciousness. A part of what is perceived comes through the senses, while the other part comes out of the mind (James 2000). Finally, his work also sets out the theory that emotion occurs because of physiological reactions to events. "*As with instincts, so with emotions, the mere memory or imagination of the object may suffice to liberate the excitement*"

(James 2017, 1050). Consequently, emotions are tied in with bodily expressions.

Ernst Mach (Mach 1959), like William James, is also linked to the idea of empiricism. The belief that learning is the product of evolution. That senses, minds, and cultures are part of an historical evolution and that each experience allows more and new understandings. A process that progresses through the interaction of sensation with human inborn capacities. Where the cognitive structure is formed through previous experiences, and current experience is structured by it in turn. For Mach, phenomenology is the result of the application of psychology and evolutionary theories. Mach recognises that perception is not the result of direct stimuli but the result of a relation of stimuli. To him, individuals don't perceive things directly, but perceive contrasts of things. The world is, therefore, a biological construction created through a process of adaption from the nervous system to new sensations, and perception is more than observing what surrounds us by being influenced by motivations and expectations. Where the mind and senses actively contribute to sensation. Finally, Mach suggests that the whole is greater than the sum of its parts and that perception was based on understanding objects as a whole and not as individual parts (Gestalt theory).

Edmund Husserl (2017; 2019), considered one of the founders of phenomenology, defined the "intentionality" of experience. He argues that experience is directed to or "intends" objects only through concepts, thoughts, ideas, or images. Which represent a combination of dimensions that structure the meaning or substance of an experience and are distinct from the objects they present or mean. This approach considers dimensions such as temporal and spatial awareness, self-awareness, embodied action, purpose or intention in action, awareness of other persons, social interaction or linguistic activity which involves meaning, communication and understanding. Husserl's perspective of phenomenology also seems to direct into the background or previous conditions of an individual's experience and into the conditions that help to give experience its intentionality (Smith 2018).

To James Jerome Gibson impressions from the senses are considered as secondary, and he believed that perception is direct and active, instead of mediated by the senses. Gibson also questions whether the sociocultural context and interaction with it provide perceptual information that constitutes a part of the behavioural sphere. (Covarrubias et al. 2017). To this author, sensory systems are already adapted to present perceivers with a controllable environment and its affordances to meet the individual's (functional) needs and goals. He defines "affordances" as the qualities of an object or environment that connect opportunities to do certain things (e.g., shade can be perceived as an opportunity to shelter from the sun, etc.). Consequently, sensory experience is essentially world-presenting, spatially expansive through three dimensions, and utility alerting. (Hatfield 2021). Because of the functional significance of affordances, Gibson suggests that perception involves innate mechanisms forged by evolution and that no learning is required (McLeod 2018). A concept that is supported by Merleau-Ponty's idea is that the body is experienced primarily in terms of the specific potential for action introduced by the environment (Glotzbach and Heft 1982). James Jerome Gibson is an advocate of an evolutionary approach to perception. He believes that there is enough information in the environment to make sense of the world in a direct way. To this author, perceptual processes are not exclusively visual and involve the full organism while moving in its environment. This movement promotes a constantly changing pattern of stimulation in which "invariant" elements surface. It is the detection of these invariants that provide the information for perception. "The active observer gets invariant perceptions despite varying sensations." (Gibson 1966, 3). At the same time, Gibson repudiates the theory according to which the individual sense sensations and then corrects them. To this author, the individual extracts over time the invariants that specify the substances and surfaces and the layout of these surfaces of the environment (Radman 2012). On the other hand Serres' believes that individuals should forget what they know to facilitate the emergence of the true invention (Serres 1995). Highlighting the need for a refocus of sensory research on the sense of 'purity' and to liberate thought from current knowledge. (Tucker 2011b). Finally, Gibson does not see the different senses as mere producers of visual, auditory, tactual,

or other sensations and understands them as active mechanisms for looking, listening, touching, etc. Emphasizing the importance of understanding the perceptual systems as active and interrelated, Gibson also clearly supports that the perception of reality is not something built or calculated by the brain from a constant variety of sensations (Gibson 1966).

Along with the debate on what is sense and perception in the relationship between the individual and the environment, the discussion continues to which elements are considered fundamental in this analysis. As mentioned before, a particularly important element to Gibson is the medium, such as air or water for example. The medium emerges as a concept that relates to the context within which the individual moves through. Although to Gibson this concept is different from the concept of space, which should be neutral, constant, and unchanging. For Gibson, medium changes with elements such as weather or pressure. As Lucas and Romice (2010) mention, this shift from space to medium is one of the fundamental discussions within the sensory field. As space is the result of a dominantly visual and geometrical bias in urban design; one of permanence and fixity, when compared with the idea of temporality and complexity of a medium.

Another perspective is provided by Ernst Mach, who explores the idea of absolute space. To Mach ‘physiological space’ is bounded, finite, and non-uniform, built through the cognitive structure and a result of unconscious adaptation. While ‘geometrical space’, is unbounded, infinite, and homogeneous and the result of intellectual construction and purposeful experience. They are both different and neither can be seen as ‘objective’ or ‘absolute’. Geometrical space is removed from the emotional psyche, while physiological space is entwined with basic emotions (Mach 1959; 1890; Pojman 2019). ‘Space’ cannot be materially measured as space is a product of the comparison of spatial sensations. Any measurement requires a standard, and as the standard is of the same nature as the objects measured, measuring doesn’t seem possible (Pojman 2019).

The concept of Rhythmanalysis, created by Henri Lefebvre emerges as an alternative to the geometrical approach to space. A method for understanding the rhythms of urban space and the effect those rhythms produce on space

users. Rhythm shapes the experience of place and allows the researcher to use rhythms to characterise places (see for example the work of Degen (2008), Bull (2000), Edensor (2010), or Wunderlich (2008) among many others). Rhythmanalysis includes the movement of flows of capital, people, objects, energy or matter and explores how the result of multiple rhythms, or temporalities, comes together and organises time and space (Amin and Thrift 2002). Lefebvre has a materialistic version of phenomenology in which the epistemological perspective moves from the individual that thinks, acts, and experiences to the process of social production of thought, action, and experience. Space does not exist without a social reality, therefore, space is socially produced and can encourage or discourage certain practices and behaviours (van der Meide 2018; Blauvelt 2003). To Lefebvre space goes beyond the physical arrangement of objects to include everyday spatial patterns of social action and routines, with individuals extending themselves mentally and physically into space (Lefebvre 1991). In this, sense space and time are also a product of the relationship between people and the surrounding environment, and therefore also limited by physical, biological, psychological, socio-cultural, or spiritual phenomena. The materiality of space is understood through the five senses, conceived as a whole, and lived through daily life experiences. Space is the interplay between material production, the production of knowledge and the production of meaning, made of continuous sequences of perceptions, knowledge, and experiences, with human corporeality and sensuousness' having a fundamental role in the analysis of space. If social space and time produce, and are produced, through varied and repetitive rhythms, then quotidian spaces as public space are also the result of daily activities such as walking, talking, etc. (Revol 2019; Vermeulen 2015).

Lefebvre conceived rhythmanalysis as a tool of analysis, an embodied approach through which the researcher has to feel and experiment empirically on how rhythms are lived (Lefebvre 2004). An experience, through the body and senses, is required to feel and perceive lived temporalities and to understand how they relate to the evolving temporal and spatial environment. Doing this, he criticizes the reduction of place to images, which reinforces the pure visual space and degrades space (Lefebvre 1991). Consequently, he argues that

urban space analysis depends on human experience, which includes elements that go beyond the physical, to the descriptive and cultural and that the study of the urban should go beyond the simple and narrow assessment of urban design and planning disciplines. To this author, the material space (urban realm) is the material basis that supports the relation between activities and interactions. It is the urban realm that supports meanings and symbols and their norms, values and experiences (e.g. feelings about a space) (Schmid 2008).

De Certeau (1988), supported by Lefebvre's ideas, emerges with a more specific and ethnographic approach. He focuses on everyday practices, such as walking, talking, reading, dwelling, and cooking to reflect on the idea of space. To this author, space can only be thought of in terms of the process, not product, and activities such as walking are to the urban structure the same as a speech act is to language (de Certeau 1988, xiii). Walking is the process that allows individuals to apprehend and articulate the space of the city. Even if this process of spatialising appears to be random, as a practice it is instilled with logic and regulations. To de Certeau, cities are the result of spatial practices. Consequently, space is what happens when people navigate places, like when individual letters are put together and words are articulated and, for example, cannot be mapped or read through maps as something always slides away (de Certeau 1988). De Certeau understands the agency of space as the representation of another's script, while Lefebvre sees it as a container for the construction of action itself. (Vermeulen 2015), but as with Lefebvre, de Certeau opposes the notions of a theoretical space with that of a practised Space (Hardy 2001). If perception is fundamental to understanding space in de Certeau's theory, a re-orientation of thought about space is needed to accommodate the demand for diversity. This re-orientation can be supplied by Merleau-Ponty's theory of perception and his elaboration of a bodily space (Buchanan 1996). However, in contrast to Lefebvre and Merleau Ponty, Michel Serres (2008) argues that the world can only be perceived in silence, far from the public noise, the dialogue, and cultural and social constraints. His definition of noise is linked to the idea of boundaries, whether it is between science and literature, language and materiality or homes and cities. The capacity to feel in a way that eludes the common cultural patterns (Serres 1995).

Language is another basic element to explore when analysing sensory perception. Language is a fundamental medium to communicate sensory perception. However, not only differences in languages and cultures have a strong impact on how clearly that communication happens (Caballero and Ibarretxe-Antuñano 2009; Caballero and Paradis 2015), as there are authors that highlight the limitations of language in the ability to express the complexity of sensory perceptions (Gibson 1966; Serres 2008). Authors such as Lefebvre include linguistic representations as a frame of reference for communication and orientation, along with other dimensions that support his work (Schmid 2008). In contrast to de Certeau, critics of Lefebvre, accuse him of supporting a 'passive understanding of perception' leading to a lack of a more 'creative dynamics of rhythm' and of not understanding space in an exclusively linguistic approach. For him, semiology in spatial research should always be used in relation to other models of analysis, in particular on phenomenology and social theory (Vermeulen 2015). Taking another perspective, in his work The Five Senses, Serres' aims at demonstrating that language has both limited and overtaken the primacy of the senses, and that science and technology have diminished the authentic empirical experience. In this sense, his work defends the empirical and qualitative against the reductive logic (Pearce 2010). He is reacting against the philosophical question of language but also to language. In this way, he criticizes Merleau-Ponty's Phenomenology of Perception, claiming that there are "*lots of phenomenology and no sensation—everything via language*" (Serres 1995, 131–32). However, while Serres argues that language generates noise and contaminates the senses and that a return to the immediacy of the senses is needed, he also believes that in recent times, information and data have surpassed language; that more sophisticated forms of words, such as codification and categorisation are conditioning the experience of the world (Pearce 2010). He believes that language has finally become redundant providing individuals with new possibilities in their relationship with the world (Pearce 2010). He asserts that "*Language has taken the place of the given, science is taking that of language*" (Pearce 2010, 333). A trajectory that is evidenced by the overarching use of technology today, provoking many new questions about the legitimacy of sensation as the five

senses must be considered as a complex, interconnected web of multi-layered hybridity (Pearce 2010). However, Serres' writing strengthens the same sensory boundaries that he criticizes. (Salter n.d.; Pearce 2010). In his criticism of language to describe sensory experiences, he uses descriptions and heavily charged words. Nevertheless, his work aims at challenging sensory academics to develop new ways of exploring sensory knowledge while stimulating new perspectives and ideas. The five senses (Serres 2008) was written to bring the senses back (empiricism) as the best mode of articulating knowledge of the world, while emphasizing the challenges and limitations of writing about the senses. This author argues that complexity cannot be done by a single discipline (Tucker 2011b). An approach that is supported by authors such as William James (radical empiricism). The sense in *The Five Senses* is more a claim for 'experience' rather than the creative force of literature or the grips of scientific knowledge as the sense is something that cannot be entirely captured by the words and meaning attached to it. Language can affect the sense, but not feel it. Consequently, as Tucker (2011b) argues the book finishes with an appeal for reinvention, and the need to build a language of the sense, one that does not burden sense with meaning, which constrains the very thing it aims to illuminate. Serres highlights the role of language in producing mediated knowledge while constraining direct access to experience, as the author is interested in what experience feels like, not just about what is said about it (Serres 2008; Connor 1999). However, even if Serres is right in his assumption that words are not enough compared with sensory perception, the description of perceptions might be the only way to analyse or illustrate the senses. Especially when dealing with urban environments as a researcher tries to understand patterns of perception. Even if Serres argues for an alternative language, he does not say much about how this 'language of sense' may develop in particular when exploring urban design and planning.

In this sense, this investigation brings back some of the main debates to acknowledge the complexity of the exploration of the human–environment relationship. It recognises the need to explore this relationship through its basic components, such as the individual, the sense, the perception, and the role of elements such as space and language, with all the limitations introduced by the

literature. An analysis that recognises the empiricism of the experience, with the qualities and “affordances” of the object. The individuality of sensory perception, the complexity of understanding space as an embodied experience, and a medium that combines both the material and the fluid, along with the fundamental role of language as a tool of analysis. Although recognising that the complexity of the sensory experience cannot be expressed by language alone, this investigation aims at bringing language as the common methodological element to explore how participants perceive urban space and how they mediate their sensory experiences, rather than the analysis of the complexity of what individuals experience which would be fitting the fields of psychology and neurology. These debates also highlighted the importance of recognising the perceptual systems as active and interrelated, while demonstrating the complexity of sensory studies. Consequently, this investigation recognises the limitation of the exploration of the human–environment relationship from a single point of view rather than in integration with other sciences, but also believes that the results of this dissertation will bring forward perspectives on concepts and methods that will add to the existing literature and practice.

The next section will bring in some of the current debates in planning practice. How the concept of perception is seen from the current dominant planning debates, the methods applied in policy and practice and the empirical discrimination of the positive qualities of the sensory stimuli in urban space. Finally, it will illustrate some of the tools and instruments that planning practice has created to deal with different qualities of space and outline how the non-visual senses have been dealing with prejudice and preconceived ideas from the start.

2.4 The good, the bad and the need for a referee

In more recent years, other disciplines outside urban planning (history, psychology, anthropology and geography) have started what can be called a “sensorial turn” (Howes 2003, xii), in which the senses constitute not only a field of study themselves but also a mode and medium for observing and defining

other fields of research. The study of the senses in the urban realm has been strongly related to the analysis of the human–environment interaction or the mechanism linking the two (Rapoport 1977). As with any study of interaction, there are a number of issues to be considered here, namely subjectivities related to the mind–body problem, the nature of objective reality and the value of introspection. Along with individual, social and cultural dimensions that can also affect perception (Rapoport 1977; Adhitya and Tyler 2016). It is, then, fundamental to understand how, when and why this interaction happens and how current planning approaches have been dealing with it. However, the study of perception (how people perceive the environment) has been mostly led by philosophers and psychologists and based on the premise that the knowledge of the world was derived from the senses and from stimuli acting upon the senses (Wood 1970). Planning appears to have overlooked such issues – only an inclusive interdisciplinary study can contribute to a more comprehensive human–environment analysis. Consequently, the conceptualisation of the senses is a fundamental question in the analysis of public space, the space where most urban life happens. As seen previously, this investigation starts from the hypothesis that the senses have an impact on the way people use public space and proposes a multi-sensory methodological approach to the study of public space. A tool to better understand the relationship between individuals and the environment that can be adapted to urban planning and design.

After understanding how a human relates to the environment through perception, it is important to know why this human–environment relationship is so critical, and where in this interaction a concrete connection to urban planning can be achieved. According to Rodaway (1994), a comprehensive definition of the concept of perception should include four different dimensions. (i) Perception is not the reception of single stimuli from one source directly to the sense organ concerned, but rather involves a myriad of different stimuli from various sources reaching the different sense organs (it has a multi-sensual characteristic) (Tuan 2001; Rodaway 1994). Hence, the study of the interaction between the senses becomes fundamental. (ii) Perception is not a direct, isolated process but the interaction of stimuli, sense organs and the brain,

which takes place within a geographical space. This space is not empty and the surfaces, textures and/or objects within it can interrupt or alter in some way the nature of the stimulus message. (iii) Perception is, again, an action, this time a behaviour learning action. The complete definition should take into account habituation factors and increased sensibility to different stimuli, be culturally specific and consider the action as being the result of a socialisation process. (iv) Perception should be seen as corporeal, mediated by the body and other technological extensions that it may employ (especially in case of disabilities).

In trying to fit ideas of perception into a geographical framework, Wood (1970) presents a set of different authors' works and ideas. He cites Kirk (1963),[10] arguing that the most important division in geographical studies should be between the "*phenomenal environment*" and the "*behavioural environment*". The author understands the phenomenal environment as being the world of physical facts, expanded to include those environments altered and even entirely changed by man. The behavioural environment is understood as a psycho-physical field in which phenomenal facts are arranged into patterns or structures and acquire values in a cultural context. "*Phenomenology sees the world's significance not as fixed and awaiting perception, but as emerging in its significance as the perceiver emerges*" (Spinney 2006, 714). Confronting Lynch's (1960) idea of the "*image of the city*", Spinney (2006) defines the "*phenomenology of a place*" as one in which all its material substance, colours, shapes, sounds, textures and smells are experienced. Further challenging Lynch's argument, Stevens (2006) presents a study in which he analyses the structure of urban space from a phenomenological point of view. He demonstrates, through behaviour observation and analysis, how physical and sensory (not only visual) conditions can influence the use and experience of space.

This research will focus on the role of space and consequently on the role of design and planning in stimulating human sensory perceptions. Planning is about the "*making of an orderly sequence of action that will lead to the*

[10] In 'Historical geography and the concept of the behavioural environment'.

achievement of a stated goal or goals" (P. Hall 2002, 3). In the urban space, these actions and goals will definitely involve people and therefore should take into consideration the urban realm and the environment. Consequently, the study of how, why and where people perceive the environment should be just as important in planning as in other urban studies disciplines. There are different aspects that can help to correlate perception with planning objects: the cognitive (absorbing and organizing the collected information); affective (feeling and reacting); interpretative (giving it a meaning or an association); and evaluative (valuing and giving preferences) (Ittelson 1978; Downs 1968). These aspects cannot be considered independently, however, as individuals often fit simultaneously into two or more of these categories of interest (Wood 1970). Since the cognitive aspect has been the focus of the discussion above, it is now time to turn to the importance of the analysis of the other three aspects (affective, interpretative and evaluative) in the urban environment.

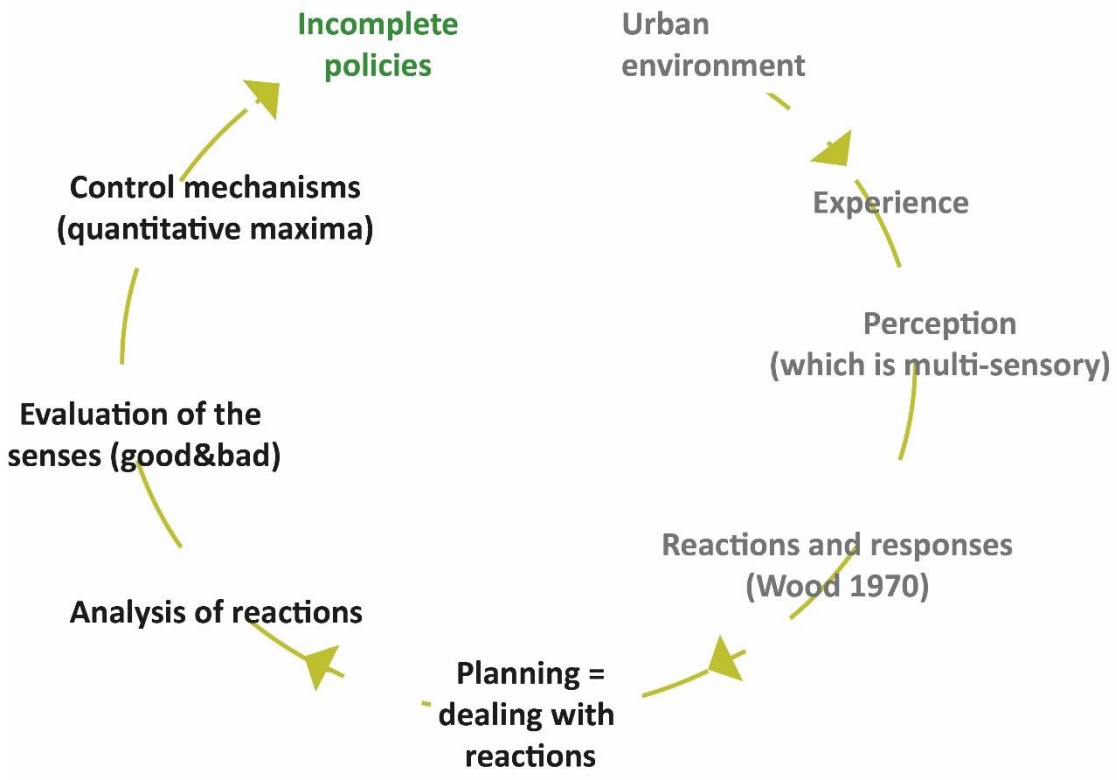

Figure 4: Incomplete planning policies framework circle.

If people perceive the environment in an embodied phenomenological manner, they will consequently react to that perception (Figure 4). This creates a need to

plan and design spaces with an intimate concern for those responses and reactions (Denham 1968). Such reactions, however, according to Raimbault and Dubois (2005) when writing about noise, depend on factors other than just sensory stimulus and may be influenced by the structure of urban areas and architectural (visual, aesthetic), lifestyle and social parameters (Schulte-Fortkamp 2002). Therefore, a reaction is not always a clear response to the sensory stimulus. This means that urban planning has to also consider that an individual's evaluation of the stimulus and response can be subjective. Reactions can influence individual (or group) decision making and thus different individual (or group) behaviour may be expressed. Nonetheless, even if there is no apparent behavioural reaction to sensory stimulus the existence of personal effects cannot be rejected (e.g. on health) (Raimbault and Dubois 2005). This analysis of reactions and possible effects leads to the discussion that follows regarding the evaluation of the senses, the good and the bad, and how the creation of control mechanisms and regulations has helped planning practice to deal with the senses.

Figure 4 illustrates the current planning and management process, which, due essentially to limitations of time and costs at the planning and design stages, lacks any discussion on the evaluation of the senses. In addition, the fact that notions of negativity vary from person to person is overlooked, which means that planners have, instead, established their objectives around the creation of control mechanisms that are mainly focused on physical measurements and neglect the subjectivity of people's experiences of sensory stimulus. Urban management practices reveal that most urban policies and regulations are not complete since they are missing the advantages of a multi-sensory and more comprehensive integration (considering the positive alongside the negative senses responses).

Writing about noise, Kosko (2006) refers to notions of badness that vary from person to person: "*This theme runs throughout Noise: One person's signal is another person's noise and vice versa*" (Kosko 2006, 6). Nevertheless, as seen above in the section on how the senses have been perceived in history, "*the mastery and privatization of bodily functions in turn were elements in the creation of a new form of personal subjectivity and a bodily habitus in which*

spontaneous reactions of shame and disgust were important forces"(Curtis 2008, 8). Not only societal stereotypes are linked to behaviour and contextual reaction. Even gender differences can be important, as in the case of touch (Major 1981). Yet "*sensory stimuli are usually perceived and appreciated as an interconnected whole. The individual dimensions can only be separated out by deliberate actions (closing one's eyes, blocking one's nose or ears) or by selective attention*" (Carmona et al. 2003, 87). In the case of touch and even taste the individuals can choose to accept, reject, continue, or give up on the sensory sensation but with vision, smell and sound that decision is not so easy due to the implications for other fundamental functions of the same organs (used for breathing, talking and eating, etc.). This can be a good explanation for why visual, sound and smell reactions and perceptions have been dominant within planning studies, and that of these three, the first two (vision and sound) prevail due to their pervasiveness in urban space activities (Gehl 1987).

The role of the planner is "*to provide for a spatial structure of activities (or of land uses) which in some way is better than the pattern that would exist without planning*" (P. Hall 2002, 3). To provide that structure, she or he has to consider all urban elements, and try to foresee sensory qualities and the impact those qualities will have on individuals. The role of the planner should be proactive rather than based on mitigation. However, a need to avoid problems and complaints due to "excessive" sensory stimulus, for example "bad smells" or "bad noises", seems to have dominated planning studies and interventions up to now. A in-depth reflection on this approach should be straightforward when analysing planning legislation and policies and it should be possible to recognise, by looking at past examples, where there may be a need to anticipate and avoid future problems and complaints. In his discourse on dirt, Douglas (2002) argues that when a problem or an "anomaly" is recognised it triggers a reaction, mainly anxiety, from which grows the need for avoidance and suppression. To address such anxiety, legal frameworks and specific policies have been shaped by those who have responsibility for developing and changing urban space, in order to supervise and help with planning and decision making at different levels. However, according to Raimbault and Dubois (2005, 346), "*the review of city-user experiences of soundscapes shows*

that predicting sound qualities of an environment or the impact of noise on individuals is far more difficult than estimating levels of physical noise exposure with engineering methods", such as those used in current planning regulations.

Although engineering methods have changed classifications of sensory stimuli, these are not modern innovations. Classen et al. in their book *Aroma* (Classen, Davis, and Synnott 1994) present us with some examples of olfactory classification systems through history and the employment of them: "*olfactory symbolism, thus, was used very effectively to pass value judgements on different groups of people in antiquity. Given the strong emotional and physical reactions of pleasure or disgust which smells inspire, such an olfactory classificatory system would have been a potent aid to maintaining different classes in their 'proper' place in the social order*" (Classen, Davis, and Synnott 1994, 98). These classification systems can be described as "referees" in a "game" where subjectivity between what is bad (wrong) and what is good (right) is considerably high. Here, however, as in other situations where adjudication is required (football, for example), referees are not perfect. The current use of classification systems in planning, when considering only non-visual stimulus, has been principally related to noise and smell nuisances and problems (Figure 5). Even though urban planners have been making efforts to include human evaluations (non-technological) of environmental quality, subjective evaluations remain sporadic. Urban noise, for example, is still considered an unwanted sound (Raimbault and Dubois 2005), and when the acoustic environment has been studied in the past, the research has always been in relation to noise pollution and health impacts (Adams et al. 2006). In the case of noise (as with pollution), the current planning system uses a recording method, followed by an evaluation and a final phase of representation that classifies the noises ("anthropophony", "biophony" or "geophony") based on, sound pressure levels resulting from the use of specific instruments and the location of the sound source. Sometimes also the distinction between foreground and background sounds forms part of the attributes considered in planning (Papadimitriou et al. 2009). Sound is not only sensation, sound is also information (Degen 2008). Acoustic studies go even further into differentiating sound into signal and noise. A signal is the sound we can interpret as information, while noise is an

unwanted effect on the signal which reduces the visibility of that same information (Mockford and Marshall 2009; You, Lee, and Jeon 2010; Santini, Ostermaier, and Adelmann 2009). However, even if this differentiation is recognised, it will not be directly applied in this investigation.

NOISE IN THE CITY

LONDON, 1969

Type of noise	Complaints
Traffic	492
Building sites	224
Telephones	200
Office machinery, etc.	180
Refuse vans	139
Street repairs	122
Trucks (lorries)	109
Sirens	86
Ventilation machinery	69
Voices	59
Motorcycles	52
Aircraft	42
Doors	34
Radios	10
Railways	9
Factory machines	5
Miscellaneous	81

CHICAGO, 1971

Type of noise	Complaints
Air conditioners	190
Construction	151
Refuse trucks, etc.	142
Other trucks	125
Factory noise	113
Musical instruments	109
Exhaust fans	97
Loudspeakers	95
Motorcycles	82
Automobiles	80
Horns	77
Vibrations	55
Gas stations	34
Church bells	25
Trains	23
Miscellaneous	214

P. H. Parkin et al., *London Noise Survey*
London: Ministry of Public Buildings and Works, Her Majesty's Stationery Office, 1968

New Housing and Airport Noise
Central Mortgage and Housing Corporation
Ottawa: CMHC, 1978

174

Sense of the City: An Alternate Approach to Urbanism (2006)

Figure 5: Noise in the city (Thompson 2005, 174).

Complaints from city dwellers, such as the ones about noise in London in 1969 and Chicago in 1971 that are illustrated in Figure 5, render visibility to such non-visual senses, though mostly through the process of quantitative analysis and based on negative views. Some recent studies have pointed out the limitations of the current approach that is followed to assess noise (Raimbault and Dubois 2005; Adams et al. 2006) although some attempts have been made to find new methods of investigating and assessing the effects of urban noise on people. These limitations reveal themselves when urban noise that is produced has more than one origin as reactions to coincident noise sources are not predicted

from the addition of the reactions to all the separate parts (Berglund and Lindvall 1995). Limitations regarding the subjectivity of the sound quality assessment have also been pointed out. The identification of positive and negative sound levels or "*soundmarks*"[11] (Schafer 1994, 9) is possibly not sufficient in itself to establish an understanding of what is wanted and unwanted noise, at an individual or community level, "*but it enables us to recognize that those responsible for noise policy must do more than simply measure general noise levels when regulating the soundscape*" (Adams et al. 2006, 13). Urban management practices have also revealed that most urban policies and regulations are incomplete, and do not go far enough, as they typically aim only at reducing any undesirable feature to an identified acceptable maximum level, that is measured according to weighted noise or visual dimensions, such as volume, size of construction area, etc. These policies are principally focused on physical measurements, and they neglect to consider human experiences of these sensory stimuli. The majority of management decision making regards non-visual-related issues, identified in response to complaints about noise or smell and results in noise mapping (see Figure 6), noise and smell monitoring, noise abatement and zoning. These steps consider mainly the physical characteristics of the environment and disregard their physiological and psychological consequences (Raimbault and Dubois 2005). Consequently, it is vital that the existing interplay between technical regulations and individual perceptions and the limitations of taking only an abatement approach that is imposed under the current noise policy are clarified. Otherwise, future cities will just focus on the negative, possibly dealing with sound levels as the only indicator of sustainability and consequently aiming for a silent urban space: "*Where then is the space for the 'buzz' that many people say they come to the city for?*" (Adams et al. 2006), the buzz that Jane Jacobs (1961) so firmly defended in her chapter on street sidewalks.

[11] Soundmark is a concept derived from landmark. A soundscape that has unique cultural or natural characteristics (Schafer 1994)

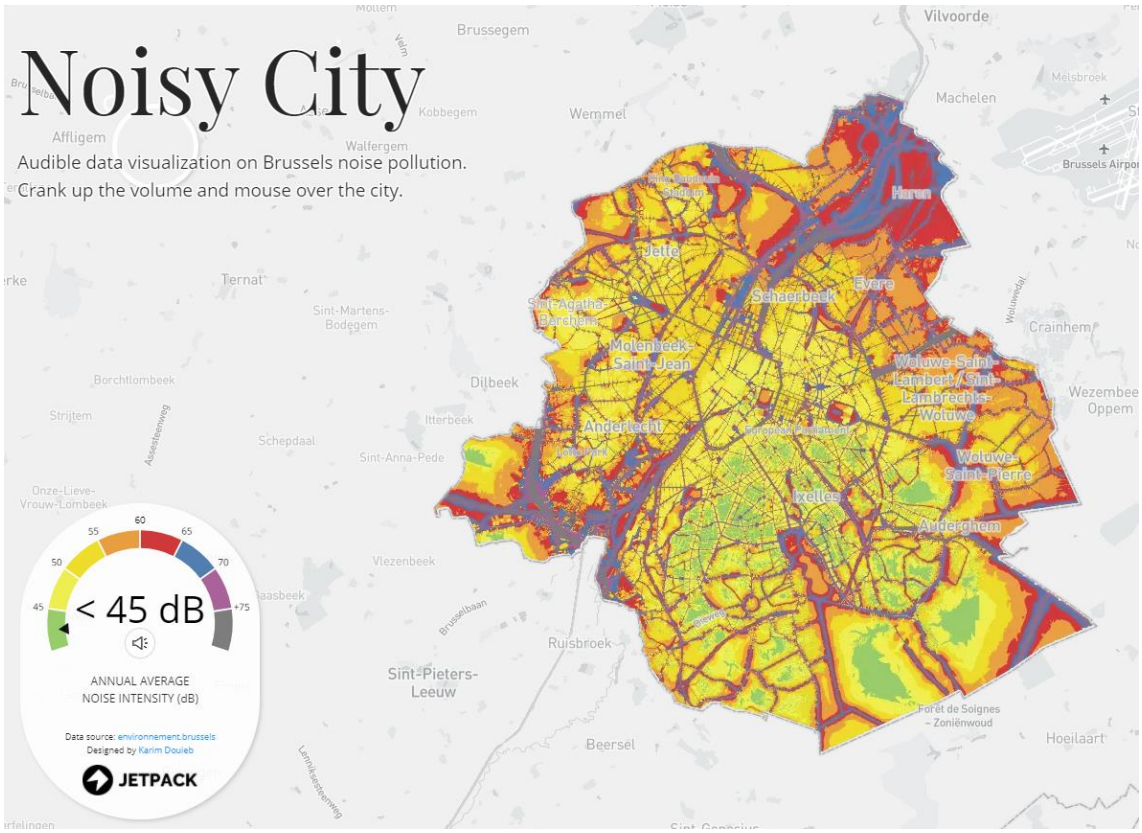

Figure 6: 'Noisy city' map (environnement.brussels and Douleb 2016).

Raimbault and Dubois (2005) argue that as a consequence of current policies important decisions on urban soundscapes that rely only on simple measurements and on inadequate information based on incomplete knowledge about acoustic phenomena in cities are being made. On soundscapes they argue that experts and planners are working to achieve a less negative soundscape rather than creating a more positive (pleasant) one. Elsewhere, some urban studies are already showing that the quality of a soundscape refers mainly to fundamental questions concerning the quality of life, way of life and human activities. Must these studies and ideas be limited to soundscapes?

In the first section of this chapter, criticism was made of the dominance of the visual in some of the urban planning classic literature and some examples were presented in support of the fact that perception of space is multi-sensory. Although some effort has been made recently to re-think the analysis of noise and soundscapes, there is still a need to move from a mono-sensory study of the visionscape or the soundscape to a comprehensive study of the different urban "sensoryscapes". It is paradoxical to find that while studies in geography,

psychology, philosophy and even architecture are devoting increasing attention to a multi-sensory experience of space, the urban environment remains almost untouched by this sort of consideration (Zardini 2005). In terms of urban planning policy, it is unsurprising to note that visual aesthetics are a major part of the planning regulatory system, with strong guidelines determining what is acceptable or unacceptable: "*References to 'landscape quality', 'landscape value', 'visual amenity', 'loss of landscape' and 'visual effects of the development on the surrounding area and landscape' are commonplace in planning documents*" (Adams et al. 2006, 2386).

As seen above, when considering specifically non-visual planning policies and practice attention has principally focused on the negative effects of sound (Raimbault and Dubois 2005) and smell (Knopper 2003), meaning the prospect of a comprehensive sensory plan of the city is likely to be a long way off. Although some groundwork has already been done in urban studies on the sound and smell dimensions of cities, a broad investigation of all the non-visual senses is yet to be conducted. In addition, studies that actually consider a truly comprehensive multi-sensory perspective are still few and far between; most research is currently based on the exploration of a single sense only. Among other authors also referenced in this chapter, Zardini (2005) has proposed some paths for an alternative sensory approach to urbanism, which would address these gaps. The moment is, therefore, ripe for exploring and establishing a sensory approach in urban space and transforming this into a solid foundation on which to base future planning methods and practices. Technical measurements and descriptions might help to understand the built environment characteristics, but are not capable of providing a comprehensive understanding of environmental experience (Lucas and Romice 2010). Studies of perception, phenomenology and behaviour can provide a better understanding of how to bond the human–environment relationship with planning.

The next section will explore the beginning of this planning practice bias by briefly introducing and exploring the history of senses in urban design and planning classical literature through some of its main academic authors. This

will be the starting point for a reflection on how planning and design literature can change and offer a more sensory-inclusive approach.

2.5 Planning (and) the senses

The sensory question has been more noticeably incorporated in urban studies at least since Kevin Lynch's (1960) book *The Image of the City* (Carmona et al. 2003; Zardini 2005; Sepe 2013), where he highlights the non-visual senses as the source of alternative cues to the visual sense. However, this reference emerges from the discussion of legibility, in a work that is largely focused on a mono-sensory visual perspective. Despite this shortcoming, the scholarship in this area establishes a lengthy, diverse, and critical stream of literature on which to build. The New Urbanism movement and its confrontation with the modernist paradigm will also be used in this section as a point of departure to search for clues in analysing where the threshold between the absence and existence of a sensory approach currently exists.

In response to the poor living conditions created by the industrial revolution, with workers living in small, overcrowded, and polluted areas, town planning responded with different models of cities. Since then, town planning has been linked to the arrangement of residential and workplaces with shopping and public space. This organisation has been fundamental as a reflection of new ideas but also for its impact on people and society. Up until the 1960s, most urban studies were mainly focused on the growth and emergence of new urban configurations, but they did also attempt to define new strategies of intervention capable of transforming the urban fabric and responding to new problems posed by the forces of globalisation, delocalisation, and fragmentation. As cities evolved in the early 20th century, the proposed desired urban realm as envisaged by Howard (1898), Geddes (1915) or Le Corbusier (1929)[12], demonstrates some characteristics of the rural and some of the suburbia. Their pursuit of a "healthier" human environment, with the spatial separation of work and residential areas, and the use of the greenbelt was thought to be the best

[12] See (Le Corbusier 2007) in bibliography.

alternative solution at the time. The garden city of Ebenezer Howard, with the separation between pedestrians and cars and the combination of the urban with nature through large green areas still influence how streets and public space are designed and experienced today. Le Corbusier used architecture to provide daylight and fresh air to apartments while its towers were built in open green spaces influencing the sensescapes, even with social and psychological challenges. At the time the landscape was an important dimension in the design of urban space. There are some references to the urban "sensorium" (McLuhan 2005) but these mostly offer a critical perspective. References to combating urban crowdedness, impure air, noise and dirt can be found, including Howard's explanations of the advantages of garden cities using words such as crowded or sanitary:

'Town and Country' equal, nay better, opportunities of social intercourse may be enjoyed than are enjoyed in any crowded city, while yet the beauties of nature may encompass and enfol\d each dweller therein (…) how the most admirable sanitary conditions may be ensured; how beautiful homes and gardens may be seen on every hand. (Howard 2007, 317–18.)

Or Le Corbusier, with more explicit reference to terms that relate to non-visual senses as quietness, fresh and stale air, noise and dust, together with the noun chaos which described his vision of New York at the time.

Modern toils demands quiet and fresh air, not stale air (…) The city's residential quarters must no longer be built along "corridor-streets", full of noise and dust and deprived of light" (Le Corbusier 2007, 324)*; (…) "Here is the city with its crowds living in peace and pure air, where noise is smothered under the foliage of green trees. The chaos of New York is overcome. Here, bathed in light, stands the modern city.* (Le Corbusier 2007, 329.)

From the 1960s onwards we are presented with critiques of planning practices, and reflections on the qualities of the urban environment, which at the metropolitan and city level came to add to the discussion of the importance of the senses, in particular, sound and smell pollution, in daily life. If in the 1960s the separation of cars and pedestrians was important in urban development, this also meant that more highways were built, and motorisation was emerging

as a problem due to its negative impact of pedestrian activity in streets. A challenge for those fighting for a more human dimension, and for the role of the street as a public space (Jacobs 1961). Jacobs in her book *The Death and Life of Great American Cities* presents strong critiques of Le Corbusier's Radiant City and the Decentrist movement that included Mumford (1938), Stein (1957), Bauer (1956) and Henry Wright, especially in respect of the real needs of people in the city streets. She defends the use of streets for encounters, the need for more public space and the safety that crowded, and 'noisy' streets provide; two terms also used by Le Corbusier but from the opposite perspective. For Jacobs, a good city is planned to enhance the senses, which she defines as a necessary evil, rather than mitigating them. "*The presence of many other people is, at best, a necessary evil, and good city planning must aim for at least an illusion of isolation and suburbany privacy*" (Jacobs 1961, 30).

However, city planning impacts the streets and their role. Jacobs calls for crowded streets and sidewalks for a more enjoyable life, with all the sensory consequences, though mostly from a visual perspective.

[T]he sidewalk must have users on it fairly continuously, both to add to the number of effective eyes on the street and to induce the people in buildings along the street to watch the sidewalks in sufficient numbers. Nobody enjoys sitting on a stoop or looking out a window at an empty street. Almost nobody does such a thing. Large numbers of people entertain themselves, off and on, by watching street activity. (Jacobs 1961, 35)

This last point, that the sight of people attracts other people, is something that, she argues, city planners and city architectural designers seem to find incomprehensible. They operate on the premise that people in cities seek the sight of emptiness, obvious order and quiet. Nothing could be less true. *People's love of watching activity and other people is constantly evident in cities everywhere* (Jacobs 1961, 47). Also with Jacobs, the visual element is dominant in her observations, even if seeing people in the streets would mean more people, and that would have an obvious impact on the other senses too.

In the late 1970s and 1980s authors such as Cullen (1971), Rapoport (1977), Whyte (1980), Gehl (1987) and Jacobs and Appleyard (1987) analyse urban

spaces and streets and their mode of use. They introduce the concept of "kinaesthesia" and discuss how the environmental components of a space, such as the wind or shade, are perceived, but most of all they formalize the idea of an "urban environment" and a "sensorial street". This relates sensory perception to the built environment, the alignment and height of buildings, materials or colours used and thus continues to privilege vision over other senses. For Gehl (1987), a familiarity with the human senses (comprehension of the concept of perception), a knowledge of the way they work and an understanding of the areas in which they function are important requirements when designing and dimensioning all forms of outdoor spaces. In his own work, however, his studies are limited to sight and hearing interactions, something that he acknowledges and justifies by explaining that he selected these two senses due to the comprehensiveness of their relation to outdoor activities. Lynch, in his work (1960), considers how a city is perceived by its inhabitants to be a fundamental element of the urban structure, or indeed of the way any geographical environment is identified. Still, Lynch, with a methodology more related to social sciences, connects the composite of the senses in operation with the "image" one has of the city (a term that is clearly enhancing the visual sense). He underlines the psychology of place associated with the notion of "mental maps", which people use as internal guides to navigate urban places (Lucas and Romice 2008; Montgomery 1998). "*To understand this, we must consider not just the city as a thing in itself, but the city being perceived by its inhabitants; (…) Indeed, a distinctive and legible environment not only offers security but also heightens the potential depth and intensity of human experience*". (Lynch 1960, 3–5). A critique to Lynch's work is that an "image" of the city includes more than visual landmarks and legibility. However, his work, although visually biased, has informed and framed some of the concepts also used in non-visual studies. Another important urban design author, Gordon Cullen stresses the individuality, kinaesthetic aspects and physicality of spaces, and makes his analysis by framing views while progressing through space. Although these rely on perception and on the senses, the visual sense and the image of space are still privileged: "*We turn to the faculty of sight, for it is almost entirely through vision that the environment is apprehended. If someone knocks at your door*

and you open it to let him in, it sometimes happens that a gust of wind comes too, sweeping round the room, blowing the curtains and making a great fuss. Vision is somewhat the same; we often get more than we bargained for" (Cullen 1996, 10). Later on, Jacobs and Appleyard (2007) worked "*towards an urban design manifesto*" and formulate ideas on how to encourage a liveable urban environment in cities. For these authors, liveable streets and neighbourhoods must have adequate characteristics such as sunlight, clean air, no offensive noise, cleanliness, and physical safety. Here, again, the perception of environmental components of space was considered (although not discussed) but this time centred on what is reasonable and not as Howard (2007) or Le Corbusier (2007) in complete radicalism of a utopian city.

In summary, there has been a clear visual bias used in the classic discourse on the city. Influential urban planners and designers aim at more aesthetic, and visually attractive spaces and use visual language and tools in their approach. In urban planning studies the non-visual senses are often forgotten, rarely considered but always emerging in classical works as a consequence of visual planning and design. Terms such as clean air, cleanliness, noise, or crowding are present in most of the accounts of what should be a good city or street. However, within this dominantly visual aesthetic perspective, non-visual senses are mostly seen as disturbing elements to hide or eliminate (e.g. noise, unpleasant smell, too crowded), here with the exception of authors such as Jane Jacobs. However, with all the challenges to the non-visual senses, the classical approach to city design brought some hints to the importance of the non-visual senses and created opportunities to adapt some of the most classical visually biased concepts and tools to the sensory studies.

The next section will explore some of the most recent literature introducing alternative approaches to contest the mono-visual perspective of planning and design, and through these, leave some clues to future research needs. The new concept of 'Sensescapes' will be used as an exploratory tool to make design and planning more aware of the non-visual senses.

2.6 Sensescapes. The need to explore the invisible

The multi-sensory character of the individual perceptual experience can be overwhelming, but this should generate incentive, and create an expectation of an equally multi-sensory conceptualisation of space and place (Feld 2005). Public space demands to be analysed in a comprehensive way, considering its availability, conditions, quality and usage (Edwards and Beng-Huat 1992). An analysis that should incorporate the city, the neighbourhood, and the streets in their sensory complexity.

What do things look like? What colours do you see? How far can you see? What do you smell? What sounds do you hear? What do you feel? What do you touch? The city is an assault on the senses. Cities are sensory, emotional experiences, for good and for bad. But we are not accustomed to articulating things in this way: the smelling, hearing, seeing, touching and even tasting of the city are left to travel literature and brochures. (…) We do not recognize, let alone describe its smellscape, soundscape, visual spectacle, tactile texture or taste sufficiently. Our impoverished articulation is made all the worse because the city can overwhelm our senses – honking, flashing, whirring, whizzing, precipitous, huge, confusing. Too often, urban stimuli induce a closing rather than opening out of our senses (Landry 2006, 39).

The visualism that dominates urban planning, as well as other disciplines (artistic and scientific) is "*deeply rooted in the European concept of landscape*" (Feld 2005, 181). This concept is incorporated in geographic and planning studies because it "*denotes the integration of natural and human phenomena which can be empirically verified and analyzed by the methods of scientific enquiry over a delimited portion of the earth's surface*" (Cosgrove 1998, 9). Over time, however, it has become intimately related to an objective appropriation of the world that is achieved through vision and its related technique of pictorial representation (Cosgrove 1998). The absence of the "invisible" sensoryscapes in urban planning can be explained by the ease through which landscape ("land-scape", visual) can be captured and represented, in comparison to the more challenging characteristics of, for

example, soundscapes (Adams et al. 2006), smellscapes or hapticscapes (touchscapes).

To cite Venturi et al. (1977, 3): "*Learning from the existing landscape is a way of being revolutionary for an architect. Not the obvious way, which is to tear down Paris and begin again, as Le Corbusier suggested in the 1920s, but another, more tolerant way; that is, to question how we look at things. (...) Modern architecture has been anything but permissive: Architects have preferred to change the existing environment rather than enhance what is there*." Architectural practice has, as has planning, forgotten the "invisible city" and the positive role of the senses in mediating and structuring the urban experience (Adams et al. 2007; Degen 2008). Instead, planning process has been favouring sensory control. Urban plans have become highly idealized and present schematised visions (Pallasmaa 2005). However, studies and proposals from the 1970s that deal with such urban characteristics as the quality of the atmosphere, nature and environment, human body and health, are again at the centre of debates concerning urban space (Zardini 2005). Sustainability and the improvement of the quality of the urban environment are now, more than ever, in the discussion.

It is not a matter of returning to a conception of the environment as purely climatic fact or visual phenomenon, as with the British townscape of the 1960s and 1970s, but rather of the proposing a broader view of the environment that takes into consideration the full spectrum of perceptual phenomena that make up the sensorial dimension beyond the regime of the visual (Zardini 2005, 19).

Material and tactile properties, temperature control (insulation, shadows, etc.), humidity (and rain) and odours, along with sound qualities, are some of the characteristics identified as fundamental to the definition of urban spaces and yet are hardly considered in architecture or planning (Zardini 2005). At the same time, there is evidently a gap between how policy treats sensorial stimulus (noise) and how individuals respond to sound (which may not be in a negative or bad way). As a result, Adams et al. (2006) in their paper on sound policies have identified a need for research into what is positive about the soundscape and how much of that knowledge should and can be incorporated into existing

policies. Then again, and returning to Zardini (2005), why not consider also the haptic and smell qualities of space? The study of sound has been explored in a number of planning studies, but, as discussed above, mostly with a focus on its negative characteristics. Nevertheless, the depth and critical quality of some studies on the soundscapes offer a useful source, in this section, for exploring alternative ways of studying other sensescapes in city planning. Sensescapes, as a concept, represent the full scope of sensory modalities that allow human interaction with the environment and the breadth and richness of the ways in which the environment is experienced (Andringa et al. 2013). They are the result of the interplay between body, senses, and place. As Degen (2002) argues, without the combination of the senses we cannot make sense of the world but they need to be framed contextually and in relation to an object, which they define. *"We do not experience sense in a vacuum but need to be confronted with a material world for the senses to exist as for example a flower we smell, a path we step on and touch, or food we taste*" (Degen 2002, 1).

In their study on urban soundscapes, Raimbault and Dubois (2005) hypothesise about the usefulness of object-centred and human-centred representations of soundscapes. These two types of representations, when joined up, could fill a gap that is currently encountered in decision making by town planners when they are considering potential measures to improve sound quality in towns. Leading them to later defend a more subject-centred methodology that evaluates diversity of meaning in response to noise (see Chapter 6 for a more in-depth exploration of this topic), from annoyance to pleasure, in an urban environment (an interpretation of sound variations in space and time). According to Raimbault and Dubois, such a methodology could facilitate soundscape design and management, provide an ideal soundscape for city users and offer urban planners an accurate representation. There is, however, a high risk of negative reaction by government or local authorities to new developments in noise policy (or other non-visual senses), mostly due to their persistence in considering sounds (or smell) as pollutants and the prospect of the considerable additional financial cost. This will "*mean that quantitative evaluations will be sought in preference to detailed in-depth qualitative studies that are time-consuming and expensive*" (Adams et al. 2006, 2396). Drawing on

Schafer (Figure 7) and other scholars working on “soundscape ecology”, Adams et al. (2006) question the relationship between general average noise as measured and referred to in noise regulations and community responses to a sensory stimulus in their local environment. Arguing that people are more concerned with individual acoustic events than with overall averages. Some planning studies have attempted to document such events using modern cartography techniques and software, for example, GIS (Geographical Information System), in order to achieve a level of representative analysis (Raimbault and Dubois 2005).

Figure 7: Bruce Davis and Peter Huse recording at SFU, circa 1972 (Schafer 1969).

Traditional measures used by city planners, such as zoning, land-use patterns, density, sound weight, etc., have limited proven value in measuring or predicting the quality of the built environment as experienced by users (see

Chapter 5 for a more in-depth discussion of the relation between the built environment and quality of perceptions). The more recent use of geographic information system (GIS) mapping technologies has made some environment attributes, for example, sun and shadow, microclimate, street definition and scale, much more measurable and these can now be directly connected to place quality (Southworth 2003). One fundamental feature of GIS as an interactive mapping and analysis tool is that it is not limited to providing a simple representation of spatial data – it uses overlay techniques to communicate and develop knowledge of spatial–temporal phenomena (Das 2006; Talen and Shah 2007; Thwaites and Simkins 2005). Map production processes offer an analytical basis that is common across various disciplines. Although they are currently used mainly in relation to the visual, they have also been used in a number of sound, smell and haptic studies related to the urban built environment (Papadimitriou et al. 2009; Klæboe, Engelien, and Steinnes 2006; Tsai, Lin, and Chen 2009; 'New York City Subway Smell Map' n.d.; Eliasson 2000; Mertens 1999). Maps enhance the spatial character of the analysis and allow a precise geographical location for the study. If "*'urban' planning conventionally means something more limited and precise: it refers to planning with a spatial, or geographical, component. (…) Such planning is also known as 'physical' planning: 'spatial' planning is perhaps a more neutral and more precise term*" (P. Hall 2002, 3). Using GIS amplifies the knowledge gained through more traditional tools. It broadens and intensifies space evaluation by offering a new methodology that uses space meaning and satisfaction as tools for spatial planning (Talen and Shah 2007). The overlaying techniques that this software uses facilitate not only the design and analysis of each sensescape but also the interaction between these. However, GIS, a computer-based methodology, is still mostly employed in quantitative approaches and other mapping exercises have been used to enable a more user-centred and qualitative analysis of urban space (Lucas and Romice 2008). This research will explore further graphic analysis of the sensory realm in Chapter 4.

Massey (2002, 474) points to the significance of studying all the different senses: "*there are local landscapes of sense other than vision. Try imagining – and designing – a city of sound and touch, a city that plays all the senses*"; a

city that, as Urry (2002) then suggests, plays to taste and smell. Study and discussion of the multi-sensory city have been increasing in recent years and an example of evidence for this is *The Senses and Society* a journal published since March 2006 (Berg Publishers n.d.). This academic peer-reviewed journal has published different articles on the sensory realm and has probably inspired more studies on this subject. Although their scope does extend beyond the visual and beyond the "negativisation" of the senses, most of the articles in *The Senses and Society* present the study of space from a mono-sensory perspective and therefore fall short of the scope of this research. Assuming the need for a more comprehensive sensory study and the benefits of the use of maps as tools to help design and analyse urban sensescapes, some of the most relevant recent studies will be explored next.

In their paper *Representing Sensory Experience in Urban Design*, Lucas and Romice (2008) present an interesting literature review and methodology but they conclude the article without proposing a defined model for representing sensory experience in urban design. While the authors did create a model to be tested by students, it did not correspond with or meet their expectations. No corrections to improve the model or suggestions for alternative tools were made, which highlights the difficulty of this process. Degen (2008), in her book *Sensing Cities: Regenerating Public Life in Barcelona and Manchester* also has good body of research and analysis on the urban sensory realm, using a more sociological approach. Perhaps because they are not fundamental to her work (although this is contrary to what is suggested in the introduction), Degen presents hardly any schematic space representation or maps. Thwaites and Simkins (2007) in their book *Experiential Landscape: An Approach to People, Place and Space*, as in other studies of the "Experiential Landscape Unit" (Thwaites and Simkins 2010) use an interesting methodology of observation, community participation and mapping, with a Lynch (1960) inspired model, that is thorough and replicable, but not comprehensive regarding the senses. Having analysed these examples, the question remains: "*How can space be represented at a general level and what methods of capture can be employed to assist our understanding of these dimensions of space? And embedded in this is a deeper question of which the privileging of the 'urban scale' appropriate*"

(Rogerson and Rice 2008, 191). Even if the examples given here do not analyse the complete sensory spectrum, do not arrive at the best conclusions or present alternative ways of drawing urban sensescapes, they do, nevertheless, represent some of the best attempts so far and establish excellent starting points to build upon to better understand sensory experience in a city. To develop this, the representation and operationalisation of the sensory framework (sensescapes) is fundamental for understanding the power relations in an environment. Investigating the ability of certain groups to superimpose their own rhythms over those of others, to pinpoint what is included and excluded in the experience of public space, becomes crucial in determining how the identity of a place is created (Allen 1999, 65 in Degen (2002)).

The most recent literature offers different multi-sensory frameworks of analysis (Wankhede and Wahurwagh 2017; Sarıbaş, Kömürcü, and Güler 2017; Rodrigues et al. 2019), demonstrating the importance of thinking through the different dimensions that mediate sensory experiences. "*The complex sensory experience of urban space can be well understood if we follow systems approach*" (Wankhede and Wahurwagh 2017, 742). However, these approaches tend to be thematic. They may explore only the key stakeholders involved in the planning process (Rodrigues et al. 2019) or present a very simplified framework that only investigates an individual reaction (Sarıbaş, Kömürcü, and Güler 2017) or a framework that is more comprehensive, integrating elements and context, but still only in a simplified way and not clearly organising the different dimensions (Wankhede and Wahurwagh 2017). Nevertheless, all these different frameworks are integrating a multi-sensory approach and therefore a good point at which to start to "*attempt and identify components and subsystems of urban spaces, while understanding its sensory experience*" (Wankhede and Wahurwagh 2017, 742).

Another challenge that is encountered in the analysis of the sensescapes is the difficulty of visual representation. In planning and design, most of the visual representations relate to the mapping of the intensity of the stimuli, which principally are a source of nuisance and complaints (Atkins n.a; Roberts 2017; Papadimitriou et al. 2009). The use of bar charts and diagrams is still widespread (usually in a quantitative approach) and some may have limited

links to the spatial characteristics of the source location. Lately, though, more innovative approaches have emerged that explore some of the potentials of a more qualitative and spatial visual representation of what people experience in public space. The work of Guastavino (2006) presents an alternative way of representing qualitative data using bar-chart graphics, which she uses to illustrate sources of sensory stimuli in a simple and strict graphic way (Figure 8). Though not showing a directly relation to the elements in space, her work explores sensory judgements, the relationship between semantics and physics, in terms of sonic environments and with a focus on memory. The simplicity of the graphic enables a clear analytical approach and renders the layering of different variables easier to understand. However, as mentioned before, although Guastavino manages to establish a link between sources, meaning and perception, the relationship of these to space remains unexplored.

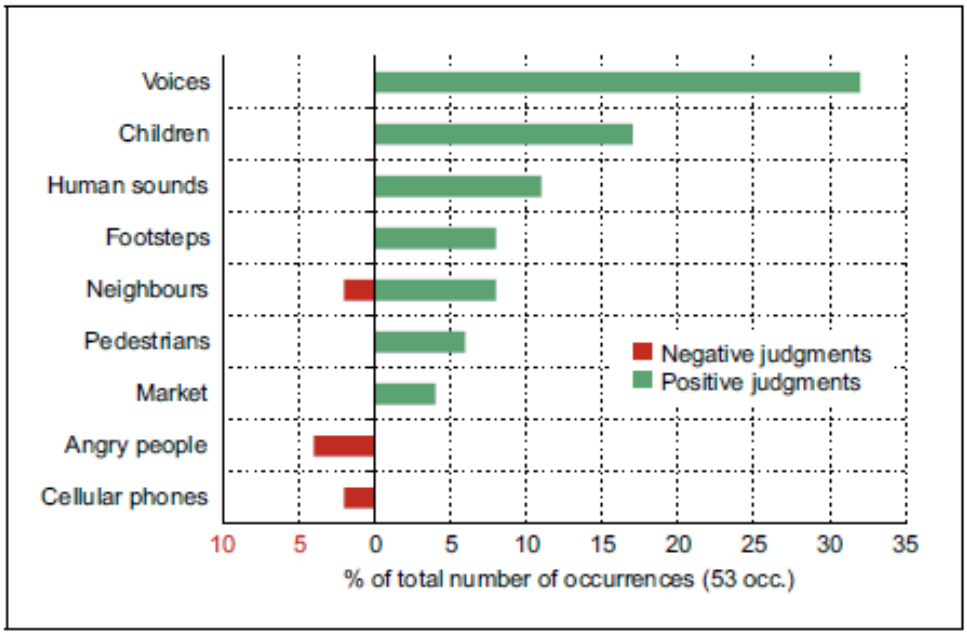

Figure 8: Bar chart illustrating judgements on sensory stimuli sources example.

Lucas and Romice (2008) experience a similar challenge when they create a notational representation in a radar chart diagram – another example of using a typically quantitative graphical representation to visualise qualitative data on sensory experiences (Figure 9). However, this notation was mainly created to capture the "*thinking process itself, and not a later representation of an already complete and static idea*" (Lucas and Romice 2008, 84). It is, in effect, a tool

that records experiences in a location, with the aim of building an archive of experiences for designers to work on the latter part of the design process. Although using multisensory descriptors, related to the different characteristics of sensory perception and to the geography of space, these still don't provide a direct analytical result between specific elements, or characteristics of space and perception.

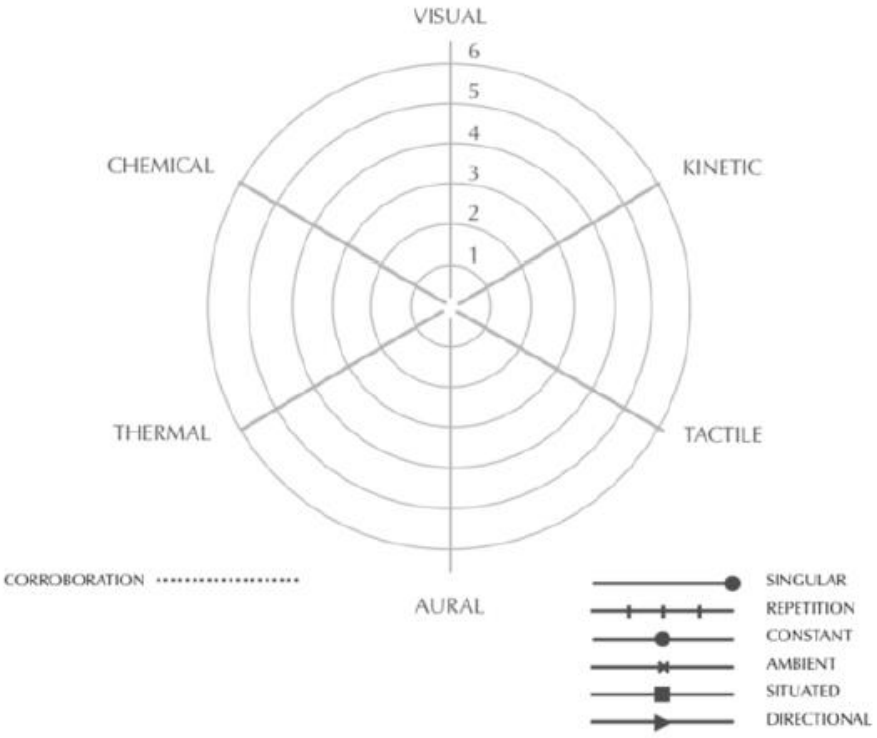

Figure 9: Diagram for sensory notation system example.

The pictures presented in Figure 10 appear in Christian Nold's (2009) *Emotional Cartography*. These demonstrate alternative ways of representing and mapping sensory experiences in urban space (San Francisco, Stockport and Greenwich, London). These images represent a very artistic and simple way of representing emotions and the senses, though mostly descriptive and again without much relation to spatial characteristics. Nevertheless, these are a good base for experimenting with different mapping and visualisations of sensations and experiences.

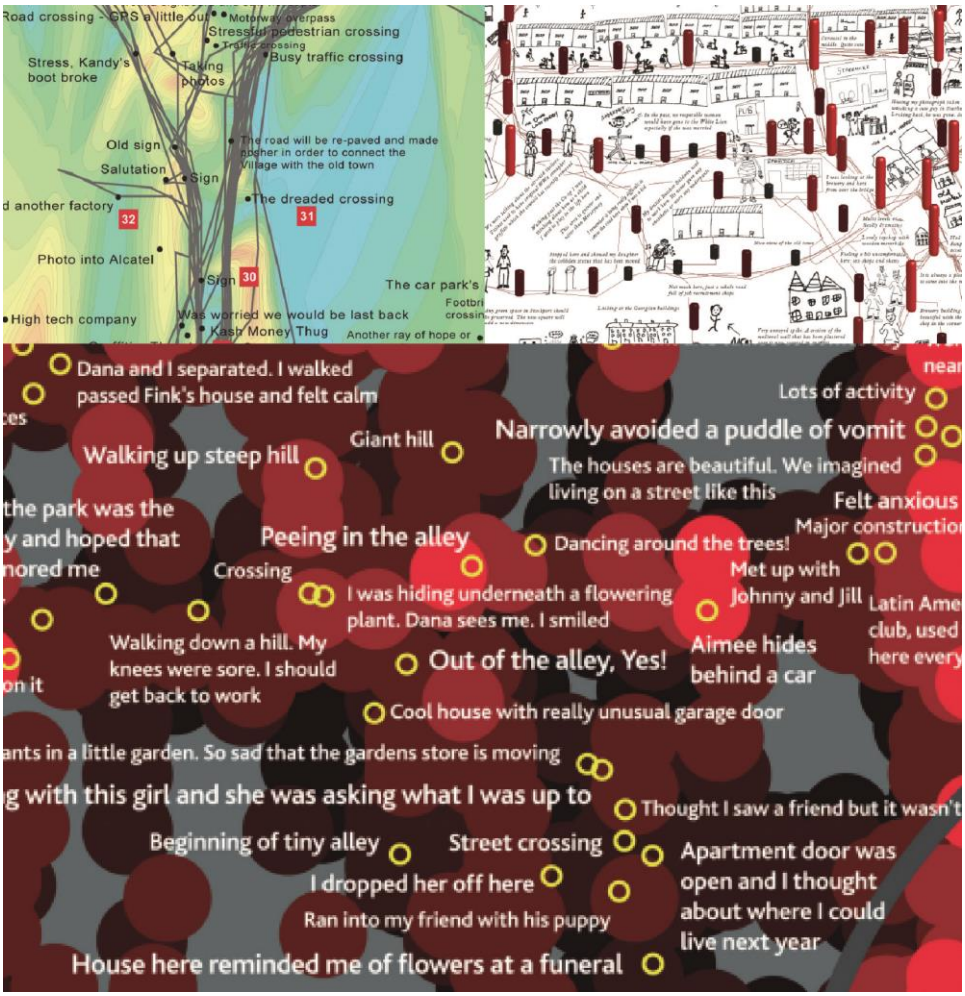

Figure 10: Emotional cartography example (Nold 2009).

The sensory maps of Kate Mclean (n.d.) are another most recent example of mapping the senses. Her maps are beautifully drawn and represent perceptions in space (Figure 11). In the design and notation of Mclean's work, however, a direct connection to urban design and planning research is absent. The maps are motivated by individuals' awareness of their sensory perceptions and seek to chart those same experiences in innovative, creative but mainly descriptive ways.

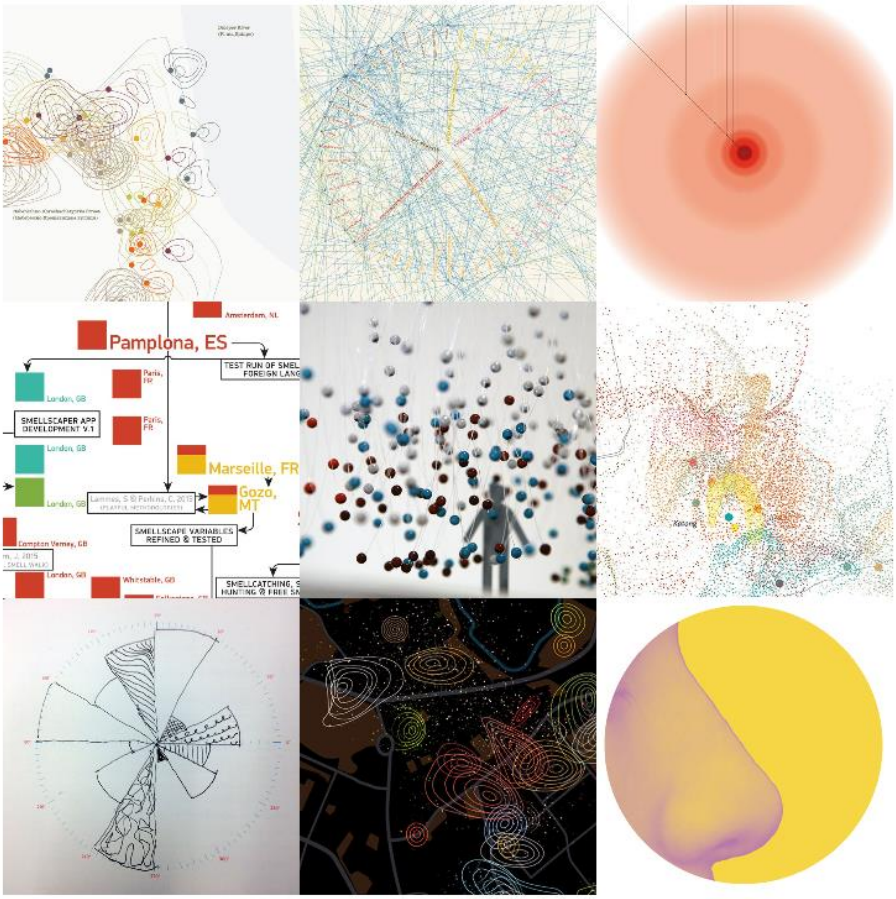

Figure 11: Sensory maps example (McLean n.d.).

Finally, the work of Degen et al. (2017) and a project that seeks to capture the essence of Smithfield Market, London through an ethnographic approach that includes digital maps (Figure 12). Within the five maps produced, the project team recorded not only the user's sensory experiences but also the type of users. These maps have been integrated on an interactive website that allows the overlay of different layers (e.g. sound, smell and textures).

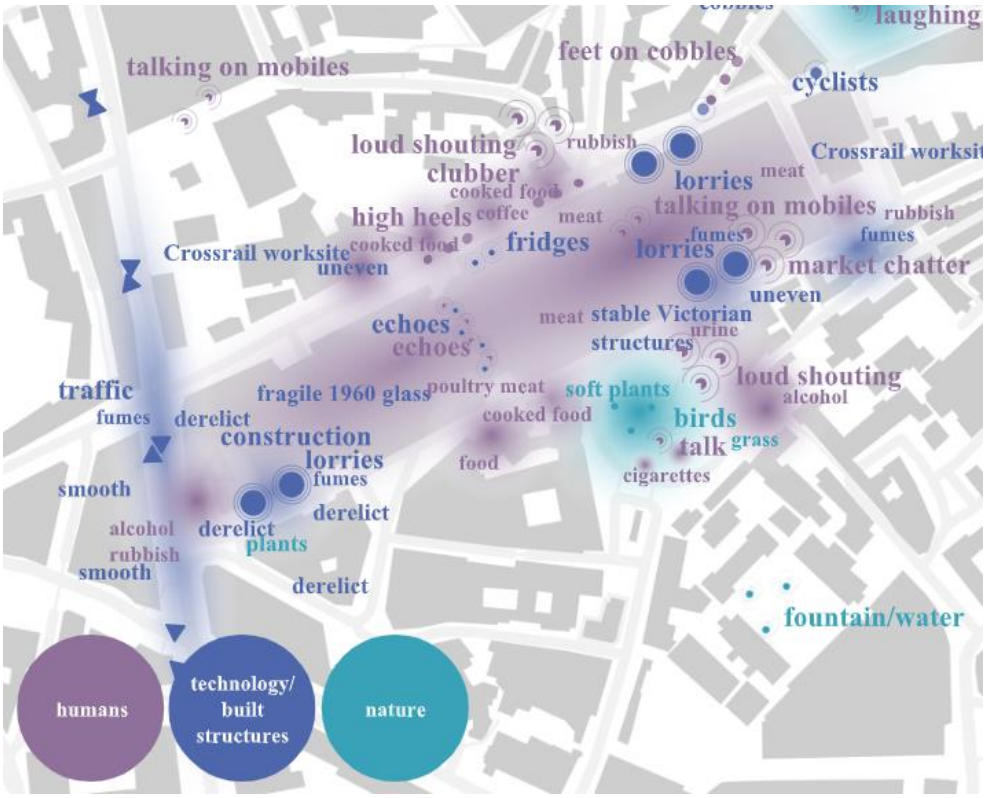

Figure 12: Section of the sensory Smithfield evocative map example (Degen et al. 2017).

These last three examples result directly from the work of designers, usually working in collaboration with academic researchers. The work here is graphically innovative and very good at describing the ambience of the relevant case-study area but the connection between an experience of the location and the impact it may have on urban design or planning is missing. The interrelation between sensory perception and space is a gap that mapping, and representation, still have to bridge.

Maps are visually pleasing and, as a representation of places, can very effectively describe geographical locations and some of their main spatial characteristics, but they are descriptive rather than analytical tools, which can make analysis challenging. Another challenge for analysis is that maps provide a 2D representation of all the variables and their arrangement, and where overlay results (especially in a non-iterative map) this can be harder to interpret. Finally, the effort to produce a map demands much more work and design skills than other less appealing visual representations. With all these factors in mind, the use of graphs (bar charts, radar diagrams or others) emerges as a more

functional (less descriptive) and easy-to-use method for analysis (see chapter 4 for further discussion on sensory graphical representation).

In summary, innovative means of representation are important to communicate the complexity of the urban environment, in particular for disciplines such as urban design and planning. However, the selection of this representation also reflects some of the theories of space, as representation is often not neutral and carries with it knowledge of the body and space (Lucas and Romice 2008). As with the work of Lucas and Romice (2010) this investigation supports its analysis with the idea of space as a medium, of space understood as a fluid understanding of experience. However, the support of some graphical elements will provide a level of abstraction and a representation of a period which is also relevant in the creation of a framework of analysis and fundamental in urban design and planning. Consequently, this work will still use graphical types of representation hoping to build a framework of analysis that can be adapted to other spaces and periods of time. One that is also inspired by the work of Kevin Lynch with routes and images (1960), Christopher Alexander and the exploration of language and patterns (1978) or even de Certeau with the integration of everyday practices (1988). Although recognising the limitations of the method and that through maps something always slides away (de Certeau 1988). A representation that tries to describe and understand the relationship between sensory perception and the resulting form of expression. As with product design (Schifferstein 2011), to try to understand why some spaces seem to relate more to particular expressions and to understand the social, environmental and physical characteristics that seem to evoke these expressions. A process that will demonstrate that an expression can also manifest itself in different forms. (Schifferstein 2011).

In this dissertation, a variety of graphical representations will be used that, with their limitations, will respond to the aims of the research. The graphical exploration of what is experienced by street users in different locations and the role of the urban elements in promoting those same experiences. The complexity of drawing the overlay of elements, sensory experiences and descriptions is something that is difficult to translate through a visual medium such as a static map (in comparison with the interactive mapping of Degen et al.

(2017)). Therefore, this dissertation will include a multimodal representation of space whenever possible, including photography and maps to provide a sense of location, and other visual elements to explore the relation between elements of an area, patterns and densities in order to allow a more informed design of these areas (Lucas and Romice 2010).

2.7 Summary of the literature

The overview provided in this chapter of the literature on the senses clearly demonstrates the dominance of the visual over the non-visual senses, in humans (e.g. biology, psychology) and urban research; a visual dominance that, as described in the previous sections, emerged early in time, mostly as a result of historic and culturally driven factors (see sections 2.2 and 2.5) rather than a natural bias. While there is a consensus on this bias, there is still no consensual reason to explain it. Arguments supporting this bias start from the dominance and complexity of vision, to methodological difficulties in describing and analysing some of the non-visual senses (e.g. smell). However, it is important to highlight that these structural and technical explanations are related, as methods and techniques of research relating to vision are only currently more advanced due to the initial bias toward vision (Hutmacher 2019). This bias still remains and is still very present in urban studies, as described in this section.

Hence, the initial sections point out the relevance of the senses in human life and in human interaction with the surrounding environment, while some of the following sections present a historical overview of how this dominance of the visual developed from ancient Greece to the classic literature on planning and urban design. This review also demonstrates that when non-visual senses are considered, these are mostly viewed as disturbing elements that should be hidden or even eliminated (e.g. noise, unpleasant smell); a perspective that has since been adopted in urban planning and design practice. This has come about due to a variety of issues, including not only those relating to power and control of space but also the desire to construct pure and clean environments (to address pollution and environmental aspects), as well as a lack of research,

time and financial constraints. Demonstrating that planning has simplified what is effectively a very complex system, a complexity that is well described in Serre's (2008) work and in his dialogue with words and sensory perception. Section 2.3 highlights the discussion of what sense and perception mean and demonstrates that the relationship between individuals and the environment is part of a more comprehensive discussion that involves literature from many other disciplines, including psychology and philosophy.

The observations presented here also emphasize that planning is still reliant on policies and regulations and is based on the use of quantitative mapping. These approaches do not present a multi-sensory analysis of space, apart from a few exceptions in relation to noise and smell nuisance, which leads to the fact that most of these parameters are also presented through their negative characteristics and maximum limits. The lack of a comprehensive sensory approach and the focus on the negative leads to two of the main gaps that currently exist in sensory urban literature, policy and practice. A reality that is demonstrated when measuring literature and interest in the senses (section 1.1).

Nevertheless, as section 2.6 demonstrates, some important groundwork has been made more recently in which the introduction of the concept of 'sensescapes' has promoted more comprehensive studies and alternative methodologies. This concept (see Figure 13) is defined as a result of the influence of the urban realm and environment (a) on human activities and space use (b) through the exploration of sensory perception and experience (c). It contributes to more complete and inclusive knowledge that should and can be, incorporated into existing research, policies, and practices.

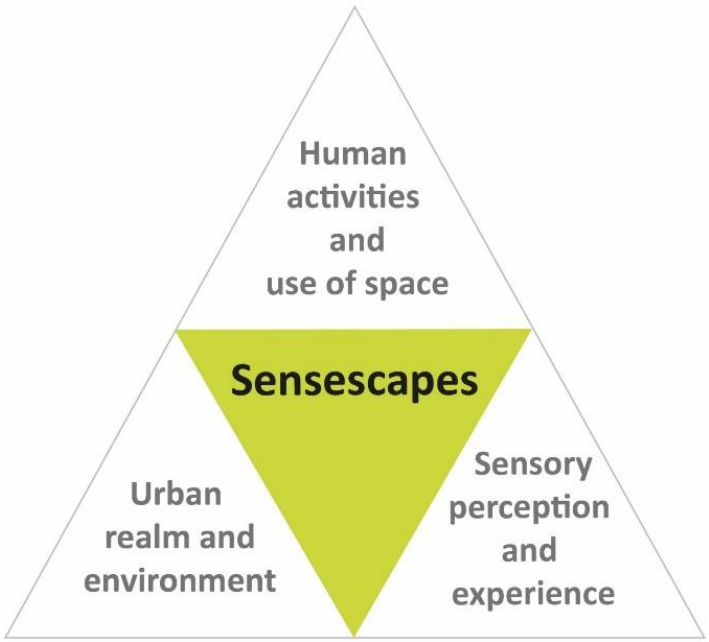

Figure 13: Triangular interrelationship contributing to the sensescapes. [13]

This concept of sensescapes (Andringa et al. 2013; Caballero and Ibarretxe-Antuñano 2009; Degen 2008; Diaconu et al. 2011) also helps in defining the three main dimensions that are explored in this thesis: the urban realm and environmental elements; individuals and their sensory perception and experience; and the space, with its variety of activities and uses. Consequently, these dimensions support the structure of this investigation, which seeks to explore the urban environment in a more comprehensive way (multi-sensory and beyond the negative experience of the non-visual senses) and incorporate the interaction of these dimensions in research, policies and practices.

Finally, graphic representation of the sensescapes presents different forms. Although graphs (bar charts, radar diagrams or others) are usually used to represent quantitative data, examples given above show how these can also be effective and easy to use in sensory analysis, especially when compared with maps, which demand much more work and design skills to produce and are still primarily used to illustrate descriptions of spaces. The challenge of adequately

[13] Based on Punter (1991), cited in (Carmona et al. 2003).

articulating the relationship between sensory perception and space is a barrier that mapping and representation still have to overcome.

In conclusion, Figure 14 below presents a word cloud created to illustrate the literature review, showing the 100 words most used during this analysis. The word cloud presents a snapshot of the contents and structure of this chapter, in particular the review of planning-related literature and sensory studies, the relation between the senses and the urban environment and the focus on space and the senses, using a non-visual and multi-sensory approach.

Figure 14: Chapter sample word cloud.[14]

[14] By default, the more frequently a word is found, the larger it becomes in the word cloud. This word cloud was created using the website: https://worditout.com/word-cloud/create.

3 Methods of Analysis of the Sensescapes of a Space

From the olfactory point of view, no [nothing]. I keep saying, there it is, when I speak, maybe I'm a little bit constrained by the existence or not of the smell of car pollution (Interviewee GP). So, it's always negative? (Researcher). No, the fact that it is neutral is positive. The fact that I don't feel the presence of that smell of car pollution (Interviewee GP).

This chapter will outline the specific research design choices made during the investigation period, along with their challenges, opportunities and limitations. From the research framework that creates the base for the fieldwork and case study analysis, to the data collection process and data analysis methods. It will also highlight the relevance and adequacy of the selected approach, and introduce the analytical method based on the comparative and thematic analysis of a sample of answers from a group of participants (space users).

Charles Landry observes that "*cities are sensory, emotional experiences, for good and for bad. But we are not accustomed to articulating things in this way: the smelling, hearing, seeing, touching and even tasting of the city are left to travel literature and brochures. (…) We do not recognize, let alone describe its smellscape, soundscape, visual spectacle, tactile texture or taste sufficiently*" (Landry 2006, 39). It is this absence of recognition and inability to articulate what sensescapes are and embody that this research seeks to address.

As mentioned before, one of the goals of this investigation is to challenge the dominance of visualism in planning and design; a superiority that has consequences for the non-visual senses, which become largely overlooked. Even if sound and smell have achieved some relevance within planning in the context of noise and odour nuisance studies (see section 2.4). This investigation, therefore, aims to make the non-visual senses more visible. Such an idea has been advocated in the past by some of the most recognised scholars in urban research, for example, Kevin Lynch in *The Image of the City*

(1960), Murray Schafer through the World Soundscape Project (1969) and Paul Rodaway through his work *Sensuous Geographies: Body, Sense, and Place* (1994). Reading these authors, as well as many in other disciplines, such as Merleau-Pont (philosophy), Sennett (history and sociology), Pallasmaa (architecture) or even Howes (anthropology), confirms the need to explore the "invisible" and the "positive" alongside the "negative" for better integration of this research with city planning and design.

The three research questions that are presented in Figure 2 create the context to address these concerns and will be explored in chapters 4–6: (1) What are the multi-sensory characteristics that people experience when using urban public space? (2) What is the role of the urban realm in mediating those experiences? (3) How can this knowledge contribute to urban planning and design? As described above, in responding to these research questions the multi-sensoriality of space, the individual's perception and the mediation role of the urban realm emerge as fundamental factors to explore (as seen in Figure 13).

People perceive urban space through their senses and this perception is mediated through different factors, that include the geography of space and its urban elements, which in turn, may promote, enhance or mitigate that perception. The perception of sounds, smell and touch can be achieved either directly from the source element (for example, the sound of a car motor, the smell of someone's perfume in a narrow street (i) or the haptic sensation of cobblestones underfoot (ii)) or indirectly and meditated by elements of the urban realm (for example, a building blocking the sound of traffic, a cover protecting from the sun or rain (iii), or a street channelling and increasing the strength of the wind blowing in a specific direction (iv)) – see Examples with urban realm elements mediating sensory perception. with some of these examples. Urban realm elements that can be found in, and compose public urban space. Although the perception of public space is very much down to an individual and a result of multiple factors that go beyond the physical characteristics of space (cultural, social, political, ethnic, biological, etc), these urban realm elements still have a key impact on how public space is perceived and used.

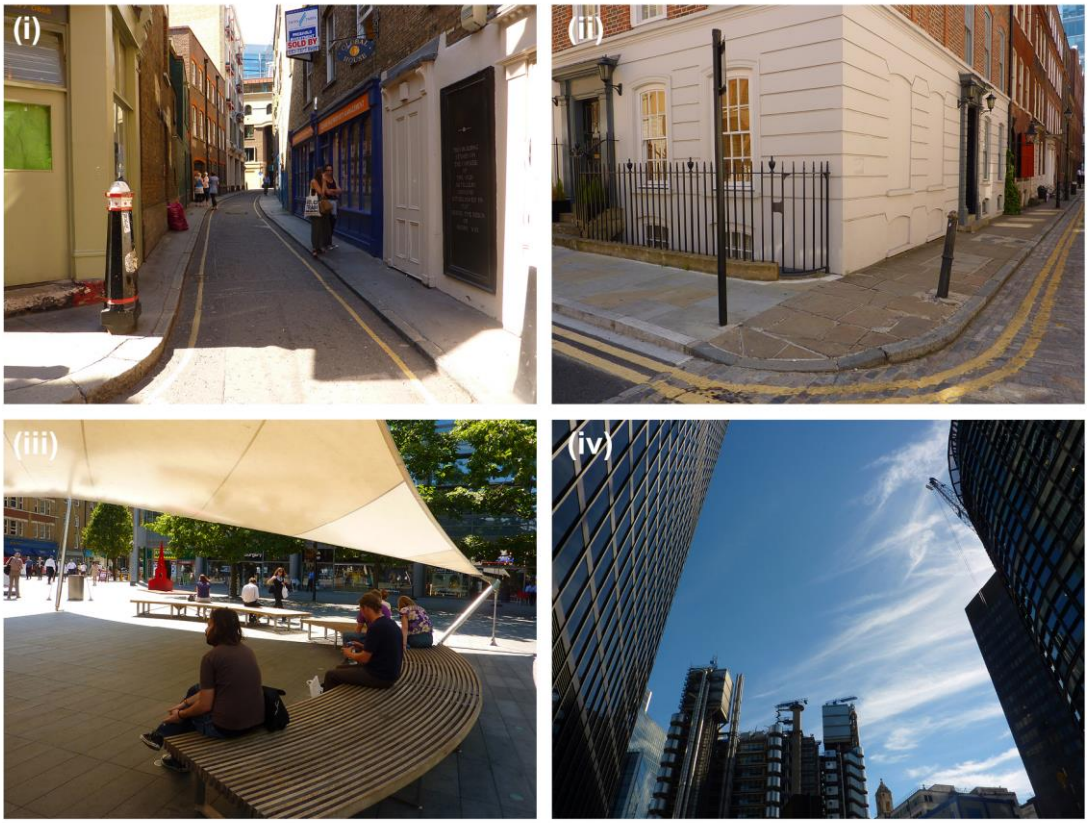

Figure 15: Examples with urban realm elements mediating sensory perception.

The analysis of these elements is fundamental in planning and design because their particular features or context promote different space characteristics and qualities, which may influence space users in different ways and encourage them to stay within or avoid a specific location. Improved knowledge of how the urban realm affects the sensory stimuli and people's level of appreciation of public space will have an impact on its use, as urban designers and planners will be able to use this knowledge to better manage changes that are needed. These changes will then, in turn, influence space densities and patterns – more specifically, the more people enjoy a particular place, the more people will tend to use it and vice versa (although there may be a tipping point here as overcrowding can also provoke negative impacts and alter the perception of quality of space). The analysis of sensory perceptions will, therefore, provide cues for a better understanding of this impact. As language is a privileged medium of communication, the analysis of the content, patterns and repetitions resulting from the description of sensory perception from different individuals will, therefore, provide a more comprehensive understanding of the human-

environment relation. Ultimately, this will help explain the differences in space quality and densities of use and support processes of urban policy and management. The verbal outputs of the relation between the information provided by the environment (space) and perceived by the individual through perception are the starting point for this analysis (Figure 16).

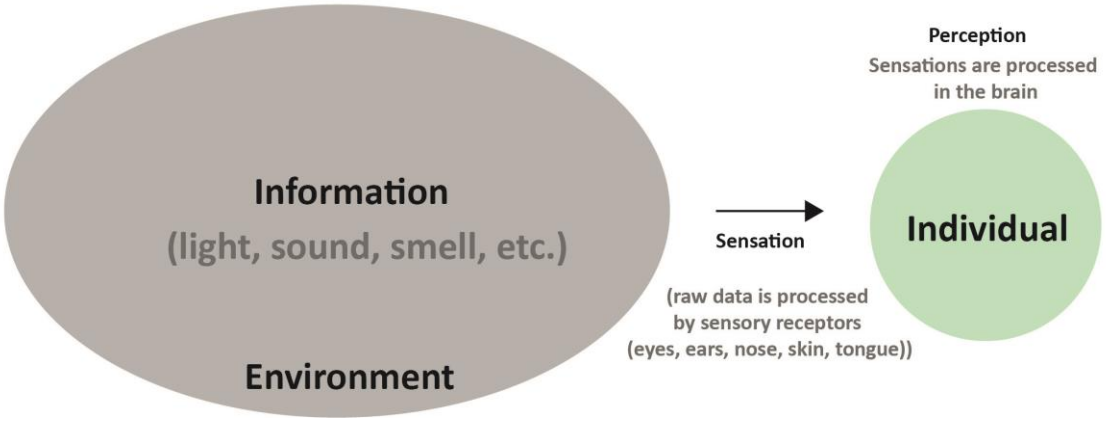

Figure 16: Sensory perception of the urban environment – a conceptual diagram.

As a user-centred investigation, trying to understand sensory perception from space users, findings are based on a qualitative approach supported by in-situ, interviews conducted in the presence of the researcher, meaning that both the participant and interviewer are immersed in the same sensory context. This allows the researcher to better explore the complexities of the sensory realm, to observe and note particular details from the interview and also to recognise when the participant's responses may include omissions (i.e. when the participant fails to mention something that the researcher instead can perceive), revealing differences in the simultaneous experience of the same location.

The investigation builds on the idea of a three-dimensional world being experienced, where the elements of the urban realm affect space, which then influences human behaviour through sensory experience (Figure 13). The combination of these elements and the experience they help create at an individual level will then contribute to what can be designated as the sensescape of a place (Andringa et al. 2013; Caballero and Ibarretxe-Antuñano 2009; Degen 2008; Diaconu et al. 2011). Consequently, this research will

explore the sensescapes through these aspects and consider their impact and influence in shaping urban space qualities.

Figure 17 introduces the conceptual and analytical framework, relating each chapter (4–6) to the particular dimension it explores, a series of sub-questions (directly related to the research questions as described in section 1.2 above) and outputs. The dimensions themselves result from the triangular interrelationship contributing to the sensescapes of a place and are identified as elements, space and individuals. The sub-questions introduce the relationship between the dimensions and the research questions. These ‘What’, ‘How’ and ‘What meaning’ interrogations will help with the final outputs of this research, the framework of analysis (key input for planning and design). They also directly represent the focus of the relevant chapter. Finally, the direct outputs of each chapter are introduced, presenting the results of the interactions between the elements, while focusing on the three dimensions, in particular, the identification and characterisation of the space through its elements which includes the positive and negative dimensions of sensory perception, the analysis of the urban realm elements mediating divergent experiences and the exploration of the impact of the sensescapes in space users. The final chapter (Chapter 7) introduces the resulting output, the framework of analysis, as the culmination of the three preceding analytical chapters. This framework is intended to provide a methodological approach for planning and design practice and policy. The structure introduced in Figure 17 not only sets out how the research questions will be answered but also demonstrates a comprehensive sensory approach to urban public space analysis.

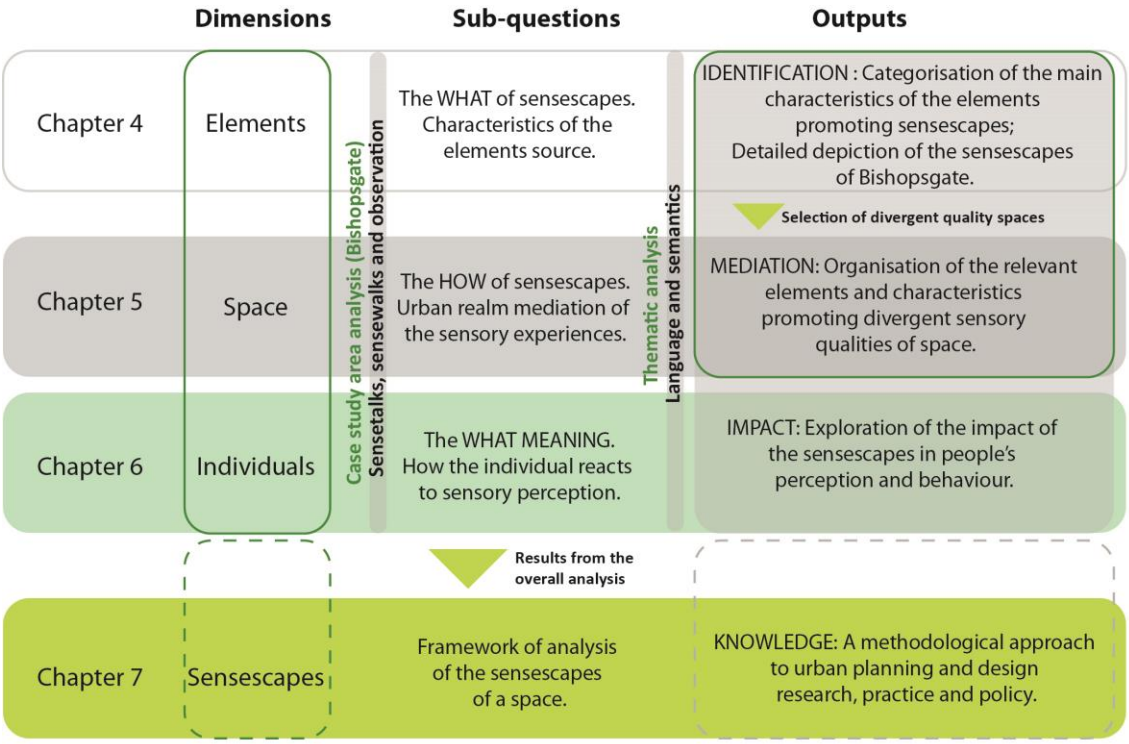

Figure 17: Summary of the conceptual and analytical framework.

The concept of a sensescape (as described in 2.6), can be related to a more intimate idea of place (Davies et al. 2012, 1). The sensescape is a broader concept that emphasizes the physical and spatial aspects of the sensory landscape, with an emphasis on the production of space. It accommodates the complete sensory environment, from the location to the human response to it. However, like the soundscape (Schafer 1994), it is less easy to formulate an exact impression of a sensescape than of a landscape. Consequently, presenting a number of disadvantages, primarily the fact that it is difficult to characterise due to the variety of the factors it incorporates and the complexity of the relationships between them. Nevertheless, much of this complex character comes from the variety of ways in which people experience places through their senses and so this concept highlights the idea that design can directly affect people's sensory experiences of a place: "*good design can help create lively places with a distinctive character; streets and public spaces are safe, accessible, pleasant to use and human scale; and places that inspire because of the imagination and sensitivity of their designers*" (CABE 2000, 8).

When exploring the importance of the non-visual sensory experiences, such as smell, sound and touch, in the creation of different urban environments, thermal

and kinaesthetic experiences are included as a way of detailing the haptic experience. Taste will be excluded since it is assumed that the urban environment cannot be experienced directly through this particular sense (although higher levels of pollution can be tasted, as described in section 2.1 above). While sound and smell are senses that can be perceived at a distance, touch implies proximity that can only exist at the street level and this, therefore, is established as the scale of urban public space analysis. In order to ensure a comprehensive approach in this research, a variety of urban realm elements are considered and classified according to their nature, from the built environment to human activities, land use and natural and environmental factors. The full list of elements, designated as urban realm and environment elements, are introduced later in the section (Table 3). The impact of these elements, which co-exist in space, on the individual is also analysed through patterns, dimensions and characteristics emerging from the results of the interviews.

Table 2 explores the main dimensions and variables to be considered in this exploration based on the work of authors such as Macpherson (2011), James Jerome Gibson (1966) and Thwaites and Simkins (2005). For each dimension, it introduces the key factors contributing to their selection and the elements to consider within the investigation[15]. The contents of this table establish the base of exploration for the following chapters.

[15] In the table touch is related to the skin. "*The skin is therefore counted as one sense organ even though it is acknowledged as containing at least 15 separate sensory mechanisms*" (Rodrigues et al. 2019, 10).

Table 2: Main factors contributing to the sensescapes.

Dimensions	Variables	Main reasons	Elements in study
Sensescapes	Senses and scale	Consider all non-visual senses with direct impact on urban design and planning Taste not included as it is only indirectly related to urban design	Ears and nose as distance receptors (sound and smell), skin as immediate receptor (touch, including thermal and kinaesthetic if mentioned by participants) (Hall 1969) Not vision or taste
Elements	Urban realm and environment	Recognise the comprehensiveness of the urban realm elements - comprising urban space and influencing sensory perception	Qualities, dimensions, patterns, and characteristics of the elements of the urban realm
Space	Sensory perception and experience	Understand the importance of the characteristics of the stimulus or space in sensory perception	Urban realm elements to consider: Built environment; human activities; land use; environmental factors; physical settings
Individuals	Human activities and use of space	Understand how sensory experience promotes activities Reactions from individuals	Stay, pass by, avoid

In order to examine the relationship between the element's source of stimulus and the resulting sensory stimulus this section introduces a list of factors to consider in the analysis (Table 3, next). This list attempts to be as comprehensive as possible in terms of isolating and identifying the individual element sources of which the urban realm is composed. Its purpose is to identify the urban realm elements that stimulate and mediate sensory experiences, and to capture the complexity of the senses in a structured way.

The complexity of the sensory realm is an issue that impacts on the ways in which it is described, classified and mapped. When people describe sensory perceptions, they often refer to the source rather than the perception. Scholars such as Henshaw (2013) have developed mechanisms to overcome this, for example descriptor wheels, which are used in particular to describe odours and people's perception of them (Quercia et al. 2015). Henshaw (2013) created descriptors that were based on a range of smells encountered during walks made with participants and then added to a graphic wheel, using describing words such as floral, barbeque, waste, cigar or pain. A "*smell dictionary*" using the sum of descriptors sourced from literature and smellwalks Quercia et al. (2015). However, when exploring how urban planners and designers can (re)design places in consideration of their sensory environments, the sources become more important. "*First, all sound sources in the vicinity of the soundscape should be identified and noted. Then, planners have to take into account the local contexts of the sound sources, the interaction of which gives meaning to the perceived noise*" (Raimbault and Dubois 2005, 347). The descriptors themselves are just a medium that enables a better understanding of the sources, their qualities and dimensions.

In Table 3 sources are categorised based on the identification of their nature (Guastavino 2004). The main categories chosen for the list are drawn from a range of existing studies, for example Gehl (1987), Thwaites and Simkins (2005), Guastavino (2004), Raimbault and Dubois (2005), Lucas and Romice (2008), Adams et al. (2006) and Henshaw (2013), and include a variety of elements added later from the case-study analysis. The list started as a set of basic descriptors based on available literature and the integration of elements identified from the fieldwork and interview responses occurred at the end of the analytical phase of this research. The categories and elements that are presented in Table 3 inform the structure of the following analytical chapters and case study analysis and can be used to create a framework of analysis to use in policy making, as it can easily be edited and adapted to different geographies and spaces. The categories are: the physical elements of the space, designated as built environment; human activities, which are not fixed and are dependent on an individual's actions; land use activities, which are

directly related to planning decisions on the use of space; environmental factors, where climatic factors were considered; and finally, natural settings, which establish contextual elements of the space. Within each of these broad categories a cluster of sources is included – a number of these descriptors, for example, traffic, the presence of people and building works are based on the soundscape work by Shafer (1969) and Delage (1980) as described by Raimbault and Dubois (2005).

This structure mirrors the five categories of the urban realm and environment elements (which relate directly to urban policy and management) as defined in the elements of study in Table 2 (above) and now describes these in greater detail, demonstrating how many elements each category contains: built environment (15 elements); human activities (9 elements); land use (9 elements); environmental factors (5 elements); and natural settings (2 elements). The combination of these elements helps to compose and define the character of a space – as each space is a composition of some of these elements and different spaces will be composed of different elements. The elements that are here identified promote and/or mediate the sensory stimuli and consequently support the analysis of the sensescapes. An analysis that intends to go beyond a simple aesthetic evaluation and achieve a more personal interpretation of how the elements and their qualities reflect on the individual qualitative perception of a space.

These elements of the urban realm will be the main basis for the next chapter (Chapter 4) and the initial section of the framework of analysis exploring the 'What' sub-question (Figure 17). Based on the identification and description of the elements that are recognized by the research participants and how these relate to each of the senses, per location. Finally, these elements will also support the analysis of the characteristics of the space and the HOW[16] sub-question, which will be further developed in Chapter 5 and later also designated as the 'spatial characterisation' section of the framework of analysis (the methodological output of the investigation).

[16] How does space mediate sensory perceptions?

Table 3: Urban realm elements categorisation.

Source of elements mediating the urban realm	
Built Environment:	**Human Activities:**
– Air conditioning – Animals' presence – Building façades/interfaces – Building textures – Covered structures – Other physical barriers – Pavement textures – Street pattern and types – Surfaces and materials radiation – Type of pavement (stairs, ramps, etc) – Urban form (blocks, scale typology) – Vegetation – Water sources (fountains, etc.) – Way-finding signals – Seating areas	– Commercial activities (market, stalls, etc.) – Other activities and attractions – People's presence – Pet animals' presence – Rubbish, garbage and excrement – Traffic – Planes – Trains – Works, building site
Land use:	**Environmental Factors:**
– Commercial use (food, flowers, music, etc.) – Industrial use – Office use – Playground – Public services (hospitals, schools, etc) – Public space (park, plaza, etc.) – Religious buildings – Residential use – Transportation nodes	– Air movement (breeze, wind) – Fog – Rain – Snow – Sun (sun/shady area, radiation/heat)
Physical Settings	
– Water proximity (sea, river, etc.) – Topography (slopes, etc.)	

In this type of analysis, as observed by Rodrigues et al. (2019), problems can emerge associated with the vast number and types of objects that an individual can perceive, along with the fact that these objects can be perceived by one or multiple sense organs at the same time. "*For example, when we pick up an object we may see and touch it at the same time, thereby perceiving two simultaneous sensory experiences that we may not necessarily perceive as*

distinct from each other, rather we consider it as one experience with two (visual and tactile) sensory dimensions" (Rodrigues et al. 2019, 10). Although this challenge is recognised (in particular in terms of how the visual sense interferes with other sense), the methodology and interview guide questions adopted mitigate potential issues by asking people questions that focus on one sense at a time. In this investigation, sensory experiences will be considered separately even if in chapter 5 some of the analysis will explore the interaction between the senses. Figure 18 introduces a visual representation of the five dimensions of urban space, establishing the spatial characterisation cluster of the sensescape's framework of analysis[17].

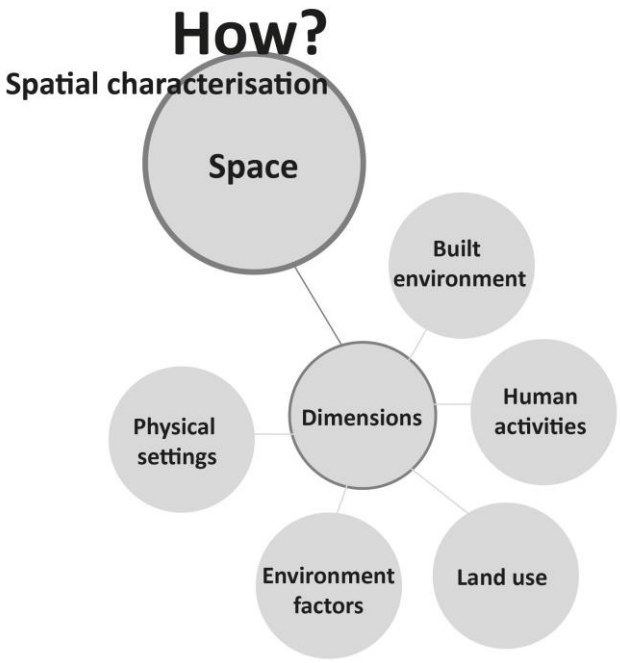

Figure 18: Framework of analysis – spatial characterisation dimensions.

3.1 Selection of a methodology

Terms such as "urban", "the city" and "urbanization" are used to refer, on one hand, to certain physical and geographical features of human life and, on the

[17] The full framework of analysis is a key output of this research and is introduced in Section 7.1.

other, to social and attitudinal characteristics (Gibbs 1961). Urban research is, therefore, the systematic examination of the nature of political, social and economic activities, processes and outcomes at different spatial levels (Andranovich and Riposa 1993). Considering the breadth of this perspective urban research methods should, in recognition of this, be diverse, adaptive and framed for different research aims (Figure 19).

Figure 19: Urban research methods as a balance between processes.

From the origin of the concept of soundscapes through Schafer's World Soundscape Project (1969), a number of studies have stressed the key role it plays in environmental evaluation. Several scholars have attempted to identify the informational, aesthetic or affective qualities of sound that help to confer quality on a given landscape (Carles, Barrio, and de Lucio 1999). Acoustic ecology later defines soundscape as "*the sum total of all sounds within any defined area, and an intimate reflection of, among others, the social, political, technological, and natural conditions of the area*" (Landry 2006). However, as described by Raimbault and Dubois (2005), soundscapes are variable in space and time, and can be viewed from a global to a local scale. If the soundscape of a specific space could become an acoustic image of a city, the perceived scale of a sound source is finite. As Semidor (2006) observes, the identity of a city is not only defined by its urban composition, its appearance but also by its soundscapes. "*Listening to a city is trying to seize a mental representation,*

which is essential for the comfort of city dwellers and inevitably, it has to be taken into account by decision makers and urban planners alike" (Venot and Sémidor 2006, 1). At the same time, soundscapes can't be described only through traditional quantitative metrics as they can have similar measured levels and be perceived differently by those experiencing them *(…) This is because, amongst other things, level does not include consideration of character and it also does not account for the levels of neighboring areas with which the place might be positively or negatively compared*" (Jennings and Cain 2013, 3). This statement helps illustrate the limitations of quantitative methods in sensory analysis. A qualitative method is essential, therefore, to achieve a clearer understanding of how people perceive and react to different sensory situations, in different contexts and times. How they evaluate whether sounds (as other senses) are wanted or unwanted. How they evaluate the complex overlay of sensory parts in different urban spaces (the sensescapes) and what they value and appreciate. A quantitative method would limit the amount of information that can be retrieved from individuals' responses, and it would hardly translate the intricacy of people's sensory experiences.

However, most of the user-centred qualitative research to date has been mostly applied to a mono-sensory analysis of urban space (principally sound and smell related). In addition, it has not always been based on responses of participants actively immersed in the location, instead relying too much on people's memories and facts retrieved from the past. Therefore, with results that reflect a static impression of the environment rather than its dynamic reality and fail to represent it in a comprehensive way. In order to understand the current state of the art in qualitative methods, DEFRA's study on Soundscapes (DEFRA 2009) provides a relevant and comprehensive list of key studies and methods. Table 4, presents the methods from this list, organised to illustrate the disadvantages and advantages of each approach. It adapts some of these methods from their original context of soundscapes to a broader, multi-sensory analysis of space, to show how they may be applied to an investigation of the sensescapes of a place.

Table 4: Methods comparison.

Method	Disadvantages	Advantages
Sensewalks	Cannot assess the strength of the different sensescape factors; Statistical data analysis.	Promotes direct experience of the area; Good basis for interviews; Awareness of different ways of perceiving the same experience.
Sensetalks (semi-structured interviews)	Statistical data analysis.	Deeper understanding of individual assessment; Highlight relationships between different variables in the assessment; Highlight relationships between sensescape and other everyday aspects in people's lives.
Scales (numerical and adjectives scale)	Results heavily dependent on the exact wording of questions and same personal interpretation.	If used in situ provides large amount of information from a large number of participants on their perception and environment assessment.
Categorical responses (questionnaires)	Quite simplistic results; Limited assessment (if used in isolation).	Fast and simple for an individual to respond; Simple analysis of the data; Quick way to check for associations between different variables.
Image and Sound notebooks / annotations	Rely on active participation and comfort with the demands of the method; Individual differences in dealing with method can create possible data bias.	Allow comparisons between subjective responses and physical data; Help understand the importance of socio-cultural factors in individual assessment; Choices of participants highlight attention grabbing sources; Does not rely on the memory of participants; More freedom for the participant (what and when).
Acoustic / Odour measurements	Do not necessarily reflect people's subjective assessment (in same measured sound/smell level areas).	Allow easy comparison between places; Highlight more problematic places; Quick objective assessment; Do not rely upon the public's input.

Table 4 has then been analysed in search of a method that fosters a location-direct experience, a deeper understanding of the individual assessment and greater qualitative content. The purpose was to avoid a reliance on physical

measurements since quantitative methods are already dominant in this field and are considered to limit the scope of sensory research. High-tech and experimental methods were excluded due to technical and resource limitations. No individual method presents all the characteristics that are needed to address the aims of this research, so a mixed methodology was adopted. This includes sensory notebooks (notations only kept by the researcher), a mix of sensewalks and sensetalks[18], and the use of photography, video and sound recordings. Using a suite of different methodological approaches allows researchers to benefit from the advantages of each method while also slightly counteracting any disadvantages. More nuanced results can also be obtained. Using a combination of methods, therefore, can result in a more complete description of the sensescapes and a more comprehensive understanding of how they are subjectively assessed. Other recent studies of the relationship of the senses and urban space have employed such methods, and Henckel (2019, 1) observes that "*sensewalks are gaining momentum in urban studies*". Examples of sensory study methods as sensewalks and sensetalks, sensory notebooks/annotations, use of images (photos/video) and sound recordings can be found in the works of authors such as Millman, Coles, and Millar (2008), Adams et. all (2006), Degen and Rose (2012), Henshaw and Bruce (2012), Lucas and Romice (2008), Vasilikou (2016), Pink (2007) and Semidor (2007).

Although this research aims at a multi-sensory approach, the methods applied in this thesis are rooted in the work of authors investigating sounds and smell through a mono-sensory approach (Adams 2008; Bruce et al. 2015; Henshaw and Bruce 2012; Semidor 2006). Although visual perception and methods are fundamental in urban design and planning (Lynch 1960; 1996; Cullen 1996; Project for Public Spaces 2010), and are still dominant in urban studies (see Sections 2.3 and 2.5 for more in-depth analysis of the role of vision in urban studies), vision mostly has a superficial and less dominant role in user-specific

[18] Both sensewalks and sensetalks (an adaptation from sensewalks) are in-situ, semi-structured interviews conducted by, and in the presence of the researcher. The former takes place as a walk with participants who are interviewed in a series of different locations along the route. For the latter, participants are approached along the same route but interviewed in only one location. Sensewalks are often referred to as walk-alongs.

experience and perceptions (Vasilikou 2016; Franck and Lepori 2007). Nevertheless, even in non-visual sensory studies, visual methods such as observation, photography and video can help characterise urban spaces and illustrate some of the analysis outputs.

The selected combination of methods also challenges the classical methods (quantitative, sensing machines, surveys or interviews in a room) as they create an immersive method, user-centred, and flexible in the sense that it allows the researcher to understand doubts, and absences, and to adapt the set of questions if needed. Although differing in their emphasis they also complement each other. These methods also permit the capture of the participants' descriptions, allowing a focus on the language terminology used and how that helps understand the stimuli, the space, and the impact on the individual. In a way, comparable to what is now designated by sentiment analysis (Mohammad 2016) and done by computers, the study of affective states and subjective information. However, the "*actual experience of urban spaces while navigating in the city is based on the overlapping of sensory experiences, presenting an array of methodological problems in its assessment and evaluation*" (Vasilikou 2016). Even if other methods could be applied, the acknowledgement of the selected method's limitations and advantages is fundamental to the robustness of the research. The literature and conceptual support, and the construction of a specific combination of methods of data collection and data analysis allowed an integrated analysis and a thorough interpretation of a set of practices normally looked at from a single angle in the existing literature.

To minimise methodological limitations, and as mentioned before, most of the primary data was produced by way of a mixed-method approach (observation, annotations, sensewalks and sensetalks), over a period of a year. These methods, introduced briefly in Table 4, will be explained in more detail in section 3.2. Data related to the characterisation of the case study area was obtained through site visits (using photography and video) and desktop research. See Figure 20 for the relationship between types of data and data sources.

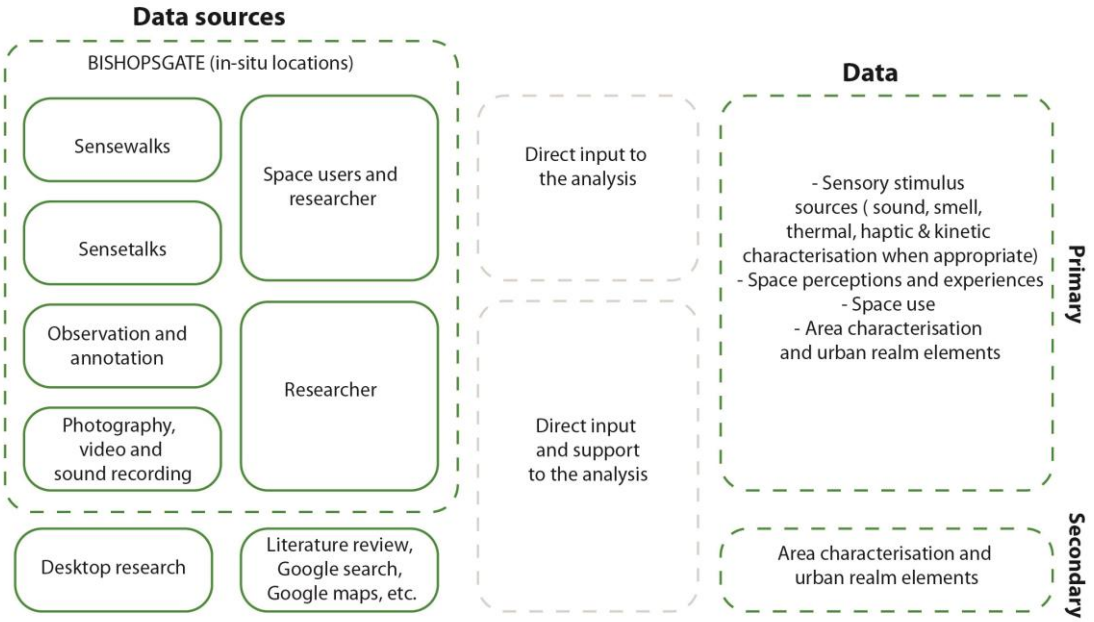

Figure 20: Summary of the type and sources of data.

However, a comprehensive exploration of the sensescapes of a place, and the analysis of how the urban realm elements interact and are experienced by individuals is not achievable without on-site engagement and thus a case-study approach. A case-study area is the perfect medium for analysing how people perceive public space within public space. This assumption is supported by scholars, such as Yin (1994), who assert that a case-study approach applies to particular types of research questions and that its efficacy depends on the amount of control that an investigator has over behavioural events and the degree of contemporary (real-time) focus as opposed to interest in something that occurred in the past. Considering that this investigation focuses on contemporary events that are not subject to any control mechanisms established by the investigator, the selection of this approach for this study seems appropriate. Other methods, such as surveys and archival analysis could have been used, but in that case, the aim of the research would have been different and either more quantitative or historical in its outputs. The case-study method allows for an in-depth understanding of the relationship between individuals and the built environment in its real-life context. An obvious technique in qualitative research that is used in a variety of disciplines, and offers an adequate empirical mechanism to help find answers to research questions: "*case studies are useful in providing answers to 'How?' and 'Why?'*

questions, and in this role can be used for exploratory, descriptive or explanatory research" (Rowley 2002, 16).

The results of the participants' responses within the different locations of the case study area will be analysed through thematic analysis (see also section 3.6), trying to understand the relationship between space and sensory perception and behaviour. An analysis that will consider the elements, patterns, and omissions from individual and collective descriptions of sensory perceptions. As Pallasmaa (2005) argues, individuals experience the city and the city exists in their embodied experience, in a way where the city and the body both supplement and define each other. A more comprehensive knowledge of how the city influences the body will, therefore, need the exploration of perceptions of space.

A more detailed explanation of the method will be introduced in the next section. An additional literature review devoted to each analytical chapter, supporting the relevance of the analysis and its methodology, is presented in each chapter's introduction (Sections 4.1, 5.2 and 6.1).

3.2 Description of the method

In terms of the data collection, Table 5 introduces a number of practical aspects that were considered for the application of the selected research method, including timeframe and scale. In terms of timeframe, at the start of the investigation, it was assumed the research should include the effects of climate variations and seasonality of the year (winter/summer) along with weekly differences (week/weekend) and daily changes (day/night), as these would increase the researcher's knowledge of the area and the variety of sensory experiences encountered there. "*It is also important to consider the effect of temporal conditions, as perception of a soundscape may change over the course of a day, or over the course of a week or a year. Weekdays and weekends may produce very different soundscapes in the same space. Seasonal differences, and consequently changes in the weather also have a significant impact"* (Jennings and Cain 2013, 3). These variables were initially appraised and discarded before fieldwork started due to the complexity of the

system and the excessive number of variables they would bring into consideration[19]. Given the elevated number of variables already required to be able to respond to the research questions, i.e. the fundamental dimensions that can influence the relation between space and individual behaviour through their senses – the variety of spaces, the senses (three), and the individual participants themselves – timeframe variations are not considered variables in this research although they form part of the participants' experience by default (e.g. weather, day of the week). Narrowing down the number of variables would help deliver a more in-depth and comprehensive investigation of the relationship between space and the individual and support the creation of a final framework of analysis that could later be expanded with some of the discarded variables. It was also determined that these extra variables would not interfere with the potential to answer the research question and could have an unwanted impact on the analysis – e.g. hampering the ability to control the type of users and space use, and include visual limitations that could create barriers to space use (i.e. at night-time). They would add to the difficulty of the analysis and make it harder to define clear types of relationship between space elements and user experience. Nevertheless, the importance of some of these variables is still recognised in this analysis through their inclusion in section 7.4, future research agenda.

The selected spatial scale of analysis is that of the urban design scale of the street, as it is the only scale that is common to all the senses in the study. The activity of staying in a location is defined as the main activity to analyse because all the interviews were carried out while standing in one place and not while walking or in motion, even though some of the participants walked between different locations. The rationale for this, again, is due to the need to keep the research simple and decrease the number of variables. The case-study area was selected based on the number of locations necessary to fulfil the basic descriptors for it. Additionally, it was necessary to ensure that the maximum distance that would be covered within the case study area could be

[19] The impact of weather conditions as thermal effects or rain, and its impact on touch or smell, will be considered as elements in the analysis if referenced by participants.

achieved in less than 30-minutes walking, in order to limit the total time taken to conduct the interviews (time of the walk and time to answer all questions). The walking path route was chosen according to a criteria of diversity and similarity between the different space characteristics to enable some comparability between elements and perceptions. Table 5 summarises these factors and introduces the criteria influencing the case study analysis.

Table 5: Case-study analysis basic conditions.

Elements	Aspects considered*	Some details
Periods of analysis	Winter to summer; Weekend and weekday; Day and night.	Allowing analysis of similarities and contrasts (seasonal and daily).
Participants	Different types of space users (workers and residential users + visitors); Minimum sample size of 20 to 30 participants.	Allowing analysis of similarities and contrasts between users; Comprehensiveness and variety of responses.
Activity to analyse	Walking; Staying.	Whole body sensations; Looking at densities of people and activities; Analysing experiences and sensations.
Spatial scale	Street(s).	Common scale to all the senses; Urban design scale; Limited area (allowing repetitions).
Walking time / distance	30 mins.	Average walking time/distance.
Walking routes *	Variety and similarities of urban realm elements; Include some dominant daily routines routes (work, shopping, leisure) Include some passers-by route.	Observing and interviewing in locations from selected route; Observing densities and activities; Asking about daily routines/passers-by routes.

Some of the elements identified in this table**20** emerge from the idea that "*different types of people carry out different (activities) durations in different types of urban spaces with different characteristics in different geographical locations*" (Jennings and Cain 2013, 3). People, activities and space are factors that affect the sensescapes, "*but interestingly, few of them directly relate to the sound itself [or other sense]"* (Jennings and Cain 2013, 3). However, because

[20] These elements were subject to consideration before the fieldwork phase, and not all were adopted (as described in the text).

they do influence sensory perception these factors should be clearly identified, even if they are not considered variables. Similarly, the participants' personal characteristics can have an impact on the way they perceive space (e.g. age, gender, impairment, etc.): "*In addition to the objective personal characteristics, people also bring their own cognitions to the listening situation. This cognition can represent memories, ideas, feelings, attitudes, values preferences, meanings and behavior and experience which relate to the variety and complexity of the physical setting*" (Jennings and Cain 2013). The selection of a diverse group of users is considered important for the case study as "*the status of a listener [in the case of the soundscapes] as a visitor or a resident could also have an effect since a person's priorities and responses may be different according to this status"* (Jennings and Cain 2013, 3). Finally, the selection of the area to be studied needs to be made carefully and a diversity of locations within it should be ensured because a variety of choices will influence how the relationship between the individual human and the space around him or her is understood. "*The land use or purpose of a specific type of space, i.e. whether it is a public square, thoroughfare, busy road, undercover shopping area, etc. will also obviously affect the soundscape [or other sensescape], as will its geography, culture, morphology ad the built landscape, so it is important to take all of these factors into account*" (Jennings and Cain 2013, 3).

Figure 21 illustrates in a conceptual way the basic structure and variables considered and selected for the fieldwork. The triangulation of space, urban realm and space users, influences sensory experiences. These experiences are then reflected through the sensory perception that is analysed through the participants' descriptions. The weather conditions, time of the day and week/weekend days (see Table 5) are some of the factors that though considered and recognised ahead of the fieldwork, even if they have an influence in the system (e.g. thermal, rain and snow on touch), ended up not being the focus of analysis as explained before. If the relationship between space and users will influence experience, the results of this investigation will be based on the descriptions of participants' sensory perception analysis. The elements of this diagram are described in more detail in the following sections.

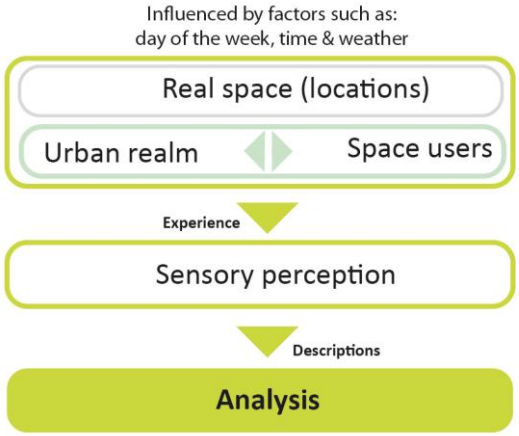

Figure 21: Dimensions of analysis.

3.2.1 Sensewalks and sensetalks

Sensory walks are often described as a method that was devised from Murray Schafer's soundwalking practice, through the World Soundscape Project (Schafer 1969). This method has since been adapted and used in other disciplines (Adams 2008), including urban studies and in particular through a mono-sensory approach. Later, Westerkamp (2001) highlights the adaptability of the method and the fact that it can be individual or shared, through space or within a space. The selection of in-situ and go-along (walks) interviews with participants seemed the most appropriate method considering the aims of the research: capturing the full extent of how people perceive space and analysing the relation between space and the individual through the senses (Semidor 2006; Adams 2008). The comprehensive understanding of these relations is fundamental as the senses "*constantly reinforce each other to provide the intricately ordered and emotion charged world in which we live*" (Tuan 2001, 11). This is not an approach from an engineering or humanities perspective, but from the social sciences where case study analysis and qualitative methods are adequate. The purpose was to avoid a reliance on physical measurements since quantitative methods are already dominant in this field and are considered to limit the scope of sensory research.

When walking in urban spaces individuals consider the variations of the surrounding urban realm and environment while the senses act as mediators of

the human understanding and experience of these spaces. Walking is a natural, and the most common, way of living and experiencing any street, neighbourhood or city, whether as a simple *derive* or as a regular part of the quotidian routine. However, it is only in more recent years that walking has become increasingly important as part of the methodology of urban research (Adams 2008; Adams et al. 2008; Wunderlich 2008; Henckel 2019; Thibaud 2013; Vasilikou 2016), and that more thematically focused methods, such as sensewalks and sensetalks, are being applied to different topics within urban studies.

These are innovative research methods that facilitate the total immersion of participants in the research area. This immersion enables an embodied multi-modal experience about which participants can provide direct feedback while they are experiencing it, all of which can be captured during the interview and provide a rich source of data. Even if each participant has their own perception, or interpretation of reality, that also depends on the sensory input, expectation and previous knowledge or experience, dimensions that were introduced in section 2.3 and will be discussed in the following analytical chapters. Consequently, in order to understand how urban realm elements influence people's perception, this investigation will explore the content and patterns emerging from the participants' responses. The main proposition here is that it is possible to combine different approaches to contemporary urbanism to achieve a comprehensive sensory perspective, and that these research methods are capable of offering a broader understanding of urban settings, describing the character and atmosphere of places, and contributing to a new definition of public space.

Interviews (sensetalks) were selected as the primary qualitative method for this investigation as these are able to capture participants' experiences, insights and opinions. These interviews were designed to be semi-structured to allow more flexibility through follow-up questions and interrogating participants' replies in more depth. Finally, the repetition of the interviews in different locations along a walk, both in the sensetalks (with different participants) and sensewalks (with the same participants), brings comparability to the analysis, enabling the understanding of patterns and distortions between areas (Figure 22).

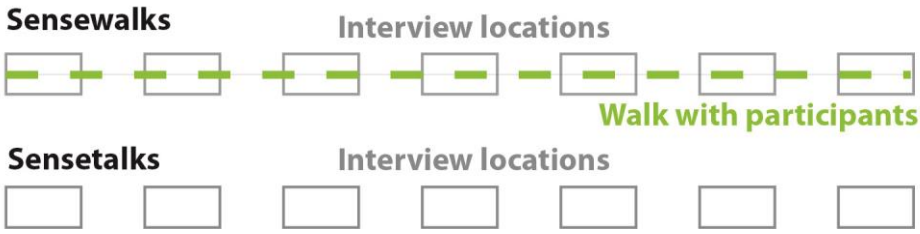

Figure 22: Sensewalks and sensetalks.

Another innovative feature of this method is the fact that the interview respondents are on location and in the presence of the researcher. This means not only an immersive and shared sensory experience for the participant and researcher but also that responses can be clarified and elaborated on when necessary, during the interview. In this field of research, dominated by quantitative studies, the selected method enables much greater participation than is usually seen as it requires direct engagement between researcher and participants.

The questions formulated for these in-situ interviews are framed by the aim of this research to investigate people's perception of urban space: what people hear, smell and feel (touch) in different locations and interpreting these in their relation to those spaces. A wide range of responses has been sought to reflect the diversity of individuals' experiences, from local residents to those working in the area or those visiting (a more detailed explanation is given in section 3.2.2). The interview approach acknowledges the multi-sensory nature of space and tries to explore differences and similarities that appear across various locations through the selection of the sites (typologies), their expected sensory characteristics and the nature of the questions. The structure of the interview guide is aimed at facilitating discussion about the characteristics of public space, and bringing to the conversation the different qualities of space (negative but also positive or neutral).

There are some limits to the application of such methods in research. First, Kusenbach (2003) claims that one of the main constraints is the restriction of narrative, which is especially true in the case of sensory perceptions and in

describing one's experience of place. The aims of the research are complex issues to understand and therefore explain to participants, and limitations of language from the researcher or participant can also be an issue. This can be particularly problematic in London, considering that a high percentage of Londoners do not have English as their first language and may lack the vocabulary or have difficulties with grammar. Second, perception acts as a filter of reality and influences how people interpret reality with a strong impact on their (re)actions. However, even if perception is not reality, this analysis focuses on what and how individuals describe that same perception – as it is a perception that influences behaviour. Finally, there are also limits to an in-situ interview. The urban environment can provoke a stimuli overload causing the participant to concentrate on describing predominant elements and disregard other less dominant elements. In addition, variations in weather conditions can influence people's perception of public space and create practical difficulties for data collection.

The choice of in-situ interviews over surveys or focus groups allows for a more immersive experience and greater breadth and granularity in the responses. This is because the details that people notice and the expressions they use to describe them can help the researcher understand how each person experiences a place. Most quantitative methods of data collection would limit the quality, complexity and "openness" of the response. In terms of alternative qualitative methods, focus groups can be equally as comprehensive and deliver similar levels of quality and detail as one-to-one engagement, but within a group setting participants can be conditioned by others' responses. In the specific case of this research, it would also be logistically harder to consult a group of people moving through the same places at the same time. The entire walk route selected for the study is long and some of the spaces along it are quite narrow and crowded. The choice of sensetalks along the selected route (together with the sensewalks) was made to minimise the amount of time needed for the interview, an important element for participants working on the area, and to recognise other constraints that the respondent may face (for example not having time to do a full walk or willingness to be part of a group). The selected method is mainly a methodological compromise that takes into account the

limited time that workers and residents in the City of London (an area with a very high proportion of offices and services) have and the fact that they would not participate otherwise, if longer interactions were required.

As described above, in-situ interviews were used to better understand people's experience of public space – participants are approached on location so that their responses depend less on their past experiences and more on the immediate location context – because any possible correlations between the surrounding environment and their sensory perception can be picked up. The concepts of sensewalk[21] and sensetalk (the latter deriving from the former) establish a hybrid approach that combines participant observation and interviewing, and have been employed in some high-profile urban research projects in the UK, for example, the *Rethinking the urban experience: the sensory production of place* (RIAE – University of Salford 2006) and *VivaCity2020* Project (aavv 2003), both funded by the *Economic and Social Research Council* (ESRC). The methods used in both projects engage both researcher and participant within the same space and at the same time. Such methods, initially developed following a lead established by Raymond Murray Schafer and Hildegard Westerkamp and the acoustic community, have had a significant impact on research with sound and have since been adopted and adapted for sensory-focused studies. Examples of acoustic research comprising walks include the ESRC-funded *The Positive Soundscape Project: A Re-evaluation of Environmental Sound* (Davies 2006) and research by Adams (2006; 2007; 2007) and Pink (2007; 2008b; 2008c; 2008a). Sensewalks are now regarded as a holistic tool for an in-depth and embodied analysis of space.

Schafer's method for conducting a sensewalk involves a group of people being led, in silence, around an area or along a route, followed by a discussion regarding participants' impressions of the entire soundscape, which depends on an acoustic memory (Davies et al. 2012, 3). This thesis, however, was focussed on how perceptions of the different sensescapes change in different locations

[21] Also denominated as "go-along", "walk-along" or "walkabout" (see, for example, Kusenbach (2003) or Low (2015).

(though not along the route) and in the detailed and comprehensive descriptions that are given of these same experiences. These descriptions should not be dependent on memory but given and recorded in real-time. The sensewalks for this study were designed as semi-structured and open-ended interviews conducted on location or in a number of different locations encountered along a specific walking route through the case-study area. The walk took place in silence to allow the participant to concentrate on the surrounding environment and focus on the non-visual senses. In specific locations the participant was presented with a pre-prepared sample of questions about perception or sensory experience. The same questions were asked in different locations along the sensewalk so that a comparative analysis of perceptions of the built environment is possible. This was considered to be the ideal method to use in this investigation.

Due to logistical difficulties in finding locally available volunteers (residents/workers) to walk at specific times and to specific locations (which could require more than an hour's commitment) sensetalks were adopted as an additional method to supplement the sensewalks. The format of these originates from the sensewalks, but the interviews do not have to occur as part of a walk and therefore require less time commitment from participants. Sensewalks, therefore, were carried out with people available to complete the whole walk and all locations. For the sensewalks mainly people who did not know the area well (usually visitors) were selected, and sensetalks were conducted with those who had less availability to participate but could be interviewed in one location (residents and workers). A small section of the interview guide was added and adapted for residents or workers in the area – this section includes questions that only people who know the area well are able to respond to – but both sensetalks and sensewalks largely asked the same questions to different people in the same areas to enable comparison between results. All participants were asked questions about the live sensory experience of the space; residents or workers were asked additional questions that related to changes, previous experiences and preferences.

This interview methodology was designed to mitigate risks of "*diversity and paradoxes produced by different forms of mobility and perceptual memories of*

built environments" (Degen and Rose 2012, 1) by conducting the interviews in situ and in real-time and by including the participation of visitors, who are unfamiliar with the selected location. The variety of participants and their engagement in spontaneous conversations lead to imbalanced, abstract, personal opinions and sometimes contradictory ideas being articulated. This is an opportunity to inform policy making as it demonstrates that in order to plan and design public space it is important to adopt a more user-centred approach that takes this breadth and diversity of public perception into account. Different contributions from different types of people (workers, residents, visitors) enabled a more comprehensive analysis of an area, which can ultimately result in planning and designing spaces that can be enjoyed by a wider variety of people.

It is, nevertheless, argued that these methods also engage the participant in sensory perception of the environment that goes beyond the perception of the physical space into the space of social, and political tensions and flows (Lefebvre 2004). The direct engagement between researcher and space user also acts as a tool for understanding how the senses influence thoughts about and the relationship with the elements that participants interact with, either physical or human. It also creates a shared sensory experience, more participatory than other methods, which has direct benefits for the quality of the responses. Being in situ, on location, permits a whole-body experience, as a result of which the senses are considered to be more alert. Allowing an understanding of which elements are highlighted in each location through the individual and collective perception, relation to behavioural changes, and identification of verbal patterns. Something that a non-situ experience would not provide in the same way. It is however acknowledged that a sensory experience can't be truthfully described, as it doesn't only depend on the individual senses, or the participants' previous experience, but on a dynamic process of different interlinking perceptual systems (Gibson 1966; Rodaway 1994; Serres 2008). If the experience was not direct, but based on previous memories, there would be a stronger interference of the participants' reflective consciousness and a weaker relationship between space and physical and affective responses. Figure 23 provides a summary description of the method.

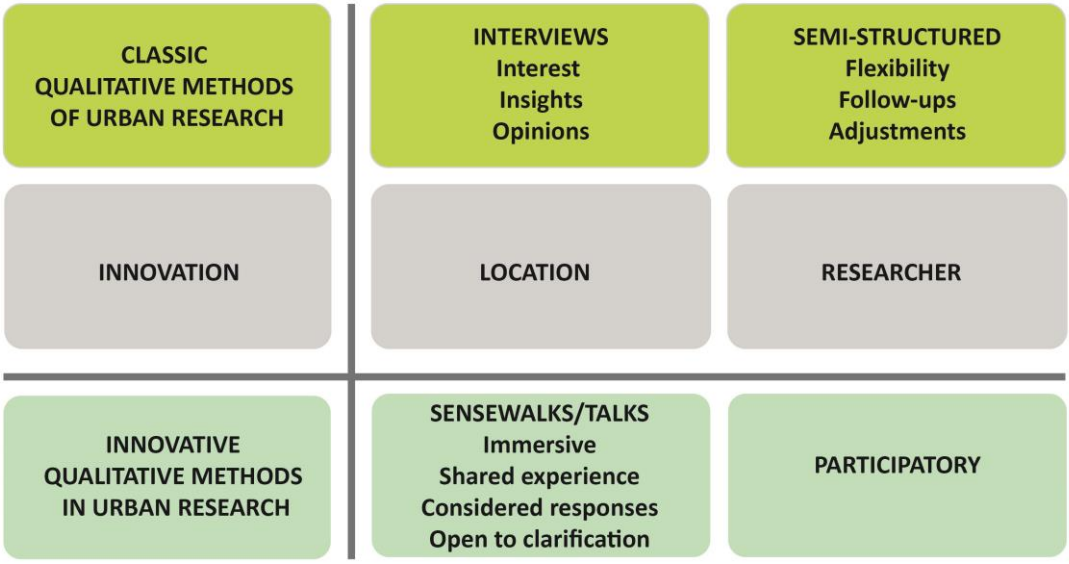

Figure 23: Descriptive summary of the method.

The questions used in the in-situ interviews were framed around the three research questions. The interview questions mostly asked what people hear, smell and feel (touch) in each location and invited them to describe the quality of spaces in the surroundings. The duration of each interview depended on the depth of the responses, each set of questions taking from as little as 5 minutes to as much as 20 minutes in each location but the whole sensewalk lasted between about one hour to one and a half hours. The interviews conducted during a sensewalk (with visitors) tended to be much richer than the shorter sensetalks (residents and workers) in terms of data generated because all the interviewees are voluntarily there for the duration of the walk and have no time constraints. The sensewalks delivered lengthy and detailed responses on particular locations but complementing these with the sensetalks provided a more comprehensive analysis and knowledge of the area in general. Table 6 below outlines the interview guide structure and questions used in the fieldwork. The set of questions prepared for both types of activity, sensetalks (residents/workers) and sensewalks (visitors) are quite similar as they share the same aim. The guide questions for the sensetalks are organised under one of four themes: (1) user characterisation; (2) sensory perception; (3) impact of changes; and (4) qualification of space. For the sensewalks, Theme 3, which is a more in-depth exploration of the sensory perception (Theme 2) in its

relationship with the surroundings, was excluded because it requires participants to have knowledge of the area, which visitors cannot be expected to have. The interview begins with very general inquiries about the participant (including gender, age and time spent in the area), followed by questions on what he or she perceives about the location they are in, and ends with interrogations that can help the researcher better understand how the respondent qualifies the space and the reasons why. At the outset, under Theme 1, additional notes about date, time and weather were also recorded in case these may be needed (Lucas and Romice 2008; Dubois, Guastavino, and Raimbault 2006). All questions are in English and the open questions were presented in broad terms so as to avoid influencing or restricting the answers.

Table 6: In-situ interview guide questions.

Sensetalks	
Theme 1 **User characterisation (researcher notes)**	Date and time Location and short area description Weather conditions Gender and age (approx.)
Theme 1 **User characterisation**	Why are you here? (options: Live nearby; Work here; Just passing; Other) Do you know this area well? How frequently do you come here?
Theme 2 **Sensory perception**	What do you smell? What smells do you associate with this place? What do you think about this/these smells? How about sounds? What do you think about the sounds you experience in this area? How does this area feel to you? What do you think about it?
Theme 3 **Impact of change**	Do you think this area changes much from the week to the weekend? What changes? Why? What would you change in your outdoor routine if it were very cold, very hot or heavy rain?
Theme 4 **Qualification of space**	Which part of Bishopsgate is your favourite to stay in and enjoy? And why? Which part of Bishopsgate is your favourite to walk by? And why? Which part of Bishopsgate is the one you dislike the most? And why?
Sensewalks	
Theme 1 **User characterisation (researcher notes)**	Date and time Location and short area description Weather conditions Gender and age (approx.)
Theme 2 **Sensory perception (extended)**	What do you smell? What smells do you associate with this place? What do you think about this/these smells? How about sounds? What do you think about the sounds you experience in this area? How does this area feel to you? What do you think about it? How do you relate your sensory experience with what is surrounding you?
Theme 4 **Qualification of space**	How do you evaluate the experience in this space? Can you compare with previous points? Best location of the walk? Why? Worse location of the walk? What was the most surprising element of the walk?

Theme 2 aimed at understanding what people perceived in each space while exploring freely its characteristics. This is the theme that most directly explores the multi-sensory characteristics of urban space as it asks participants what they are experiencing. The order goes from the smell, and sound to touch, and it was kept the same for consistency. If there was no particular reason to

address this order, except for its consistency. Touch was left to last as smell and sound were considered to be simpler ways to introduce the participants to the interview aims. The mediation of the urban realm (see Chapter 5) is the overall result of how individuals describe their experiences and is not directly associated with any theme and is only indirectly related to Theme 2 and Theme 4. Theme 4, included in both sensetalks and sensewalks was adapted to the respondent's level of knowledge of the area and highlights differences related to different times of the day, personal choices, and appreciation of the area (even beyond the in-situ locations). Since these are semi-structured interviews, the questions were intended to establish a starting point from which the line of enquiry could be adapted and revised according to the development of the conversation and points raised by the participant, ensuring that the most relevant information was captured.

Over the course of developing the analysis and shaping its focus, it was decided not to use all of the themes and questions in the analysis. Figure 24 illustrates the relationship between the structure of the interview, the questions and the analysis, relating it to the chapters of this thesis that they inform. It is possible to see that responses collected under Theme 2 were used in all core chapters, but Theme 4 responses were mostly important for Chapter 5. Theme 1 was only used as a supporting and contextual element and Theme 3 was not analysed at all as differences caused by weather changes or time of the week (week/weekend) were not considered in the end – leaving scope for more in-depth analysis of these factors in the future.

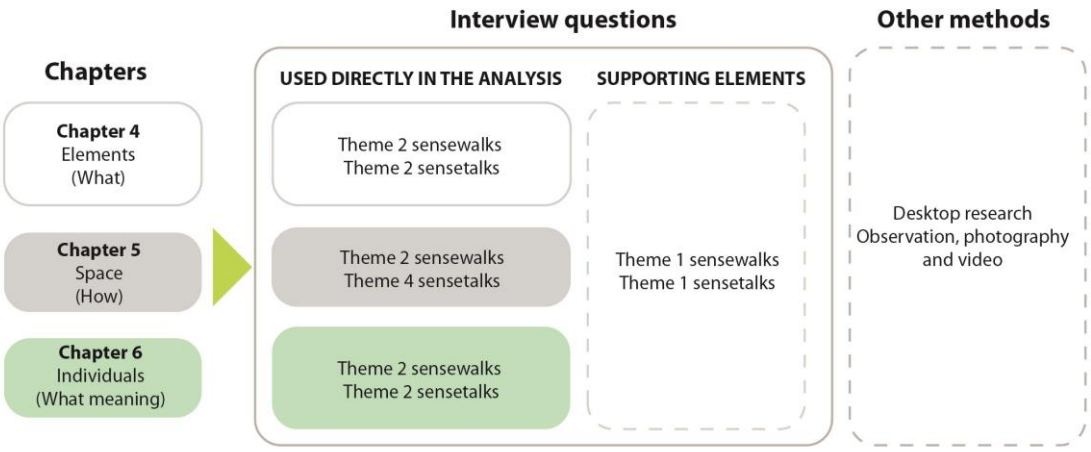

Figure 24: Relation between the interviews and the research structure.

3.2.2 Selection of participants

Qualitative research sampling aims at selecting the individual cases that can provide the most revealing and valuable data to address the research questions. Unlike quantitative research sampling, the intention is not to provide a precise statistical representation of the research population but to reflect on aspects of diversity and generate insight. However, within qualitative analysis, there are different approaches to the selection of participants. This investigation applied purposive sampling. "*The goal of purposive sampling is to sample cases/participants in a strategic way, so that those sampled are relevant to the research questions that are being posed. Very often, the researcher will want to sample in order to ensure that there is a good deal of variety in the resulting sample, so that sample members differ from each other in terms of key characteristics relevant to the research question*" (Bryman 2012, 418). Participants were chosen deliberately to represent characteristics that were relevant to the research questions. The composition and size of the sample was then determined to fit the goals of the research. Rather than achieving a certain number or numerical representativeness, the sample needed to be large enough to reflect the diversity of space users and reach data saturation. Due to limitations of the analysis, in particular the number of variables, time of the day and characteristics of the case-study area, most participants were of similar ages (working age). This had the advantage of providing a more in-depth understanding of this demographic group, while still allowing the identification of

the most common themes, and reaching the point of “saturation”, when the responses from the participants produce little or no new information. This does not compromise the method or aim of the investigation, provides enough information to create a framework of analysis to respond to the research questions, and has even defined a potential future research topic. The emphasis of this research was on understanding patterns, similarities and differences between space users, and this sample was representative of the type of users of the area (with its mix of residential, commercial and offices, but also being very attractive to visitors). For this study, a suitable sample size relied on the depth, variety, and comprehensiveness of the participants’ descriptions rather than on a particular quantity. The fieldwork and data collection, therefore, concluded when it was considered that the sample coverage provided access to enough data to respond to the research questions, namely when meaningful comparisons were possible with the number and range of interviews completed (Mason 2002).

Considering the aims of the research, the obvious participants to select were those people using the streets. As described above, the selection of the participants was focused on three sub-groups that represented different types of the intensity of use and knowledge of the area: residents, workers and visitors. Due to limitations of the investigation, such as time, the number of variables and focus of the research, this research disregarded socio-economic background, cultural factors, gender and age variations (although information about gender and approximate age is collected during each interview).

Additionally, at the outset, it was assumed that the investigation would focus on ‘able’ bodied street users independent of their individual characteristics[22]. Consequently, neurodiverse groups, or groups with sensory loss and deficit were not a focus of this investigation, and subsequently were not discussed in the literature and methods. The goal of this research was to understand the relationship between the individual and space through the senses, independent

[22] None of the participants had noticeable sensory disabilities or mentioned having sensory disabilities in the interview.

of culture, gender, impairment, disabilities, neurodiversity levels, and so on – although as mentioned before the participants belong to one of three groups (residents, workers, and visitors), had a gender balance and were working age. This does not mean that one or more participants included in the research were neurodiverse or exhibited sensory deficits, but these characteristics were not identified and were not part of the variables considered in the analysis. Nevertheless, exploring these groups is important as individuals from such groups have specific sensory sensitivities relevant to sensory design and planning (Toronyi 2021; Chan 2018; Alper 2018) and are often ignored in urban studies (Frazila and Zukhruf 2018). However, these specificities and the complexity of their sensory realm suggested that exploring these groups would require dedicated research. Consequently, in Section 7.4 the exploration of how the framework of analysis resulting from this research can be adapted to these groups emerges as an opportunity for future research.

Engaging participants in the streets presented a challenge, as most people approached were not willing to stop or commit time to respond to an interview. Considering the difficulty of engaging with participants in situ, mostly due to the lack of available time, alternative methods were considered. These included recruiting participants up front, and either allowing them to walk by themselves and interview them afterwards or organising a date and time for them to be walked and interviewed by the researcher. The first alternative would not benefit from the direct shared experience by participant and researcher and would influence participants to use memory as a resource. The second could have led to more walks and interviews after working times rather than with a spread along the day and weekdays. These could have worked but the results would be different, less direct, or dynamic, and would include people who would be predisposed to participate rather than reflecting on aspects of diversity with a consequent wide variety of insights. Reflecting on the challenges, the balance between quality and number of interviews was an important base for the analysis. The fieldwork was designed to take place during the day, even recognising that during the week residents would be less present in the area and workers would dominate. Nevertheless, of all the types of participants, residents responded most enthusiastically to the interview. However, it was

noted that they often used the time to explain and complain about local issues rather than focus on the question and the aims of the study.

"*The sensory is likely to be 'classed', 'gendered' and so on, and conversely we need better understandings of the ways in which class, gender and the like are themselves sensory*" (Mason and Davies 2009, 601). Although this investigation recognises that age, class and gender might influence the way people perceive public space, these were not considered as a variable for methodological reasons (discussed above). Gender and age were, however, included within the criteria applied to the selection of the interviewees in order to seek balance. All participants were asked about their relationship with the area to ensure that the sample would include a good representation of the three defined groups.

When people experience a city, certain features of the urban realm and its environmental characteristics (space) are filtered out by elements of the built environment, which mediate a sensory response in the space users. These elements are, in turn, filtered out by the space users themselves (Figure 25).

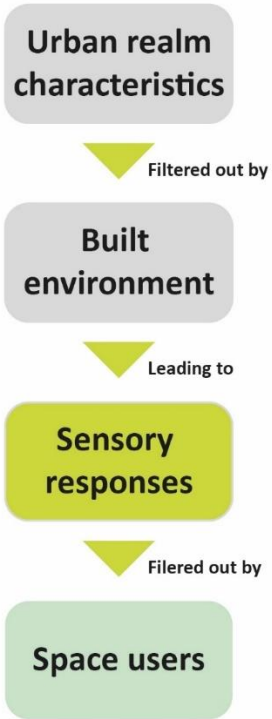

Figure 25: Elements of analysis and how they relate to one another.

The users were, therefore, considered as an input variable, and the preferences that the different types of users (with different levels of familiarity with the

location) demonstrated, would be associated to the specificities they would bring to the research. Those familiar with the place would have spent more time there and know the space better. However, they were probably more limited in their descriptions and were likely to relate their experiences to remembered events (often focusing on their own preferences, worries and complaints). Those who are strangers to the area would probably be more open to the experience and more immediately aware of the different elements. Ensuring that participants represented different degrees of familiarity/unfamiliarity would ensure wider variety in the descriptions of the sensescapes.

3.2.3 Observation and annotations

The observation was carried out before and during the fieldwork. Most of it took place before the interviews (sensetalks and sensewalks) and was used to collect data that supported the analysis. Observation was continuous throughout the fieldwork period (including the interviews), but an additional 12 days were dedicated to observation and notetaking and the use of photography and video to support the analysis. These days happened over the course of a year, during which a variety of temperatures and weather conditions were encountered (see Table 7). A balance between observing on week and weekend days was kept.

Table 7: Observation period.

Observation		
Dates	Start date	16/06/2010
	End date	27/07/2011
Weather	Temperature	-2–28C
Week		7 days
Weekend		5 days
June 2010		1 day
July 2010		5 days
December 2010		3 days
May 2011		1 day
June 2011		1 day
July 2011		1 day

The observation consisted of going to the case-study area and walking through the different locations while looking, photographing, and taking notes not only about characteristics of the urban realm but also human behaviour. On a few occasions, video recordings of the walk were made and a set of annotations (similar to a short observation diary) was created at the end of each observation day. These notes were essential for the construction of the analytical framework as well as for the description and selection of the case-study locations. A summary of these annotations was used to build the descriptions of the challenges and opportunities introduced in section 3.5.

While most of the analytical data collection depended on the in-situ interviews, the researcher's observation is important. This period was not only fundamental for the collection of supporting elements (annotations, images and videos) and preparation for the fieldwork (case-study area selection and method testing) but also as a way of collecting data for sources of elements and mediation of the urban realm (in particular for Table 3). Site visits and observation prior to the fieldwork led to a better understanding of the study areas and stimuli and provided a good tool for building the interview guide.

The technique of observation was also very useful in testing and supporting the main applied methods. During interviews, the researcher (who has detailed knowledge of the research questions and this subject more generally) was always in-situ with the participant, so personal observation was the best means of analysing differences in stimuli awareness. It was essential to establish a critical perspective of the content of the responses and to promote a sense of shared experience with the participant (although always maintaining physical distance and not influencing the responses). Finally, it also meant that the researcher engaged as a participant-observer and, as such, could react to any changes or phenomena as they occurred in the setting and delve into responses to gain greater insight to these where appropriate.

3.2.4 Fieldwork

Most fieldwork and interviews were made around lunchtime (from late morning to mid-afternoon) when the density of users in the street peaks, to facilitate

engaging a higher number of participants. A total of 50 interviews were conducted: 40 sensetalks and 10 sensewalks. For reasons of methodology and ethics, all the sensetalks were recorded in writing, while all sensewalks were audio-recorded and later transcribed. The final sample size achieved was considered sufficient for the aims of the study.

The 40 sensetalks (short, semi-structured street interviews) were made with the participation of residents and workers in the area (those already familiar with it). In this case, the number of interviews is not consistent with the number of case-study locations, meaning that for different areas there is some variation on the number of interviews that took place there. The reasons for this were differences in the intensity of use of the area and difficulty in finding participants willing to collaborate. The final number of interviews, therefore, had an impact on the final selection of comparable areas to explore during the analysis, and these always include more than one location. Even with a different total number of interviews across locations, the quality of the responses was considered sufficiently comprehensive for analysis. The ten sensewalks (longer semi-structured interviews) engaged people who do not know the area well or perhaps had never been there before (the visitors).

Even though it is recognised that the urban environment changes over time (Adhitya and Tyler 2016), time was not considered a fundamental aspect of the investigation since the purpose of the analysis was not to examine how the sense of place varies across the day (or even between people). Time was always used, however, as a supporting, contextual element to help understand how the different senses worked together. Consequently, the selection of the best time for fieldwork and interviews was only constrained by the need to find space users who had the time and availability to respond to the interview. Most sensetalks (for those familiar with the space) occurred during the middle of the day (from around 11:00am to 4:00pm) while the sensewalks (for visitors) occurred variously within a wider timeframe (11:00am–7:00pm), according to the availability of the volunteers. Weekdays but also weekends were also identified as supporting elements as it is important to include a plurality of space and land-use variations, which in the case-study area occur quite intensively from the week to the weekend.

Although the different groups of participants constitute input variables, their outputs are not discriminated against in the results of this investigation, as this research is not focused on how the sensory experience of space varies between people but rather on how the different senses work together – on the human–space interaction independently of the type of user. The differences between users only emerge to provide diversity to the answers since this study is interested in including and understanding differences in reactions to the same kind of stimuli. In terms of other fieldwork variables, weather conditions differ throughout the fieldwork period as in London the weather is quite changeable even over the course of a single day, so this fact is acknowledged and included in the research although the weather is not a variable to explore. For a more detailed understanding of the context of the interviews per location, see Table 8.

Table 8: Characteristics of the interview sample (Theme 1 information). [23]

		Sensetalks	Sensewalks	Total
Dates	Start date	20/07/2011	23/07/2011	-
	End date	05/10/2011	26/11/2011	
Weather	Temperature	17–23C	13–24C	-
Gender	Female	14	4	18
	Male	26	6	32
Age group	20–29	7	4	11
	30–39	19	6	25
	40–49	8	0	8
	50–59	5	0	5
	60–65	2	0	2
User type	Resident	5	0	5
	Worker	32	0	32
	Visitor	3	10	13
Day	Week	40	4	44
	Weekend	0	6	6
Location	A–E	6	10	16
	E–F	8	10	18
	F–I	1	10	11
	I–L	8	10	18
	L–N	6	10	16
	N–O	0	10	10
	O–P	4	10	14
	P–R	2	10	12
	R–T	4	10	14

[23] **Sensetalks** - different participants being interviewed in different locations. **Sensewalks** - The ten participants who completed the whole case-study walk and were interviewed in all locations. **Location** - The initials (A-T) represent the complete path route and the final locations (areas of analysis) within the case study area of Bishopsgate, London. The case study area will be introduced in more detail in section 3.3.

The majority of participants are of working age (between 20 and 65 years old). An attempt was made to maintain a gender balance but the selection was made independent of race, religion, background and social status. Although information about age and gender was not a prerequisite to the study it was nevertheless obtained to understand and monitor the characteristics of the final sample and ensure a balance of these across the sample. In terms of context, most interviews were carried out under similar weather conditions (from late Spring to early Autumn) and both on weekends and weekdays. These conditions worked quite well.

People are at the centre of the research, although the focus of the investigation is the urban realm and its role in mediating the sensescapes of a space. This reinforces the importance of the fieldwork in collecting data from different experiences, a variety of sources, and detailed descriptions from participants that can provide hints to the role of the urban realm in mediating those experiences. In this case, it was considered that the quantity and quality of responses collated from the sensewalks and sensetalks reached a point of "saturation" that sufficiently characterise the dimensions of the sensescapes of the locations under analysis.

3.2.5 Ethics

This research followed existing UCL's regulations regarding research ethics at the time of the fieldwork. Interviewees were never asked for their full names, age, or other personal information. All procedures regarding anonymity and confidentiality were taken into consideration. When approached, participants were informed of the purpose and context of the study and asked to provide oral consent for the use of the interview material required for this dissertation and publications. Observations and any contact with street users was made in order to minimize infringing on the private space of any individual or group.

3.3 Selection of the case-study area

To understand how an individual perceives public urban space, and how the urban realm mediates perception, a research method that provides direct

experience of such surroundings is fundamental. Consequently, the selection of a suitable case-study area is essential. It is also important that the spaces within the case-study area demonstrate similar and different characteristics, so that patterns in people's experience of them are revealed. The area selected for this study had to meet a number of key requirements: it needed to include a diversity of spaces within a limited distance; it needed to be a central area within a city so as to best reflect the urban character; it needed to offer basic characteristics, such as a variety of mixed uses, people and building densities, public space (in its broader sense as accessible to all without physical restrictions) and sensory stimuli and contrasts. Although the decision on the city was important, the selection of the right area and sequence of spaces was fundamental due to the scale and nature of the analysis. Another factor to consider was that the aim of the research and methodology could apply to a variety of cities, even if the results were different. This research was, however, considered as the first test of a methodology and framework of analysis that could be replicated in other spaces, streets, neighbourhoods, and cities.

London was selected as the city of analysis due to its urban characteristics, unique diversity of spaces and people, and the fact that English is the main language spoken and the language used for the research. It also presented time (proximity) and cost advantages (limited travel costs for the researcher). Within the boundaries of London, however, a number of different areas were considered for analysis.

Following conversations with Londoners and drawing on the researcher's personal knowledge of the city, six different neighbourhoods/locations with suitable socio-spatial characteristics were initially identified and shortlisted as potential case-study areas. These were: Hackney Wick, Archway, Old Street, Borough Market, Whitechapel Road (Aldgate) and Bishopsgate. These locations were then visited to understand if they would provide the required descriptors (see above). Extended walks in each area were done to understand its feeling and diversity and then all the areas were compared to select the one with the best characteristics to support the analysis. Although all the areas demonstrated most of the required characteristics, only one area was able to

provide the full variety of these features within a limited walkable distance: Bishopsgate.

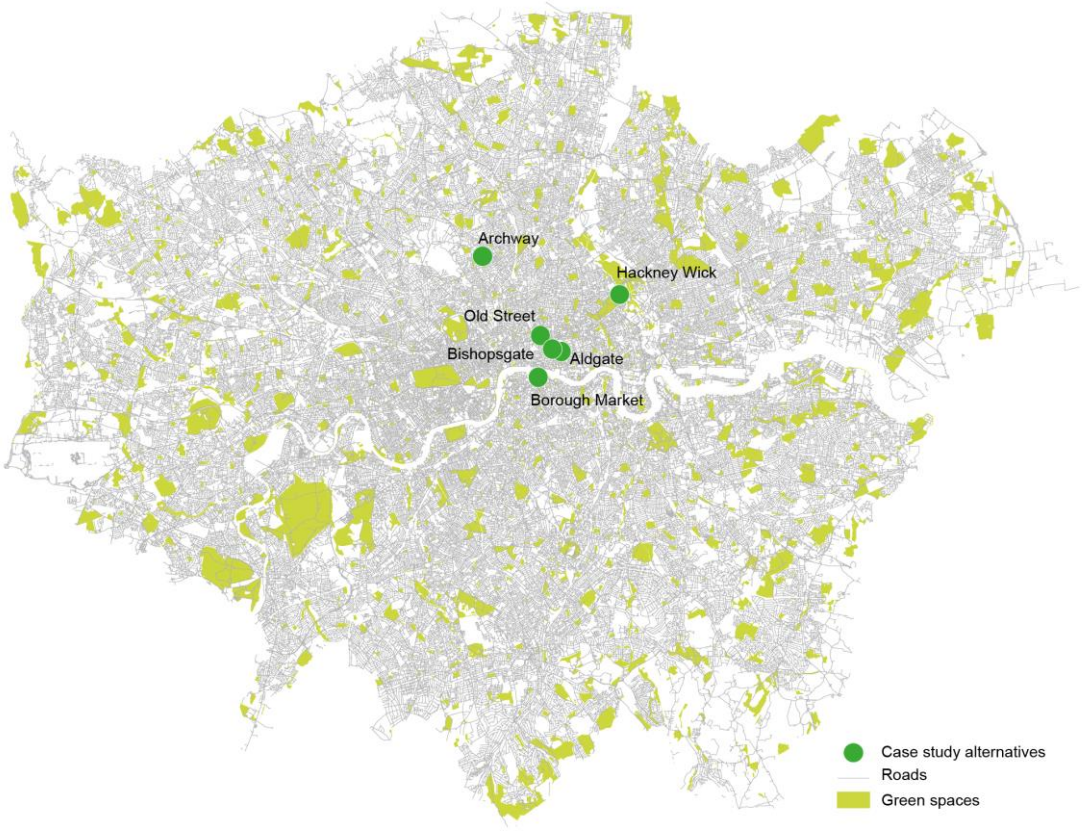

Figure 26: Shortlisted potential case-study areas location in London.

The selected case-study area of Bishopsgate, in East London, is a well-delimited space between the area of Old Street and the district of Whitechapel. Although quite a large area, a suitable case-study section within it was easily narrowed down to a few blocks, streets and small open spaces. Bishopsgate has the variety of socio-economic and morphological contrasts that are created by an array of spaces and uses (e.g. historical areas, modern areas, mixed-use and mono-use areas, large but also narrow streets, squares, etc.). When compared with the other short-listed locations, this was, without doubt, the most diverse and interesting area in spatial and sensory terms and therefore expected to better provide contrasting sensory experiences and enriched research results. In practical terms, being a very central urban location and accessible by public transport or on foot, commuting for research fieldwork was easy and convenient, facilitating the exploration process.

In Bishopsgate, a good representation of the diversity of urban spaces is found in a section boundaried by three of the district's main streets: Commercial Road, Bishopsgate and Bevis Marks/Whitechapel Road (Aldgate). This made defining a bounded area within a short walkable distance fairly easy.

This area was then narrowed down to a route due to time and analytical constraints – it was necessary to limit the number of locations to a number that could be easily managed by one researcher and for the expected duration of a PhD. This route was selected to include similar and contrasting spaces that would include most of the urban and sensory elements needed and with a walking course that would not take more than 20 minutes to complete, to make sure the participants have the time and physical capacity to participate. The final walk route chosen is approximately 1.7 km long and crosses Bishopsgate north–south along residential, office and commercial areas. It includes high- and low-rise buildings, wide and narrow streets and squares. The route covers a mixed-use area with residential and commercial areas, offices, churches, schools, small green areas, plazas, weekend marketplaces, etc. It still has old narrow streets, but also very modern spaces, leading to a contrasting mix of urban design areas.[24] It has modern and expensive residential areas and also social housing estates. It includes pedestrianised streets as well as traffic-dominated roads, particularly the boundary streets. The overall occupation of the area is considerably dense although some spaces are low in density (see the route map in Figure 27).

[24] See the Appendix for a summary table of all the area characteristics.

Figure 27: Walking route in Bishopsgate area.

In sensory terms, it presents contrasting sounds, smells and concentrations of people. Different uses occur during the week and street markets take place on Saturdays and/or Sundays. The walking route includes three squares with different levels of vegetation and a variety of pavements and surfaces, including cobbled streets and smoother asphalt. It also presents a unique proximity to travel nodes and landmarks, for example, Liverpool Street Station, Spitalfields Market, *The Gherkin* (30 St Mary Axe) and a few churches, all of which heavily influence the use of the area. The selected walk Route, although predominantly located in the City of London, also includes areas of the borough of Tower Hamlets, thus it represents one of the richest and one of the poorest boroughs in London respectively, even if Tower Hamlets is changing with the development in and around Canary Wharf and the Olympic Park.

However, due to methodological limitations, a sub-sample of locations had to be selected from the total of identified locations in Bishopsgate. Initially, a total of 20 points (A–T) were defined, one at every crossing where a change of direction in the route occurred, since a change of direction often leads to a different context. After completion of the fieldwork and the interviews, however, a sub-sample of areas was defined. This focuses on particular locations that can be considered homogeneous in terms of the similar spatial characteristics

they demonstrate and the consistency in the type of responses to them that participants expressed. In these locations, a specific point or change of direction does not necessarily mark any change in context or present any new elements to be analysed, and it was determined that these points could be reduced in number. This process, therefore, reduced the number of units of analysis from 20 down to nine locations (A–E, E–F, F–I, I–L, L–N, N–O, O–P, P–R and R–T; as shown in (Figure 28), a number that allowed a more in-depth comparison between these areas and their elements.

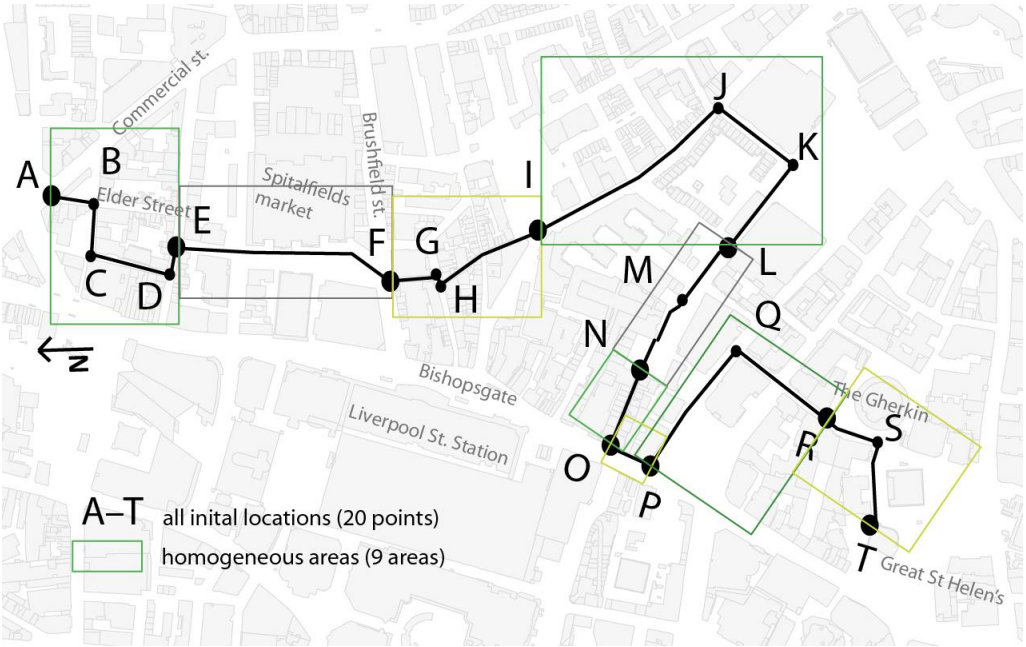

Figure 28: Case-study area map and locations, before and after the reduction.

As mentioned before, Bishopsgate was selected due to the variety of spaces that are available within a walking distance. These included factors such as its urban form, densities of use, land use, and so forth. The triangle between Commercial Street, Bishopsgate and Leadenhall Street emerged as the area that combines the greatest diversity of elements. These sub-sample locations were then selected to include, in the same route, areas that represent some of the main parameters introduced before. Area A–E represents a low and medium density of buildings, low density of use and dominantly occupied with residential areas and offices. It has a mix of architecture types including old warehouses adapted to creative uses. Area E–F represents the “square” and public space typology, with a variety of land uses (permanent and temporary), very tall buildings and high levels of footfall, along with natural features and

elements of urban design supporting the area uses. F–I, represents the narrow and organic old city, with low density buildings but quite compactly built, creating a unique space when compared with other surrounding areas. I–L is comprised of a mixed of urban typologies and uses, that include a street market on the weekend and one of the few social housing estates in the area. L–N, is the other open space, this time with natural features. However, in a more secluded area mostly linked to an office area development. N–O, is the bottle neck area to the wider Bishopsgate in O–P, where the most intense activity can be found, due to the diversity of uses, public transport routes and connection to Liverpool Street. Finally, P–R with development in a grid and low density or use, even if the buildings are not low. R–T is the last area, with the presence of one of the most iconic buildings in a wide-open space, along with a small heritage church building in a small square. The combination of these areas creates a unique comparative potential of urban spaces and atmospheres, within a well-delimited area in Central London. As the goal of the research was to understand differences and similarities of sensory perception and how that related to different urban factors, the fact that the distance from A-T is walkable in 20 mins approximately was fundamental to make sure participants had the time and physical capacity to participate. A more in-depth description of these areas will be introduced in Section 3.4. Ultimately these locations were selected as urban scenarios, presenting a variety of urban spaces that make possible the observation of sensory patterns and how they compare and contrast across the built environment.

3.4 Descriptions of the case-study area

Sensory analysis linked to space is fundamental to understanding how sensory perception relates to the urban realm and how this influences the individual. To achieve this investigation’s aim and to understand these relationships, a clear description of the case-study area is crucial. It is important that this description takes account of the date and temporality of some of the urban geographies it covers. In London, spaces are in continuous transformation, buildings are being demolished, works starting and finishing, and land uses change. The area of

Bishopsgate is no exception. Therefore, in the description of the case-study area, there is a temporality factor because by the time this investigation is finished the area may have changed and no longer be the same. This section introduces the case-study area and its different sub-locations, highlighting their main features and providing graphical cues as to how they look and feel. Figure 30 illustrates the complete route and the different locations within the case-study area – the subsequent illustrations (Figures 30–38) and accompanying descriptions try to provide a sense of what these places feel like. Provided for each location is a simplified diagram showing the area in question, a set of panoramic photos illustrating the type of area and its uses, and a description of its key characteristics.[25] Panoramic photos are used as a compact way of displaying more of an area. The stitching of the frames is employed for showing wide angles of the area, which would not be possible with typical lenses. This is a useful perspective for the analysis of landscapes and in this case, to visually illustrate the differences or similarities between the case study area sections. Each photo is an illustration of the "feel", scale and physical characteristics of each area, even if it does not show the full extent of the area.

[25] An additional analytical device is provided in the form of a summary diagram (Figure 40) that uses small visual icons to illustrate the main characteristics of each location. This summary diagram will be introduced and repeated in later chapters, when needed, to help relate the analysis to each specific space type. Due to layout limitations in this document, the diagram of each area is rotated 90 degrees so that the north is at left.

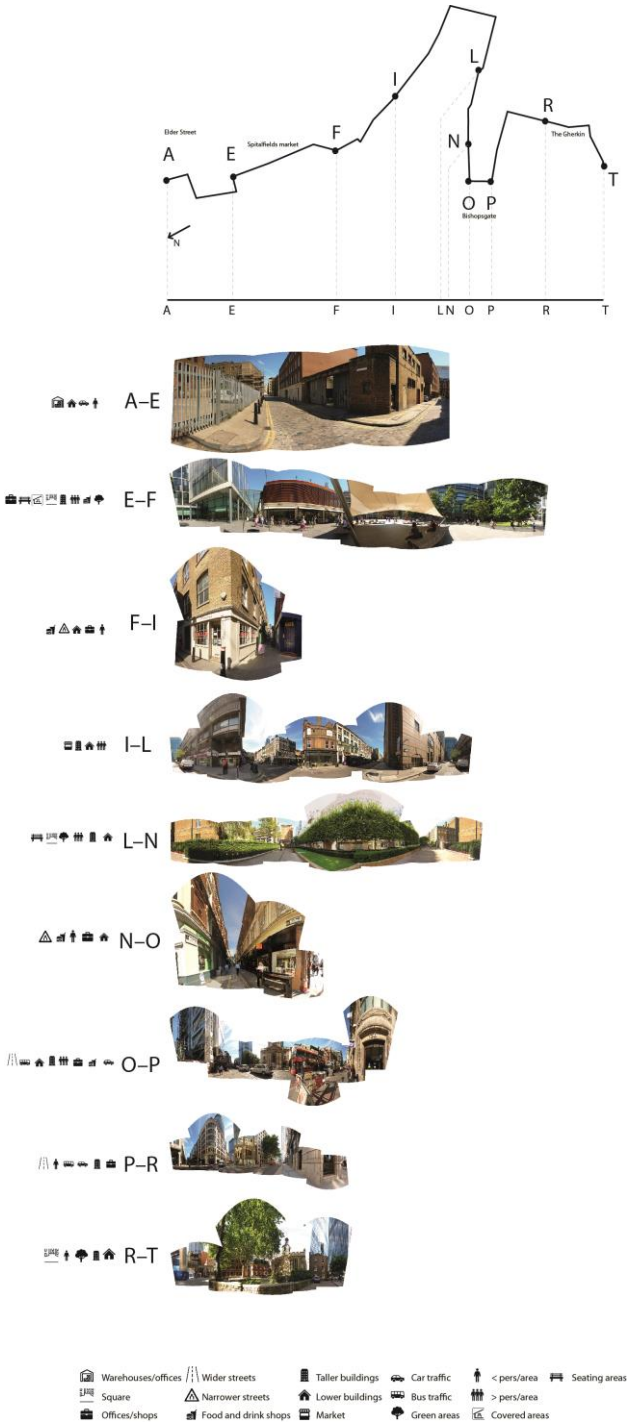

Figure 29: Case-study area. Location photos and main urban characteristics.[26]

[26] Due to space layout limitations all diagrams of the area was rotated, and north is facing the left. See the Appendix for more information on the case-study area.

All sections map | Elder Street – Great St Helen's

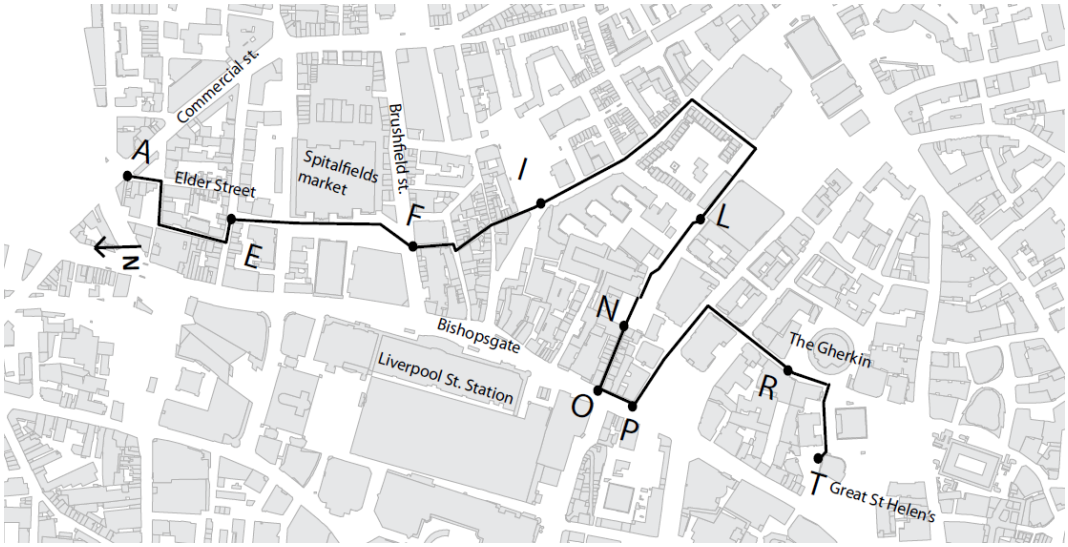

Figure 30: Map showing all locations within the case-study area.[27]

Section A–E | Elder Street–Spital Square

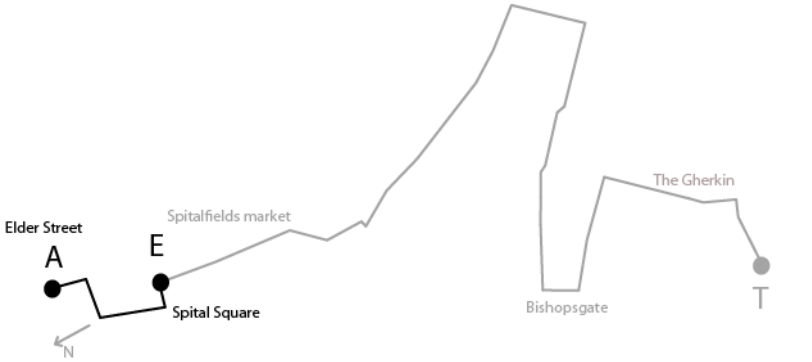

Figure 31: Section A–E.

[27] For more information on the areas, see Table 20 in the Appendix.

This is the initial section of the case-study area route. This space is located within an area where offices and warehouses are dominant, behind large gates and small doors, and there are almost no retail areas. Not many people were observed walking along this street during the fieldwork period; its surface is different from the main streets, still cobbled, and therefore not inviting to drive through. From here, however, there are two routes providing direct links to the buzz of the main street (Bishopsgate). One of those links is a narrow pedestrian alleyway with blank façades on both sides. At the end of this section of the route where respondents were asked to stop, there is a pub and, close to it a large group of rubbish bins. Almost at the completion of the path is the Dennis Severs House, a museum house that only a few will recognise to be there (these features are not visible in Figure 31).

Section E–F | Bishops Square

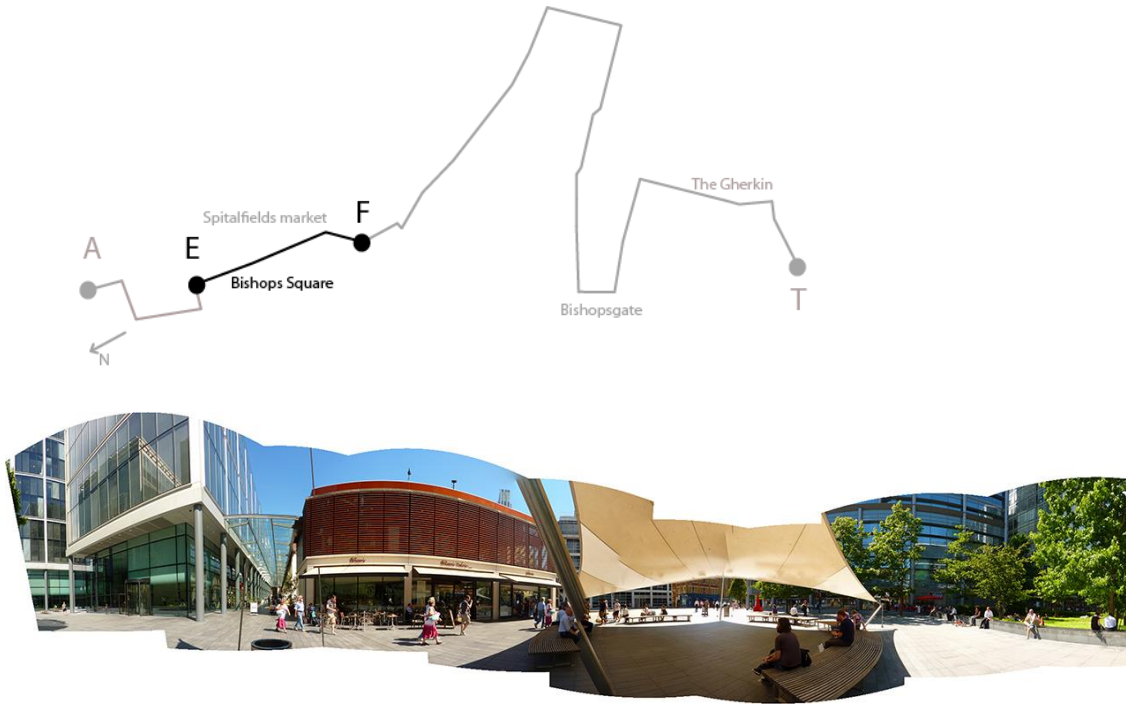

Figure 32: Section E–F.

This section of the route comprises one of the largest and widest areas along the case-study itinerary and has a mix of uses. It is almost entirely pedestrianized, with limited car traffic movement, but it has many connections to

the main street via access through some of its higher buildings on the west edge. Buildings here are almost entirely dedicated to commercial and office use. The ground has a particular, smooth surface that incorporates, grass, trees and water features. Seating areas are provided, some located under a canopy, creating a unique space that is used for artistic/cultural events. This is a continuous leisure area that includes a square and a small green area (garden). It is part of a large commercial property development in the Spitalfields area of London, and is often cited as an example of a privately owned public space in London.

Section F–I | Fort Street–Sandy's Row

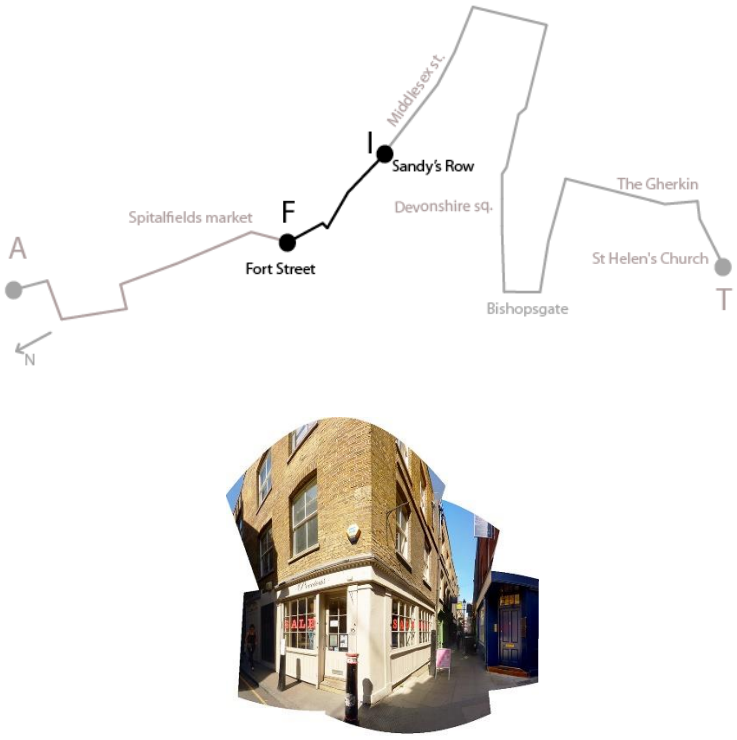

Figure 33: Section F–I.

Of the whole case-study area, this is the section that creates a bottleneck of pedestrian traffic. The area follows a spacious square and precedes a large and wide street, but itself contains a small quarter of narrow streets, a maze of tighter lanes composed of a mix of small-scale buildings between three and five storeys high. Here, a mix of old and new, but especially the narrowness and small scale of the built environment, together with diverse land use, including

pubs, stores, restaurants, offices and a synagogue (Sandys Row Synagogue), promote a sense of lack of personal space and of proximity with the surroundings.

Section I–L | Middlesex Street–Cutler Street

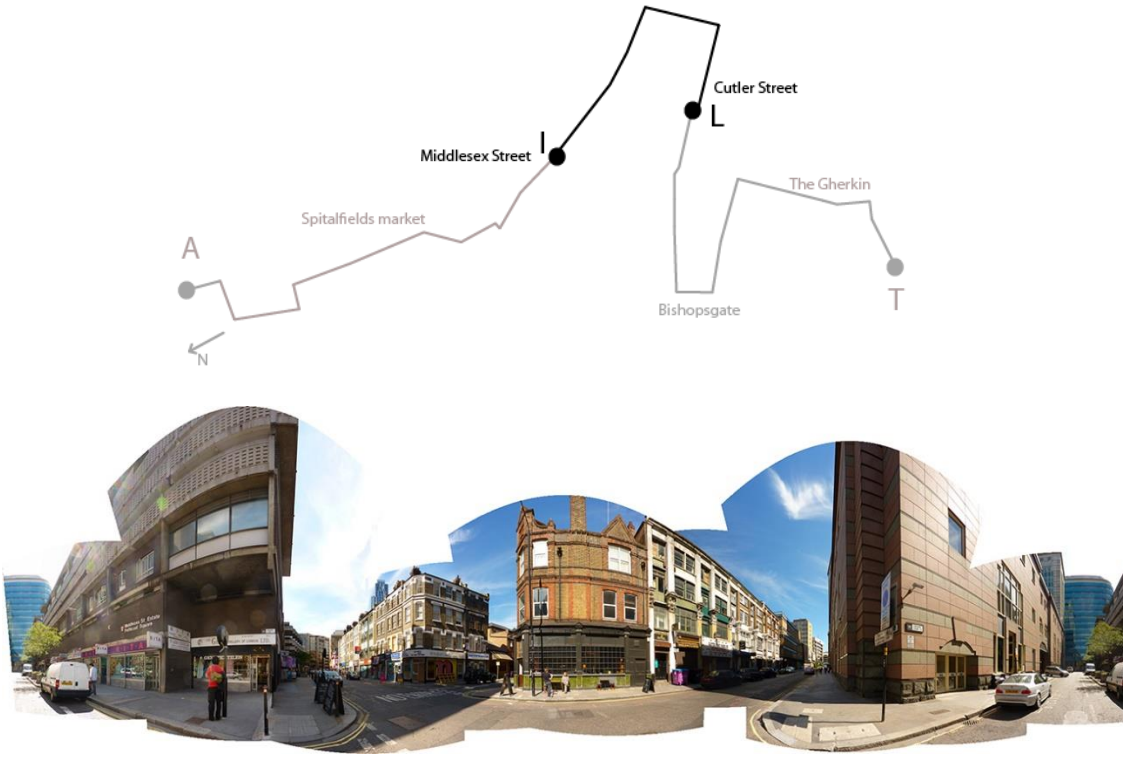

Figure 34: Section I–L.

This section of the route demonstrates a wide variety of scales, building types, and types of urban occupation, reflecting the variety of socio-economic backgrounds of those who live there. The main street hosts a weekend street market with a variety of stalls built with metal frames and sellers loudly advertising their products. Along that same street, a concrete modernist block of social housing from the late 1960s (Middlesex Street Estate) incorporates, under its podium area, a set of small shops and here there are some benches

to sit on[28]. Further along, again is an enclosed small square with only one building presenting an active façade and some private seating outside to support the food and drinks establishment in this same building (White Kennet Street). Visually dominant tree pots here also offer an opportunity to sit down in a square that does not offer many opportunities to linger (these features are not visible in Figure 34).

Section L–N | Devonshire Square–Devonshire Row

Figure 35: Section L–N.

[28] The estate includes 120 low-rise dwellings and 80 apartments in the tower block surrounding an elevated landscaped podium area.

The fifth segment begins with steps up to a slightly elevated platform transformed into a private green area, or garden, allowing for informal seating or occupation of the lawn area (see Figure 35 above). It is open to the public and its layout and location mostly attract those working in this part of Bishopsgate. The linear layout of the garden leads passers-by who continue on, to pass across the entrance area of an office block (with office space, shops, homes, restaurants and bars) into a small classical square planted with small trees that offer shade to several formal seating areas (see Figure 35 below).

Section N–O | Devonshire Row–Bishopsgate

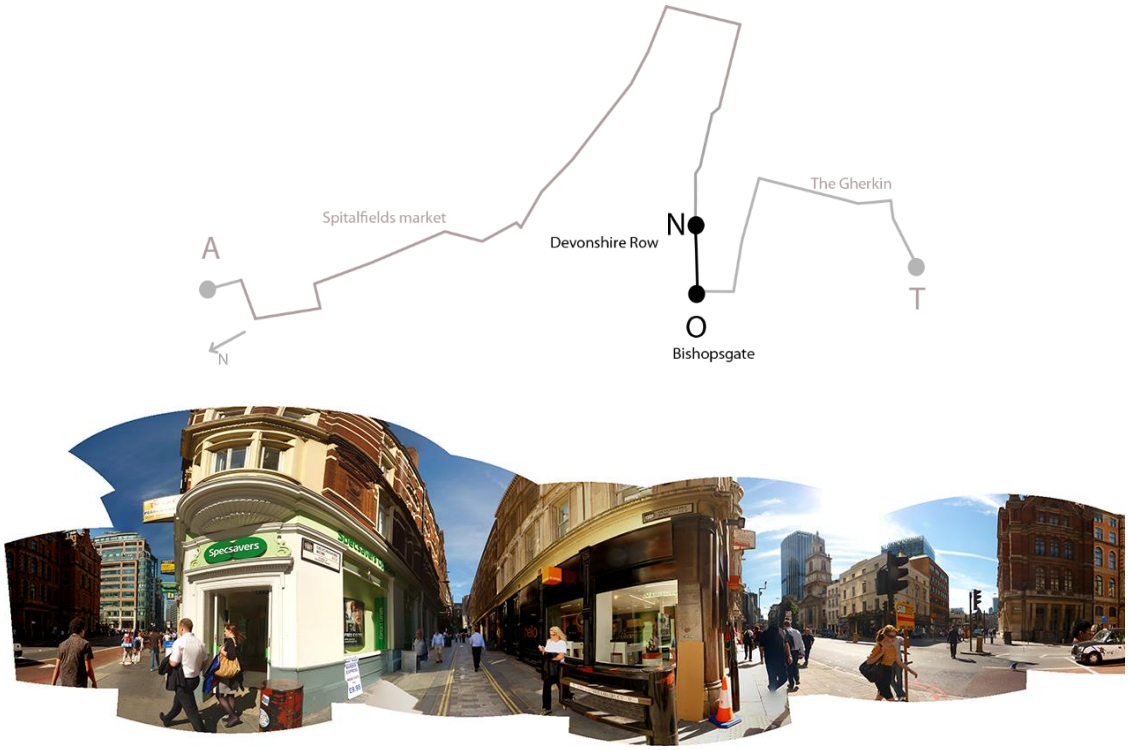

Figure 36: Section N–O.

The portion of the route between Devonshire Row and Bishopsgate represents an interchange in the urban layout as it starts from the edge of a square, goes along a relatively narrow street with lower-rise buildings and ends on the busy Bishopsgate road. Although Devonshire Row is not as narrow as the streets encountered in route segment F–I, the relation of the street width to the building heights makes this area quite shady. Despite its secluded layout, the proximity

to Bishopsgate and its dominantly commercial land use, the active frontages of buildings and the absence of traffic bring some pedestrian density to the area.

Section O–P | Bishopsgate

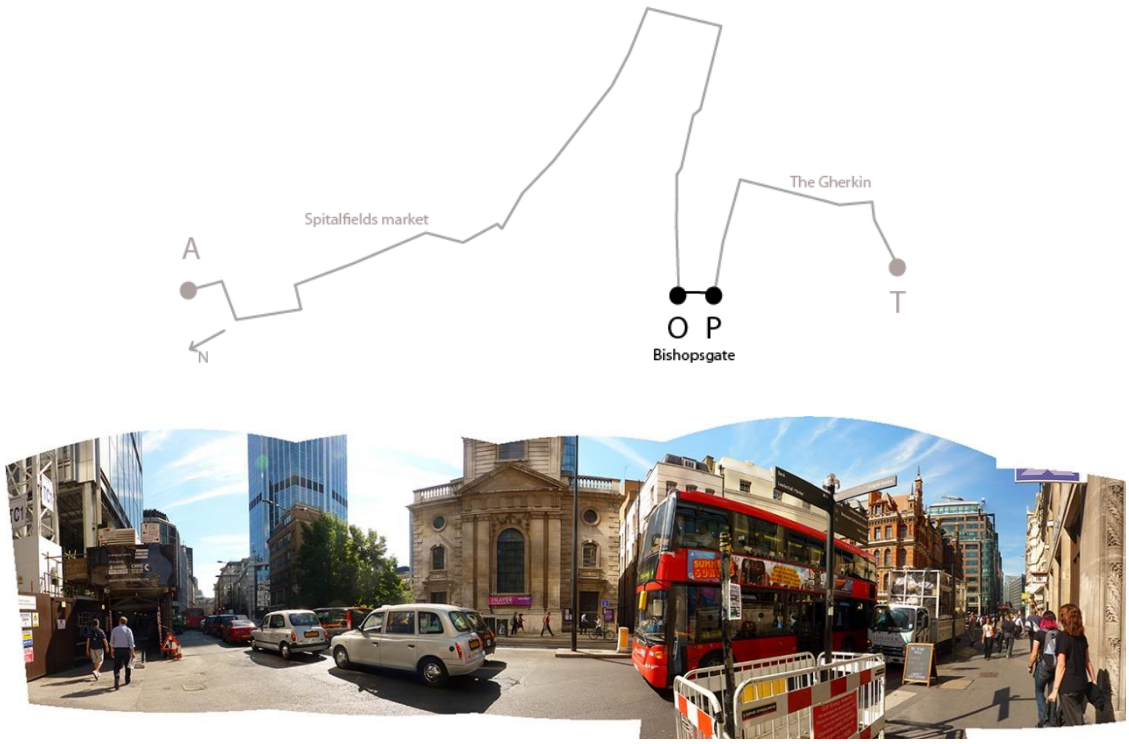

Figure 37: Section O–P.

This part of the route follows a section of the street known as Bishopsgate, where there is a mix of buildings (from the Victorian era to mode modern buildings) of different heights, most office blocks with active frontages to support the area workers. This is one of the most traffic-dominated areas in terms of vehicle and human traffic – it connects to Liverpool Station (which is very close to this location) and is the only area under analysis with enough width for intense traffic (an average of 4 lanes) and high-density footfall. This is also the only area of the walk where busses pass along.

Section P–R | Camomile Street–St Mary Axe

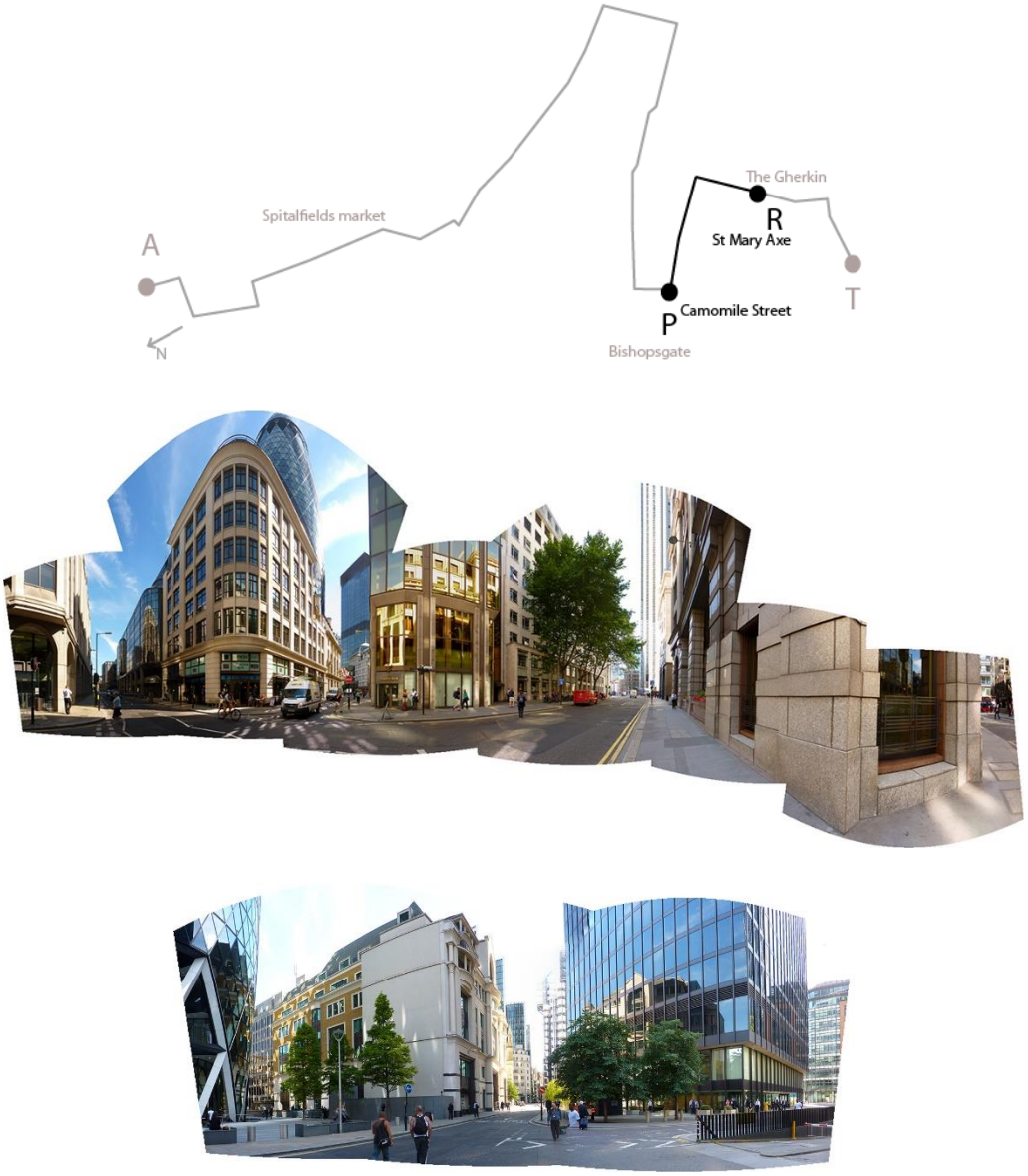

Figure 38: Section P–R.

This, the penultimate, section is the most grid-like, linear and orthogonal segment of the route. Made up of wider streets mostly designed for car traffic and some public transport, it offers mainly non-active facades that are interspersed with retail (mostly the hospitality sector and small grocery shops). Land use is dedicated to offices. Of the whole route, this presents itself as the least remarkable of the locations. The scale and architectural design of buildings are similar throughout and there is not much pedestrian traffic; this location is used primarily as a thoroughfare to reach somewhere else.

Section R–T | Undershaft–Great St Helen's

Figure 39: Section R–T.

This location, the final section of the walk, presents spaces with contrasting urban morphologies, buildings and layouts. It begins with a plaza principally occupied by one of the most well-known architectural landmarks of London, the Gherkin. This is surrounded by a number of active façades and retail sites, with a less diverse transition (in between buildings) to a small and intimate churchyard and green square (in front of St Helen's Church).

The following diagram (Figure 40) is a short compilation of the main characteristics of each location, using descriptive icons. This list is not meant to be exhaustive but is intended to reflect some of the main urban realm elements that may have an influence in the sensescapes of each location (i.e. morphology, land use and human density). This summary diagram seeks to help us "visualise" the case-study area when discussing the analysis (in the following chapters) and understanding how some sensory perceptions emerge in the specific locations within the case-study area.

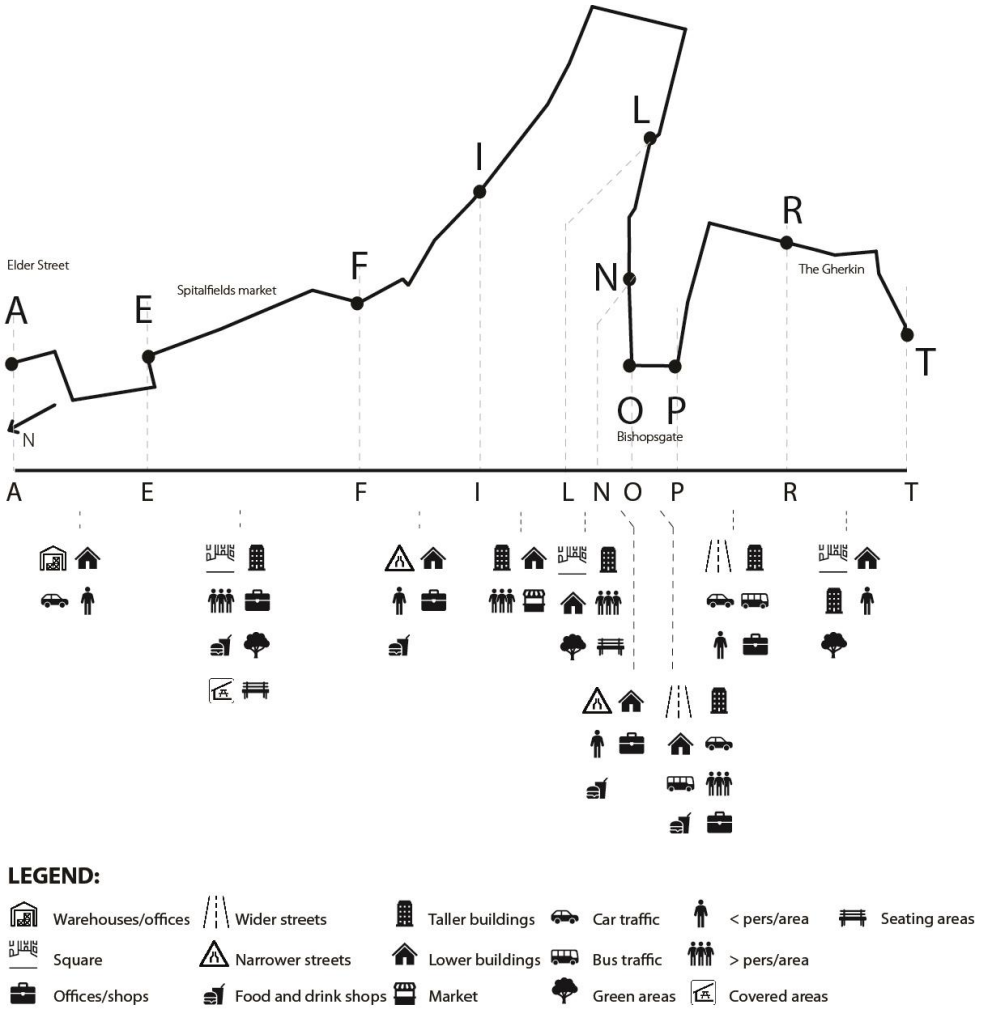

Figure 40: Summary of the key urban characteristics for all study areas.

3.5 Challenges and opportunities of the fieldwork

This section briefly introduces some of the main research challenges and opportunities encountered when conducting the sensetalks and sensewalks (fieldwork) in the case-study area. A summary and compilation of notes taken by the researcher during the fieldwork.

On the Sensetalks

The sensetalks required the researcher to complete the same walk starting from point A to point R and recruit participants to interview at each of the defined segments of the route, with the aim of completing the same number of interviews for all the locations. The researcher would walk the route at a regular

pace while looking attentively for targets to interview – people who were familiar with the space, i.e. mostly local residents and workers.

One of the main challenges of this method was that it required unsolicited approaches to people in the streets in the hope of finding someone available to participate. Most people who were approached while they were walking or accompanied by other people declined to participate. It was very difficult to source interviews from people working in service industry roles, restaurants and cafe workers, as they usually only had short breaks from work and, as they often remarked, had neither the time nor patience to respond to any questions (some mentioned that their work already involved talking to people a lot). Also, as most sensetalks were done during weekdays on either side of and during lunchtime, the majority of people in the area were workers, so it was quite hard to find people who lived in the area. To maximise the possibility of finding people willing to take part it was therefore decided that only people who appeared to fit the right participant profile, were alone and stationary would be approached.

Age and gender of participants were not criteria for analysis but were recorded as part of user characteristics and did form part of each participant's profile. The location of the fieldwork and the time of day it was conducted meant that the majority of participants were of working age, from their 20s to their 60s. It was difficult to find any children and young people or older people on the sites, although this was not an issue in terms of the quality of the data collected, and this provides an opportunity for future research focusing on these age categories. Similarly with gender, owing to the location and the type of work and activities that take place here there (in particular linked to financial services) were more men than women present. When women were approached, they were more likely to decline to participate. Gender is not considered a variable for analysis but, nevertheless, there was an attempt to establish a gender balance among individuals interviewed.

People's habits of using mobile phones while outdoors and on their own presented a challenge as well for approaching potential participants – many individuals were found to be engaged in phone calls or messaging and

therefore unavailable to collaborate. However, the choice of lunchtime and the hours either side to carry out the fieldwork proved successful, as it meant greater flows of pedestrians and more people available to participate (most of whom were very likely to be people who worked locally and therefore of working age). It also meant that fieldwork would take place during daylight. Increasing the levels of comparability of the analysis while keeping the comprehensiveness of the responses. Most of the participants were people having their lunchbreak, smoking breaks or just passing by to or from their place of work.

Fieldwork was done during the summer/autumn period and this meant that some diversity of weather conditions was experienced. Even on cold and rainy days, however, people would still be found outdoors and could be invited to take part in the study. On a single day, an average number of three to six people were approached and interviewed within a period of three to four hours. In some cases, also, the location of the interviews was a challenge. In the less busy streets or narrow streets where there was less space to linger it was hard to find people willing to stop. In open spaces and squares, where there is more space to stay, people tended to have more available time and therefore willingness to participate in the study. Additionally, the higher densities of occupation that these spaces tended to have offered more opportunities to find someone prepared to collaborate. A particular challenge in engaging with individual participants during the interview was encountered between points M and N where individual benches provided here are spaced some distance apart. The provision and design of seating areas (which allow the researcher and participant to sit) have a direct impact on how social interaction can take place. In this case, the distance between seats created a barrier, a sense of awkwardness, which created an issue for the data collection, making it harder to source more detail in responses and continue to engage the participant.

When approached and invited to participate, which included a brief introduction to the aim of the interview and a short preamble about consent, most people asked about the duration of the interview before they decided to accept or not. At the end of the sensetalks, around a quarter of the participants showed interest in the research and spent additional time with the research to learn

more about it. A couple of people even asked to add a few details to their answers after the interview had finished.

With regard to the reaction to the questions themselves, it was interesting to note that people appeared to need to consciously make an attempt to smell space for the first time (while in reality just by being there smell is perceived and there is no need to force it). When they could not recognise any smell, they would often smile and give up and say, "*I can't*". Other cases emerged where they used the expression "*usually it smells…*". Along with the smell question, the final group of questions also presented some difficulties, especially when participants were asked to explain why they liked or disliked a space. This suggests that it is something that people do not think about, at least consciously. Nevertheless, as described before, local residents tended to provide more information about a place, but this was usually linked to complaints about it and negative experiences, rendering the interview with responses that are less indicative of a sensorial response and influenced more by existing personal opinions and views. At the end of the interview, residents would often ask if the research would be used to improve the area or be sent to the local council. On the contrary, one of the participants, a street cleaner, felt somehow restricted or uncomfortable in terms of how he could respond, especially to the last three questions, which asked for his opinion on the best and worst places in the area, to which he replied, "*any part*" and "*don't mind. Anything is good*" (Interviewee 6[29]).

These interviews were not digitally recorded. After the interview, the researcher used some of his time to fill in the first section of the interview (i.e. Theme 1 researcher notes), the section that does not depend on the participants' responses. In particular, the basic information data related to the date and time of the interview, age (approx.), gender, weather, local conditions, etc. Along with extra notes from the interview if needed.

[29] Interviewees from the Sensetalks were given a reference number; while participants from the Sensewalks were given a reference with two capital letters, corresponding to the initials of their names. This guarantees complete anonymity to the participants while offering a clear reference system.

On the Sensewalks

Before any of the walks began, a short introduction to the research and a brief preamble about consent was given to each participant. However, the introduction was kept to a minimum to avoid making them more aware to the stimuli than they would normally be. This risk of increased awareness was also potentially an issue with the repetitive format of the interview questions because, from the moment that participants were first asked about their perceptions, this awareness would inevitably increase.

Once it began, the walked sections of the sensewalk were undertaken in silence, which allowed participants and the researcher to focus more on experiencing the area through the non-visual senses. This also provided more time to understand the variety of the elements provoking these sensory experiences within a particular segment of the route. At each stopping point along the route, the researcher engaged the participant in a session of questions and these elements were explored using the interview guide. As previously described, the stopping points, or locations were selected in order to ensure a variety of atmospheres was experienced and explored during the walk, presenting differences in urban design, urban grain, social and economic factors, land use, streets and squares, etc. This facilitated the exploration of differences and similarities of experiences between spaces. The comparison of qualitative judgements made by the participants along the route supported the analysis of the influence of different factors in the sensory experience. Factors such as the time of day, day of the week, weather variations (e.g. temperature but also the presence of rain) and the flow of people's activity and movement in the area more generally were acknowledged, even if not formally included in the analysis as a variable to explore.

The sensewalks occurred between July and September 2011 and temperatures ranged from between 13 and 24 degrees centigrade. These walks were carried out both on weekdays and at weekends and at different times of the day, with the earliest commencing at around 11:00am and the latest finishing at 7:00pm. The times are chosen mainly depended on the availability of each participant,

but late-evening interviews were excluded in any case for safety reasons. All the sensewalks were digitally recorded and transcribed.

Figure 41 presents a summary of the overall key limitations and strengths of the sensewalks and sensetalks described in both section 3.2 (above) and this section.

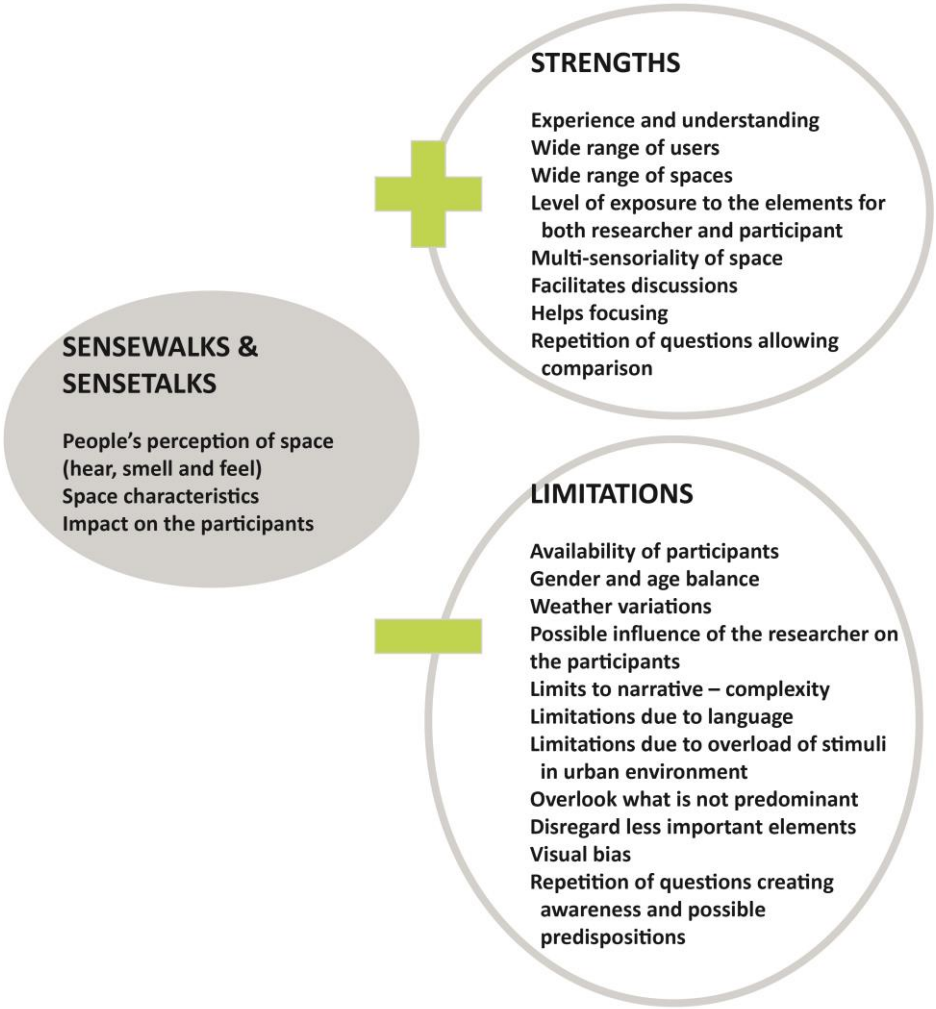

Figure 41: Summary of the strengths and limitations of sensewalks and sensetalks.

Along with the procedural steps of the method, it is also important to describe a "typical fieldwork day", so that the same process can be used by future researchers or planners. To make this description simpler, a diagram of flows was created where each box represents an important decision/procedure of the process, for the sensetalks, sensewalks and observation days (Figure 42). This diagram not only allows an understanding of the different steps of the

researcher on a fieldwork day, and their sequence, but it also shows the complexity of the process. This diagram cross-references with the report tables and sections where these steps, their challenges and opportunities are described in more detail.

In summary, and although this table attempts to go through the steps of a “typical fieldwork day”, it is important to highlight that in social sciences a “typical fieldwork day” doesn’t exist. A fieldwork day is a combination of procedures that depend on a multitude of factors that can relate to the researcher or the participant (due to their human nature), the space (due to the complexity of its flows) or the relation between these three dimensions – so adaptations are needed every day. Nevertheless, the diagram shows that there was an attempt to follow a general structure when doing the data collection. Further information on the methodological restrictions is introduced in Section 3.3, while some of the main challenges and opportunities of the fieldwork are described previously in this section.

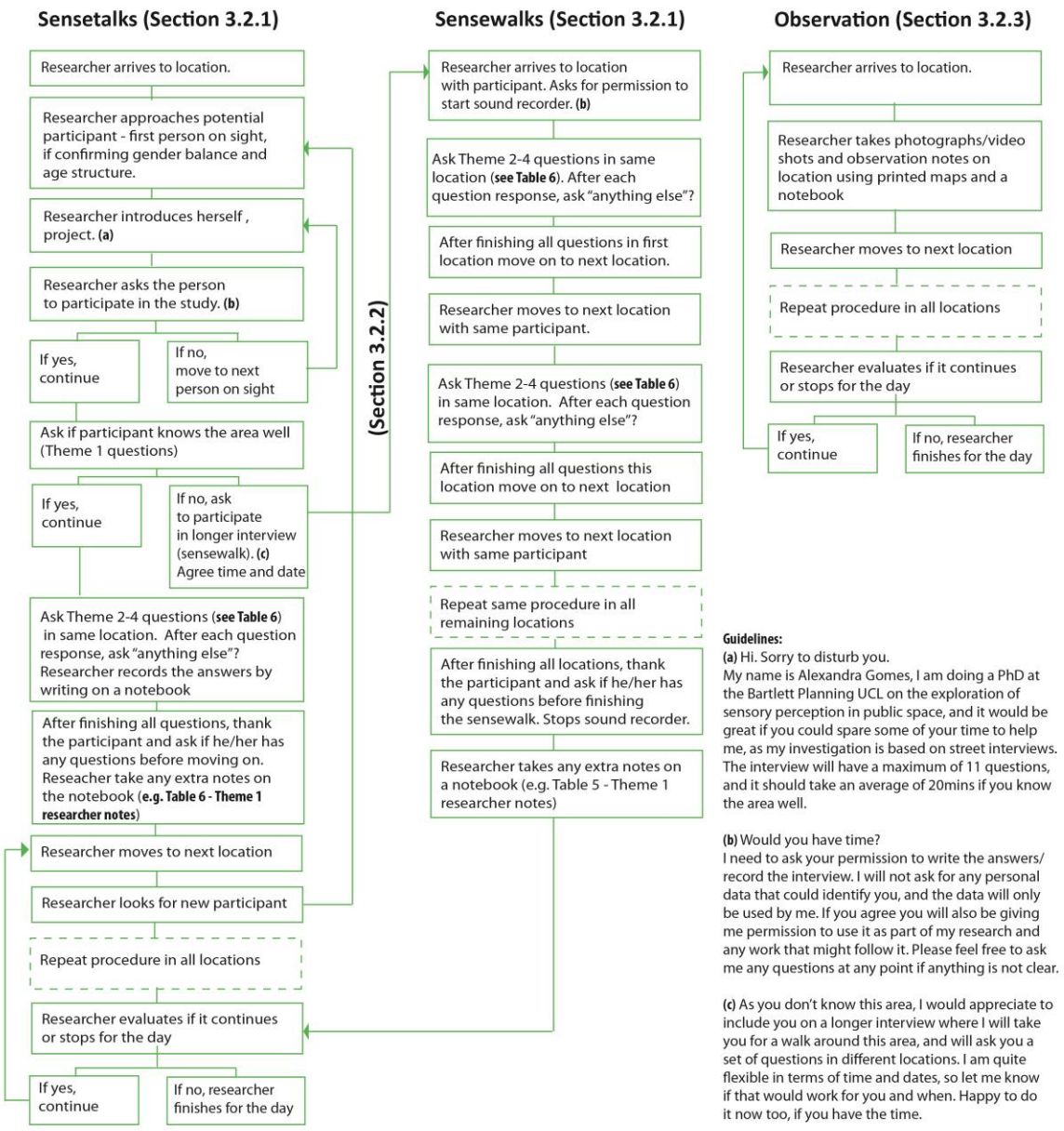

Figure 42: Typical field-work day process

3.6 Analysing participants' sensory descriptions

Following the above description of data collection methods, this section explores the methods of data analysis. It discusses how these methods are used to synthesize the different variables from the content of the participants' responses in specific locations in a way that responds to the research questions and fills a number of existing gaps in academic literature, through the exploration of the sensescapes of space from a multi-sensory standpoint.

Two analytical approaches were used to acknowledge the sensory comprehensiveness of space and identify how it results from the interaction between elements: a thematic and spatial analysis. These are applied to different datasets and used in combination.

The first, thematic analysis, is "*one of the most common approaches to qualitative data analysis*" (Bryman 2012, 578) and this is used in the analysis of the interviews. It offers a reflective process where the researcher interprets the collected data from the interviews. This approach aims at finding themes through an inductive and deductive approach, using some of the categories derived from the literature review along with the themes that emerge from the fieldwork data. Themes were considered due to their relevance to the research questions (see examples in Appendix), although in the case of the elements (Table 3) also repetitions were considered in the analysis (see example Table 23 in Appendix). It seeks to find themes from the available data and establish the framework for analysis of the sensescapes, based on the focus of the investigation, categories derived from existing literature and research and from the participants' own responses. Themes were defined according to their levels of repetition, singularity or even absence, but only when relevant to the research questions.

This analysis included several phases of dealing with a large number of transcript notes (around 40,000 words of text) and organising it around each of the senses, the different locations and broad themes as referred to in the previous paragraph. Starting from the participant's description, the main characteristics of the senses and sensations and their relation to space or individual reactions are recognised and identified. Elements such as scale, dimension, structure, patterns, sequences, contrasts, and values become important variables to explore when analysing the transcripts (Lucas and Romice 2008). The role of the urban realm elements as sources and mediators (enhancing or creating barriers) was also important to highlight at this stage of analysis.

This phase also explored the data to identify finer-grained themes and patterns and examine the descriptions that are richer in detail, along with relevant quotes

from the participants. Focused primarily on semantic or psycholinguistic analysis, "*a methodology based on the linguistic exploration of spontaneous descriptions*" (Guastavino et al. 2003, 1), where the expressions and words used by the participants are recognised as important components to explore (Dubois, Guastavino, and Raimbault 2006; Hedfors 2003; Dubois 2000; Saitis et al. 2017).

The qualitative analysis largely followed Ritchie et al. (2003) analytical hierarchy stages, which include data management, descriptive accounts, and explanatory accounts. Referring to the procedure through which the themes emerge from the raw data. The first stage consisted of organising a large amount of transcribed data around the three senses (i.e. sound, smell and touch). This first level of organisation relates to the fact the three senses are the overarching aim of the analysis and this would allow the interpretation of similarities and differences between the different sense's perceptions.

The second stage involved the organisation of the data per location. For example, within "sound" all sections of the interviews regarding location A–E were clustered together. This second phase is important to be able to understand the relationship between the spatial characteristics and sensory perceptions. The link between the sections of the transcripts and the interviewees was always kept, so that it was possible to relate the transcripts to specific elements (if needed), for example, specific dates, weather, times, or gender, while also facilitating the process of identifying individual quotes.

The third stage involved an exploration of the transcript sections in order to identify themes and patterns across the data (i.e. senses, locations) and generate the "descriptive accounts", richer with details but still keeping the integrity of the participants accounts as much as possible. For example, similarities and differences between the areas (e.g. in terms of understanding the different characteristics of the sensescapes) were considered.

The last stage involved looking for patterns of association that were important to understand the sensescapes, and accounting for these to support interpretative accounts. Spatial characteristics, collected from observation, mapping and desktop research were also combined to develop this final stage. Tables of

analysis were used throughout the whole process to visualize the different themes emerging from the data and the analysis of the sensescapes of a place (examples in Table 21 to Table 23 in the Appendix). The process was not direct and included back and forward phases and constant (re)definitions of the data granularity and themes. The writing-up of the analysis was part of its conceptualisation and not done at the final phase of the dissertation. The thematic analysis of the interviews was the base to highlight categories, patterns, relations, and concrete elements that were then explored and organised during the analysis, depending on the focus on the elements, space or the individual. Both transcripts from the sensewalks and sensetalks were organised the same way and went through the same process although the level of detail and quotes from the sensewalks are more fine grain. Table 21 and Table 22 in the Appendix illustrate one of the coding phases of the sensewalks with a finer grain description of the events and part of the process in order to understand the relevant themes to extract from the transcripts. Table 23 in the Appendix shows one of the coding phases of the sensetalks, to extract the intensity of references to the elements based on Table 3. Figure 48 also provides a more visual, rough example of how some of the themes were highlighted from the transcripts.

For each case (elements, space and individual) the analysis departed from the set of attributes identified within the urban realm elements categorisation (Table 3) but also included attributes that emerged from the analysis of the interviews. Using a combination of observations of the area and mapping, these attributes were examined in relation to each area's characteristics and type. The analysis highlighted the What (elements), How (space) and What meaning (individuals) and allowed the combination of the elements into a framework of analysis of the sensescapes of a place. The analytical chapters of this thesis are then organised according to the three main categories defined in the analytical framework. Figure 44 summarizes the methodological framework and shows the links between Chapters, Outputs and Methods.

The second phase of this stage investigates the data for patterns in association with spatial analysis. Graphic and visual methods (mostly graphics and tables) are also created at this point. As with most research work, this investigation was

a process that required backwards and forwards referencing between the different phases.

This approach, the spatial analysis examined data relating it to its location (space), observation and other spatial elements emerging from the participants' descriptions. Annotation, photography, video (these last two as supporting elements), diagrams and mapping are all included in this process. The aim of the spatial process was to explore the distribution and co-location of themes and elements. It investigated spatial relations through evidence of the coexistence and distribution of sensory qualities, along with the location of patterns and densities (focusing on the locations of sources as well as places of sensory phenomena and sensory experiences). Analysis of the urban realm attributes began with characteristics identified from the literature review and fieldwork preparation and build on these with features that are identified from the participants' descriptions (Table 3).

Figure 43 provides examples of descriptions of locations given by participants. These descriptions illustrate how some of the wider categories (for example, "*all people*", reference to I–L) and more detailed elements from those categories (for example, "*walking*", "*talking*", etc.) are arrived at. It also reveals that interviewees used different expressions to highlight intensities of the same element, for example describing other voices as talking, shouting, or something else. A similar methodology is then applied to other categories and elements. The descriptions included in Figure 43 also show that, in some cases, the intensity and dominance of elements became clear, and this led to specific individual reactions. Elements such as traffic and building works are highlighted, and framed through a strong qualitative acknowledgement and a perception of proximity (i.e. "*too close!*", reference to O–P). In another case, it is noticeable how positive sounds (in this case described as "*fairly pleasant*" music, reference to E–F) can be a medium to attract people to specific places. Finally, the use of onomatopoeia and sound effects by participants themselves to mimic the element perceived highlights, in an expressive way, an element that is characteristically dominant and continuous (i.e. "OMMM", reference to L–O). These are some examples of the analytical approach underpinning the three core chapters.

"And this alley here, by chance it's **not smelling now**, but looks like one of those places where people come for the national public sport, to pee!
[The lady who lives there calls it 'Piss Alley']
Yep...it looks like it....though it doesn't smell, it has probably rained...and that's it."

"I'm hearing a **song**, *fairly pleasant*, but... not very recognisable, it could be from a Zara shop or somewhere like that. Some **birds**, some **children**, **steps ... people walking.** [Anything dominant?] The music. The music is *dominant*. It almost pushes me towards the Bershka shop."

"I can also tell you that this street, I've passed by several times, and it has the smells of the **people walking on it**. As it's always crowded and it has always...a lot of people passing by, and then you feel it, and it is also quite narrow...so you walk close....and then smell the others, whether they're smoking, or finishing eating their garlic or onion or chilli...or even, well, their perfumes and what else...

Sounds ... **all people**, **walking,** talking, bargaining ... vendors trying to sell their stuff, somebody shouting there: perfumes; a whole bag for £10!...all these things.

Sounds ... it's *very noisy*. It's *too noisy*, I'm aware of having to speak louder because of the noise. The **traffic** *is really frustrating*, but, *worse* than that, is the **roadworks**, I can hear the **drilling**. It's quite *frenetic*, it's the sort of space you just want to get out of because of the noise. I'm aware of the sound of **people**, but it's *overpowered by the other sounds*. I can hear the **construction work** as well, that kind of drone of an engine going, like a very powerful engine, not a car engine. When the traffic moves, I definitely have to talk louder, *it's not pleasant*, and it's too close!"

The **air-conditioned** "OMMM". The **airplanes**. Oh man, the planes in London are a constant "rrrrrrrrr"! A *random* **little bird**. And nothing more (...) **sound of trees**, which is good.

"I don't understand anything about *vegetables* ... but it smells like *green things*"

Figure 43: Examples of space descriptions given by participants.

Consequently, most of the research outputs are derived from the interviewees' responses and the thematic analysis. A detailed reading of the transcribed interviews enabled the recognition of the themes that are revealed by the participants' responses, and these could be organised per sense, and within each sense per location. The themes highlight the main issues and patterns that emerged from the interviews (some examples of this analysis are presented in Figure 43 above). The selection of themes was filtered through their relation to the two approaches defined earlier for creating a sensescapes framework of analysis and exploring the spatial distribution and co-locations of the variables within the context of overarching the research questions. This analysis enables us to better understand what people experience in public space (Chapter 4), how the urban realm mediates those same experiences (Chapter 5) and how these experiences impact these same space users (Chapter 6). It achieves this through an in-depth investigation of the relationship between sense, space and individual and a comparison between spaces and senses, which leads to a more comprehensive understanding of patterns within the multi-sensory characteristics in space.

The responses and descriptions provided spontaneously by the individual people who participated in the study are the main source of data and elements of analysis. "*Mental representations of urban soundscapes cannot be observed directly, and one way to study these representations empirically is through verbal reports, specifically, by analysing how people talk about their sensory experiences*" (Guastavino 2006, 945). Consequently, the main tool of analysis was the language used by the participant and its semantics. At a broad level, complex answers were explored and classified by themes (e.g. identification, qualification). At a detailed level, verbal data is reduced to its base form, with synonyms grouped together (e.g. cars, motorised vehicles, traffic), which also created semantic themes. These two methodological dimensions will be explored further in chapters 4 and 6. Patterns of responses were then presented together, either through the framework of analysis or as graphics. The interpretation of the verbal data collected from the participants' descriptions was the main instrument used to analyse the sensescapes of a space. This was achieved through the interpretation of patterns in sensorial responses and then

classifying these using themes and semantic categories, namely a process of thematic analysis (Dubois, Guastavino, and Raimbault 2006; Guastavino 2004; Bruce et al. 2015).

The results of the analysis are presented as different layers using graphics and diagrams. Comparable work in other areas is presented using mapping representations. Graphic or mapping design helps us reflect on the initial ideas of structure, patterns and sequences along with distribution and co-location, demonstrating that is it possible to visualise even subjective interpretations of the urban realm.

Finally, in order to indicate where the results of the research can be integrated into urban design and planning policies this investigation illustrated the role of the non-visual senses, described how the urban realm mediates sensory experiences and highlighted the importance (and different levels of manageability) of the elements in the creation of different qualities of space. Therefore, in the analytical chapters that follow, two types of results can be expected: the structuring, description and “mapping” (in its broader sense) of the sensescapes of a place; and the creation of a framework of analysis and tools that can be used for future research and design. The combination of both will add knowledge to the field and can contribute to the improvement of urban policies.

Figure 44 illustrates the combination of methods used in this investigation, from data collection to data analysis methods and interpretation in an integrated and structured argument, that lead to the final analytical framework. It also introduces the links between chapters, sub-questions, methods and outputs.

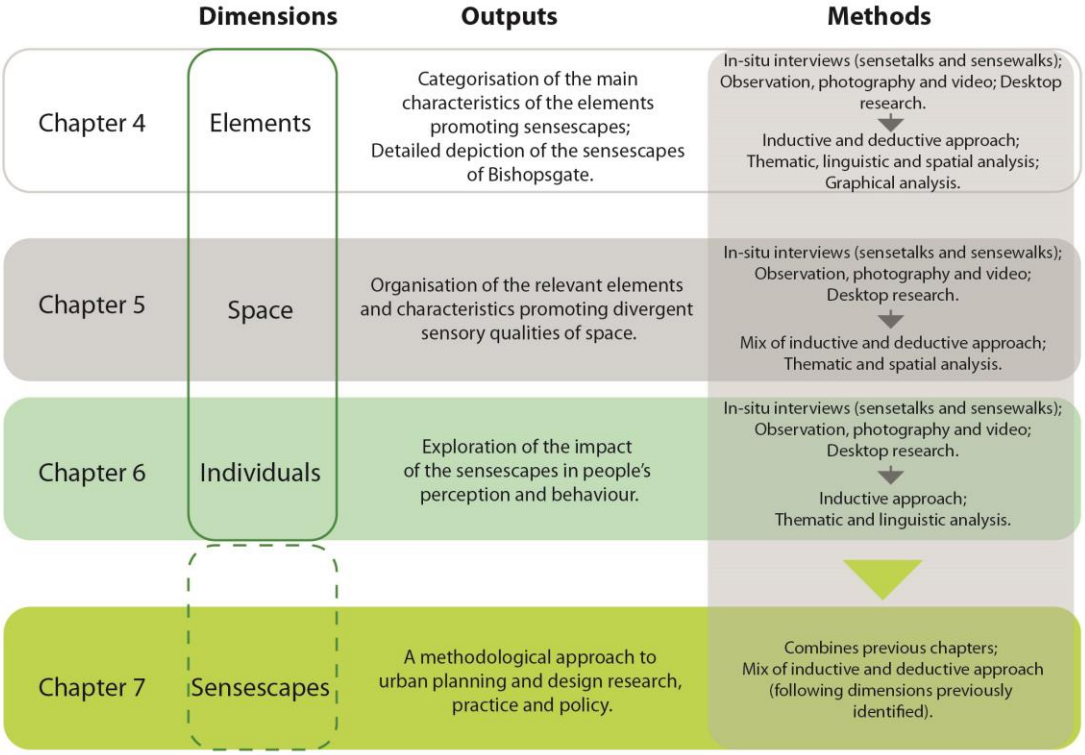

Figure 44: Summary of the conceptual and methodological framework.

As Figure 44 shows, the three analytical chapters (4–6) introduce the 'What', 'How' and 'What meaning' to the analysis of the sensescapes of a place. Chapter 4 focuses on what people experience, analysing the descriptions recorded from the sensetalks and sensewalks, exploring their patterns and defining categories, to create the initial section of the framework of analysis. Chapter 5 focuses on the characteristics of the space, using a selection of three disparate locations, and provides a more in-depth analysis of how the urban realm mediates sensory experiences. This helps us recognise the different levels of manageability required for the urban realm elements. Finally, Chapter 6 explores the impact and meaning of sensory experience in the individual, through linguistic devices that include identifying variant forms of expressions, reducing words to their base forms, grouping synonyms together, and identifying semantic themes based on words that belong to the same stem. Different approaches to contemporary urbanism that when combined allow a more comprehensive sensory perspective of public space.

3.7 Summary of the methodological approach

In summary, this thesis research methodological approach can be organised through a group of seven procedural steps. These steps broadly highlight the aims, sampling, tools and process of data collection and analysis (see Table 9). This table introduces the description of the method in the manner of a protocol so that it can be replicated by other academics or practitioners. While cross-referencing the sections where each of these steps can be analysed in more detail along the thesis report.

Table 9: Methodology procedural steps.

Procedural steps	Description
Aim	Analysing and comparing a set of different areas of Bishopsgate through a total of 50 in-situ semi-structured interviews focusing on the participants sensory experience of public space.
Sample (see sections 3.2 and 3.3)	Participants – individuals, working age (20-65 years old) organised into two groups, depending on their levels of knowledge of the selected areas. Those with good knowledge (i.e. working and/or living there) or those with low or no knowledge of the area (i.e. visiting). Locations – areas representing a diversity of urban spaces (i.e. urban form, densities of use, land use, etc.) within a walkable distance, and in central London.
Restrictions (see sections 3.2.2 to 3.2.5)	Number of areas selected to include a diversity of urban spaces through a number of manageable areas. Equilibrium on the number of interviews per area to allow comparability. Equilibrium between the two groups of participants for a more comprehensive analysis and comparability.
Sample technique (see sections 3.2.2 and 3.3)	Participants were selected from the universe of street users on the basis of their knowledge of the area through a purposive sampling approach, a technique within the qualitative research sampling method. Locations were selected from a set of discussions with academics and non-academics, the researcher's local knowledge of London, and a comparative spatial analysis after pilot visits to other areas of central London.
Tools (see section 3.1 to 3.2.1)	Semi-structured interviews were applied to the selected participants. The interview questions were structured in order to support the analysis (research questions) and adapted to the two groups of participants – those who know the area well (Sensetalks) and those who don't (Sensewalks). Locations were compared and investigated using case study analysis.
Procedure (see sections 3.2 to 3.5)	All participants were in-situ together with the researcher. They were either interviewed by the researcher in one of the case study areas (Sensetalks) or taken through the different areas (Sensewalks). Same questions were asked to the participants, with adaptations for the specific groups (see section 3.2.1 for the questions).
Analysis (see 3.6)	Thematic analysis of verbal and semantic descriptions from the participants was used to establish a baseline for the exploration and the creation of a framework of analysis for future exploration of the sensescapes of a place.

The following three chapters (Chapters 4-6) are the main analytical chapters of this investigation. Each chapter begins with a short introduction that

summarises its structure and narrative, and provides an overview of the methodological approach and relevant academic literature. A literature review that aims to complement the discussion in chapters 2 and 3 and help focus and contextualise the theoretical framework with its basis of the chapter methodological analysis.

4 The Elements of the Sensescapes

Yeah, this is interesting 'cos there's a lot of building works and I did, when we were walking down the street, I couldn't tell if there was traffic coming towards me, it was almost as if I knew the traffic was behind me going down a main road. At some points, when there was a bike or a loud car, I thought "oh, is it coming down the street towards me?" Then, I'm aware of a low-level continuous background buzz of normal London traffic, but because of the building work, you get the occasional high screeching like a metallic sound. I heard some people talking earlier, but I can't hear that right now, it's mostly just traffic. I don't know if it's echoing off the buildings because we're next to quite a closed space here. I could hear the occasional person talking (Interviewee LN).

Analysis of the sensory elements and patterns perceived in space and time results in what is described as sensescapes of a place. Sensescapes are also defined as the full range of sensory modalities that allow interaction with the urban environment and the full richness of the way individuals experience it (Andringa et al. 2013). This range fluctuates in its intensity and in its relationships (Degen 2008).

There have been major advances over recent decades in the study of the relationship between natural landscapes and human individuals. These emerge from different disciplines, such as anthropology or environmental psychology, and explore the impact of sensory qualities on the human being, for example, stress, health, and general well-being. Most of these studies, however, continue to centre around the visual medium, leaving other senses (e.g. sound, smell and touch) somewhat sidelined and attracting less academic interest. Furthermore, much of the emergent academic work explores perception, cognition and assessment of environmental qualities, while ignoring the meaning of the (sensory) landscape to the observer (Porteous 1996, 11). When scholars have tried to explore the characteristics and meaning of the sensescapes of a place, their work has been principally focused on a single sense (Adams 2007; Adams et al. 2008; Brown 2004), on non-continuous geographical areas (Margaritis and Kang 2017) or in disciplines, such as

ethnography or sociology, that are not necessarily specific to urban planning and design (Pink 2008b; Rhys-Taylor 2013; Degen 2008). Another challenge for the investigation of the senses is the verbal and graphic translation of these reflections. Not only are the sensory experiences difficult to describe (e.g. very personal, complex, language limitations, etc.), but they are also hard to illustrate graphically (see also sections 2.1, 2.3 and 2.6). Nevertheless, representing and mapping sensory experiences is a demanding but critical task (Degen 2008; Weber and Heuberger 2011; Lucas and Romice 2008; Quercia et al. 2015). This chapter aims at a first exploration of the spatial characteristics influencing individual sensory perception, using graphical methods that help illustrate some of these elements' characteristics. it therefore explores the space conditions leading to individual experiences. An analysis supported by the participants' descriptions of space and their in-situ sensory perceptions. In particular, through references to the different stimuli (elements) and their characteristics, as well as patterns, differences, and similarities between locations within the case-study area.

As the notion of sensescapes, similar to the concept of soundscapes (Dubois, Guastavino, and Raimbault 2006), translates into a multi-sensory equivalent of the visual landscape, the way in which it is perceived and understood by the individual is core. The recognition of this perception demands a more cognitive approach to the study of sensescapes in the urban environment. This chapter supports the idea of a sensescape that goes beyond simply identifying the negative and positive of sensory perceptions, to the establishment of a broader evaluation of its qualities. Assessing these qualities by considering the way these are verbally described by a collective of individuals in urban settings and exploring the semantics of what is being said and how is said (see the similar method in the study of the soundscapes by Dubois, Guastavino, and Raimbault (2006)). Thematic analysis is used in this chapter to understand how people process and conceptualise their sensory perceptions (see also section 3.6).

Evidence will be presented to show that a more user-centred approach is needed when exploring urban space and that a comprehensive study of the sensescapes must consider three main dimensions: 1) the sources of the stimuli; 2) the spatial conditions that mediate sensory perception of multiple and

diverse spaces; and 3) the impact of the stimuli on the individual's perception and behaviour. Figure 45 illustrates the different categories of elements that will be considered in this chapter to understand the relationship between urban space and its elements (in grey) and personal experience. It also shows how this relationship is circular, as people are also part of the elements in space, therefore influencing space (and its characteristics) with an impact on personal sensory experience within a different timeframe. Emphasizing the dynamic and processual qualities of place through which spatial order is sustained (Lefebvre 2004).

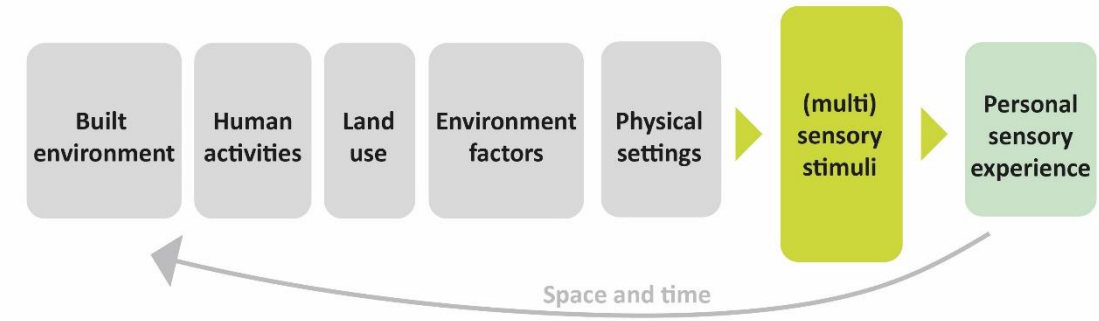

Figure 45: From space characteristics to personal experience.

This chapter explores the conceptualisation of sensescapes based on the idea of a cognitive and interpretative dimension of perception (Carmona et al. 2003). The investigation considers the source elements of the stimuli and their qualities in context (space) and examines the relationships between specific factors: spatial patterns and the characteristics of the elements source. The chapter structure has three main sections. The first examines the semantics of the responses collected from fieldwork participants, defines categories of analysis and creates an initial framework to explore the sensescapes of a place. The second part uses this framework to investigate the relationship between areas, elements, characteristics and patterns, using graphical representations of stimuli and qualities of space. Finally, the third section compares and contrasts the senses in the context of perceiving the surrounding space and identifies elements that are common to them and different between them. A more detailed examination of the complexity of the interaction between elements and space will be explored in Chapter 5.

4.1 Short summary of methods

The concept of sensescapes, introduced by Porteous in 1996, is defined by Degen (2008) as the layering, superimposition and simultaneous presence of several sensuous experiences in geographical encounters. Experiences that might have different intensities, rhythms, directions, and stimuli. This definition is somehow translated through the diagram introduced below (Figure 46), where the overlay of the sensory events results in a multi-sensory experience in space. However, as Mach (1959) argues, perception is not the result of direct stimuli but from a relation of stimuli attributes, and the whole is not deducible from the examination of the parts in isolation. A thought that will be developed further in chapter 5.

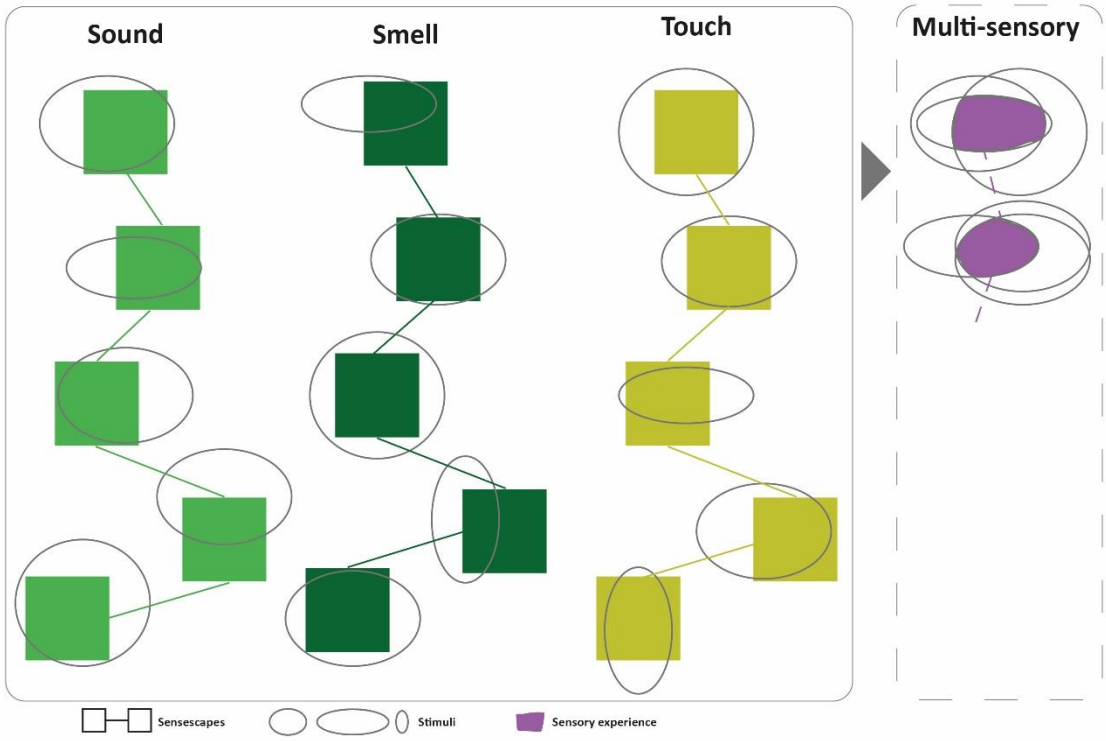

Figure 46: Multi-sensory as the overlay of the senses.

This chapter explores this idea of a “sensory collage” (as represented in Figure 46) and, similarly to Guastavino’s work on the “ideal soundscapes” (2006), investigates and represents these layers and their superimposed presence in space. Even if the parts don’t represent the whole of sensory experience (Mach 1959), the investigation of the parts will nevertheless contribute to the analysis

of the whole. It does this through the analysis of the urban environment from the user's perspective.

On methodological grounds, this investigation relies on thematic and semantic analysis of the user's verbal descriptions. It does so, however, and in contrast to some of the previous studies mentioned above, using a multi-sensory approach. Investigating the sensory characteristics of public space through in-situ interviews with users permits not only an analysis of individual senses but also a comparison between the senses. The approach is empirical and aims to achieve a more theoretical, conceptual and cognitive policy-oriented framework. However, as described in Chapter 3, this in-situ user-centred approach presented a number of challenges, including an issue that occurs when interviewing those who know the area well – their responses often integrate previously acquired knowledge and reflect their own expectations of the area (memory). This research acknowledged this issue and tried to address it by integrating into the sample a group of people who do not know the area, ensuring a broader perspective and a more comprehensive range of answers.

Elements that are highlighted verbally by the participants in their answers and in-situ discourse represent the way in which these individuals select what is relevant from the urban sensory information that surrounds them. Identifying and recording these elements, therefore, helps us to define and understand how the layering and superimposition of sensorial experiences occur. This investigation considered what respondents communicated verbally when talking about and expressing their personal sensory experiences, and then highlighted the particular dimensions and categories of elements that they reveal in their sensory judgements. It begins with the categorisation of elements identified within the case-study area of Bishopsgate, which enables the graphical analysis of patterns within and in between the senses.

4.2 Categorisation of the elements in sensory analysis

Dubois, Guastavino, and Raimbault (2006) observe that recent ecological psychology studies have highlighted that to better understand how people decipher complex sonic environments, these soundscapes need to be

deconstructed into discrete categories that reflect everyday life. Consequently, verbal descriptions emerged as one of the preferred means of investigating individual and collective perceptions of public urban space, as analysis is not restricted to observation (Guastavino 2006). Investigating how individuals express sensory phenomena through language has two main objectives: understanding the discrete verbal categories that influence individual sensory experiences, and identifying the relevant sensory parameters necessary for a full understanding of the sensescapes. From soundscapes studies (see, for example, Dubois (2000), Guastavino (2006) and Dubois, Guastavino, and Raimbault (2006)) evidence has emerged to suggest that everyday sensory experiences can be categorised at different arrangements of aggregation. Two of these categories are strongly emphasised in soundscapes studies: sound recognition, translating the "*names of things causing particular sensations*" (Lucas and Romice 2008, 88), and sound qualities. Both are quite generic clusters that mostly aggregate sensory perception produced by similar sources and explore their qualitative evaluation.

A variety of other groupings can also be found in academic sensory literature (see Table 10) but these are, again, principally related to soundscapes and with little consensus emerging beyond the two main categories of "identification" and "qualification" (see Figure 47 in the next section). The categories represented in Table 10 are the basis for the thematic exploration of the participants' interviews, using a mixed inductive/deductive approach. The table represents some of the key terms and categories previously used by different scholars and establishes a first attempt at aggregation, which is then considered during the process of analysing participants' verbal descriptions of the locations they experienced.

Table 10: List of sensory descriptors.[30]

Sensory descriptors
Qualification
– Pleasant/unpleasant/neutral criterion – Dubois, Daniele (2000)
– Variability in wording – Dubois, Daniele (2000)
– Assessment – Raimbault et al. (2003), Raimbault (2006)
– Qualitative evaluation – Dubois et al. (2006)
– Non-aggressiveness – Guastavino (2006)
– Maximizing positive – Adams (2008)
– Linguistic expressions – Dubois et al. (2006)
Description detailing
– Strength – Raimbault et al. (2003), Raimbault (2006)
– Spatial occupancy and spatial localization – Raimbault et al. (2003), Raimbault (2006)
– Temporal balance and time evolution – Raimbault et al. (2003), Raimbault (2006)
– Clarity – Raimbault et al. (2003), Raimbault (2006)
– Activity – Raimbault (2006), Raimbault et al. (2003)
– Tranquillity – Guastavino (2006)
– Height – scale/level: Adams et al. (2007)
– Amorphous sequences – Dubois et al. (2006)
– Proximity – Adams et al. (2007)
– Corroboration (how they overlap) – Lucas and Romice (2008)
– Event sequences – Dubois et al. (2006)
– Complexity – Adams et al. (2007)
– Ambivalence – Raimbault et al. (2003)
– Priority – Lucas and Romice (2008), Raymond (2008)

[30] **Qualification** - This category is also the base for Chapter 6's analysis, in particular, the section on "'Adjectifying' intensities: a framework for sensory quality meaning". **Description detailing** - This broad category is the base for the analysis undertaken in this chapter.

Guastavino (2006) focuses her work on the analysis of the soundscapes and uses descriptive spatial memories belonging to research participants. With its reliance on memory, the method could be limited in terms of the number of referenced sources and the descriptive complexity of the elements that respondents can provide. To avoid such limitations in this investigation, and to record what people actually perceive, in-situ street interviews are conducted in the presence of the researcher and the three same questions – each one focusing on an individual sense (sound, smell and touch) – are asked of different individuals in the same selected spaces. Typically, responses collected through these open-ended interviews consist of spontaneous descriptions of the urban sensescapes. These were then analysed and classified according to verbal themes, similar to the verbal data analysis undertaken by Guastavino (2006). In this analysis, all variant forms of the words used by respondents to describe their experiences were reduced to their base forms and synonyms grouped together.

4.3 Creating a framework of analysis: the elements to consider

The soundscapes analysis work of Schubert (1975) and Guastavino (2006) establishes that a fundamental task of sensory investigation is the identification of the sources of the stimuli and their quality characteristics. In this investigation, a description of the object source producing the sensory stimulus, and a broader description of some of the characteristics of sensory perceptions, forms the basis of the thematic analysis (see Figure 47). These are referred to below as Level 1 aspects. During the process of investigation, however, other aspects emerged, some of which had already been referenced directly and indirectly by other scholars (Table 10) and others that became visible during the analytical process. These are referred to as Level 2 aspects.

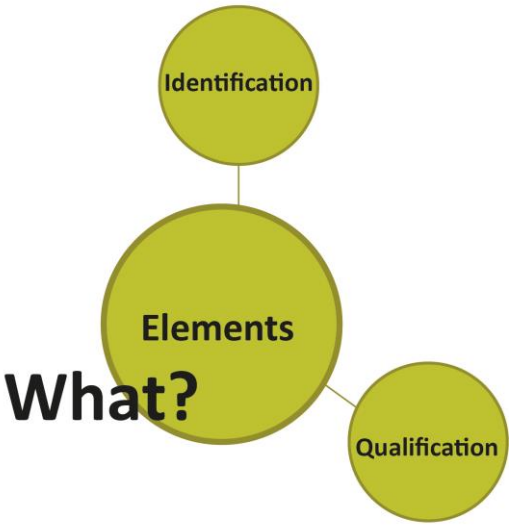

Figure 47: Framework of analysis – initial elements (Level 1 aspects).

Level 1 – IDENTIFICATION – From the analysis of participants' descriptions, the object source producing the sensory stimulus is the main feature. The fact that the source element is often used to describe the stimulus and the sensory experience suggests that the sensory phenomena is not abstract and processed independently of the object (Guastavino 2006). This, therefore, supports the creation of a category of analysis with the same name. This "requirement" may help explain the common recourse to the visual sense as a resource when that same object is not identifiable. The fact that most participants provide more than one description for a single source appears to demonstrate the sensory variety of the urban context, and hence supports the decision in this investigation to incorporate all the sources mentioned in the analysis.

When exploring the semantics of a description, similar to the soundscapes analysis work of Guastavino (2006), the most common language device in the identification of the stimulus source is its denomination. One example is "*car*", which could have been expressed as the "*sound of car*", or more generically with the term "*traffic*". Another one, used to describe human sounds, includes for example, "*voices*" or "*shouting*", demonstrating not only that sources can be experienced in a variety of ways but also that these sources have varying forms

of expression, which may be influenced by the urban context. This also highlights the need for a more concrete lexicon in sensory analysis.

For the purposes of this study, all the terms collated were grouped into an appropriately representative and generic term used to describe the source. All these sources were then listed under one of the four main dimensions that relate to the nature of the elements (defined in Chapter 3): built environment, environmental factors, human activities and land use. This clustering of the terms establishes a hierarchical structure, or tree, in which the four dimensions are the terminal nodes. Any observed similarity is represented through connections between these nodes, with the main categories at the top and all subordinate categories distributed in the branches below. Figure 48 provides an example of this, an additive tree representation of the dissimilarity matrix with verbal descriptors of the main categories and the subordinate categories given by the participants (Guastavino 2007). In this case, however, no values were attributed to any of the sub-categories.

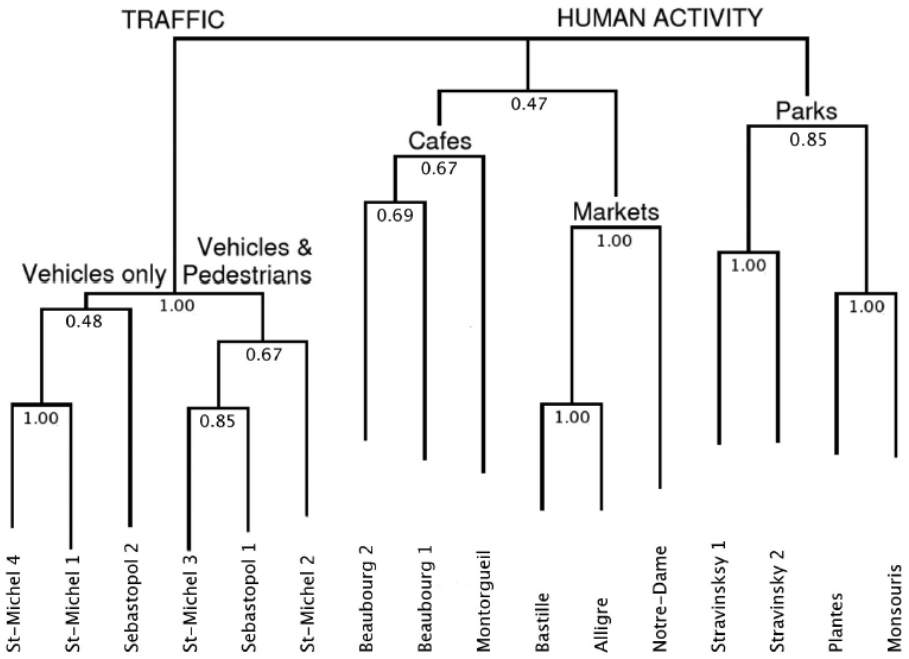

Figure 48: Additive tree representation (Guastavino 2007).

This initial process of identification is demonstrated in the following extract from an in-situ interview in the case-study area (the underlined words are some of the identified sources): "*It's fresher, it's definitely fresher here. I've smelt a few*

cigarettes around here. I'm more aware of natural smells with plants, they're quite near us, you can actually smell ... it's almost like minty, which is pretty nice. Much less traffic smell. When we were going round the corner, there was a really strong ... the sort of smell you'd get from a printing factory ... quite polluted. Whereas, here, it smells a bit fresher and cleaner, definitely" (Interviewee LN).

Level 2 (under identification) – VARIETY – An important category that emerges from the recognition of the element source is variety (Guastavino 2006), usually identified as diversity, complexity or contrast (Adams et al. 2007). Urban environments are the realm of different activities occurring simultaneously or in different periods of time. Descriptions of sensory landscapes need to be able to accommodate and structure this variety and, where necessary, overlapping of sensory sources, which do not occur in any uniform way, as for example in the following interview extract (the underlined words are simultaneously identified smells from distinct natural and humanmade sources identified by the participant): "*I smell a bit of fresh air coming from maybe the greenery around. I expect to have some smell from motor, because it's so green, but it doesn't smell at all. I can't notice maybe. No, nothing, just some fresh air. Some perfumes coming from people*" (Interviewee BB).

Level 2 (under identification) – ABSENCE ELEMENT – In the midst of the variety of urban stimuli, there are instances where a particular source element is anticipated by the participant but is not actually experienced. This expectation on the part of the respondent is either due to his or her previous knowledge of the area or due to expectation of the effects of specific space characteristics: "*No. It doesn't smell anything to me. No ... although we're here close to trees and all... I do not smell neither good nor bad. There is no dominant smell*" (Interviewee RL). It may also occur as an expectation on the part of the researcher that the interviewee will reference a particular stimulus but doesn't; an expectation created by the researcher's own personal experience of that stimulus. Such cases are categorised as 'absent element' and are only considered when this absence continues to remain following the question 'is there anything else?' This particular question is a tool to reinforce the

comprehensiveness of each answer, and is not used to force respondents to make any specific reference.

Level 2 (under identification) – NEUTRALITY – There are other types of cases in which absence can be related to the sensory experience and not to the element. In this example, absence occurs from an equilibrium between elements: "*Aaaa… this is probably the location with a better equilibrium between human sounds, steps and some car traffic. These are quite equivalent in this location, there is a big equilibrium between one type of sound and the other, in this specific space*.... *It's neutral. Not pleasant, not unpleasant, it's tolerable … it doesn't affect the experience either positively or negatively*" (Interviewee GP). It exceeds the nullity of a stimulus, rare in urban environments and mostly occurring in relation to smell, where a dominant element is lacking. Often translated as continuous neutrality, it is usually described as "neutrality" or "not good or bad". These expressions are repeatedly used instead of words that clearly express absenteeism or nullity of sensory perceptions.

Level 2 (under identification) – DOUBT – Identification often relates to clarity (Raimbault, Lavandier, and Bérengier 2003; Dubois, Guastavino, and Raimbault 2006), but there are circumstances in which individuals present 'doubts' when identifying the source of a stimulus. "*In the auditory sensescapes we are often confronted by a variety of different sounds, which cannot be individually distinguished and are experienced as a background hum*" (Degen 2008, 59). When doubt occurs, these sounds may be described collectively as white noise, or the describer will express doubt directly. This often happens when a stimulus is unexpected or there is a lack of visual cues to identify it: "*That motorbike came through a bit more clearly and I can hear something digital going beep, beep, beep, I don't know if it's a van reversing*" (Interviewee LN).

Level 1 – QUALIFICATION – The identification of the object source is often the most dominant feature in sensory perception description. Characteristics of the quality of the sensory perception, however, emerge as another important category to consider in the analysis of the sensescapes and, as seen above in Table 10, it can take many forms. Most of these characteristics are reflected

through the use of positive and negative expressions when describing sensory experiences. Even though the interview did not include any questions regarding the assessment of the stimulus quality, many participants still make judgements about the associated sources (a more detailed exploration of the verbal modes and expressions used in this way is explored in Chapter 6).

Level 2 (under qualification) – QUALITIES – As in the work of Guastavino (2006), when a negative observation is made, "*traffic is really frustrating*" or "*too busy for me*", a negative assessment is attributed to that same source. Similarly, the use of positive phrases to describe a characteristic is interpreted as a positive assessment. The absence of both negative and positive constructions leads to a neutral interpretation of the source, e.g. car traffic: "*It's curious. Smell. I don't feel anything. A neutral smell. A neutral smell, not even the most characteristics smell of the most polluted streets where you clearly feel the automobile presence. Here you feel nothing! Which is interesting. As the existence or not of a car shapes immensely the odour of a specific point of the city*" (Interviewee GP). Descriptions relating to the visual sense are excluded from this category of analysis, although they are discussed in Chapter 6 as they highlight the (pervasive) role of the visual in the perceptions of the other senses.

Finally, cases emerge where elements are considered positive and negative. This may be due either to differences in context or where diverse opinions are expressed by different participants. The possibility of encountering ambivalence or contradictions should also be considered when analysing the qualities of an element (Raimbault, Lavandier, and Bérengier 2003). For example, in the case of a crowded space, which can be enjoyable and annoying depending on the type of location or the person experiencing it. Contrast "*Spitalfields Square. To relax and watch people go by!*" (Interviewee 3) with "*Area here (Spitalfields Square). Crowded, nowhere to seat, too busy, not enough personal space*" (Interviewee 4).

Level 2 (under qualification) – DOMINANCE – A dominance of certain elements seems to emerge due to changes in the equilibrium between elements, and is directly related to differences in intensity, strength or level (Raimbault, Lavandier, and Bérengier 2003; Adams et al. 2007). It may occur

when other elements are comparatively weak or tranquil (Guastavino 2006), or if other elements are absent entirely. This can result in a weak stimulus being the dominant element if nothing else is perceived, or when there is an "abrupt" change to the sensory routine, either with a new stimulus emerging or if an existing one becomes inactive. When this is the case, participants become aware of the change in the dominant stimulus and also seem to become more aware of the overall sensory context. The urban context, due to its customary overload of sensory stimuli, is a perfect scenario for such changes to be noticed when they do occur. An example of smell dominance due to the absence of other elements is illustrated by the observation, "*Yes, it's dominant but only by absence of everything else, it's not a strong smell either...*" (Interviewee FA). Or when a particular sound stimulus overpowers others due to its comparative intensity: "*Sounds? Traffic. Superimposes onto everything else. Effectively I can't hear anything else."* (Interviewee AC). It is important to highlight such examples of "routine" changes. The urban realm is bursting with different stimuli, which causes people to be less aware of specific, individual prompts. They may only become conscious of these when something happens, and the particular stimulus becomes inactive or absent. This can happen in situations that are out of the ordinary: "*the absence of airplanes during the volcano ash clouds in 2011? And suddenly all became more quiet and you were more alert*" (Interviewee LA). Or simply due to changes in the physical environment: "*change in sound as we came around the corner, as we walk towards the open square, the noise stopped really suddenly"* (Interviewee LN).

Dominance also seems to occur in situations of close proximity (Adams et al. 2007), continuity, intensity or distinctiveness, in comparison with other elements. Distinctiveness occurs when one element is clear and others are not easily recognised: "*Again, it sounds like a pneumatic drill or something in the background, that's fairly obvious ... high pitched. There seems to be a generator or something in the background as well, sort of high pitched, whining noise behind me, not quite sure what it is, maybe air con or something like that. The odd person walking by, possibly the odd plane overhead, but it's hard to tell with the drilling in the background but, yeah, that's about it*" (Interviewee LA). Cases also emerged where dominance is related to extreme element qualities

(extremely positive and negative). Or when comparing senses, where odours, as with sounds, are often described as pervasive sensory stimulations as they do not respect boundaries and are not governable and dominating over visual stimuli. On a subjective level, these types of stimuli can cause changes in the way place is experienced (Howes 1991; Degen 2008).

Dominance in urban planning is mostly attributed to the physical analysis of the "weight" of a specific stimulus in space. Through the use of verbal recognition of the importance of a stimulus, this investigation highlights the need for a more qualitative assessment of the urban sensory space.

Level 2 (under qualification) – ROLE – The role of the elements in mediating sensory experiences is another category to consider. It occurs mostly where elements act as mediators, through enhancement or mitigation of different stimuli rather than as a direct source. These are situations where elements co-exist and where the interaction between elements influences the level of perception of a sensory experience; frequently one element is the source, and the other element is the mediator of the experience.

The urban realm is, by default, a multi-element and multi-sensory environment in which different elements co-exist. A comprehensive analysis of the sensory environment therefore must consider the interaction between these elements. For example, situations can occur when an element, such as wind or rain, enhances or creates a barrier to a stimulus (causing a chain reaction) – such "environmental factors" can enhance smell or even cancel it. Two examples from this study illustrate two experiences with rain. In the first, rain enhances the smell of soil by making it more intense: "*Automatically and because it rained, soil smells more intense, so there is a more humid smell, perhaps more closed. But ... it doesn't smell bad. No, no*" (Interviewee PM). In the second, the rain seems to promote air freshness (clean) and enhance the smell of plants: "*Ah, smells the grass that surrounds us, smells plants, I don't know exactly what, but you can feel it slightly, very slightly, and that's mostly it. The air is quite fresh also, it was raining, and it's cold, and I can smell slightly the smell of plants*" (Interviewee FA). At the same time, clean air can also be mentioned as

a factor in cancelling out other existing smell stimuli: "*it was also raining in the midst of all… this nullifies the air, which is...very clean*..." (Interviewee FA).

The wind, in contrast, although it presents similar patterns to rain, helps to move (or carry) a smell to the individual rather than enhancing it. Henshaw (2013) makes reference to air movement influencing smell experience and the concentration, dilution and movement of the odour. Air movement is a fundamental factor to consider when exploring urban sensescapes, even if it occurs in a less consistent manner than rain: "*Urgh ... smells like sewage now. Now came a smell of sewage. With the wind. It stinks, stinks*" (Interviewee JG). Similarly to rain, wind can also promote the disappearance or cancelling of smells when strong enough: "*It doesn't smell anything. It's too windy*" (Interviewee JG). These particular examples describe negative experiences but Henshaw (2013, 137) observes that wind can also be described as 'freshening' the air in a positive way. According to Henshaw, perceptions of appropriate wind speed levels vary from place to place, depend on factors, such as area usage and type, and are interlinked with judgements made about the urban smellscape and overall environmental quality (Henshaw 2013, 170–73).

Touch is another sense experience where this type of this element–element interaction can be found. Cases emerge when specific street pattern and types enhance or mitigate the perception of stimuli related to crowds. Stimuli linked to people's densities and personal space, or even temperature, promote either comfort or discomfort. In the case-study area, this often occurs when the narrowness of streets enhances a feeling of crowdedness: "*It's not comfortable as it's quite narrow and it has a lot of people*" (Interviewee LA). The same narrowness shields areas from direct sun (shading) and influences the way temperature is perceived: "*About temperature, it's a narrow street and it's well protected from sun. At one side, I can see that there is powerful sun, but we are quite well protected from it*" (Interviewee BB). Narrow spaces can also appear to influence temperatures while mediating wind flow: "*It feels a lot more enclosed. I don't know if it feels warmer, I get that impression, but maybe it's because I'm in a narrow street away from the wind*" (Interviewee LA).

Finally, links between street patterns and types and sounds are also identified. Some participants commented that these elements protect from or mitigate the sound of traffic: "*Sort of a faint sound of traffic, feels like you're between two main roads, you don't really hear too much, it's fairly shielded*" (Interviewee LA). These elements are also described as enhancing sounds that are usually only perceived at close quarters but now echo through the built-up space: "*I don't know if it's echoing off the buildings because we're next to quite a closed space here. I could hear the occasional person talking*" (Interviewee LN). Further examples of this mediator role emerge when interruptions in these street patterns are described as enhancing the sound of traffic: *"And then punctually ... in the openings of the square, facing the busiest roads, the sound of individual cars passing by mixed with a generic buzz also from there, in several layers*..." (Interviewee FA).

It is noticeable in these cases that the urban realm elements can have a multi-sensory interaction, for example, rain can affect touch and also smell stimuli, and street patterns may affect both touch and sound. The roles that the elements play also relate to the dimensions and categories that will be introduced in Chapter 5, in particular in the analysis of how the urban realm mediates sensory perception and where exploration of this goes beyond the simple definitions of source, barrier or enhancing elements.

Level 2 (under qualification) – CONTINUITY – This aspect expresses permanence in space and time and is often related to spatial occupation and temporal evolution (Raimbault, Lavandier, and Bérengier 2003). It becomes important when comparing the same space at different times, or different spaces that are connected. This is a sensory characteristic that also relates to other categories (see Dominance, above, for example). In physical analysis permanence is mostly demonstrated using physical measurements along space, but in qualitative research, this permanence, constancy and continuity of a stimulus derive from statements made by the interviewees or from similar sensory descriptions of other places.

Using the participants' verbal descriptions of their sensory perceptions of particular locations to create the above list of categories, this investigation,

therefore, establishes an in-depth and structured framework for thematic analysis that enables examination of the sources of sensory stimuli beyond simply identifying them and their qualities. The characteristics described above demonstrate that an element source can also be described through its variety, neutrality, absence and even doubt that it exists and that consideration of its role, its level of dominance and continuity are also key factors at play in understanding how a sensory environment is experienced. This set of categories is described as **SENSORY CHARACTERISATION**. It emerges from the translation of what people experience and can be summarised as the 'What' of a sensory experience. Although these categories should not be generalised to other spaces, times, socio-economical or cultural backgrounds (Pink 2009), they nevertheless create a baseline and a framework for future analysis. The proposed structure (Figure 49) includes qualification and identification as the two dimensions already referenced by Guastavino (2006) along with the other eight categories described above.

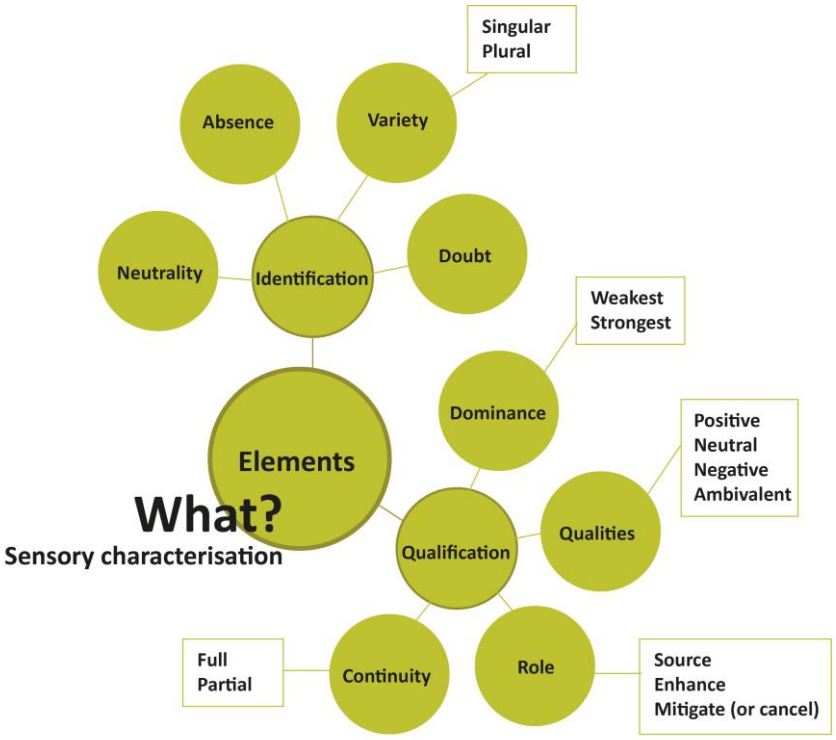

Figure 49: Framework of analysis – sensory characterisation.

4.4 Some challenges

From the analysis of the categories presented above in section 4.3, most represent a direct relationship between the elements' source and the individual (with exception of the "role" aspect). This type of relationship can be described as simple and bi-directional, but in the context of the urban space, however, where simplicity is rare or non-existent, the relationship becomes more complex. When occupying public space, individual people are surrounded by stimuli and are experiencing different sensations simultaneously. They are themselves an element influencing those same sensations and other elements around them. This fact must be acknowledged. However, for the purposes of this chapter and for methodological reasons, this simplicity is still assumed, and the analysis is based on the categories as set out in the previous section. This seems the most effective method to achieve a baseline and a comprehensive understanding of what people perceive in public space.

Other factors that have been identified (above) as being fundamental to the exploration of the sensescapes of a place are the individual's socio-cultural characteristics, the urban context and space and time (Lucas and Romice 2008; Dubois, Guastavino, and Raimbault 2006; Raimbault and Lavandier 2002; Adams 2008; Raimbault, Lavandier, and Bérengier 2003). However, the selected categories are those that can be used to explore any space, at any time. This investigation did not consider time or an individual's socio-cultural characteristics as variables, even if these factors do have an indirect impact on the results of this study. It has been explained in Chapter 3 above that this research does not explore participants' backgrounds other than to determine whether or not the respondents have existing knowledge of the case-study locations.

Although time is identified in this chapter as a challenge to analysing sensory perception, the aspects of space and time are discussed in the following chapters, either through the continuity of the elements or the way that time can influence individuals through memory and expectations (this argument is developed further in Chapter 6). It is important to note that the conceptualisation of time in the sensory analysis is about the time experienced rather than the

time passing on the clock (Lucas and Romice 2008). In this study, cases emerge where time, especially long periods of time, promotes changes in the sensory experience of the same place. "*When I came to London one thing that more impressed me was, everywhere I went...the smell (…) everything smelled badly. People smelled badly, everything in this city smelled bad, in the first and second year, and then I just went over it (changed)*" (Interviewee PM). Similarly, with the relation between week and weekend days in the same space: "*These are not good things. And we are on a Sunday afternoon. What makes this more present, I guess. I don't like this type of sounds*" (Interviewee AC). Or with the different seasons of the year: "*I can smell grass, I can smell ... it's a very overpowering smell of lavender actually, but it is the season, so it's very nice*" (Interviewee LN).

Finally, and alongside a recognition of the effective changes in sensory experiences, an expectation of change seems to be integrated into the individual participant's mind. This can be explained by the complexity and unpredictability of the urban context, where sounds and smell, for example, can change from one moment to the other: "*Don't worry if you don't perceive anything, it's not a problem*" (Interviewer); "*Ask me again in a minute*…" (Interviewee LN). Sounds and odours are immaterial; they can merge, linger over time or even temporarily vanish. Sound, just like "*smell, defies visuality and tactility in that you do not need to be near an object to surrender to its odour*" (Degen 2008, 45).

The key categories of analysis exploring the sensory elements and their qualities are now structured into the first section of the framework of analysis. This output is achieved from the analysis of verbal descriptions of what people experience in urban space. Figure 49 (in the previous section) helps to visualise and represent these categories. This structure is the basis of the analysis of specific areas of Bishopsgate, to be described in section 4.5. This next section will also explore in more detail the location and co-location (when more than one element is experienced in the same space) of elements and their qualities before Chapter 5 sets out an in-depth investigation into the relationship between space characteristics and the sensory perception quality.

4.5 Analysing the sensescapes of the area through its elements

Here, the framework of analysis defined in section 4.3 is employed to explore in a more empirical way the case-study area of Bishopsgate. Seven of the eight defined categories are used to help structure and describe what people experience in each location (the role of the elements is not discussed here as it relates to the analysis undertaken in the next chapter). This is an exercise of data visualisation and interpretation, using the categories of analysis to bring a more comprehensive perspective to describing and understanding the sensescapes of Bishopsgate. It highlights patterns and anomalies that are revealed in the data through the exploration of occurrences of sensory perception within a space, per sense and in-between the senses. Each occurrence is matched to a space element and characteristics that are identified from verbal descriptions provided by study participants. These are then matched with a location (see more on the selection of the areas of analysis in Chapter 3). In summary, this section will explore the relevance of the "sensory characterisation" section of the framework of analysis, through its categories, such as variety, continuity, dominance etc. While it relates to Bishopsgate (the case study area where the interviews were done) and retains some of its spatiality, it is not meant to assess the qualities of the space.

The urban environment is a complex multi-sensory system and, as described above, this complexity is often overlooked or simplified when studying urban public space. Section 4.4 (before) showed clearly that this complexity can hinder the description and expression of sensory perceptions. An even bigger issue, however, emerges when trying to visualise these same perceptions, which is difficult. Some scholars have attempted to overcome the challenge of visually representing sensory experience. Some recent efforts, for example, the work by Lucas and Romice (2008), have tackled this by using more traditional methods to create a form of notation that allows both multi-sensory description and multimodal design. This notation system is also comparative and highlights

some of the key characteristics of sensory perception (e.g. sense description, dominance, co-location and continuity). The results, however, are quite generic and do not permit a more in-depth description of what people perceive in public space; such a general representation of the interconnection between the sensory modalities of space misses the richness that a description from each of the senses can offer. A multimodal sensory perception notation that addresses the different senses, exploring how they overlap and collaborate (Palipane 2011), will not only provide a broader view of each sense but also an analysis of their interconnections and relations.

Therefore, this section of the chapter aims to provide a graphical representation of people's descriptions of the case-study area of Bishopsgate, which functions also as a tool to analyse the sensescapes of this particular urban space. It is structured around the dimensions and categories of analysis described above and applied to each of the senses, and the exploration of similarities and differences between them. From the different visual methods tested, bar graphs were selected due to the simplicity in their creation and analysis (see section 2.3 for a wider discussion in sensescapes representations), and are used below to visualise the outputs of the in-situ interviews (see also Guastavino (2006)). The framework based on identification and qualities (see section 4.3) will be the basic support for this empirical test. The graphics illustrate the identification of the elements that contribute to sensory experience per area (location and co-location) and along different areas (spatial distribution) and show their characteristics, patterns and pattern anomalies. Finally, the element's qualities (positive, negative, neutral), possible uniqueness[31] and ambivalence are visually represented, this latter being another characteristic within the complexity of the sensory context that needs to be acknowledged.

The following graphs (Figures 51-56, 58-63 and 65-70) illustrate an overview of the interviewees' responses to the interview questions. This overview is organised according to individual senses, as this helps highlight the concept of

[31] Kang (2006, 45) defines elements that make a space unique as 'soundmarks'. In this case, these could be designated as 'sensemarks'.

sensescapes and fluidity, and the continuity of an experience. As *“a perceived thing has the constitution of a gestalt. There are different sensible aspects, and each does something in its own place and moment to contribute to the composition of the thing*” (Lingis 1994, 4). Beginning with sound analysis, comparable illustrations for smell and touch then follow. At the end of the section, a short comparative analysis of the three senses is presented.

A set of six graphs is used to visualise each sense. In the first four graphs in each set, the x-axis represents the different sub-areas of the case-study area, in the last two graphs, the x-axis represents the perceived elements. In all graphs, the y-axis records the number of times that each element is referred to (occurrences) and here the significance of some elements when compared with others is highlighted. The graphs represent every single occurrence where elements are mentioned in interview responses, including the cases where more than one or multiple elements are cited within the same answer. This is done in order to improve our understanding of characteristics, for example, dominance, absence, etc. To allow better comparability between senses, qualities and areas, colours are consistent along the different graphics, and a horizontal black line was added on the value 10 or 20 of the occurrences (Y axis) depending on the graphic type. All graphics representing similar analysis will have the line in a comparative position. Adding this line to all charts allows a better understanding of how the senses and areas compare.

In each set of graphs (bar charts), three represent the elements within the urban space and the other two investigate their qualification in space, one in particular, focusing on the relationship between elements and qualifications or how the different elements are perceived by the participants (i.e. which locations are most positive, negative or neutral). The interview does not include a question that directly asks participants to qualify the element, therefore, for analytical reasons, where a qualification is absent this is considered to represent neutrality (default qualification). Positive or negative qualifications are provided directly by the interviewee (as explained in section 4.3). The first bar chart in each set presents the elements aggregated by the key categories defined in Table 3 from Chapter 3 (land use, human activities, environmental

factors and built environment[32]), establishing the four-dimensions structure that can be used to inform urban policy and management. The second graph uses this same aggregation to explore the qualification of the elements. The remaining four graphs in the set present, in detail, the elements identified by the interviewees, reconfiguring them according to location, qualification and their continuity in space. The baseline of this analysis is the framework presented in section 4.3.

4.5.1 Sensescapes analysis

The sub-section below examines the results of the adopted forms of visualisation of the sensescapes of a space (bar charts), used to create a "sensory collage" of Bishopsgate through the analysis of patterns and anomalies identified along the selected route in the case-study area. As mentioned before, the graphs represent every single occurrence where elements and their qualification are mentioned in interview responses, including cases where more than one or multiple elements are cited within the same answer. This leads to some of the bars having more registers than others. Due to the limitations of the method, the presented outputs should be interpreted as being indicative and not absolute. These are not statistically sound results, and the adoption of bar charts was selected to help a qualitative and descriptive analysis that allows inferences to be made in relation to patterns, dominance, etc. This seems to be a useful tool to inform introductory discussion and analysis of the multi-sensory characteristics of urban space. In the graphics below (Figure 50), a visualisation of the key characteristics of each location is introduced. The different icons represent the key urban features of each space.

4.5.1.1 Soundscapes of Bishopsgate

This section will explore some of the patterns of the soundscapes of Bishopsgate. "*Soundscapes can help in conceiving ambient sound environments in cities*" (Raimbault and Dubois 2005, 339) because they focus

[32] The fifth category, natural settings, was not used as there were no references to any of its elements.

on “*the properties of sound like keynote sounds, sound signals, sound mark, reverberation time, sonic dimensions, etc*.” (Wankhede and Wahurwagh 2017, 743).

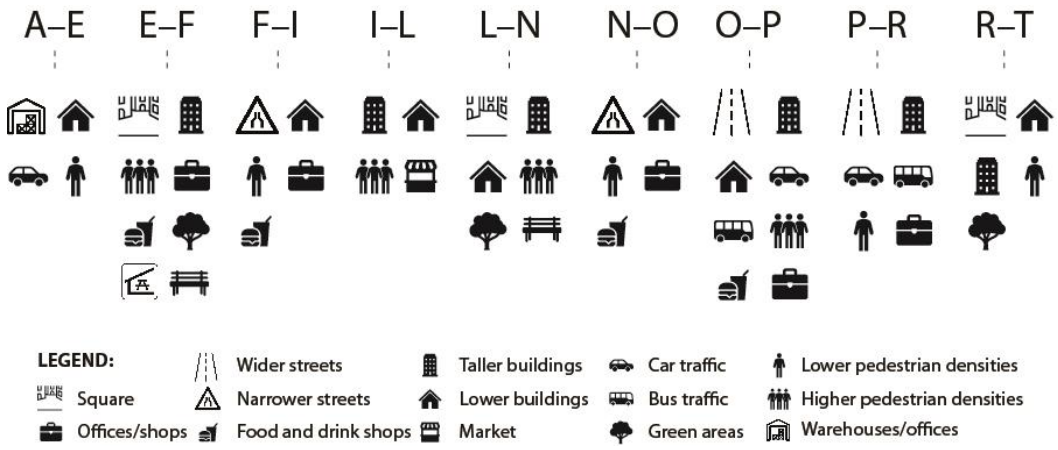

Figure 50: Location characteristics summary.

It will examine the descriptions given by individuals when asked about their perceptions of sound in individual locations (A–T). A summary of the locations’ characteristics that could be identified with sounds and described by respondents is provided in Figure 50. These descriptions are categorised and represented graphically using a set of six bar charts (figures 51–56).

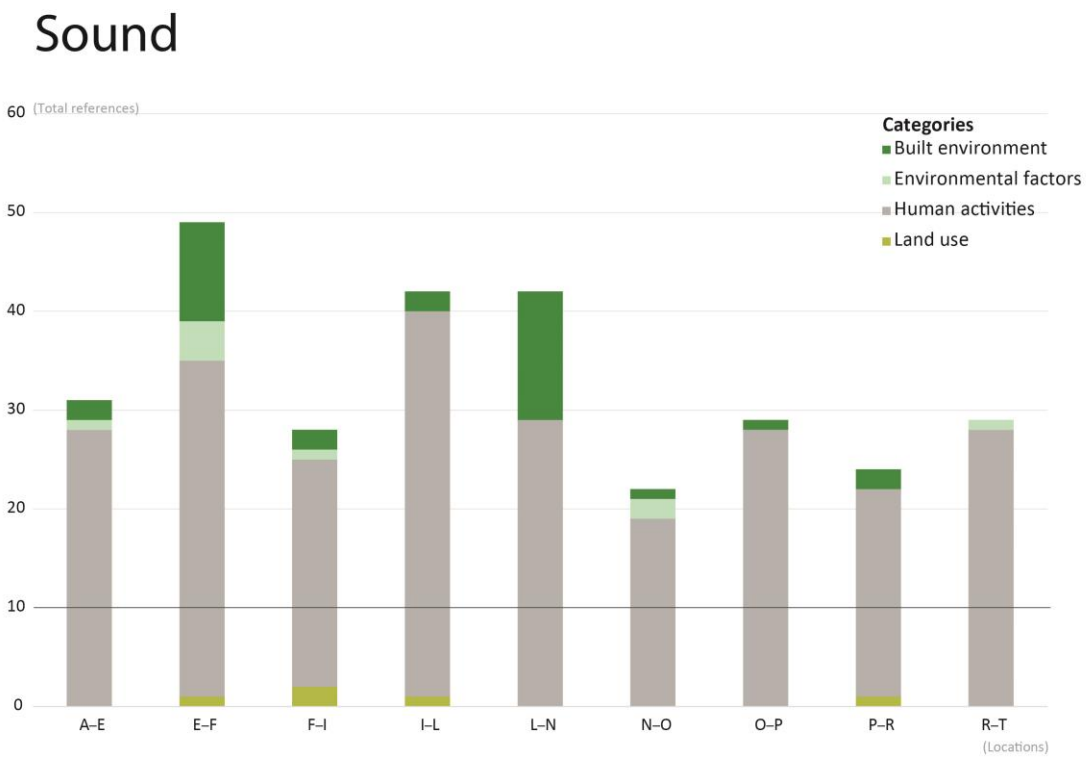

Figure 51: Sound categories per area.

Figure 51 illustrates the four main categories of elements that are represented within the sound experience of Bishopsgate. Human activities are quite visibly the dominant category, followed by elements of the built environment. This supports Guastavino's (2006, 950) conclusion that "*sounds reflecting human presence and activities are the most relevant components of urban soundscapes. In other words, the ideal urban soundscape reflects life!*". The distribution of human activities is continuous along all segments of the case-study route, with area I–L showing the most and N–O showing the least amount. The initial locations of the walk demonstrate the greater intensity of human activity but also higher levels of complexity, which is demonstrated through higher levels of other categories too. In terms of the built environment, areas E–F and L–N encompass the largest number of references.

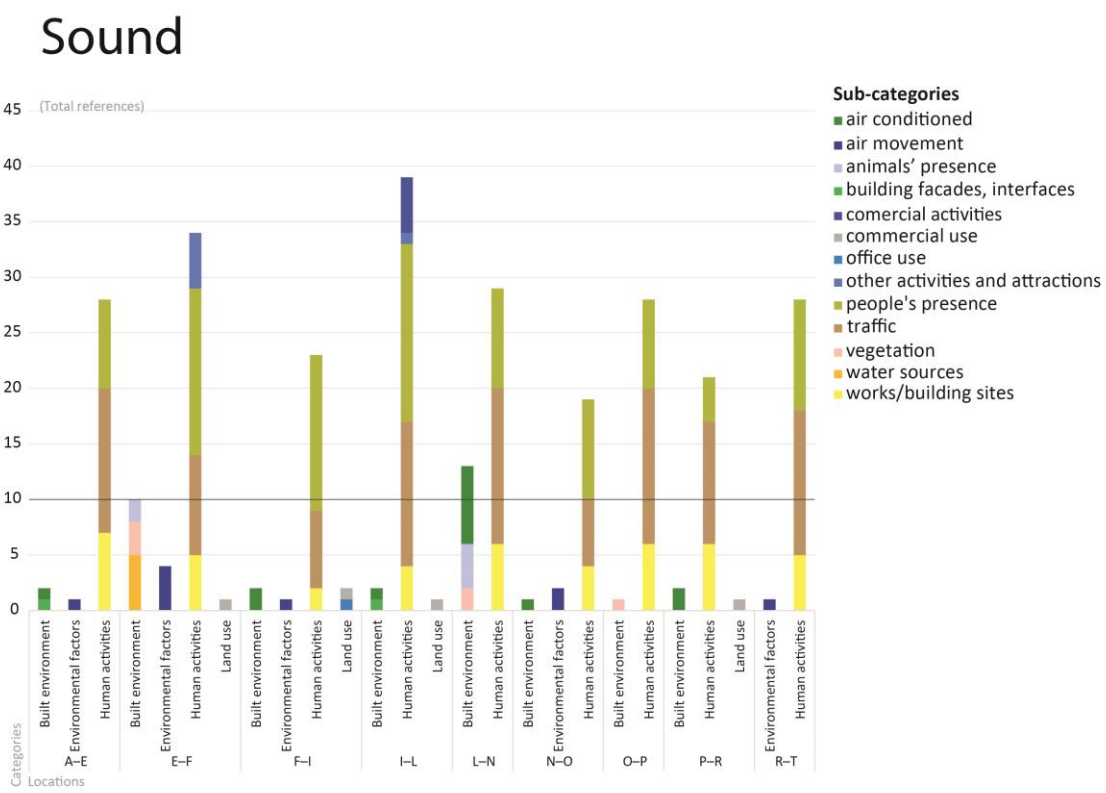

Figure 52: Sound sub-categories per area and category

A visualisation of the sound sub-categories per area and category (Figure 52) reveals route segment E–F as the only location where all the main sub-categories co-exist. Areas E–F, I–L and L–N are those with the highest level (intensity) of stimuli references and N–O is the space with the lowest level. Of the four main sound categories, only human activities are found continuously throughout the case study area – the other three categories have absences in specific areas. L–N, O–P and R–T are the locations demonstrating the least diversity of categories, with this latter location being the only area with no reference to the built environment.

The 13 sub-categories identified in Figure 52 represent the total 13 elements that are perceived and described by the participants over the entire walking route. As described above, human activities, in this case, the presence of people, traffic and building works, are dominant and have a continuous presence throughout the case-study area. Their intensities vary along the route, but traffic and people's presence are the most dominant elements. Other built environment elements, such as air conditioning, or environmental factors, for

example, air movement, are also pervasive in most locations, while the remaining elements have a more scattered presence. Locations E–F and I–L demonstrate the widest variety of elements identified by interviewees and are where the greatest intensity of references occurs. Elements related to land use and environmental factors are the elements least referenced by the interviewees and, in some areas, these are not even mentioned (see, for example, L–N or O–P).

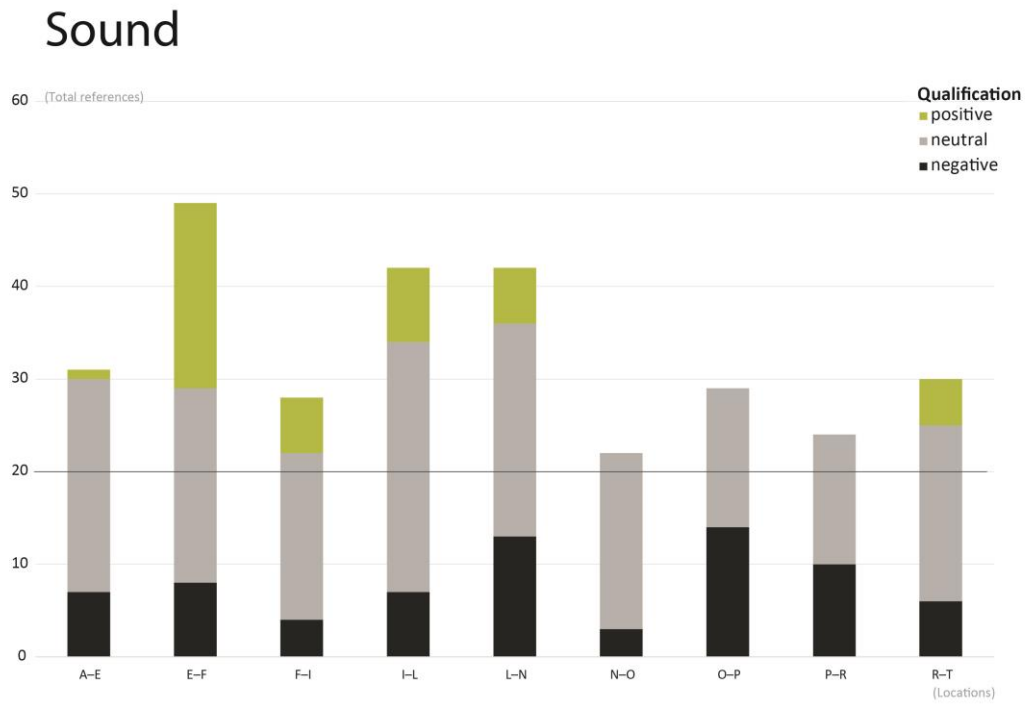

Figure 53: Sound qualification per area.

Visual representation of the qualification of the soundscapes (Figure 53) shows that neutral and negative elements continue to be present along the whole case-study route, and positive elements are not continuous. Only six of the nine locations include all three possible qualifications, with the first half of the walking route demonstrating more positive qualifications than the latter half. The dominant qualification here is neutrality, which could be explained by the fact that interviewees were not asked directly to assess qualities, and that the absence of qualification in responses was recorded as a neutral qualification. Examples of positive qualifications included, "*I like it*" or "*it's nice*". Negative qualifications were expressed with "*really frustrating*" or "*it's not pleasant*".

Finally, the neutral opinions with expressions such as "*I don't think it bothers me*", "*I'm used to it*" or "*it's normal*". A more detailed analysis of types of qualification is introduced in Chapter 6.

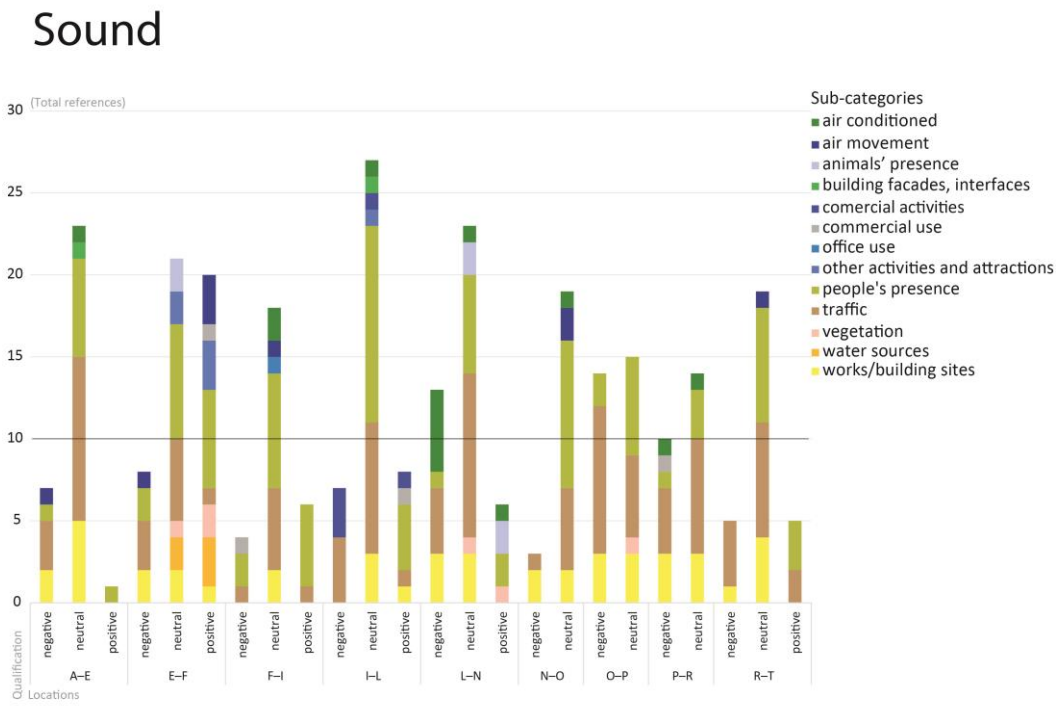

Figure 54: Sound sub-categories per area and qualification.

Looking at the detail of qualification per location (Figure 54) shows where and how the sound sub-categories are perceived. This graph mirrors Figure 53 in showing us that all spaces have elements that qualify as negative or neutral. The six locations in which positive qualifications are present are A–E, E–F, F–I, I–L and L–N along with the last area R–T. Hence, areas N–O, O–P and P–R are the areas where positive qualifications are absent. When comparing the locations where positive qualifications are found, location E–F emerges as the most positive – here the number of positive qualifications achieves similar values as the neutral ones – and segment O–P emerges as the least positive.

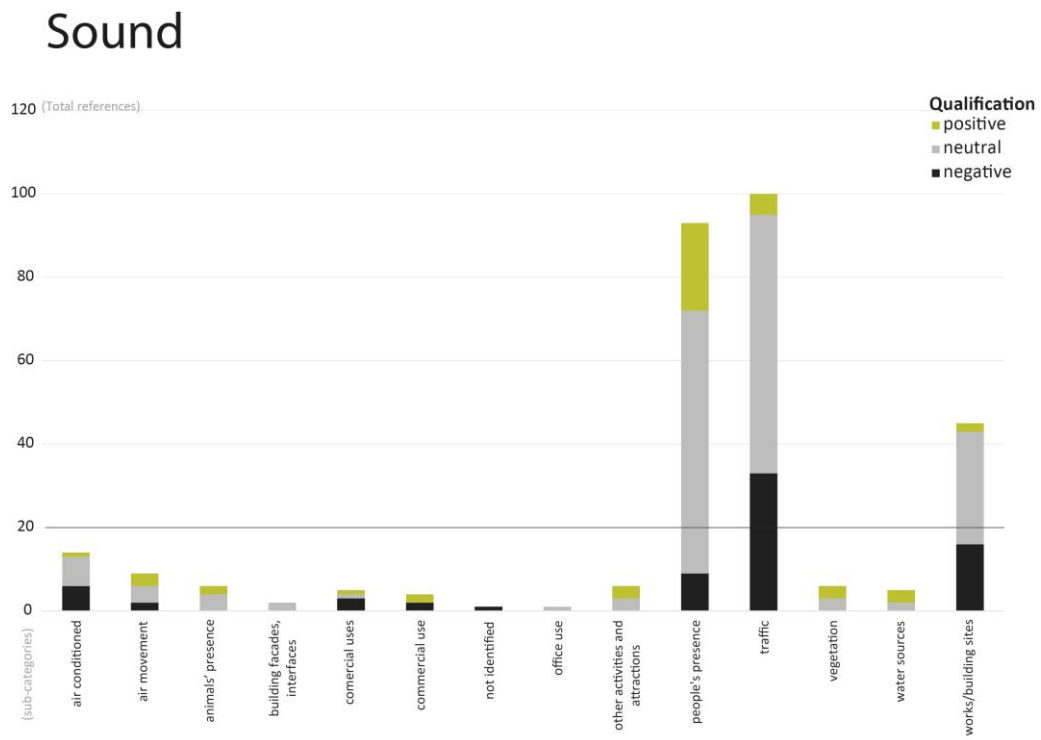

Figure 55: Sound qualifications per category.

It appears that describing the source of an element perceived within the case-study area is easier than providing a qualification of it. Since it was not requested of them, the respondents did not always offer a qualification, although in some cases they did provide one spontaneously and could do so in a clear and concerted manner. This later emphasizes the need to analyse how elements are perceived (Figure 55) The selection of specific adjectives and expressions that respondents make to describe their experiences helps to cluster the different sound stimuli into three main qualities: positive, negative and neutral (see more on this in section 6.2). Neutral is common to all elements (building façade and office use are exclusively neutral), except commercial use, which is the only element not demonstrating any neutral quality (and only negative and positive ones) and therefore the only one promoting defined qualities. In addition to commercial use, most of the other elements emerge as being ambivalent, these being classified with more than one quality (positive and negative). The presence of people, the presence of animals, vegetation and water sources is dominantly positive and clearly appreciated in the

soundscapes of the Bishopsgate area, where building works, traffic and air conditioning are dominantly negative and mostly seen as a nuisance. No elements are considered exclusively negative, as all the elements have positive appreciations attributed to them. Where an element is not recognised it is classified as “not identified or “n.i” and emerges here as an expression of doubt. In this case, from the analysis of the respondent’s answer, it is more related to a negative appreciation of the stimulus.

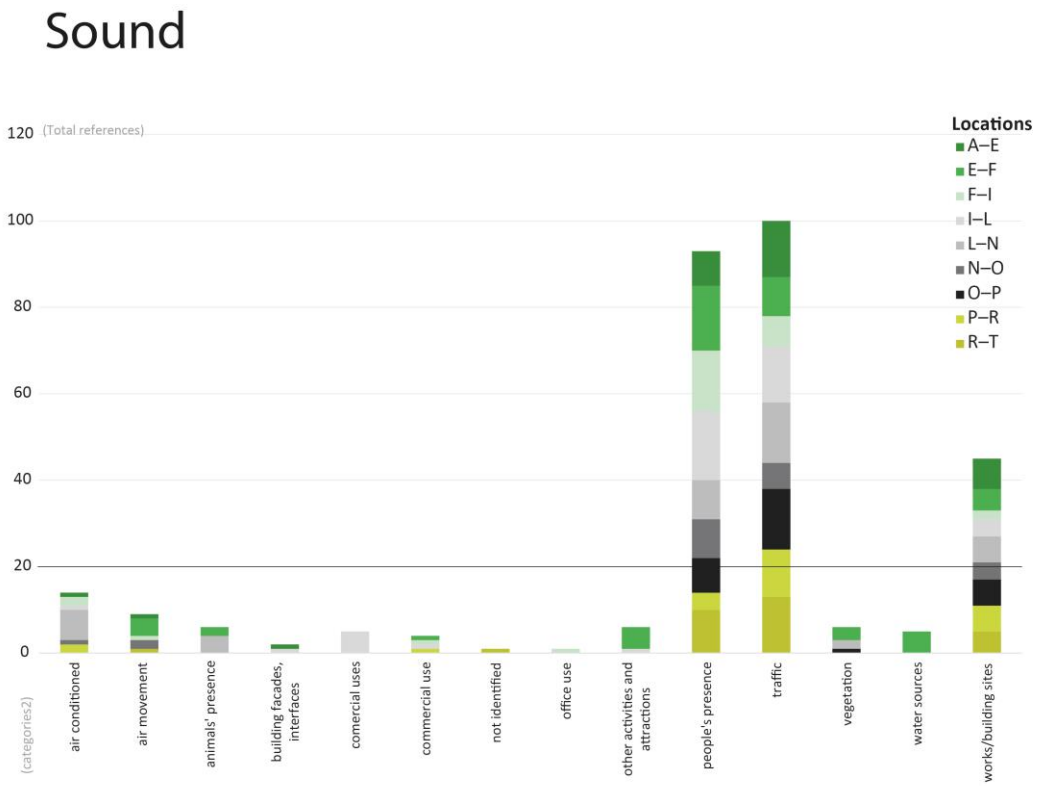

Figure 56: Locations per sound category.

When exploring elements within areas (Figure 56), the same elements are dominant: traffic, the presence of people and building works. Other elements, such as building façades, office use, commercial uses (market), water sources, vegetation and the presence of animals, are only recognised within one or two areas.

4.5.1.2 Smellscapes of Bishopsgate

This next section will explore the patterns emerging from the smellscapes of Bishopsgate. "*In considering the hedonistic role of odour within the context of an investigation of urban smellscapes, smell therefore has the potential to interact with place enjoyment, potentially having an impact on wider place perception and experience*" (Henshaw 2013, 35). As well as place enjoyment, the smell may also interact with place displeasure, thus investigation of a smellscape may include "the classification of smell in terms of aromatic, fragrant, alliaceous, ambrosial, hircinous, repulsive, nauseous and so on" (Wankhede and Wahurwagh 2017, 743). As in the soundscape section, a summary of the locations' characteristics that could be identified with smell and described by respondents is illustrated in Figure 57.

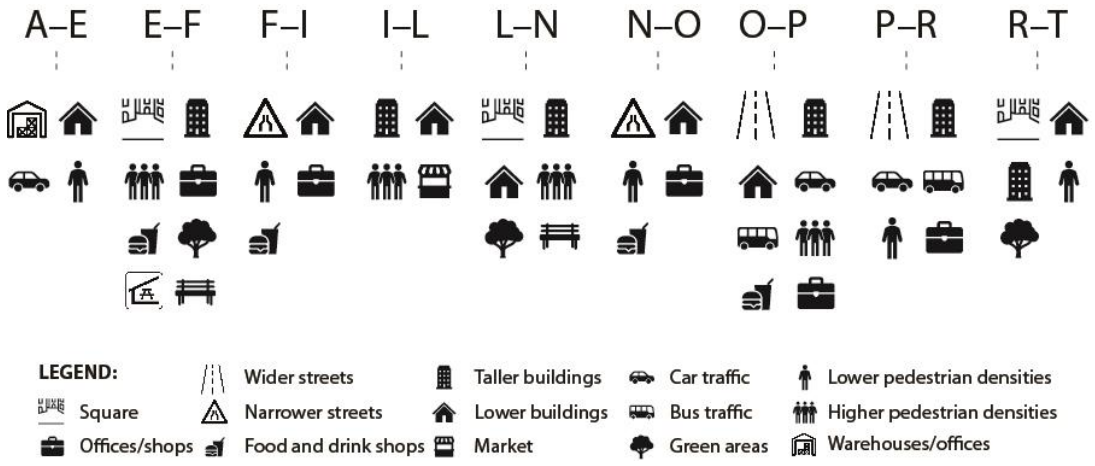

Figure 57: Location characteristics summary.

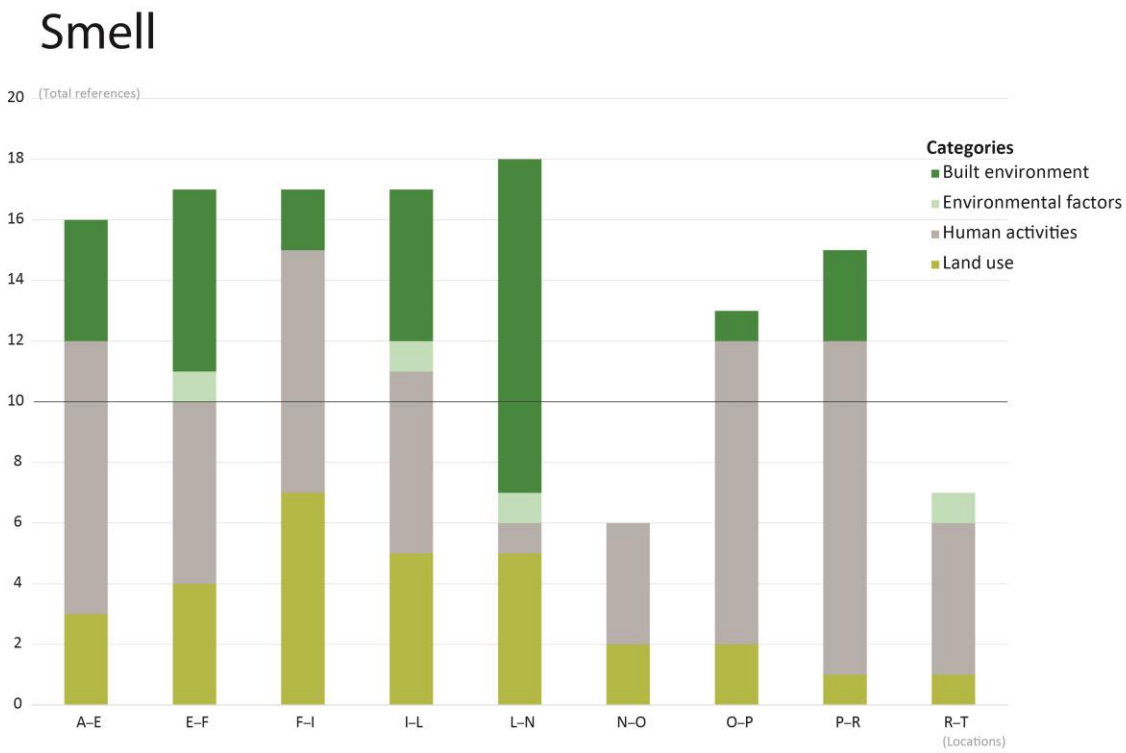

Figure 58: Smell categories per area.

The smellscapes of Bishopsgate are less intense in terms of stimuli references (when comparing the total number) from the elements perceived (Figure 58). In regard to categories of perception, while the soundscapes of the case-study area are linked primarily to human activities, the smellscapes have no such clearly dominant source. Human activities, the built environment and land use are relatively balanced in their distribution. Here, not all four categories are continuous; the built environment and environmental factors are absent in one or two locations. The distribution of categories per location is quite balanced over the whole case-study area, but human activities are clearly influential in areas A–E, O–P, P–R and R–T (they are least evident in L–N), while the built environment dominates in area L–N. Land use doesn't emerge as dominant in any of the locations, but it is strongest in segment F–I. Human activities and land use are the only categories that maintain continuity along the whole case-study route. Land use is less evident in the later segments of the walking route.

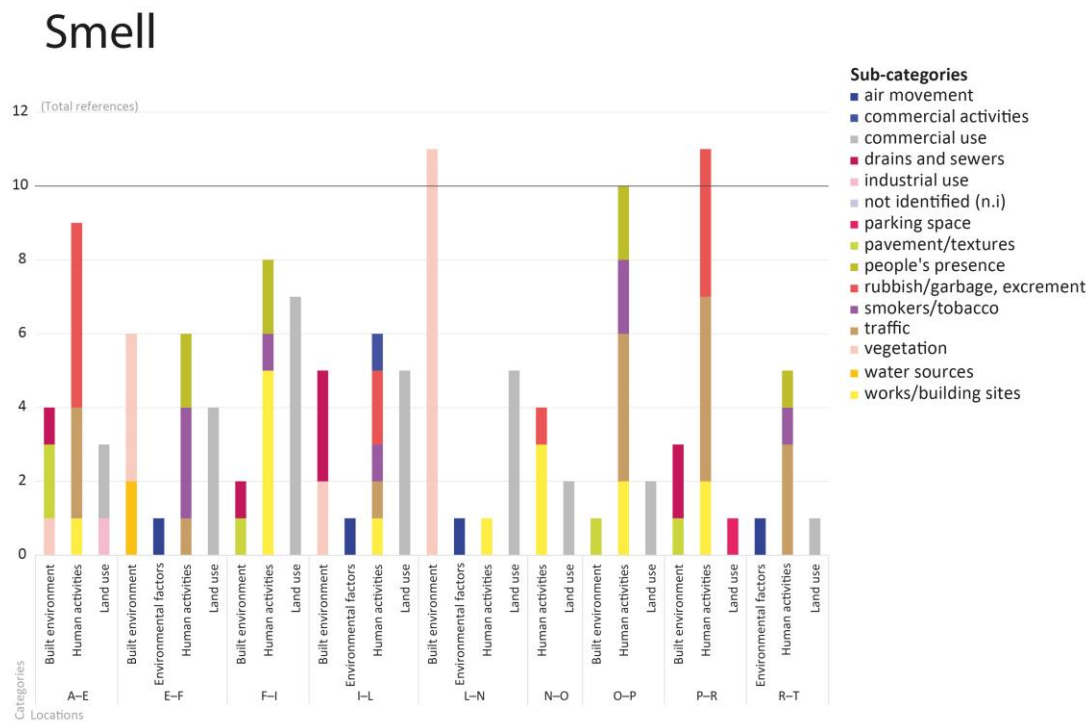

Figure 59: Smell sub-categories per area and category.

When examining the distribution of smell sub-categories that are identified across the case-study route (Figure 59), locations E–F, I–L and L–N are the only areas in which all these categories co-exist. The first half of the case-study route, from locations A–E to L–N demonstrate higher levels (intensities) of stimuli references but these reduce in the latter half of the walk, with locations N–O and R–T revealing the least numbers. Of the four categories of elements (horizontal axis) two are continuous along the case-study route but the other two are absent in specific areas. N–O demonstrates the least diversity of categories, with only human activities and land use referenced here; along with R–T, these are the only locations where no reference to the built environment is made. Environmental factors is the least referenced category along the whole case-study area, and, where they do emerge in four locations (E–F, I–L, L–N and R–T), references are limited.

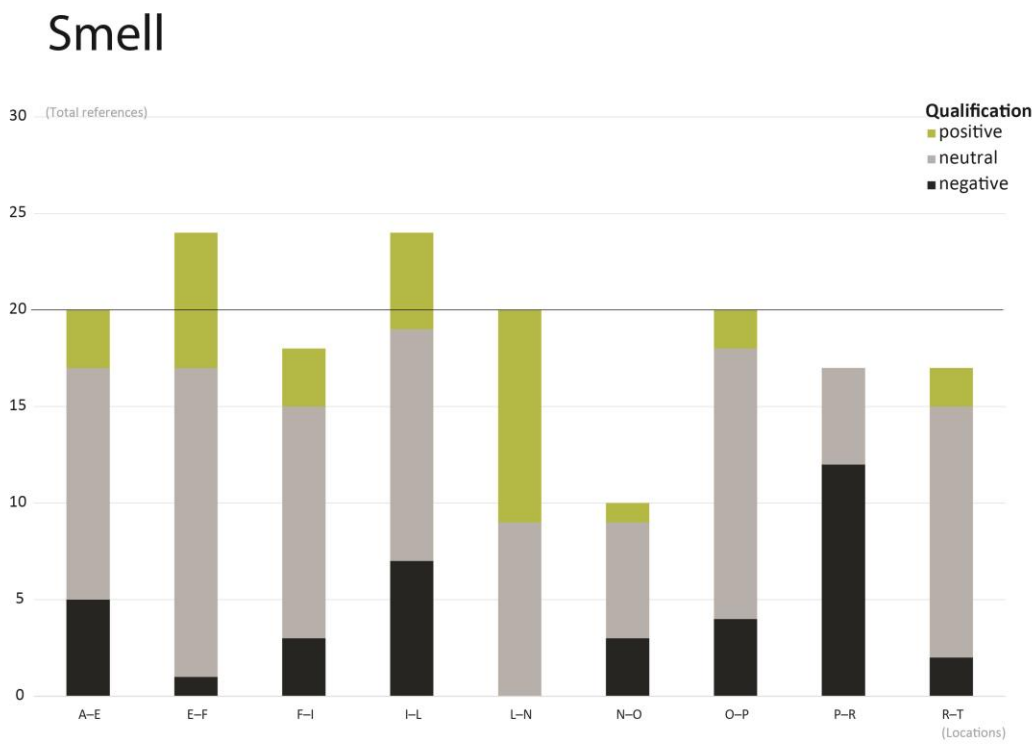

Figure 60: Smell qualification per area.

An investigation of the qualification of the smellscapes (Figure 60) reveals a continuity of neutrality throughout the whole case-study area. Negativity and positivity are only absent in one area each. In this case, there is a greater balance between the categories in the different areas of the case-study route. Here, for smellscapes, the dominant qualification is, again, as in the soundscapes, neutral. Most locations demonstrate all three types of qualification with only one space being neutral and positive (L–N) and one being neutral and negative (P–R). Location L–N emerges as very positive, with the number of positive qualifications here achieving similar values as the neutral. Location P–R, however, demonstrates more negative values than neutral ones. Examples of positive qualifications included, "*Yeah, I like it*" or "*I quite like the fact that I can't smell anything, that it is clean*". Negative qualifications were expressed with "*it's really bad*" or "*stinks*". Finally, the neutral opinions with expressions such as "*I don't mind*", "*I'm used to it*" or "*fairly neutral*".

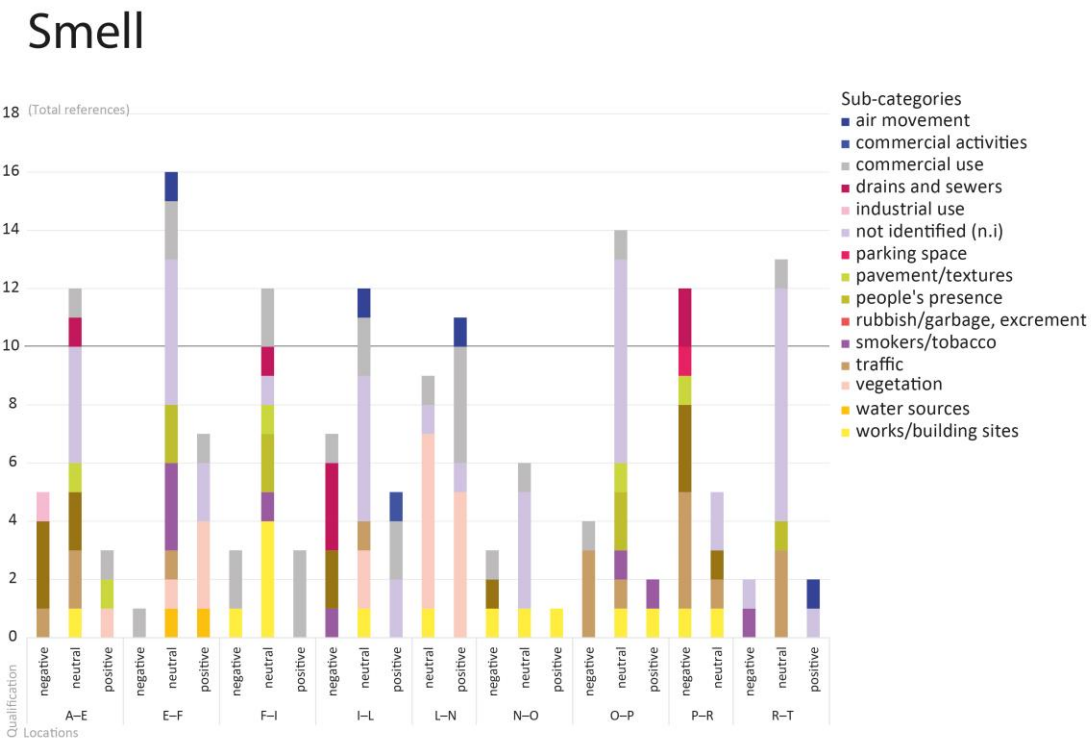

Figure 61: Smell sub-categories per area and qualification.

Figure 61 presents 14 elements perceived and described by the participants along the case-study route. This number is similar to that for the soundscapes, where 13 elements are identified (see Figure 54). A notable difference, however, is that within the soundscapes the respondents expressed little doubt in identifying elements, yet in smellscapes the number of elements not recognised (n.i) is very high and this doubt occurs in all locations. Elements such as commercial use (e.g. food, flowers, etc.), building works and traffic are pervasive in most locations. As with the soundscapes, locations E–F and I–L demonstrate the highest variety of elements, while area N–O demonstrates the least number of different sub-categories identified.

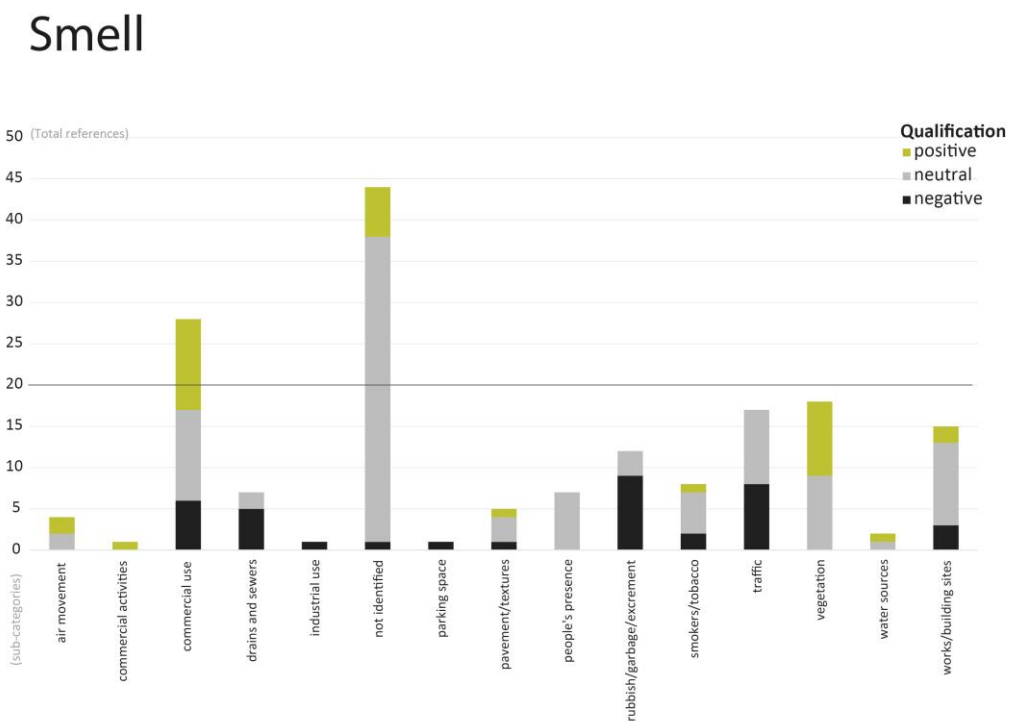

Figure 62: Smell qualifications per category.

The type of responses to each of the 14 elements is illustrated in Figure 62, which shows that a neutral response is dominant for most elements as with the case of the soundscapes Figure 55, even if with less intensity in people's presence, traffic and building works. This neutrality, however, is usually combined with a positive or negative response. Air movement, vegetation and water sources are qualified as neutral-positive and drains and sewers, rubbish, garbage and excrement and traffic are all defined as neutral-negative in terms of their odour qualities. Only five of the 14 elements combine all three qualifications. The balance between the number of elements perceived with positive and negative opinions is also quite similar. Commercial activities are the only element qualified as completely positive while industrial use is the only completely negative element. These are however weaker elements within the case study area and only perceived in areas I–L and A–E respectively (as per Figure 63).

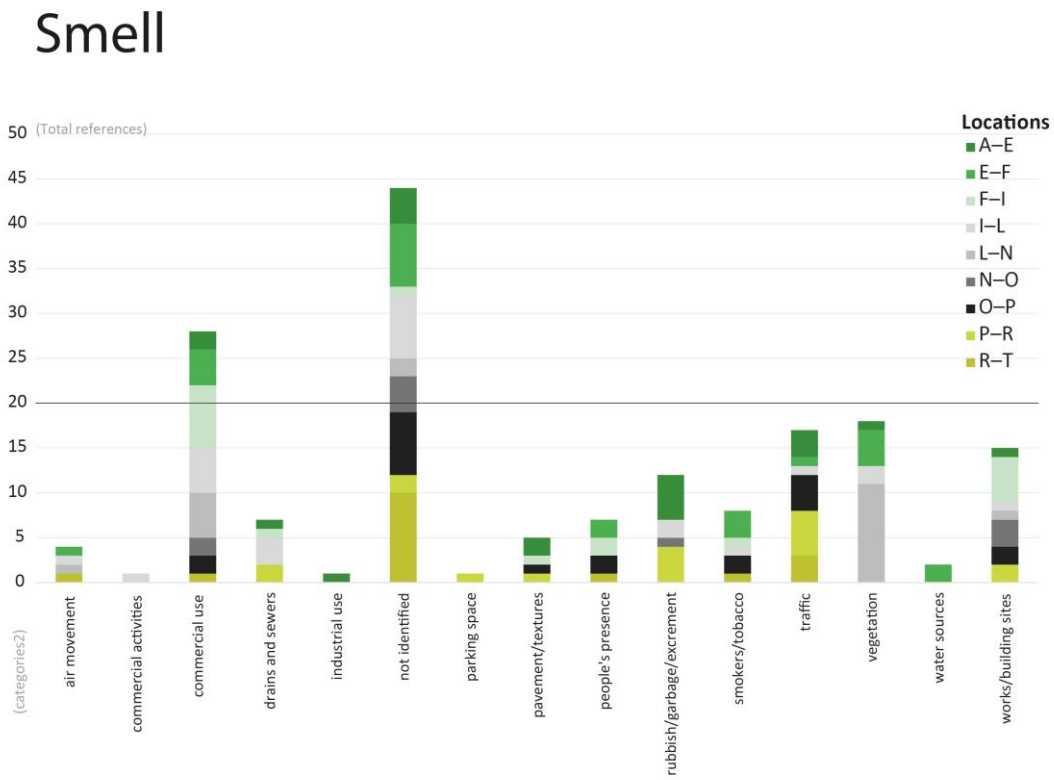

Figure 63: Locations per smell category.

In exploring where smells are identified across the case-study locations (Figure 63), commercial use, traffic, vegetation and building works emerge as dominant across the whole walking route. Also across the entire route, however, a greater number of elements are not recognised at all (n.i.). A small number of elements, such as commercial activities, parking areas and water sources, are only perceived in a single location.

4.5.1.3 Hapticscapes of Bishopsgate

Finally, this last section will investigate some of the element's characteristics of the Hapticscapes of Bishopsgate. Hapticscapes or "*touchscapes [are] reflected in the various textures surrounding us*" (Edensor 2010, 35), and may include "*elements in term of dryness, coldness, roughness, and hardness, etc.*" (Wankhede and Wahurwagh 2017, 743). As in the previous sections, a summary of the locations' characteristics that could be identified with smell and described by respondents is illustrated in Figure 64.

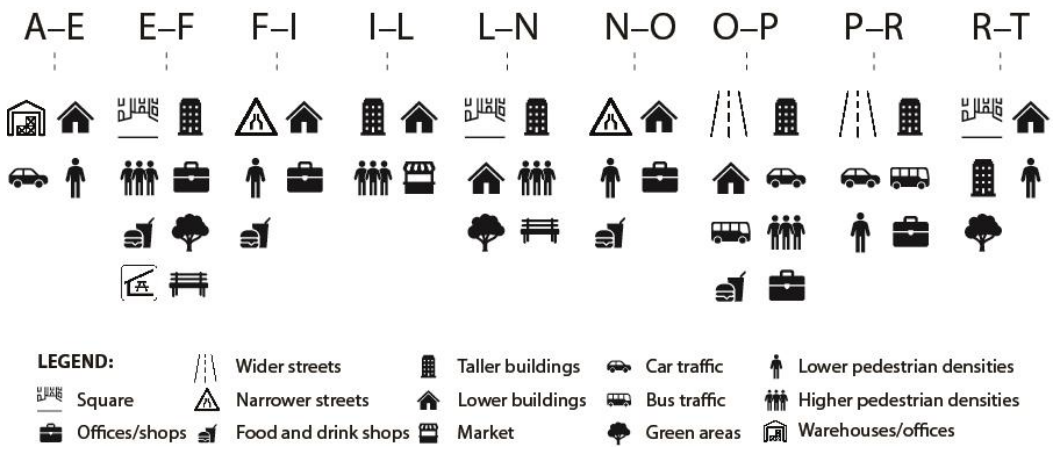

Figure 64: Location characteristics summary.

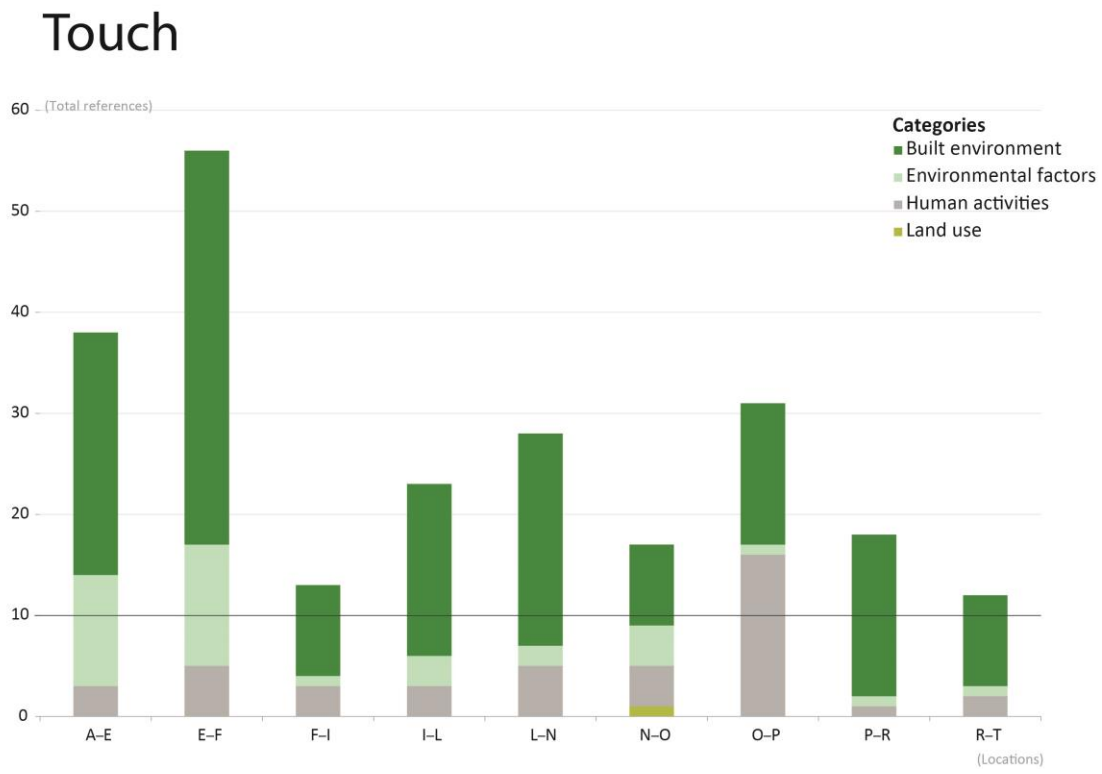

Figure 65: Touch categories per area.

Within the hapticscapes of Bishopsgate (Figure 65), only three of the four main categories of elements are continuously represented along the case-study area. Of these three elements (built environment, environmental factors and human activities), the built environment is clearly dominant across the walking route as a whole. Environmental factors are identified most strongly in locations A–E and

E–F, and in area O–P human activities are the most perceived element. The fourth and least-identified element, land use, is only referenced once, in location N–O.

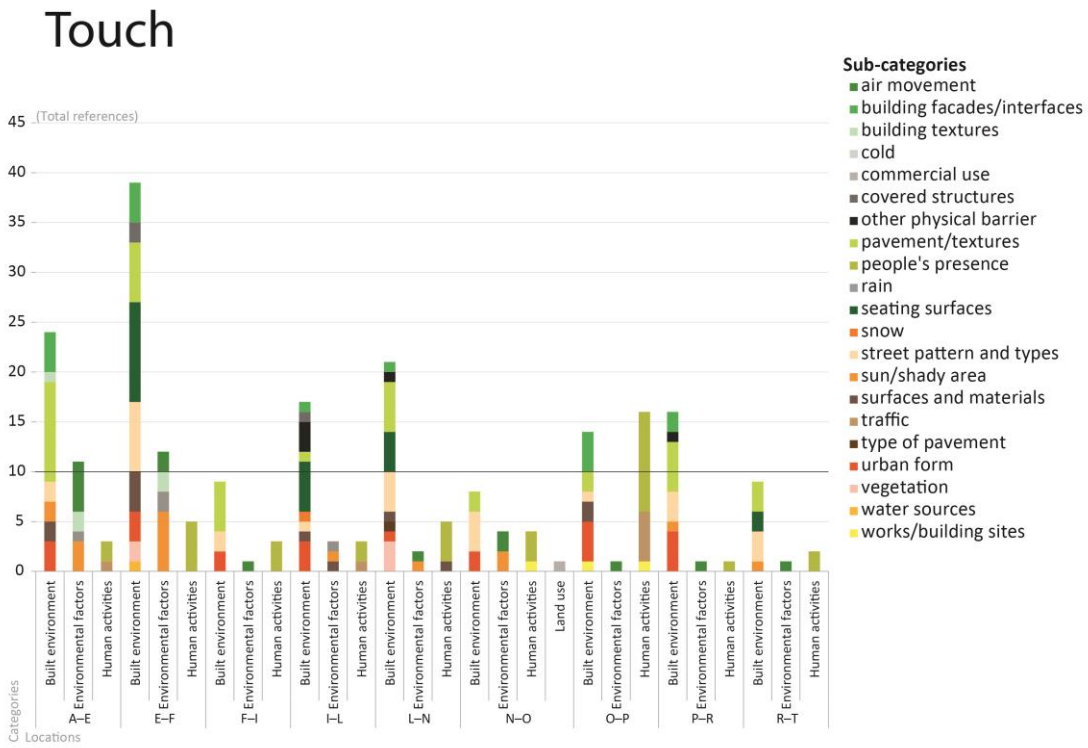

Figure 66: Touch sub-categories per area and per category.

When investigating which touch sub-categories are perceived and how these are distributed across the case-study area (Figure 66), location N–O emerges as the only area where all categories co-exist. The two initial segments of the case study route, A–E and E–F demonstrate the highest levels (intensity) of haptic stimuli references while F–I, N–O, P–R and R–T are the spaces with least with fairly equal distributions. A–E is a location for which numerous references to the haptic senses are cited, much more than for the other locations. Land use and environmental factors are the least referenced categories, in particular in areas F–I, O–P, P–R and R–T where the built environment dominates.

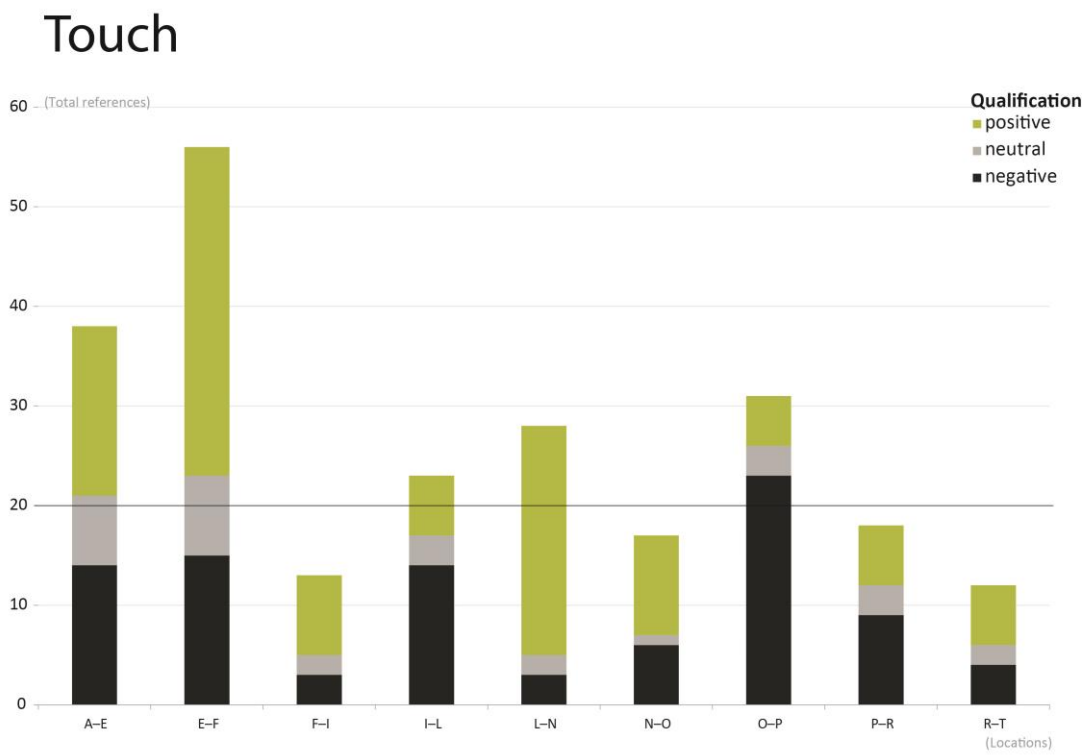

Figure 67: Touch qualification per area.

When looking at the qualification of the hapticscapes, there is still a continuity of neutrality along the whole case-study area when compared with the soundscapes and smellscapes analysis, but in this case never dominant (Figure 67). In opposition to what happens in the other senses. All areas are dominantly negative or positive and all areas were qualified with the use of the three categories. Positive stimuli seem slightly dominant when compared with negative ones. Examples of positive qualifications included, "*very sheltered*" or "*comfortable*". Negative qualifications were expressed with "*uncomfortable*" or "*uneven, hard to walk*". Finally, the neutral opinions with expressions such as "*it's different*".

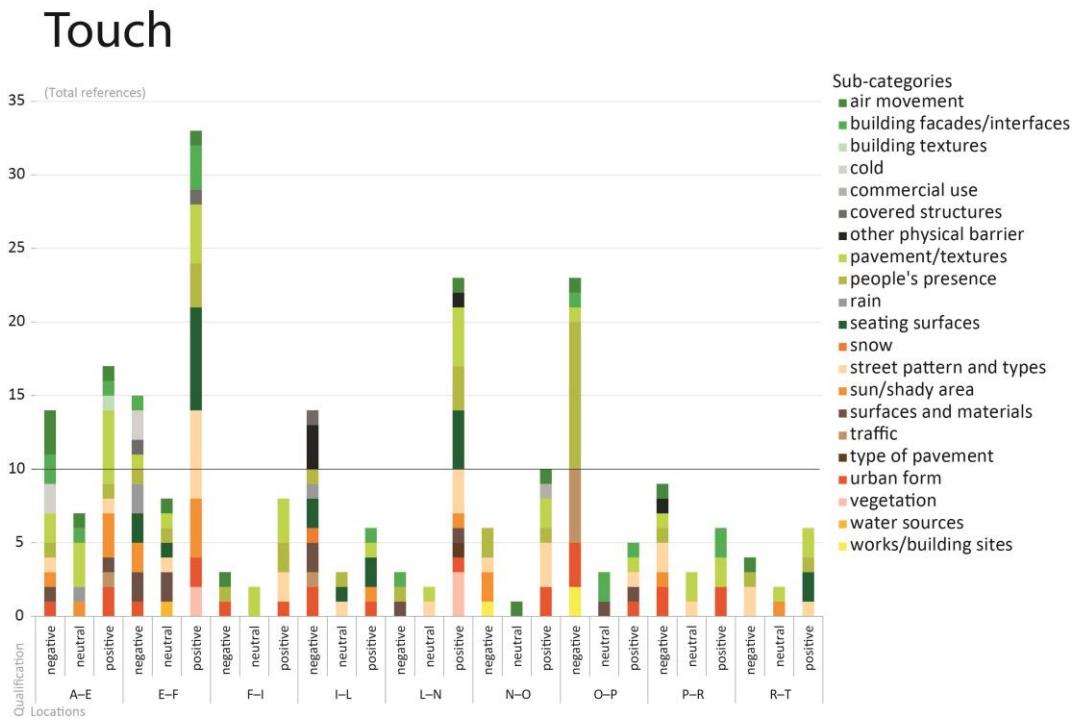

Figure 68: Touch sub-categories per area and qualification.

Figure 68 illustrates the distribution of element sub-categories across the case-study area and reveals how respondents qualified their experiences of them. Positive, negative and neutral experiences are recorded in all locations: A–E, E–F and L–N are dominantly positive, even if space A–E also demonstrate a high intensity of neutral and negative experiences. Locations I–L, O–P and P–R are dominantly negative. A–E and E–F have the greatest intensity of references, followed by O–P. In contrast to these areas where touch stimuli are strong, F–I and R–T show the least, revealing themselves as the weakest spaces in terms of haptic elements being experienced. Overall, however, a total number of 21 elements are perceived and described as sources of haptic stimuli in the case-study area, which is a much higher number when compared with the other two sensescapes described above. The widest variety of elements is found in locations A–E and E–F and the least number and range are found in areas F–I, P–R and R–T.

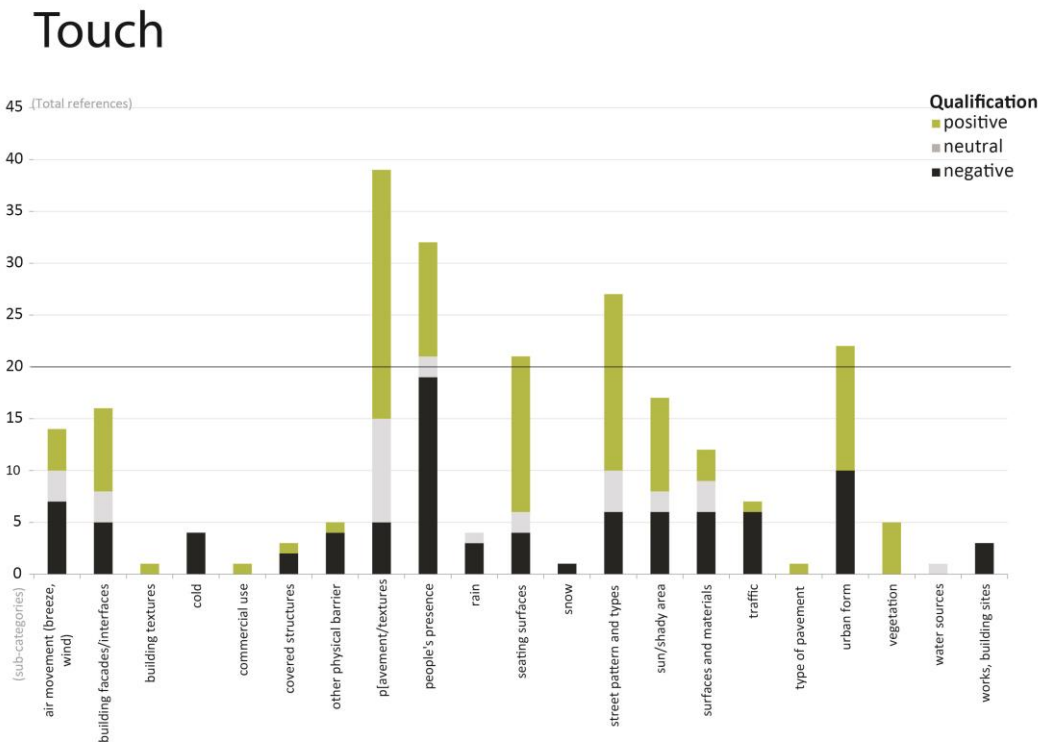

Figure 69: Touch qualifications per sub-category.

Of the three sensescapes under analysis, the hapticscapes demonstrate the least neutrality in terms of responses (Figure 69), and the same is reflected in its elements – most elements are principally positive or negative. One element water sources, is the only element described as completely neutral and the category of pavement/textures reveals a comparatively high intensity of neutral responses. Of the 21 elements recognised in the hapticscapes of Bishopsgate, eight comprise all three qualifications. The only negative–neutral element appearing here is rain. Four elements are only positive (building textures, commercial use, type of pavement and vegetation) and three (cold, snow and building works) are qualified as negative. Where elements are qualified singularly, these usually indicate some of the weakest elements recognised along the case-study area.

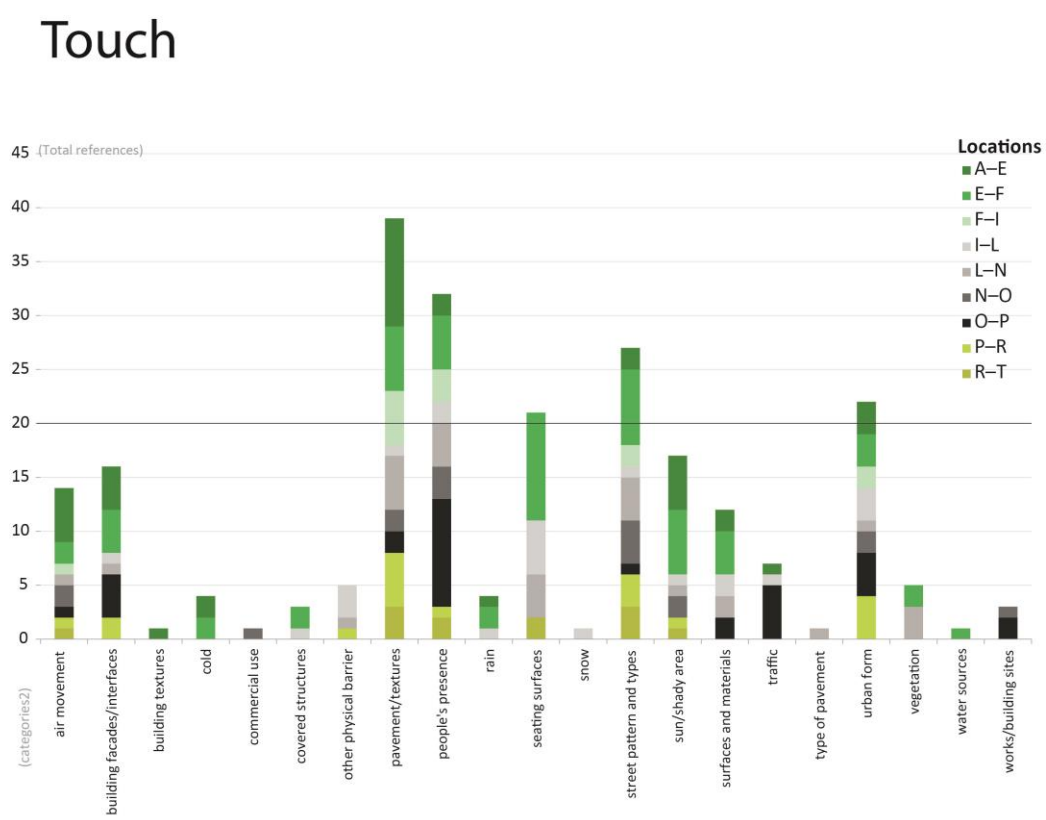

Figure 70: Locations per touch category.

Analysis of the distribution of touch elements across the case-study area (Figure 70) shows that paved surfaces and textures and the presence of people are the dominant elements, followed by street patterns and types, urban form and seating surfaces. Five identified elements – building textures, commercial use, snow, type of pavement and water sources – are only recognised within one location. Elements that are identified in all locations are the presence of people, pavement and surface textures, street patterns and types. Air movement and urban form appear in eight of the nine locations and building façades and sun/shady areas are also referenced in more than half of the walk locations.

4.5.2 Comparing the sensescapes

Now that the elements promoting sensory experiences in urban space have been analysed through the sound, smell and hapticscapes, a comparison between the main findings of the three can be made. This comparison is only possible as the elements, as mentioned in Chapter 3, emerge from an interview

guide that explores the different sensory experiences separately, with a question related to each sense. This technique tries to overcome limitations to this analysis, due to one sense dominating and “masking” others (Henshaw 2013, 144), in this case, the result from a natural urban process of overlaying one sense with another. Other limitations related to a possible dominance of elements, masking others within the same sense, are explored in more detail in Chapter 5.

This comparison demonstrates some clear characteristics in terms of the perceptibility of the four overarching categories of elements. Sound is clearly dominantly related to human activities and built environment elements. Smell has a more balanced relationship with three of the four categories – the built environment, land use and human activities. Touch, on the other hand, is dominantly built environment, with environmental factors and land use elements least discernible. When analysing the overall quality of the experience, touch also emerges as a sense for which assessment and qualification of its elements is a fairly clear process for respondents – less neutrality is recorded here and experiences are, overall, judged as positive (with a few negative spikes). In the cases of sound and smell much greater neutrality is recorded. Across all three senses, however, occurrences of an individual element being qualified in more than one way are quite high.

An examination of the overall results showing the perception of elements per location along the walking route demonstrates that human activities are more evident in area O–P and that the built environment elements are most perceived in location L–N. The segment O–P also demonstrates a high number of elements that are perceived negatively. The most number of elements that respondents qualify as positive is located in E–F. In terms of qualification of the elements across soundscapes, smellscapes and hapticscapes, environmental factors emerge dominantly positive across all three, in contrast to traffic and building works which are dominantly negative here. References to the presence of people are high overall, although assessment of this element is largely neutral, with some positivity emerging in the soundscapes analysis.

In the soundscapes, dominating elements are clearly the presence of people, traffic and building works. These appear frequently in the smellscapes too, although here, among the smells that are identified, commercial use is most prominent and other elements, for example, vegetation and rubbish, also emerge from the analysis as having some relevance. In the hapticscapes, the presence of people is frequently referenced (influencing levels of crowdedness and personal space), along with pavement textures, seating surfaces and urban form. For this particular sensescape, however, any dominance of specific elements is harder to identify, since a higher number of elements overall are identified by the participants in terms of touch stimuli.

When exploring the variety of elements linked to the different sensory experiences, sound and touch seem to respond to a greater diversity of stimuli. Touch is the sense where all the elements are widely recognised and this is probably due to the fact that it is the sense of physical contact and close proximity and therefore always seen – other senses can be perceived even when the element source is not close or visible, which means that in many cases these are not seen, and their sources not fully recognised. In this analysis, unrecognised elements are classified as “not identified” in the graphics (see, for example, Figure 63 on smell). This classification, the inability to identify an element (which occurs mainly due to doubt on the part of the respondent), occurs more frequently in the perception of smells and sounds.

When comparing the three individual sensescapes, an important characteristic to highlight is the ambivalence shown by different respondents towards multiple elements in the same location or to the same element across multiple locations. This ambivalence reflects two findings here. Not only can the elements be perceived differently within each stimulus, but they can also be perceived differently in response to different stimuli. Certain few elements, however, are consistently qualified as positive regardless of the sense being analysed – vegetation is an example of this.

A comparative summary of the descriptions recorded for each of the three sensescapes analysed above is presented in Table 11 (below). This table compares the relationship and contribution of the elements to each of the

sensory experiences, based on the interviewees' in-situ responses. It is organised by sense and by dimension according to the elements of the built environment, human activities, land use and environmental factors (as natural settings were not mentioned and therefore not relevant in this case). This table highlights the elements that make the greatest contribution to the sensescapes of urban space – here it is possible to see the elements that interfere in one sense and the ones that relate to all three senses. Where a sub-category element is identified for more than one sense this is underlined and the number of times (two or three) it is found in the table is indicated in parentheses.

Table 11 demonstrates that there are elements that are common to all three senses in most dimensions of urban space (e.g. vegetation, people's presence or air movement). These elements are designated **inter-sensory elements**. A term that, along with cross-sensory is often used in psychology to define occurrences between or involving two or more sensory systems (Lewkowicz and Lickliter 1994; Walk and Pick 2013) and emerging to the field of urban studies (Couic 2000; Howes 2006). A relationship that is relevant, as highlighted by Howes arguments, "*the model of intersensoriality (…) compels us to interrelate sensory media, to contextualize them within a total sensory and social environment*" (Howes 2006, 169). Hence, these include elements that are common to two senses (examples of elements common to two categories include commercial activities (market, stalls, etc)). The inter-sensory elements from the Bishopsgate analysis will be underlined in the table below. Elements that are unique to one sense (e.g. drains and sewers, cold and sun, but also industrial and office use) are designated as **intra-sensory elements**. Another term often used in psychology (Fisher 1962; Sigmundsson, Ingvaldsen, and Whiting 1997).

Table 11: Main elements contributing to the sensescapes of Bishopsgate.[33]

Sound: 13 elements	Smell: 14 elements	Touch: 21 elements
Built Environment: 5 (sound) | 4 (smell) | 12 elements (touch)		
		Building façades, interfaces (2)
		Building textures
Air conditioned		Covered structures
Animals' presence	Drains and sewers	Other physical barriers
Building façades, interfaces (2)	Pavement/textures (2)	Pavement textures (2)
Vegetation (3)	Vegetation (3)	Seating surfaces
Water sources (fountains, etc.) (3)	Water sources (fountains, etc.) (3)	Street pattern and types
		Urban form (blocks, scale typology)
		Surfaces and materials radiation
		Type of pavement (stairs, ramps, etc.)
		Vegetation (3)
		Water sources (fountains, etc.) (3)
Human Activities: 5 (sound) | 7 (smell) | 3 elements (touch)		
Commercial activities (market, stalls, etc.) (2)	Commercial activities (market, stalls, etc.) (2)	
Other activities and attractions	Parking space	
Traffic (3)	People's presence (3)	People's presence (3)
People's presence (3)	Rubbish, garbage, excrement	Traffic (3)
Works, building site (3)	Smoke, tobacco	Works, building site (3)
	Traffic (3)	
	Works, building site (3)	
Land Use: 2 (sound) | 2 (smell) | 1 elements (touch)		
Commercial use (food, flowers, music, etc.) (3)	Commercial use (food, flowers, music, etc.) (3)	Commercial use (food, flowers, music, etc.) (3)
Office use	Industrial use	
Environment Factors: 1 (sound) | 1 (smell) | 5 elements (touch)		
		Air movement (breeze, wind) (3)
Air movement (breeze, wind) (3)	Air movement (breeze, wind) (3)	Cold
		Rain
		Sun (sunny/shady area; radiation/heat)
		Snow

[33] This table introduces elements that are described by the interviewees as being directly related to stimuli. Some of these elements might be less obvious. The following points try to clarify these cases: **Pavement/textures** are mentioned by interviewees in situations in which they perceive the smell of stone, asphalt, or brick – materials used in pavements and walls. **Seating surfaces** are experienced when the interviewees are sat on stone benches during interviews. **Parking spaces** are mentioned by interviewees in situations in which they smell dust occurring as a result of exhaust from parked vehicles (as a smell that lingers even with stationary cars). **Commercial areas** are described as providing "warmness to the place" (Interviewee AV).

The table only considers the elements referenced by the participants and, consequently, not all elements identified in the initial urban realm elements categorisation (Table 3) are listed here. Most of the elements that are absent are related to natural settings or land use dimensions that are not relevant to the case-study context. For example, references to topography, water proximity and playgrounds do not occur as these features are either not considered important or do not exist in Bishopsgate. This diagram of elements and their relationship with the sense in this particular location in London establishes a baseline from which to consider the (re)design of urban space in Bishopsgate or, indeed, other locations.

4.6 Summary

The study of the (continuous) sensescapes of an area has, until this investigation, been mostly absent within urban design and planning research. In addressing this gap, this chapter has sought to identify and understand what people experience in public urban space, based on a uniquely multi-sensory and user-centred qualitative approach. This builds on the work on language done by Dubois, Guastavino and Raimbault (2006) and Guastavino (2006) and uses in-situ responses from study participants as a privileged tool to investigate the content of the sensescapes. The content of these verbal responses has been analysed to identify, a set of elements, along with their characteristics, and use this as the basis for an updated structured and clear technique for exploring senses in an urban context. Providing structure to the sensescapes in such a way has little precedent and goes beyond the simple naming and qualification of the elements (positive and negative). In a field of work that it is still considered, from an academic perspective, blurred and complex.

This investigation started with a semantic and thematic analysis of participants' in-situ descriptions to identify categories that can support the understanding of the sensescapes of a place, even categories that can be correlated to physical parameters (Guastavino 2006). Where such categorisation and frameworks of analysis have, in the past, been considered by other scholars, the defined categories have been fairly generic and any consensus has been confined to

just two main categories, mostly limited to the identification and qualification of the stimulus source. A classification system mostly based on place and not on affective evaluations, which vary across places, time, and individuals. The descriptions highlight the emphasis placed on people describing and categorising sensory perceptions by their source instead of by the effect it has on the individual (to be discussed in Chapter 6). This has been observed in other categorisation studies of olfaction and audition (Dubois 2000) and highlights people's reliance on describing and discussing the non-visual senses by their cause instead of their effect.

This chapter, built-upon a methodological literature review, develop a comprehensive and updated categorisation that shapes the first section of the framework of analysis. This section, 'sensory characterisation', brings new dimensions and defines eight categories, which are related not only to the element source (variety, absence, neutrality and doubt) but also its characteristics (qualities, dominance, role and continuity). These eight categories help translate in a more comprehensive way what people experience and all comprise the 'What?' of a sensory experience, allowing a better understanding of the impact of the urban landscape in the sensory realm.

As mentioned in Chapter 3, this method offers an immersive and participatory approach that is similar to the work of Schafer (1969; 2007), Westerkamp (2001), Adams et al. (2008) and Bruce et al. (2015), and an opportunity to develop a more comprehensive analysis of the sensory landscape of Bishopsgate, adding a multisensory perspective and the inclusion of dimensions related to space (elements and their role) and the individual: "*To be forced to communicate our perceptions increases our awareness of sensory perceptions in a place*" (Interviewee PM). This analysis interrogates the non-visual aspects of a multi-sensory landscape, identifies one of the key constituent parts of the sensescapes of its places, and tests them using visual graphic tools. The fieldwork technique of conducting in-situ, open-ended interviews facilitated access to participants' sensory perceptions and descriptions of various types of environments, which enabled the investigation of the elements, through patterns, differences and similarities between locations and responses. The analysis demonstrates that although sensory experiences vary from place to

place and between individuals, there are elements that due to their scale or dominance provide continuity, and a stronger relation to specific urban realm characteristics. Strong reoccurring themes (Bruce et al. 2015) emerged from the comparison of the results from the three senses, challenging the inadequacies of existing and simplistic definitions of sensescapes.

When exploring the results of the analysis, these suggest that human presence and activities are the most relevant elements for soundscapes (see also Guastavino, 2006)), while the built environment dominates the hapticscapes. No single element dominates in the analysis of the smellscapes, where there is an equilibrium between the built environment, human activities and land use. In terms of the qualities of the sensory experience, perceptions within soundscapes and smellscapes are principally neutral but in the hapticscapes they are predominantly positive or negative. Outcomes of the analysis of the elements' qualities are consistent with results of previous studies on the perception of sensescapes (e.g. Guastavino (2006)) in urban research: traffic and building works are dominant and primarily described as unpleasant, while natural elements, though weaker in their intensity, are positively appreciated.

Although building on in-situ interviews conducted with Bishopsgate street users, and while these relate to particular characteristics of Bishopsgate the aim is to explore the relevance of the elements characteristics, the intensity of their relationship with the different sensory experiences, and test the updated framework of analysis. In this chapter the location is a tool, a means to an end, providing an enabling space in which to construct a basic and open framework that can be adapted to any other urban environment. This adaptability is fundamental to the exploration of spaces with similar or diverse spatial structures at any time or even to compare between spaces. In addition to the method's spatial adaptability, this chapter also highlights the sensory flexibility of the framework, concluding that some space characteristics can only be explored isolated and per sense (intra-sensory descriptors), while others are common to different senses (inter-sensory descriptors). This investigation looks at the three sensory modes individually in order to then compare the behaviour between them. Future investigations could extend this methodology if they followed a suggestion made by Bruce et al. (2015) to ask participants to

consider themselves the intertwined characteristics of multi-sensory aspects. Additionally, the category “role” has emerged in section 4.2 of this study as an important category to explore further (although this was beyond the scope of this chapter, and only to be analysed in Chapter 5). More in-depth exploration of the role can improve our understanding of how the interaction between stimuli changes the nature of a place and contributes to an individual’s overall qualitative experience of that space. Similarly to what has occurred in the category “role”, the “qualities” of the sensory stimuli, which are limited to three categories in this analysis (positive, negative, and neutral), will be investigated further in Chapter 6. To conclude, this chapter highlights the need for more detailed and frequent consideration of the full set of dimensions of a “sensory characterisation” of urban environments as part of urban design, planning and policy making, and suggests that any new policy change in the sensory realm requires not only methods that include an immersive experience but also a critical reflection (Bruce et al. 2015).

Chapter 5 will resume the analysis and explore the link between elements and spatial qualities. It will discuss the role of the elements of the urban realm in mediating divergent qualities of space (positive, negative and neutral). Understanding this relationship will respond to the second research question, which interrogates how the urban realm mediates sensory perceptions and the appreciation of public space.

5 Urban Realm Mediation of Sensory Experiences

The sounds that come in the background is dominant, because the street is extremely calm, practically, which is a strange thing. As there is no car traffic you can hear people talking as they pass by and the sound of shoes on the street. And in the background, you hear the traffic, you hear the cranes, and you hear the train passing by. But it's strange, it's funny that in this area you can clearly distinguish, how the sounds in the foreground, those that are closer, are marked by a series of silences, you can perceive a series of small sounds. While the sounds that come in the background are already very urban. (…) It's a nice space in terms of sound. It's a little oasis, because you feel that there's a lot of movement around you, but here you're in a kind of oasis of sound, it gives me that feeling. (Interviewee GP).

When exploring the relationship between space and sensescapes it is necessary to explore the characteristics of that space that contribute to contrasting sensory qualities (positive, neutral and negative) – the evaluation dimension of perception (Carmona et al. 2003). To date, however, even though there is a growing number of people-environment studies and environmental psychology, there is still little scholarship exploring multiple senses at once.

Chapter 4 has analysed the 'What' of the sensory experience, the elements that people experience when in urban public space (in this case Bishopsgate, London) and the sensory qualities of these elements. It showed the variety of elements involved in provoking sensory experiences and highlighted the different forms of appreciation of these same experiences. Within this analysis it has also been demonstrated that the same elements in the same space may be perceived differently – Chapter 5 will now explore the characteristics of the urban realm that promote these sensory variants in space. The analysis in this chapter looks beyond the identification of the element source. It considers the role of elements in mediating sensory perception of space and investigates what makes participants prefer some spaces to others, in order to understand how the urban realm mediates these qualities and the relationships between the

type of source, effect and physical property (Dubois 2000; Dubois, Guastavino, and Raimbault 2006). With urban designers and planners in mind, the chapter ends by signalling implications for policy, identified through the analysis of the nature of the main elements referenced and their levels of management. Quality of space is here understood as the result of a combination of space, mediation and nature of use. Each element of space, with its characteristics, has a role in mediating sensory experiences, which will then influence the nature of the use of that same space. The relationship between this relation space-role-nature of use is going to be explored through the descriptions of participants when describing the qualities of space.

The previous chapter reviewed the "*fluidity*" of the sensescapes concept through the analysis of different and sequentially located spaces in a pre-defined walk in the district of Bishopsgate. It principally considered the verbal outputs of sensory experiences rather than examining the relationship between experience and space. Chapter 5 will now take into account the spatial context of the sensory experience and will do this by expanding the framework of analysis through more contextual and spatial tools of investigation. Building on the results from Chapter 4, it will explore in greater detail some of the divergent patterns and relations that have been identified, in order to understand the spatial reasons for them.

Three specific locations within the case-study area will be selected for the divergent sensory experiences (positive, negative or neutral) that they offer. The objective here is to understand how and which elements of the urban realm mediate contrasting sensory perceptions of space; inspired by the work of Raimbault and Dubois (2005) and Bruce et al. (2015) to carry out research that can "*identify, in meaningful terms and descriptions, a number of specific urban areas that are qualitatively enhanced by characteristic soundscapes or adversely affected by noise"* and include *"impacts of urban areas, such as transportation and works (traffic, maintenance, cleaning, factories, and industrial units), people presence (leisure activities, neighborhood) or natural environments, considering various sized areas, where the different categories of soundscapes [are] identified. A soundscape database involving subjective assessment"*. (Raimbault and Dubois 2005, 349).

This chapter is based on a qualitative approach to the study of the relationship between urban realm elements (the variables) and sensory perception (the results). The complexity of the urban realm makes it impossible to control variables in order to achieve particular results. There are many factors at play which means that it cannot be assumed that a simple cause–consequence relationship exists between the variables and the results. These factors include, but are not limited to, the complexity of the urban environment (with a variety of urban elements); the number and type of interviews (limited number of qualitative interviews); and the different physical, cultural, gender and socio-economic aspects that each individual respondent brings to the interviews. This chapter investigates patterns in order to understand possible correlations, and the role of the elements in the mediation of sensory perceptions. It examines how the elements and the different combinations in which they are experienced seem to lead to different sensory results, because the qualification of urban space is not the result of isolated elements – the particular context in which elements appear and the characteristics they display can cause changes in the way space is perceived.

The following sections explore different types of spaces and how a set of element characteristics can influence or mediate the way these spaces are experienced. In showing the connection between urban realm characteristics and people's appreciation of them, the aim is, ultimately, to achieve better management of public urban space.

5.1 Mediation of human experience

Chapter 4 established the role of the elements in mediating sensory experiences as a specific category that was identified from interviewees' descriptions and included in the initial 'sensory characterisation framework'. However, the senses also play a crucial role in mediating and structuring urban experience (Degen 2008). They mediate our contact with the world through the body: "*I experience myself in the city, and the city exists through my embodied experience*" (Pallasmaa 2005, 40). It occurs as phenomenology, a concept through which the "*corporeality*" of space can be understood by arguing that

space, rather than being an absolute, neutral backdrop to social life, is actively produced through lived experience (Degen 2008). Everything that happens within the urban realm, from architecture, streets, shops, social life, people's behaviour, and activities, is amalgamated through our embodied perception to create a sense of place. This blend of material and social features arouses sensuality and is responsible for the ever-fluctuating nature of public life: "*The relationship of public space to public life is dynamic and reciprocal*" (Carr et al. 1992, 343). The combination of our different senses contributes to our spatial orientation, awareness of spatial relationships and appreciation of space. Rodaway has suggested the notion of a "*sensuous geography*" to describe "*an interaction with the environment both as given to the senses and as interpreted by the senses themselves in conjunction with the mind*" (Rodaway 1994, 26). But senses do not work on their own, however, they are framed by context and in relation to a reference they themselves define (Degen 2008).

This reliance on other factors links to the notion of "*affordances*" of environments or objects, which Urry (1999) uses to draw attention to the fact that senses connect hybrid objects, the human and non-human. The term, first described by Gibson (1986), implies that the composition and layout of environments and objects "*affords*" certain types of behaviour. Thus, there is no simple and objective reality. Affordances are qualities in the environment perceived relative to the observer, activated through people's sensory experiences, moving, touching, smelling, tasting, hearing, and seeing objects and places. The reconfiguring of public space causes a reconfiguration of affordances and resistances, which consequently results in new sensescapes and different experiences of that space. These kinds of experiences, which are unquantifiable, are often described as the atmosphere or the mood that places and their settings induce. As described above, they are relational moments created by objects, people, discourses and practices (Degen 2008). They are transmitted by the senses, then understood and finally interpreted (Albertsen 2000).

Thus, investigation of the senses in urban space not only discloses place-related qualities of the sensory world but also reveals that different sense relationships have a role in creating and defining particular places at particular

times. Consequently, similar cityscapes can be arenas in which different sensibilities coexist and conflict, creating spaces of encounter that are shaped according to certain configurations of social and spatial forces – creating, for example, spaces of othering, crowding, fear, crime, surveillance and so on. Sensescapes provide "*affordances*" that can motivate or weaken such affective relationships between individuals and the sensed environment but it is always down to the individual to mediate and activate these relationships (Degen 2008).

An example of this is how sound can manipulate the acoustic environment in changing an individual's feelings and behaviour. Each created space has a unique acoustic symbolism that triggers memories, which in turn can cause a person to experience feelings of familiarity, arousal, tension, comfort, discomfort, warmth or relaxation (Vasilikou 2016). Similar responses can occur when the haptic senses create a strong immediate link between the body and the built environment (Vasilikou 2016), although in the field of sensory research such aspects of haptic stimuli are barely referenced and the focus here is largely on thermal sensation. This is despite studies indicating the importance of temperature in determining the satisfaction of people in urban spaces and the time they spend there (Aljawabra and Nikolopoulou 2010; Lenzholzer 2010). People's actual experience of urban spaces is based on the overlapping of sensory experiences, which still presents an array of methodological problems in its assessment and evaluation (Vasilikou 2016).

In his essay '*The Metropolis and Mental Life'*, Simmel describes how the modern city experience is unique in its sensory overstimulation and contrasts this with the rhythms of smaller towns. The variety of sensuous stimuli that the individual is confronted with everyday leads to "*the intensification of emotional life due to the swift and continuous shift of external and internal stimuli"* (Simmel 1903, 325). An idea that as Degen (2008) argues, was later updated with the understanding of the corporeality (Merleau-Ponty 1962) and the embodiment of the urban daily rhythms and temporalities (Lefebvre 2004), behind the work of authors such as Degen (2008), Edensor (2010), Adams et al. (2007) and Wunderlich (2008). As the city surrounds us and can't be shut down just by closing the eyes (Degen 2008), this overstimulation leads the individual to react

differently to protect himself, either through greater awareness of specific stimuli, or through a relaxed attitude or indifference (neutrality) to the surrounding setting (Simmel 1903) This supports the need to explore how "*space is actively produced through lived experience* " (Degen 2008, 39) through an investigation that transcends the existence of the individual and includes the urban realm and the social life of urban space.

5.2 Methodology and framework

In an attempt to understand the relationships between the urban realm and human sensory experience, this section draws on some of the ideas proposed by Raimbault and Dubois in their sound mapping work (2005). Of particular relevance here is their work focused on improving noise mapping through the visualisation of soundscape impacts of urban areas, which takes a selection of different soundscape quality areas and overlays them with sound assessments provided by research participants. This approach will be used to investigate the multi-sensory context of Bishopsgate and its impact on individuals. This started with the identification of different areas in terms of their sensory qualities (see Chapter 4) and will now focus particularly on areas classified as dominantly neutral, positive and negative from the soundscapes, smellscapes and hapticscapes analysis. For methodological reasons, these selected areas will be labelled as 'sensed spaces'.

If the senses play a crucial role in mediating and structuring urban experience then by examining this role this study will better understand the relationship between the urban realm and urban experience. A more detailed and in-depth analysis of divergent locations within the case-study area will make it possible to acknowledge the connections between sensory perception qualities and the urban space. This can be achieved by overlaying the urban realm characteristics that participants are exposed to with the divergent sensory characteristics they describe. This method and its results can establish a baseline for future research on this topic.

The urban context is overloaded with sensory information. Consequently, working with all this sensory information is a challenge. To reduce and maintain

the quantity of information at a manageable level throughout this study, this next analytical stage continues to work with the data already collected and analysed in Chapter 4. Focus is restricted to three locations that contrast with one another in terms of their overall qualification and the urban realm elements already considered in their analysis (e.g. building works, traffic, people's presence, air movement, etc.). Validation of this data occurs at the end of this analysis, when outputs will be triangulated with data samples from responses to questions under Theme 4 (qualification of space) of the interview guide (Table 6). These are questions that ask sensetalk participants, who know the area well, to designate their preferred places to stay, pass by or avoid, and explain why. For methodological reasons, these spaces are labelled 'preferred spaces'. Preferred spaces are a reflection of the interviewee's opinion and although in the area of Bishopsgate, these do not necessarily match the spaces of the case study walk. This validation helps capture the different dimensions of the relationship between the space elements and sensory qualities, as illustrated in Figure 71 below and the outputs of this analysis highlight the common elements as represented in this figure.

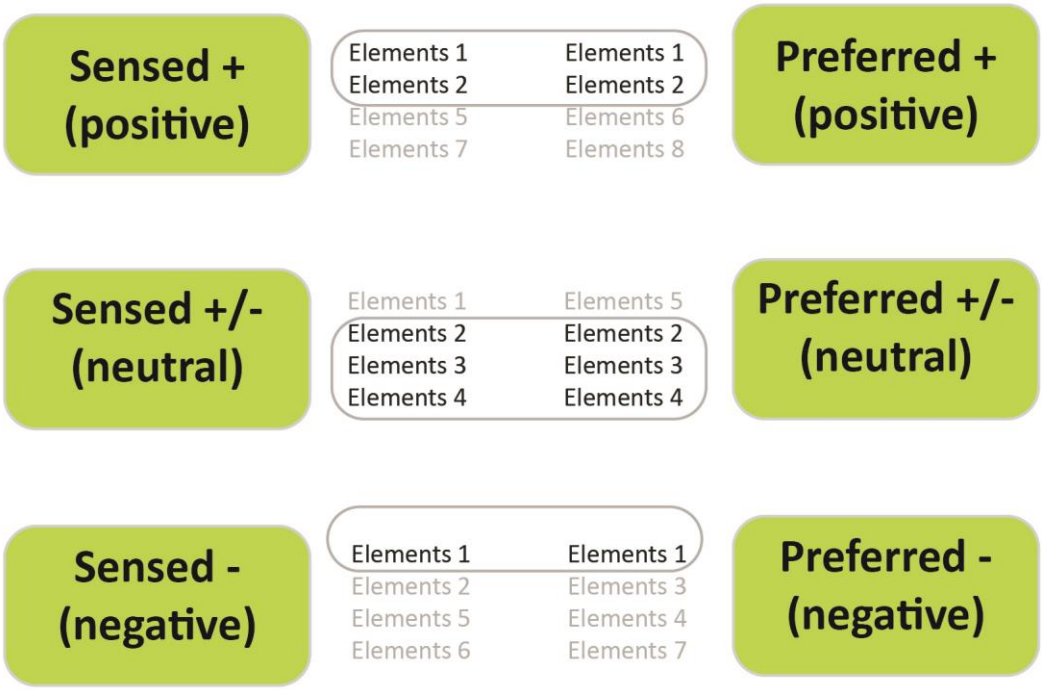

Figure 71: Mediation as a triangulation between sensed and preferred spaces.

This triangulation exercise establishes the basis of a framework that relates research participants' subjective sensory assessments with urban realm

elements, using an elements classification system. This is a baseline structure exploring the elements that contribute to the mediation of the sensescapes of a place, in terms that are more meaningful for politicians, decision makers, planners and city users (Raimbault and Dubois 2005). This final framework highlights patterns of correspondence between space characteristics and sensescape qualities: how some urban areas will tendentially cause experiences according to the features they display. Figure 72 highlights the impact of individual assessment on space use and the interdependency that exists here. Spaces that are more appreciated are often more used, until a threshold of use is reached that leads to discomfort and as a consequence densities of use become reduced, and so on. Through this methodology, emergent urban realm characteristics act as generalisations, as the key elements impacting the sensescapes. These are essential tools for sensory spatial analysis and communication.

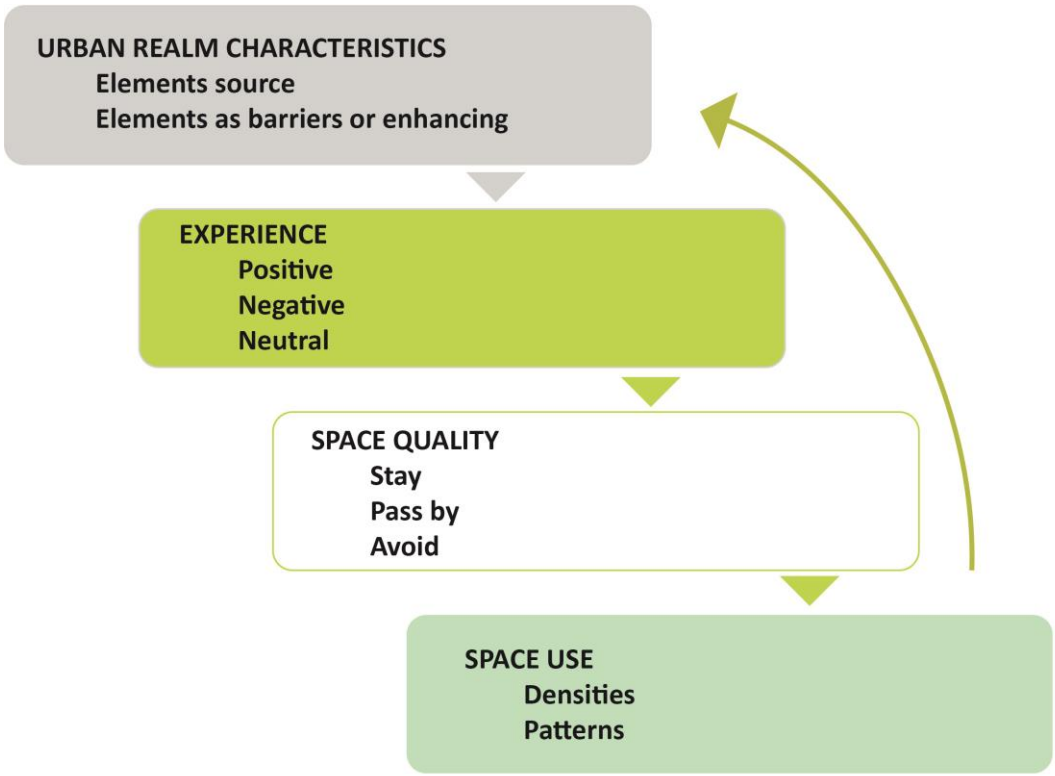

Figure 72: Interrelation between the urban realm and space use.

The methodological decision made in this study to rely principally on verbal descriptions from participants is intended to bring new perspectives to urban sensory research and, ultimately, to inform relevant decision-making processes

in relation to the urban realm (as explained in section 3.6). A method that has been increasingly explored in sensory studies and mapping, with the work of designers such as Kate McLean (McLean n.d.; Quercia et al. 2015). The user-centred and qualitative dimension of this approach also seeks to improve ways of identifying the parameters that provoke different sensory qualities in urban situations, by considering the perspective of the individual space user (Raimbault and Dubois 2005). It is different from a purely quantitative approach, which would lose the subjectivity of human appreciation.

5.3 Sensed spaces and area characterisation

As described above, this section selects and analyses three urban public spaces with contrasting qualities (sensed spaces) resulting from the Chapter 4 analysis. For methodological reasons, since most spaces analysed in the previous chapter demonstrate a mix of responses from the different participants, this section concentrates on the three spaces that most clearly demonstrate the three qualifications (one dominating in each location). The selection was based on the results of the participants' descriptions (see section 4.5) using a matrix of locations, senses and qualities (Figure 73). From the analysis of this matrix, spaces A–E, F–I, I–L and R–T emerge as the most neutral spaces to analyse, location E–F as the dominantly positive space and spaces O–P and P–R as dominantly negative spaces. In the cases where multiple locations have similar qualitative results, the primary selection factor is the richness and detail of the interviewees' description of that same urban space experience, which is the reason that locations A–E and O–P have been selected over F–I, I–L, R–T and P–R respectively (see section 4.5.1 for more detail on the analysis of the qualification of these spaces).

Figure 73: Qualification of the case-study area sections.

The three selected locations demonstrate differences in terms of their physical environment and use. Space A–E is the most reticular in shape, in terms of its

urban layout, with mainly offices and warehouses. Space E–F, one of the case-study area's open spaces, with a square, is designed for leisure activities and supports other land uses. Finally, space O–P, located in the main street of Bishopsgate, serves different land uses and promotes direct access to the main public transport network, including Liverpool Street Station. All three locations are described below in more detail, based on the observations and descriptions provided by research participants. Particular attention will be paid to the characteristics of the urban realm that mediate the divergent qualities of these spaces. As described in Chapter 3, the case-study area is in Bishopsgate, situated within both the borough of Tower Hamlets and the City of London. In terms of its geography, this area presents contrasting urban morphologies and socio-economic uses and some of these contrasts are found in the selected locations. All the factors that emerge as relevant to the analysis will be explored in this section.

Section A–E | dominantly neutral

Figure 74: Section A–E.

Based on interviewees' descriptions, the elements encountered in space A–E seem to be as negative as some elements in location O–P, although none of its elements is experienced as positively as some in location E–F. Here, in space A–E, there is little flexibility in how the space can be used and the formality of this segment of the case-study route emerges as a factor in creating a dominantly neutral perception of it. The absence of green, natural elements and seating spaces appear to add to the neutrality of this space. The element of street pavement, which is a unique feature when compared with other locations, is highlighted as a positive feature by some respondents and, it provoked some discomfort for others. The lack of diversity in land use here appears to discourage the use of this space as a route for people or motorised vehicles and although this absence of people and traffic can be seen as having a positive impact, promoting quietness and calm, it also emerges as a negative factor. It is described as resulting in "*too much*" quietness and, consequently, feelings of unsafeness and dirtiness, with references being made to such activities as people urinating in the street. Nevertheless, this space is also considered by other respondents to be quiet and clean. Its urban morphology, with low-rise buildings and narrow and more secluded streets, ensures enough space for a balanced transition of light and shade, which has a direct influence on personal comfort (mostly positive). It is described as a place that brings memories, that is familiar or historical. A place that encourages people to visit and enjoy walking in without necessarily compelling them to stop and stay for longer periods. It is a place described to have character and appear less corporate than the other locations, – the materials used to create this space are considered warmer than the glass and metal surfaces typical of modern buildings elsewhere in Bishopsgate. This is a secluded and historical low-rise space, in contrast to the modern architecture and tall buildings that surround it.

Starting with the **sounds**, analysis of the sensory descriptions highlights the elements of traffic and building works in this location, although these are described as continuous background sounds, and mostly neutral. "*It's an area... It's an area without any sounds of its own. All sounds are 'in the background' all, almost all: sounds of cars, danger, emergency. 'White noise' sounds ... a few sounds of a train passing by*" (Interviewee BC). These sounds can be explained

by this location's proximity and direct connection to the main street, where most of the noise-generating activity takes place, and some building works happening in the area. However, the subdued levels and volumes seem to be related to the urban layout: "*Sort of a faint sound of traffic, feels like you're between two main roads, you don't really hear too much, it's fairly shielded*" (Interviewee LA). People's presence is remarked on at the same level as traffic. As this area does not present much pedestrian traffic, when someone does pass by this is quite noticeable and observed distinctly. Sounds from air conditioning systems and air movement are also heard in this location. However, respondents feel that the general quietness of the area seems to influence and enhance the less frequent and lower-level sounds that are present. The general opinion on the soundscapes at this location is mostly negative.

When exploring **smell**, most of the respondents' observations start by describing smell senses in this location as being quite weak or nonexistent. However, the urban morphology of the area and in particular the alleyway that the walking route passes introduce a strong association with two negative smells, faeces and urine, which are expected smells in spaces as narrow and hidden as this: "*I'm neutral to smell. This space here, by chance, it smells like an alleyway (…) But it doesn't smell bad to me. (…) This alleyway here, by chance it's not smelling, but looks like the place to come for 'the national public sport', pee*" (Interviewee PM). References indicate a continuous and dominating impression of a stuffy and dusty place, but this is balanced by some positive appreciation expressed for the smell of food from the pub on the corner, the only place serving or selling food in this location. In response to the smell of building works, one respondent describes a feeling of impartiality (and neutrality): "'*Cos I am kind of used to it*" (Interviewee 24). Very few references are made to traffic smells, perhaps due to the lower levels of traffic in this location and its secluded position, away from the high street.

Finally, in terms of **touch**, comments on pavement characteristics dominate all the participants' descriptions. Although one of the interviewees' remarks on the temperature and comfort level of the place, describing it as "*usually quite hot*" (Interviewee 24), the majority of observations relate to the pavement type – "*very rough (cobbles and stuff)"* (Interviewee 24) – and are mostly neutral. A

number of exceptions, however, are largely due to its condition and level of maintenance: "*Pavement in a pretty bad state with cracks and holes, people often fall*" (Interviewee 5).

Section E–F | dominantly positive

Figure 75: Section E–F.

Location E–F (a square) is the only one in this stage of analysis that contains natural elements, albeit formally designed. Some of the elements found here seem to attract people to spend more time in the space, including, in addition to the natural vegetation, the seating areas, the water features, the availability of space for events, and the fact that this is a pedestrian area closed to motorised traffic. The mixed land use, with the ground floor level of most of the buildings accommodating cafes, restaurants, and shops, adds further attraction for users. At the same time, this attractiveness also has consequences for the human densification of this space. Additionally, the location's proximity and accessibility to the City of London, one of the densest office areas in London, and to

Liverpool Street Station, are fundamental elements that contribute to the appeal of this space. Despite the footfall in this space being fairly equivalent to the footfall in location O–P, the density here seems to be better perceived more positively. This appears to relate to the higher levels of personal space and the slower pace and rhythm of movement that occurs in this location (E–F).

This particular location appears to maintain a better equilibrium between personal space and levels of crowdedness. The wide breadth of the space, along with the presence of some natural elements, such as water features, grassed areas and trees, seems to promote a perception of quietness even when the movement of people through the space is intense. Here, the presence of some animals, in particular birds, is also felt. The sense of openness is clearly related to the urban morphology of the space and the layout of the square. It is described as a sunny space and a space with light and fresh air, hidden away from the traffic. Seating areas and covered spaces providing protection from the weather (e.g. masted canopy) are identified as the elements that encourage people to stay for longer periods of time. In this case, vision is also an important dimension to consider – methodologically, what people see cannot be overlooked in this study.

When exploring the different types of sensory experiences, in terms of **sound**, the presence of people emerges as the dominant element, and this seems to result from the design and layout of the space, its mixed use and pedestrianisation. Although the location itself is mostly pedestrianised, traffic sounds are still described by respondents – this can be best explained by the urban morphology and the direct access to the main high street nearby. The layout here, along with the medium high-rise characteristics of the buildings, seems to enhance air movement and wind, and, with them, sounds. Overall, of the three locations, this one displays a wider diversity of elements and therefore a broader variety of sound experiences. In addition to the elements already referred to, respondents describe market areas, cultural events (one respondent mentions music from a jazz concert), art elements and a variety of people activities that include people walking, standing, seated, eating and talking, alone or in groups. Here, more detailed and specific sound descriptions are captured in the interviews – from the noises created by wind and water (from a water

feature) to the sounds of the clinking of cutlery in restaurants. This space is considered to be both noisy and quiet, but responses from respondents are mostly balanced in a positive assessment: "*I think things are more balanced, to be honest, here. I can hear some natural sounds, I can hear some human sounds like people talking and I can hear people walking and footsteps, not loads of footsteps, but some. I can hear somebody honking, but I don't hear the emergency sirens that we did before, that might just be because there aren't any now"* (Interviewee LN).

In terms of **smell**, most descriptions highlight the green areas and the water as pleasant and refreshing: "*The smell of water and greens, of plants, I like it. It's refreshing, it's soothing*" (Interviewee PM). Tobacco smoke and the smell of perfume are mentioned with little qualification. This location, however, seems to be mostly characterised by the absence of smell, and is defined as a very clean space: "*(I can't smell) Anything actually, to be honest. I quite like the fact that I can't smell anything, that is clean!*" (Interviewee 19). Participants are often asked more than once about smells before they offer any description of smell perception in this location. Food odours and the smell of the city air (a continuous perception in London) are some of the elements also mentioned, although this latter with a less positive connotation: "*smells like the city, negative, I prefer the country*". This lack of a noticeable odour and perception of 'cleanliness' in this location might be related to the idea of a "conscious perception", which dominantly emerges with particularly good or bad smells (Oleszkiewicz et al. 2021). This lack of perception does not necessarily translate into a lack of real stimuli, as this lack of perception could be the result of sensory masking or even from habituation leading to neutrality (see more in Chapter 4), as "*olfactory perception reflects personal experience with odours*" (Oleszkiewicz et al. 2021, 1). This is, nevertheless, an important factor to consider as this section aims at exploring the role of the built environment in mediating people's experiences and perceptions. At the same time, this factor highlights the relevance of exploring perceptions (rather than reality) through participants' descriptions to really understand the value and impact of the urban realm elements on individuals.

Finally, looking at the **touch**, in this location the seating areas are a dominant feature, in comparison to the pavement, and are mentioned in the interviews as being the most important element in terms of comfort. Seating areas are described as clean and smooth but also hard and cold: "*because the seating place is kind of a stone, it brings a bit cold from my back and it's quite a place in the shade. (…) It's also somehow contrasting with the area, which is enlightened by the sun, and the area where we sit is quite dark. In terms of pavement, it is much easier to walk but it doesn't offer, visually, diversity as the place that we passed before because it's so uniform but other textures was a bit diversified"* (Interviewee BB). Weather protection also emerges as an important element to analyse. Rain, snow, wind and sun have a direct influence on thermal and personal comfort and the way people use public space. Reflecting on this influence can help urban designers improve spaces for all-weather use. Though with some contradiction in terms of how it is perceived; some participants comment it could be improved while others describe it as being fine. The height of buildings and the number of trees are identified as elements that improve weather protection. Direct references to the quality of the pavement are made in the interviews (see citation above, for example) but these are few in number. Respondents, instead, do offer several strong references to the image of the space (visual sense). As one participant mentions, "*this is a space that invites, this is definitely a space that invites to stay, and it was designed precisely for that*" (Interviewee GP).

Section O–P | dominantly negative

Figure 76: Section O–P.

In segment O–P of the case-study area, any formality in its design is overrun by the chaotic and intense use of space. Its location, the mixed use of the ground floors of buildings, the high levels of traffic (with buses and taxis in addition to private vehicles) and the proximity to Liverpool Street Station, carries the boon and burden of attracting high densities of people to this space. This "uncontrolled" density of people and traffic seems to be the main reason for this location being considered the least enjoyable space of the three. The overwhelming amount of activity here brings with it an excess of noise and smells – descriptions of dirtiness and pollution are repeatedly recorded in interviews and the perceived health impacts emerge as a concern. References are made to discomfort or nuisance caused by the fast rate and pace of activity here and these are important, in particular when compared to responses recorded in other spaces that accommodate similar densities of people, e.g. location E–F. Here, in O–P, the densities of people and vehicles create a perception of narrowness and crowdedness even in a considerably wider public

setting.[34] Characteristics of the built environment, such as the scale of the buildings (in this area, referenced as quite tall) in opposition to the scale of the pavements (referenced as not wide enough), in proportion to the human size and the density of people using these spaces, are key elements that influence sensory experience as these contribute to participants feeling restricted in their movement and lacking personal space (and uncomfortable).[35] This feeling is compounded by temporary scaffolding and building works in progress, which add to the cluttering of the streets and reduced space to walk. In addition to issues with pavement walkability being noted, crossing the road was also mentioned as an activity that causes anxiety. Overall, this part of the case-study area is presented as intense, polluted, noisy and dirty (the smell of urine is also mentioned). A variety of elements appear to elicit these descriptions, but people, traffic and building works are clearly major factors in influencing haptic, smell and sound perceptions in the city.

When analysis focuses on the different types of sensory experiences, and in terms of **sounds**, the dominant view is a negative one, with references being made to a noisy and unpleasant space, and identifying cars, people and building works in particular. The descriptions of elements given by the respondents here are generic in comparison to the detailed characterisation of people activities that are provided for space E**–**F. In O**–**P, the dominance and intensity of both motorised traffic and people movement apparently mask most other sounds, apart from the noises of building works, which can be even louder.

When exploring **smell**, most of the opinions expressed are quite neutral. Descriptions mainly focus on the smell of people, with references to strong perfume and tobacco, as well as traffic and construction works. Some descriptions indicate a level of negativity towards tobacco, with one participant even feeling the need to avoid people when they are smoking: "*I sometimes feel*

[34] Somehow also related to the idea of personal space in public open space.

[35] The analysis described in Table 13 (below) helps to illustrate the ambiguity of density – how density and the pace at which people move can influence the way in which individuals perceive space in positive, neutral and negative ways.

the smell of tobacco and even surpass smoking people not to smell it" (Interviewee 9). Finally, an idea of normality related to neutrality is revealed here too when odours perceived in this area are not specified in any way and are described as the normal smell of the city: "*There is no specific smell, neither good nor bad*" (Interviewee RL).

In contrast with the homogeneity of response in regard to sound and smell, **touch** instead induces opposing qualitative opinions. References are made to smoke and air pollution and dirty areas but also to clean streets. Respondents describe feeling cramped or perceptions of crowdedness (created by the particular relationships between people and car densities and the size and proximity of surrounding buildings) but also feelings of being protected (by those same close tall buildings and the layout of the space providing shelter from the weather). One respondent describes the crowdedness of the streets, where "*sometimes I am also pushed and have to push people on streets as they are so crowded*" (Interviewee 9). Windy and cold conditions are identified, mainly related to the tall height of the buildings, which block out sunlight. An observation of hardness attributed to the area (from the building façade materials) contrasts with the perception of a soft, well-maintained and comfortable pavement for walking. References to sensory elements are numerous and diverse, but none predominate.

A summary of the elements highlighted in the analysis of the three spaces is presented in Table 12. Structured to present the dominant elements identified, per sense, in each of the three sensed spaces, this table illustrates the relationship between the quality of space and elements perceived.

Table 12: Dominant characteristics of sensed spaces.[36]

Dominantly neutral (A–E)	Dominantly positive (E–F)	Dominantly negative (O–P)
	Smell	
Built environment Soil, brick, asphalt Human activities Urine, traffic, land use, food	Built environment Water, green, plants Human activities People, smoking, perfume, traffic (much less), land use, food	Built environment Dust, brick Human activities Engine, traffic, smoking (cigarettes), perfume, land use, food (fried) Environment factors Wind
	Sound	
Built environment Air Conditioner (fan), gates Human activities People talking, trolleys from people passing by, building works, train, cars, traffic, planes Environment factors Wind	Built environment Water, trees Human activities Traffic, honking, music, building works, children, people, birds, planes Environment factors Wind	Built environment Trees Human activities People, cars, buses, planes, building works, street sweeper
	Touch	
Built environment Narrow pavement Environment factors Wind, cold, sun	Built environment Benches, open space, pavement, protection/building façades, trees, green/water enhances cold, shade Human activities Not many people Environment factors Wind, cold, weather	

[36] In this table, **Narrow pavement** is related to touch as it influences perceptions of crowdedness and lack of personal space.

5.4 Triangulation with the preferred spaces

Having explored the dominant area characteristics for the three sensed spaces, this section compares these results with the references relating to “preferred” spaces, the locations that research respondents consider to best characterise the three qualifications of positive, negative and neutral. It investigates similarities and differences between both the experienced (sensed) and the suggested (preferred) space types, establishing a triangulation of opinions and identifying the common features that emerge in the relationship between the elements and the urban context. Preferred spaces are places that respondents identify as being their favourite spots to stay in or locations to pass by or seek to avoid in the area – even if these don’t necessarily match the case study locations. The idea is to contrast and compare the reference to elements that lead to particular qualifications of a space. Consequently, all references to any urban realm elements and their context will be considered in the analysis with the goal of identifying commonalities between conditions conducting to good, neutral or negative experiences independently of any location. The triangulation collates the characteristics of the preferred spaces to stay in, pass by and avoid, and matches them to locations E–F, A–E and O–P respectively.

When asked to describe preferred spaces, research participants cite a variety of locations around Bishopsgate as examples. Bishopsgate Square, Spitalfields Square, Exchange Square and Finsbury Circus are the places nominated as being ideal spots to linger and relax. Seating, natural green areas, and wide-open spaces are the key characteristics described: “*Spitalfields Square. Quite nice to sit in the sun, relaxing*” (Interviewee 12). The neutral spaces described include a wider variety of locations, for example, Artillery Lane, Spitalfields, Brick Lane, Bishopsgate Square, Leadenhall Market, Devonshire Square and St Botolph Church and are all mostly noted as being old historical areas, with “atmosphere”: “*These areas towards the south, the older parts, like Petticoat Lane for example, have character, are nice*!” (Interviewee 15). In contrast, when asked to describe the worst place, most of the participants cite the same location, Bishopsgate (the high street and site of location O–P). Here, respondents describe crowds, speed, ugliness, dirtiness and traffic: “*The main*

roads, very busy roads for crossing, with pavements very narrow and too many people to walk on them, quite quick" (Interviewee 19).

When categorising the elements described, environment and natural elements, open spaces (e.g. squares), mixed land use, proximity to daily basic needs (home/work/shopping), cultural events and seating areas are all dominant elements in the spaces where respondents indicate they would like to stay. Places that are identified as being the less desirable demonstrate features that are linked to traffic, pavement dimensions and building materials. The element of crowds is common to all locations, however, causing boundaries between positive, neutral and negative assessments here to be indistinct. Although qualification here is not as influenced by the number of people as much as the speed at which they move and the amount of personal space available. Finally, while construction works are a key element in the analysis of the sensed space, there is little reference to them in the descriptions given of preferred spaces. This difference might be related to the temporal nature of building works; they are not considered to be permanent features in the participants' minds.

Comparison of the sensed and preferred spaces reveals similarities and discrepancies. These appear particularly in the neutral spaces, where the descriptions of the preferred spaces are less negative than those of the sensed spaces. Elements from the environment, urban morphology and people densities are highlighted as similarities (see Table 13). These elements cannot be directly linked to the senses in this study because they are identified here from responses to questions about qualities of preferred spaces and not on sensory perceptions, therefore falling outside the scope of the methodology used. In preferred spaces, it is not possible to directly relate elements and senses, as can be done with the sensed spaces. Moreover, many of the elements that respondents remark on can be perceived through more than one sense (as demonstrated in Chapter 4) and so it is not feasible to identify which experience is linked to which sense in post-interview analysis.

When exploring the comparison between sensed spaces and preferred spaces in terms of elements and characteristics (in this case, independently of the senses), it was only possible to observe higher similarities in the positive and

negative spaces, and higher differences in the neutral, as described in more detail below.

Table 13: Preferred spaces and their dominant characteristics.

Pass by	Stay	Avoid
Built environment		
Urban morphology (open); Urban morphology (courtyard – secluded); Urban morphology (narrow street); Urban morphology (alleys) – reminder of home/memory/familiarity; Historical/lower rise area rather than modern architecture area – tall buildings; Warmer materials (vs steel and glass); Water elements; Green areas.	Urban morphology (open); Water elements; Green areas/trees; Trees (affect sound and light) Protection (from weather); Seating areas.	Urban morphology (too many buildings and walls – less built up); Narrow pavements; Concrete pavements; Nowhere to sit.
Human activities		
Space to walk (personal space); Busy/presence of people/lively; Fewer people; Not too crowded; Artistic elements; Temporary events.	Crowds (lots of people) – but not so much up and down - not in a hurry; Personal space (vs crowds); Proximity to food and drink places.	Busy/crowded/too fast paced/rushed/bumping into one another; Not enough personal space; Impossible to cross/too many cars; Scaffolding on pavement – no space to walk; Urine smell; Waiting to park – motor noise; Traffic cars; Traffic noise; Construction sounds;
Land use		
Proximity to food and drink places; Proximity to work/station/home.	Proximity to work/station/home; Away from traffic area.	
Environment factors		
Fresh air; Sunny/light.	Fresh air; Sunny/light.	
Other		
Cleaner; Quiet; More character/less corporate.	Peaceful (quietness).	Pollution/ dirty air; Dirty space; Noisy.

When comparing both sensed and preferred spaces, the pass by category on the sensed spaces shows elements slightly more focused on the negative perspective, contrasting with a more neutral/positive view of the preferred

spaces. Elements that are relevant to the urban morphology, surfaces and materials are common to both sensed and preferred spaces, and prevalent in descriptions of the latter. Open streets and also secluded and narrow streets are appreciated in these spaces. References to the use of warmer materials as opposed to steel and glass are also made. Other elements, such as the sun, air movement and people's presence are also common in descriptions of these spaces. In this latter case, however, there a personal threshold regarding the number of people who appears to be present (i.e. a busy space but not too crowded). Land use, including proximity to commercial activities, home, work and transport nodes and artistic activities are also referenced by participants in the archetypal neutral (pass by) spaces that they describe. Cleanliness and water in these spaces are also noted.

When comparing the positive (stay) sensed and preferred spaces, characteristics in both are described in quite favourable terms. In the sensed spaces there are bigger differences between neutral and positive observations of the elements than in the equivalent preferred spaces (or indeed in the ideal pass by places). There is greater attention given to green elements, and elements related to these, such as birds, plants, trees, shade, etc. References to sounds and light related to natural areas are also made. The levels of density of people and crowds are also important in this case, and the pace is mentioned too: "*not in a hurry*" and "*not so much up and down*", with one participant even suggesting a different lane to avoid crowds and clashing of people: "*here is the plateau, it's different. You should have on a pavement a fast lane and slow lane for pedestrians to avoid confusion*" (interviewee 10). References to children in the sensed spaces reveal a specific element here. Land use, including proximity to commercial activities, home, work and transport nodes, is also referenced in this case, but not the artistic elements. Sun and air movement are also present elements, and protection from the weather is mentioned in the context of the preferred space. In both sensed and preferred cases, seating is highlighted as essential. Overall, comparing the descriptions given for the positive and the neutral sensed and preferred locations, in the case of the neutral spaces more elements are included and more detail is provided in the description of the

preferred space but in the case of the positive spaces this is reversed and more details are provided for the sensed space.

In the examination of the negative appreciations, common elements emerge between characteristics of the sensed space and the preferred space, reflecting similarities with the positively perceived spaces but less so with the neutral locations. Here, in the locations that respondents would avoid, car-related elements feature very prominently with numerous references to pollution, dirty air, traffic noise, motor noise, engine, etc. Comments on the density of people and crowdedness are notable, with respondents providing more detailed descriptions (e.g. busy, crowded, too fast-paced, rushed, bumping into one another, not enough personal space, etc.). Other people-related elements, for example, cigarettes and perfumes, are also mentioned but only in relation to the sensed space – the absence of such odours in the preferred space may be explained by the fact that these smells are transitional events, experienced in passing. A smell of food experienced in the sensed space is replaced by the odour of urine described for a typical negative space. The smell of urine, however, is also referenced in the neutral sensed space. Other perceptions described relating to urban morphology and materials, in particular in the preferred spaces for which respondents describe their expectations of different layouts and what might be used to create these places, for example, "*too many buildings and walls*" and "*concrete pavements*". Sounds created by building works and construction are also commonly referenced, in particular in the sensed spaces. Finally, barriers to walkability are described for the preferred spaces, with responses here including references to crossing streets and obstructed walkways: "*Impossible to cross. Too many cars*" and "*scaffolding in pavement, no space to walk*".

This analysis demonstrates that although some elements seem to emerge as fundamental to the creation of particular qualities of space, many elements are common to different qualities and some are quite ambivalent or dependent on thresholds of personal comfort. It also highlights, however, that quality is not only dependent on the elements, but also on their interaction and the patterns that occur. Some of these patterns and levels of interaction become clear when

the different spaces are deconstructed (below) – the connection of these to the senses will also be reflected upon.

In positively perceived spaces, such as E–F, building works are considered negative elements while seating and mix of use are viewed as positive elements – here, perception is based on the type of element. In location O–P, however, rather than the type of element, it seems to be the intensity and dominance of the element in comparison to others that cause participants to consider this space as negative. This dominance and intensity also result in fewer (less variety of) elements being perceived by the individual (compared with space E–F, for example). They overload the senses, obstruct the sensory perception of less dominant elements and cause people to dislike and avoid these spaces. Consequently, they are considered to be stressful and less safe, leading to stronger connections and search for visual cues. When people feel stressed and unsafe, they depend more heavily on their visual perception to reassure themselves and feel safer. In the case of density, similar experiences can also occur at the opposite end of the spectrum: spaces that are too quiet and "*emptier of people*" also seem to promote the same experience of feeling unsafe and do not attract people to stay (location A–E).

When comparing the different spaces, too much or too little of an element and the lack of variety appears to create discomfort whereas variety appears to contribute to comfort. Location O–P demonstrates intensity and excesses and space A–E presents an enclosed space that lacks sensory stimuli. Space E–F demonstrates greater equilibrium between stimuli, which appears to be perceived as a wider variety of elements. Additionally, it is observed that a single element can cause opposing qualities of perception, and that those qualities may depend on the intensity of the stimulus. This supports the observation by Bruce et al. (2015) that the stimulus does not have to be negative to affect people negatively.

When analysing responses in terms of **smell,** a few factors should be highlighted. Space A–E is qualified primarily as neutral and the variety of the elements, or at least the variety described by the research participants, is low when compared with the other two locations. Here, the absence of stimulus is

clearly noticed or, when it does exist, the elements causing it are intermittent or continuous and weak: "*I don't smell anything very strong. It's kind of the same as it was by the road, but there's no sharp or sudden smells, so it's maybe a bit that the road is further away, and I can't smell*" (Interviewee LN). A second observation is that positive space integrates principally natural and human smell elements (e.g. water, vegetation, perfumes) but in negatively perceived space the odours are mainly related to traffic and building works (e.g. traffic, dust). The smell of tobacco, classified as a human activity, is also considered negative. When compared to neutrally sensed spaces these positive and negative locations present a broader range of elements, although the positive spaces appear to demonstrate a wider spectrum and the respondents' descriptions of them are more detailed than those of negatively perceived locations.

The comparatively narrower spectrum of elements that appears in the negative spaces seems to be connected with the intensity and overload of some stimuli. This excess may be masking other not-so-intensive stimuli, as indicated by the use of repetition in describing the same stimulus: "*Cars, pollution, car exhaust fumes*" (Interviewee GP). Nevertheless, in both positive and negative spaces, the elements promoting the stimulus are clearly recognised and there is some level of detail in the description of the sensory perception, although, as noted above, this level may vary depending on whether the space is regarded as positive or negative. When respondents describe positive spaces the level of detail is enhanced either through the use of longer descriptions or through greater variety and precision of the descriptive words that are used. Sometimes, this level of precision can be to the point of describing the type of smell of a plant or mentioning the brand of the perfume of someone passing by. "*It's fresher, it's definitely fresher here. I have smelt a few cigarettes around here. I'm more aware of natural smells with plants, they're quite near us, you can actually smell ... it's almost like minty which is pretty nice (…) Whereas, here, it smells a bit fresher and cleaner, definitely"* (Interviewee LN).

Another factor to highlight is the difference between the positive and the negative spaces that seems to depend upon some hierarchy of the elements. Negative spaces are found to have one or more elements that dominate the senses, whereas the positive spaces present a greater balance between a

number of elements (e.g. traffic is mentioned in location E–F but references are blended with observations relating to other elements). A final aspect to note is the impact of the stimulus on an individual's behaviour, which can occur via a notion of comfort or familiarity in the positively perceived settings: "*A more domestic smell, more familiar, I do not know if there is anything [?] From cooking, or food, but I cannot detect what it is.*" (Interviewee AC). Alternatively, the negatively perceived streetscapes may suggest discomfort or impact on health to the individual: "*It is an indistinct thing, which is a bad smell, of a heavy thing, and which you feel is not good, for you*" (Interviewee AC).

With **sounds,** the characteristics are slightly different from those of smell. The neutrally perceived landscape is a space where sounds are absent, weak, or exist as white noise – acoustic sources are dominantly distant or in the background, which highlights the fact that the space itself generates little or no sound. In the case of the neutral sensed space A–E, the buildings and the street layout also help to create a barrier to the noises coming from the high street that runs parallel, which explains why some sounds become distant. A consequence of this is that in the descriptions of these sounds they are referred to as typical city sounds rather than sounds specific to the setting.

The sounds coming from the background are dominant, the street being extremely quiet, basically, which is a strange thing, as there is no traffic you can hear people talking as they pass by and the sound of shoes. And in the background, you hear traffic, you hear cranes, and the train passing by. But it's strange, it's funny that in this area you can clearly distinguish that the foreground sounds, the ones that are closer, are marked by a series of silences, you can perceive a series of small sounds. While the sounds that come in the background are already very urban (Interviewee GP).

In the positive and negative locations, the elements that stimulate the sound sense are themselves mainly perceived as positive or negative. In a positive setting, a greater variety of elements is perceived, and a balance of the stimuli is maintained by no one element dominating here. In a negative landscape, however, a clear dominance of a stimulus is evidenced, often referred to as proximity, being too close.

Sounds ... it's very noisy. It's too noisy, I'm aware of having to speak louder because of the noise. The traffic is really frustrating, but, worse than that, is the roadworks, I can hear the drilling. It's quite frenetic, it's the sort of space you just want to get out of because of the noise. I'm aware of the sound of people, but it's overpowered by the other sounds. I can hear the construction work as well, that kind of drone of an engine going, like a very powerful engine, not a car engine. When the traffic moves, I definitely have to talk louder, it's not pleasant, and it's too close (Interviewee LN).

The positive landscape descriptions are, like those for smell, much clearer, and more comprehensive in terms of elements identified and detailed in their explanations: "*Again, it's quite windy, lots of trees rustling. There seems to be some building work going on in the background, some cutting tool or something whining away. Again, some background traffic noise as well. A few people traffic here and there, actually very quiet overall; it's not intrusive or anything*" (Interviewee LA). These positive spaces are considered to have more local, setting-specific sounds, in contrast to the negative landscapes where noises are described as part of a typical city soundscape.

In neutral spaces, the sense of **touch** is sometimes considered to be absent or intermittent. Space A–E is described as comfortable by some respondents as they have space there to move freely, although this benefit of personal space is only due to the lack of other people passing by during the interview. At the same time, other responses identify this same absence of people as contributing to a sense of lack of safety. The physical environment here is also perceived as a barrier to the road running parallel road and as a filter for more intense haptic stimuli. The sense of touch in this location is largely highlighted due to the cobbled road surface pavement type, which elicits both positive and negative responses. Most of the elements mentioned in relation to touch are immediate to the setting, as it is a sense that requires proximity in order to be stimulated. Of the locations that are considered positive and negative overall, space E–F is perceived positively for touch, demonstrating a greater balance between the elements and quite detailed and clear descriptions of the sensory experiences. Space O–P is perceived negatively, considered to be an intense experience, demonstrating dominant elements and less variety of features.

This analysis demonstrates that to understand the relationship between the urban realm and sensory experiences, investigation beyond the description of the elements and their qualities is necessary to achieve a more comprehensive understanding of an individual element's characteristics and interactions between the elements occurring in the same location and at the same time. If some elements mostly provoke a unidirectional perception (e.g. green natural areas are mainly positive), in an urban context overloaded with elements, being able to identify and understand the relationships between all these elements is critical for the analysis of urban space qualities. Only with an understanding of the full context can it be possible to improve urban policy and urban management, and ultimately the experience of urban space.

Table 14 (below) illustrates the importance of comparative contextual characteristics and relations between elements in space quality analysis. It summarises how the divergent qualities of space are a result of interaction, sequence or corroboration of the elements (Dubois, Guastavino, and Raimbault 2006; Lucas and Romice 2008), and the excesses, deficiencies or equilibrium they display. The table is organised per sense to illustrate how their perception is reflected in the different locations.

Table 14: Contextual characteristics mediating sensory experience qualities.

Dominantly neutral A–E	Dominantly positive E–F	Dominantly negative O–P
Smell		
Neutral to bad elements; Low variety; Absence; Intermittency; Weakness.	Neutral to positive elements; Wider variety; Clearness; Details/differentiation of the description and level of detail of the elements Impact (familiarity).	Neutral to bad; elements; Less variety; Dominance; Clearness; Details/differentiation (medium); Impact (health); Visual hints.
Sound		
Neutral; Absence; Weakness; Urban form/barrier; More city elements less local; Dominance (sounds background); No sounds from itself/too silent/white noise; Distance (background).	Good; Variety; Lack of dominance; Balanced; Detailed description and level of detail of the elements; More local sounds; Clearness; Elements source.	Intensity; Dominance; City (less local); Clearness; Bad; Distance (too close).
Touch		
Neutral to good; Absence; Intermittency; Space to move; Urban morphology barrier; Different pavement; Local; Impact (lack of safety, space of transition).	Variety; Positive; Balance; Detailed description; Clearness; Element source; Local; Impact (space to stay).	Negative; Intensity; Medium variety; Local (touch always local); Impact (space to move around).

Based on three quality divergent locations and the main elements referred by the participants (Table 12 and Table 13), this analysis shows that the appreciation of some elements can vary between participants in the same place, or between places for the same person (time is not considered here but

this could also influence how an element is perceived). This demonstrates that, in addition to the element itself, also the context and its characteristics also matter in determining whether a positive, negative or neutral assessment is achieved (Table 14). Hence, the multi-sensory and user-centred approach used in this study to understand the way in which sensory perception is mediated is fundamental as it identifies consequences for how people use public space, and direct implications for urban policy and design. This adds another component to the framework of analysis, designated as 'sensory geography', this one establishing further understanding of the space and how it mediates sensory perception through the analysis of the interaction between elements.

To conclude this particular line of inquiry, this chapter adds one further dimension to the 'space' dimension of the framework of analysis – urban realm mediation – a sub-level to the existing identified dimension of space (see also Figure 17 in Chapter 3). Both additions relate to the characteristics of the setting and how it is determined and designated as an urban 'space'.

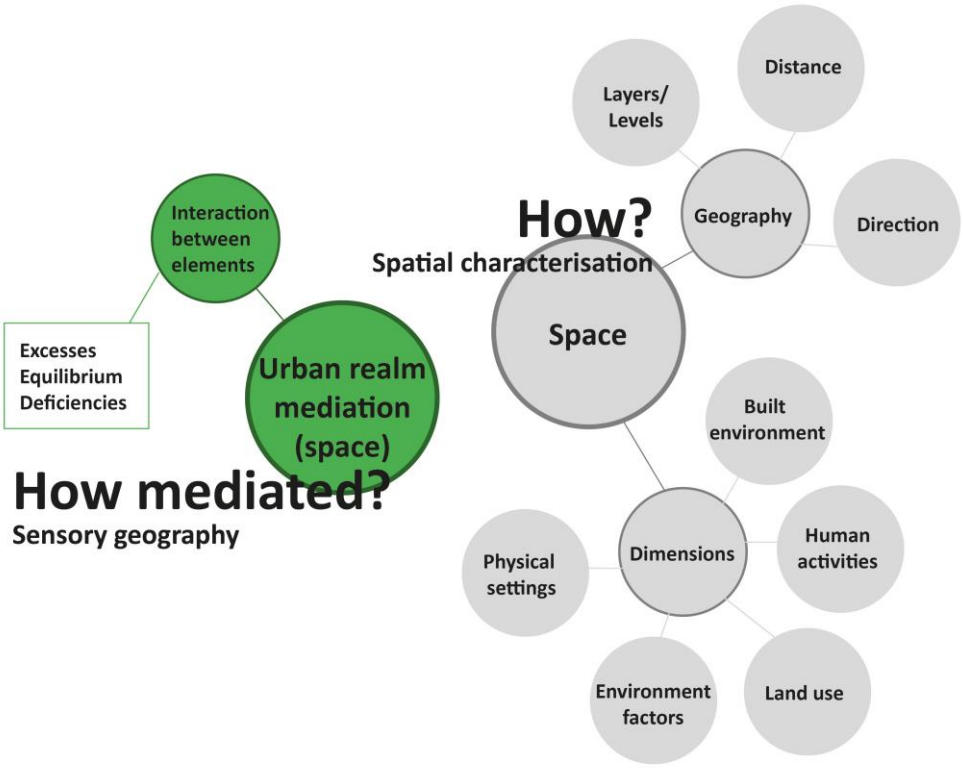

Figure 77: Framework of analysis - spatial characterisation and sensory geography.

Urban realm mediation, although being the only cluster of the structure with a single dimension (i.e. interaction between elements), is nevertheless a fundamental element of this framework. It introduces a direct link to a fundamental research question for urban designers and planners, which is ‘How does the built environment mediate sensory experience?’. The concept of mediation is introduced here as an intervention in a process or relationship, as this Chapter has tried to explore how the urban realm influences a sensory event to happen or the way in which it happens. In how it intervenes in the sensory relationship between the space and the individual – considering the interactions between the different elements (and their sensory stimuli). It requires a more detailed contextualisation of the process of sensing in space, and how it impacts a sensory element, so this group is labelled ‘sensory geography’. It is supported by the analysis of how the elements and their stimuli interact within three areas of Bishopgate, in particular through the examination of positive, negative and neutral spaces and how these relate to excesses, equilibriums and deficiencies in sensory perception.

The initial cluster (i.e. space), integrates the context where individuals are set, the urban space. And this chapter adds another sub-level, parallel to the predefined dimensions from Chapter 3 (built environment, human activities, land use, environment factors and natural settings) and to the ‘how’ question. This new level is designated as ‘geography’ and includes layers/levels, distance and direction as fundamental categories of analysis. This group of two sets of characteristics is denominated as ‘spatial characterisation’.

The new sensory geography cluster (see Figure 77) comes about through the fact that interviewees use many spatial or geographical expressions – for example, background, foreground, closer and distant (which relate to the idea of layers or levels), directions and distances – to describe how they experience a particular stimulus (e.g. sound) and where its source is understood to be. This has an impact on how the perception of it is mediated. Such expressions are used when different elements appear to come from the same direction, are experienced simultaneously, or are close or distant. They also help to explain and support some of the characteristics identified in the first cluster ‘sensory characterisation’ (see Figure 49 in section 4.3). This geographical assessment

maybe of particular importance in understanding how design and planning affect the ways in which individuals experience space. This can be demonstrated through the ways in which interviewees make direct references to the location of an element (e.g. '*it's just behind me*') or less specific references (e.g. '*it's close*', '*it's far*', '*middle distance*', etc.). Often linked to a qualitative reference to the element (e.g. expressions such as '*too close'* could be negative, and '*it's still far'* could be seen as neutral). The use of words and expressions to indicate different physical levels frequently occurs when a stimulus is in the background, or closer, or further away, lower and/or muffled. This may, in fact, be expressing a perceived hierarchical position or even the dominance of a stimulus over others (and independent of its qualification) rather than any physical layering. For example, this may occur when the intensity of a stimulus is increased through close proximity: *"in here car sounds are just on top of us, they are not far away anymore, they are passing by just on top of us!"* (Interviewee BC).

In contrast to most academic work, which explores a single sensory mode, this investigation can expand the analysis into a multi-modal dimension through the exploration of patterns, interactions, differences and commonalities in the data. Although this is a comparative multi-sensory analysis, however, it does not investigate how the different senses may interplay – future research that seeks a better understanding of how these are integrated and interact to promote different atmospheres (see Lucas and Romice (2008)) is recommended. This is because one mode can affect or influence the other and change the nature of the place perception: "*Would the design of a flower garden, with associated bird song and water feature be perceived as positive or negative in a city centre environment? Is the vibrant conversation linked with the aroma of freshly ground coffee a factor in the perception of a coffee shop, even though from an acoustic perspective the background noise levels may be what are typically considered as 'loud' and thus what maybe considered negative"* (Bruce et al. 2015).

5.5 Managing sensory elements: urban management level classification

A fundamental activity for planners and urban designers is to identify the elements that exist within urban settings and their relation to different qualities of space, since the role of these professionals is to manage these elements while understanding their contributions or impact on the sensory assessment of space (Raimbault and Dubois 2005). Understanding how these elements operate within the urban realm structure is therefore critical to know how manageable these elements are – how these can be managed, changed, or manipulated to help (re)design the sensory ambient environments in cities. An environment that is in permanent change: "*Is a living city always under construction? Yes. A city that doesn't change, dies*. (Jan Gehl on Zabalbeascoa (2016)." [Own translation]

This section of the thesis considers the main elements highlighted by respondents when describing the sensescapes of a place and categorises them according to different levels of planning and management levels the urban setting. This analysis is inspired by the work done by Raimbault and Dubois (2005) to categorise urban soundscapes based on subject descriptions and their relation to potential functions for city management, as illustrated in Figure 78.

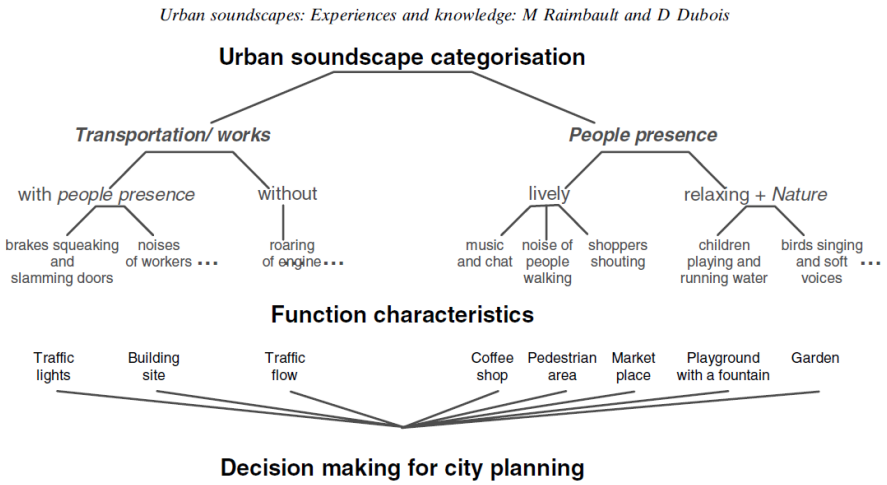

Figure 78: Categorisation and city functions (Raimbault and Dubois 2005).[37]

A comprehensive analysis of the elements involved in the creation of the urban sensescapes (see Chapter 4) indicates that it is necessary to understand the nature of these elements in order to assess their levels of manageability and to "*open a discussion on how to improve our knowledge about the diversity of experiences and representations for urban [sensescapes], which would be pertinent for urban planners and for city-users as well*" (Raimbault and Dubois 2005, 341). This is a fundamental consideration for policy makers and practitioners and brings possible policy implications. Classifying the elements is therefore a first step, and this is done in Table 15, introducing an initial framework for the classification of levels for urban management purposes. Although this investigation recognises that not all elements perceived at the local level can be solved and managed at that same level (e.g. airplane sounds, pollution levels, etc.).

[37] This image shows an example of how to relate experiences to city functions. A categorization system that was helpful to the analysis of the nature of the elements.

Table 15: Classification and management of the elements.

Elements in the urban classification	
Infrastructural	Fixed/permanent elements in the city Non-fixed/non-permanent elements in the city
Support	Temporary in the city
Contextual	Natural

Three categories of classification are identified from the ways in which the different elements support the urban realm. This support can be (1) infrastructural, in the case of elements that are fixed and permanent (long-term existence), for example, those buildings, pavements, land use, etc. Non-fixed elements that represent the more human-related elements in the city, such as the presence of people or traffic, may also be infrastructural – elements that are non-permanent but still a fundamental part of ordinary city life. Next, there are elements that (2) support urban activity. These are exceptional and the most temporary of the elements, and may either help create the city (for example, building works) or support urban public life (e.g. cultural or artistic events). Finally, the last category of classification is (3) contextual elements. This group mostly comprises environmental and natural elements (e.g. vegetation and animals), but also includes weather-related elements. These are neither defined as fixed nor temporary. Contextual elements can also influence and support other elements within this category (e.g. trees can attract birds). Of the three classifications, the non-fixed infrastructural elements and the contextual elements, due to their own nature (more complex, open to changes and uncertainties), are the ones that planners and designers appear to find harder to manage and control.

When analysing the sensescape elements in the case-study area in terms of their levels of manageability, there seems to be a balance between the three categories, although human presence and traffic (infrastructural and non-fixed elements) along with building works (supporting temporary elements) tend to dominate the soundscapes of Bishopsgate. In terms of its smellscapes, the

dominant elements include the same building works and traffic but also some land-use elements (infrastructural and fixed elements). Finally, in terms of the hapticscapes, the dominant elements are pavement textures and street patterns and types (infrastructural and fixed elements). This case study illustrates how sensory elements in an urban setting can be interpreted from an urban management perspective. By establishing levels of manageability, it becomes possible to identify which elements may be easier to control and therefore priorities for intervention can be defined. The outcome of this analysis assumes that the less-fixed elements are more manageable and that the easier categories in which to effect change are those of context and support, despite these being elements that planners and designers may feel are hard to address.

If returning briefly to the results of the previous section, in which the characteristics of the elements and their relation to other elements are understood as being able to promote or mask particular qualities of the urban sensescapes, then this classification may be used to help identify which elements can be more easily used to enhance or filter the effects of others. Adding trees to mask traffic sounds is probably easier than adding a building, for example. Understanding these potential variations in the level and scale of intervention can make a difference and help a planner or urban designer to assess, create or change, sensory conditions in public open spaces according to different levels of capacity. As Raimbault and Dubois (2005) argued, the identification of the variety of soundscapes in cities, from a human-centred analysis can be fundamental in policy and decision making, and in improving urban design and planning. The combination of sections 5.4 and 5.5 are a starting point to support this position methodologically.

5.6 Summary

Chapter 4 tackled the first research question “What are the multi-sensory characteristics that people experience when using urban public space”, the ‘What’ of the sensory experiences. A question that emphasizes the characteristics of what people experience when using public urban space. However, senses do not work on their own. They are framed in context and in

relation to a reference they define (Degen 2008). Therefore, the analysis in this chapter has sought to gain an understanding that surpasses the simplicity of the 'What' by investigating the 'How'. It focuses on the second research question "What is the role of the urban realm in mediating those experiences?", to understand the importance of the spatial context and how sensory experiences are mediated by the urban realm. It builds on the knowledge that an element might be perceived differently in the same space, or different spaces, by exploring the characteristics of the urban realm that promote these sensory variants within a space.

Three interrelated sensed spaces with different urban characteristics (locations that are dominantly positive, neutral or negative) from the previous phase of analysis are examined. In adding perspectives from research participants on preferred spaces (to stay, pass by and avoid), this analysis moves on from the simple assessment of identification and basic qualification to relocate it within a more contextual and comparative analysis of the elements' influence in creating sensory events. An investigation that helps to understand how these elements mediate divergent (positive, negative, and neutral) sensory perceptions of space. The result is a comprehensive analysis of the different qualities of space (considering the elements and their spatial interactions) through a user-centred perspective and a qualitative assessment that seeks to complement existing measurements and quantitative analyses of the sensescapes of a place.

It has been noted above that scholarship and literature on vision and visual perception are extensive, yet this chapter aims at helping to demonstrate the importance of considering multi-sensory analysis in policy decision-making. The analysis above reveals that extreme sensory experiences related to smell and sound, and the intensity of those experiences, can greatly enhance or constrain the use of public space. Showing that urban analysis without considering non-visual elements does not provide a complete assessment of urban spaces.

Results of the fieldwork also reveal that traffic and building works seem to be dominant in negative space classifications, while mixed land use seems to be a fundamental characteristic in arriving at a more positive classification. In addition to land use, such elements as water, green, seating, etc. also support a

wider variety of stimuli, a greater balance between the elements and more positive classifications. Human activities, on the other hand, cannot be so clearly defined. The density of people, the availability of personal space and the pace of movement seem to be the main factors influencing whether a perception is negative or positive.

This investigation also demonstrates that the qualities of space are not the result of elements operating in isolation. The context and characteristics of the elements, including scales of proximity, intensity, etc. can completely change the way in which space is perceived, and this is true across all the senses analysed in this investigation. In the context of the three sensescapes presenting differing qualities of space, the neutral spaces are the ones where stimuli are perceived as mild and mostly intermittent. Spaces that are most appreciated by respondents seem to be those where elements are strong, balanced, and clear, and no one element is dominant. This clearness and absence of dominance also lead to more detailed descriptions from the participants. In contrast, places where imbalance occurs, and where one or two intense and dominant elements prevail or are felt to be too close are spaces that people will move away from or avoid.

In summary, low intensity or an absence of stimuli is a pattern found in neutral spaces. Distinctness and variety of stimuli are characteristic of positive elements while hierarchy (predominance) and high intensity are consistently present characteristics in spaces that are assessed to be undesirable places to be. The interview responses demonstrate a preference for a variety of elements rather than intensity. This desired variety appears to result from a balance between elements that are present, but it can be reduced or diminished by intensity, which cancels out or masks the perception of other stimuli. Finally, the space or distance between a stimulus and the individual responding to it also seem to be important – the proximity of a stimulus largely affects the perceived quality of space in a negative way. This analysis adds one more section to the framework of analysis and launches the role of the spatial context in the framework of analysis of the sensescapes of space (see Figure 77), along with the characteristics of the elements and represents another important analytical

and methodological output of this chapter. The impact of the relationship of these sensescapes on the individual is investigated in the next chapter.

This stage of analysis concludes with an acknowledgement that the level of manageability of the elements has implications for both policy and practice. The elements referred to during this investigation are organised using a classification (Table 15) that supports urban planners and designers in understanding how to better create and manipulate sensory perceptions and prioritise the impact of some elements over others. It does this by indicating that alternative approaches to mitigating, promoting or even masking or cancelling sensory stimuli can be found. The impact of negative elements may be mitigated through the deliberate fostering of positive elements, meaning that in the case where one fixed element cannot be easily changed, another, non-fixed, element may be prioritised instead, and the experience of space altered that way.

In summary, this chapter has demonstrated the importance of a multi-sensory analysis of space, and aimed at improving the understanding of how the senses interact to create different atmospheres and experiences (see Lucas and Romice (2008)). It shows that even if one sense may be influenced by how a location is managed, the other senses are also relevant in determining the overall quality of the space. Although the full examination of how the different senses can interplay is an acknowledged limitation to this study, this chapter highlights the intertwined relationship between the senses, that one mode can affect or influence the other and change the nature of place perception and that multi-sensory and cross-sensory studies of space are fundamental to a more comprehensive knowledge of the influence the senses have in urban life.

6 From the Point of View of the Space User

I can smell that lovely lavender. I can smell it but I've seen it. I actually do that when I walk past flowers, I do actually smell it because I anticipate that they're gonna be beautiful, I do that on my street at home as well. I can smell grass, I can smell ... it's a very overpowering smell of lavender actually, but it is the season, so it's very nice. My God ... I can smell chicken, spicy chicken, it makes you feel hungry. The wind is coming from just over my right shoulder. That smells good, very nice food smells. Y'know, some places you pass like a fish & chip shop and it's got a really heavy, oily smell and you kind of feel that's gonna smell on my hair later ... this is nice, this is just a passing spiciness (Interviewee LN).

Chapters 4 and 5 have examined what people experience in public urban space and how that perception is mediated by the urban realm. This chapter introduces the aspect that is still missing in this investigation of the sensescapes, the relationship to the human individual and how he perceives a sensory experience. Guastavino (2006, 949) observes that "*source events are experienced as psychological effects caused by objects of the world, rather than the strict identification of objects as noise sources*" and, thus, exploring the ways in which people acknowledge sensory stimuli and react to the sensescapes is a critical component when considering urban planning and design.

Phenomenology is a discipline that draws attention to the expressive role of the body, linking consciousness, experience and perception. It considers experience as a corporeal process and emphasizes how different senses work actively together to develop a meaningful understanding of the environment (Crossley 1996). Phenomenology focuses on the individual body and experience but place experiences are also linked to cognitive processes, associations and knowledge, connected to particular locations and their stories, myths and reputations: "*Humans tend to map their environment with mental processes, often defined as 'images', by which we assemble, understand, remember and use spatial environmental information*" (Pile 1996, 27).

Consequently, cognitive mapping is not just a subjective activity. Meanings are often shared by groups of people because these cognitive structures are expressed in language.

"*Cognition is an individual process, but its concepts are social creations. We learn to see as we communicate with other people. The most interesting unit to study for environmental cognition may therefore be small, intimate, social groups who are learning to see together, exchanging their feelings, values, categories, memories, hopes, and observations, as they go about their everyday affairs*. (Lynch 1996, 233).

The senses are central ingredients in the composition of quotidian experience. Inherent to them, however, is an underlying ambiguity in that their meanings and experiences are constantly open to change (Degen 2008). To understand the implications of this better, this chapter adds a further category to the proposed framework of analysis: one that communicates the ways in which individuals relate to sensory experiences and introduces what a sense stimulus means to individuals. "*In distinguishing different senses we are distinguishing different ways of perceiving: the senses just are different ways of perceiving things*" (Nudds 2004, 45). Perception may relate to their memory (e.g. a sound previously heard but not present at the moment of the interview), to their own experience and appreciation of the space (e.g. how it makes them want to stay, walk by, or avoid it), to expectations it creates (e.g. an expectation of a sound due to a visual clue) or reactions it promotes (e.g. nausea). The analytical grouping that clusters this set of features is labelled as 'individual experience' as it sits with the individual rather than the space or stimulus. This chapter intends to respond to the question "What is the meaning?" and in doing so, conclude the sensescapes analysis.

6.1 Individual meaning of sensory experiences

This final piece of the framework studies the individual meaning of sensory experiences and the affective dimension of sensory perception (Carmona et al. 2003) and focuses on the psycholinguistic or semantics analysis used by interview respondents (Raimbault and Dubois 2005; Thibaud 2013; Malnar and

Vodvarka 2004). "*Analyzing the comments is not so much about classifying the objects perceived during the walk (what is perceived?) as about examining how people relate what they perceive (how do we perceive?)*" (Thibaud 2013, 15). It is recognised that articulating and expressing perceptions may occur differently for different senses, and some can prove more difficult than others. As Degen (2008) refers in her work, hearing is a dynamic sense and changes can be detected through intensity and also tone, while smell, for example, is more vague and harder to describe due to its moving and formless nature.

In the investigation of the impact of the sensescapes on individuals through the way they express themselves, two main factors seem to emerge: perception and behaviour (as it is reflected in a set of behavioural attitudes). In terms of perception, this section considers how the research respondents use language and wording to express the way they perceive a specific characteristic of a stimulus (e.g. normality or memories), or even reflect the quality and intensity of the sensory experience appreciation (e.g. from very annoying to very positive). From the findings, it is possible to suggest that some of the terms and expressions used actually translate the individual appreciation or meaning of a stimulus. Five different thematic groups are identified to structure the perceptions that are captured in the fieldwork.

In terms of behaviour, the analysis acknowledges that sensescapes can lead to different behaviour types, although to understand this further a literature review on psychological and behavioural studies would have to be done. In this case, however, and as behaviour is not a variable explored in-depth in this investigation, only behavioural attitudes from participants' descriptions will be highlighted. The focus of this section is not on the way interviewees perceive the sensescapes but on how they express themselves and how these descriptions relate to how their reactions. The detail given in a description of an experience is also found to indicate a behavioural pattern. A description can transmit the idea of a clearer experience, reflect doubts, or mimic the way a stimulus is experienced (e.g. through the device of onomatopoeia or trying to reproduce the sound heard). Another type of behavioural reaction is when experiences directly lead the individual to react – stay, pass by or avoid – (here very much related to the outputs from Chapter 5). It is acknowledged that

sensory experiences can provoke reactions or lead to physical activities (e.g. the smell of food may lead to a desire for food). Finally, it is accepted that some activities may create barriers to a wider sensory perception, for example, when participants describe being seated as a better position in which to experience the non-visual sensory realm than walking. Behaviour is structured into three identified thematic groups. All the dimensions of this analysis are explored in detail below and then summarised in Table 16.

Appreciation (under perception) – This relates to the qualification category used in the Chapter 5 analysis but here it exceeds a simple positive, negative or neutral assessment of space (see some examples from the literature in Table 10, section 4.2). This chapter will explore the many expressions and meanings that are used by the participants in their qualification of space. The content relates to the variety of forms that an individual uses to interpret that same experience, namely "*linguistic expressions*" (Dubois 2000; Dubois, Guastavino, and Raimbault 2006). See section 6.2 for a more detailed analysis of this category.

Normality (under perception) – The idea of normality appears related to something that has become customary (constant or common) or to something that would be expected in a larger-scale urban space (as opposed to a smaller, local context). The notion of a normal city experience comes from a weakness of the stimuli or locations where "*no specific events can be discriminated*" (Guastavino 2006, 948). Respondents describe this as follows: "*Smells ... it's just air, nothing particular. No particular car smells, no freshness, it's just ordinary, urban smell without any particular bad or good thing*" (Interviewee BB). Or the perception is drawn from the "routine" of what one experiences in urban space (as opposed to non-urban spaces): "*It smells ... you see, this is a very normal city smell for me because, and I'll tell you why, there is some smell of vegetation, but it's not fresh vegetation, I'm imagining like a hedge with paper in it*" (Interviewee LN).

Finally, permanence or continuity of stimuli creates a sense of normality in establishing the background noise of the city (Guastavino 2006, 948): "*The sound of building works and planes and people, the usual*" (Interviewee PM);

"*There's a rumour, a traffic rumour, permanent. And that's it, a city rumour*" (Interviewee AC). Neutrality also seems to be used as a sensory descriptive term for cities like London: "*Neutral smell, city smell*" (Interviewee GP). Normality is not considered to express any particular appreciation. It differs from conveying a sense of neutrality in response to the qualities of a space – it is describing something that becomes ordinary and routine and the impact of this leads to a passiveness on the part of the participant, which is not necessarily the case in assessing neutral qualities.

Contradictions/ambivalence (under perception) – Along with the simplified qualifications of positive, negative and neutral, there are moments in which individuals experience ambivalence (Raimbault, Lavandier, and Bérengier 2003) and articulate contradictory opinions in response to the sensory experiences. These responses may also reflect conflict or tensions (Adams et al. 2007). Three types of ambivalent or contradictory circumstances can be identified in the descriptions that interviewees provide: 1) when the same element in the same space causes different qualities of stimuli (duality); 2) when the same element provokes different stimuli but in different spaces; and 3) when different elements within the same place cause the same stimuli to demonstrate ambivalent qualities.

An example of the first case is a crowded space, which can be enjoyable or annoying depending on the location or the person experiencing it: "*Spitalfields Square. To relax and watch people go by!*" (Interviewee 3) contrasts with "*Area here (Spitalfields Square). Crowded, nowhere to sit, too busy, not enough personal space*" (Interviewee 4). An example of the third case is an enclosed area described as providing comfort but also being cold (related to touch). Similar examples also emerge when the interaction of different senses (e.g. sounds and touch) is described: "*The area where we entered in the end is always so deserted. It has two functions: (1) on one hand it tranquilizes me as there is no noise, no cars…it's all into the absence of; (2) on the other hand it gives me the feeling of loneliness, a very concrete feeling of loneliness and coldness that makes it unpleasant*" (Interviewee RL). This example illustrates dualities that can occur within an individual's reactions (e.g. tranquillity vs.

loneliness). It also demonstrates the importance of a multi-sensory analysis of the sensescapes.

Memory (under perception) – The outputs of this investigation do not differentiate responses by the different types of participants, according to whether or not they have previous knowledge of the area (i.e. if they are familiar with a place or are strangers to it). However, if they do have prior experience it is inevitable that some of their responses link their familiarity with the space, or as a memorized experience (Dubois, Guastavino, and Raimbault 2006; Guastavino 2006). This familiarity is made clear in cases where there are expectations of a particular stimulus or experience, often related to their memory of the place or from a similar type of space: "*And this alley here, by chance it's not smelling now, but looks like one of those places where people come for the national public sport, pee!*" (Interviewee PM). These cases happen when memory is clearly used as a resource in relation to either one dominant element or a previous experience from the same place.

This connection between senses and memory is fundamental in the study of urban space and is still very much neglected in sensory research (Engen 1991). Cases occur when the impact of the senses on memory is clear and some of these relate to a more generic memory of "*filth in the city": "It smells like urine. I don't like it of course, it's a bit heavy and it reminds me of the dirtiness and filth in the city*" (Interviewee BB). Or it may be clearly linked to past experiences: "*But it is also like this, I can also tell you that this street, and I've passed here several times, has the smells of the people passing in it*" (Interviewee PM). This particular example also introduces time as an important variable to consider, even if indirectly, as it depends on past activities. Memories can be triggered that apply to other senses even if they are dominantly responding to the sense of smell. "*Thus smell will reinforce the particular character of and our emotion towards a place. Scents trigger memories, familiarity, attraction or dislike to people and objects*" (Degen 2008, 45).

Visual (under perception) – This is the last category within perception. This investigation also acknowledges the almost inevitable relation that perception has with the visual sense, especially considering that all participants had their

eyes open during the in-situ interviews. When asked about their sensory experience, some participants recognise the existence of a non-visual sensory stimulus but are not able to identify it, because "*if we describe something we have seen we tend to describe its visual aspects*" (Rodrigues et al. 2019, 11). This occurs more frequently with sound and smell as these senses do not require proximity to be perceived and this can cause doubts owing to a mismatch between vision and the other sense: "*I don't smell anything very strong. It's kind of the same as it was by the road, but there's no sharp or sudden smells, so it's maybe a bit that the road is further away, and I can't smell. (…) Now, it's maybe just a little bit of stale air, possibly because of ... I'm thinking was there rubbish left out, but not domestic waste, but I can't distinguish anything particular, other than those kind of different to other places*" (Interviewee LN).

Other cases emerge in which an expectation is created in response to visual cues, demonstrating the direct influence vision has on people's experience: "*Now speaking of Expectations… It has to do with lavender, but I don't smell lavender. (…) Well, now I smelled it a little, with the air movement it came. But it was just a breeze.*" (Interviewee PM). This response is directly influenced by the element that the respondent recognises in the vicinity. This case is different from the case of the alleyway, introduced in section 5.3, where the alleyway itself is not an element source of the smell but an element mediating. Cases, for example, the lavender, where references are made to the source itself – carried on the wind – were used more often, but this doesn't always happen as was the case with the presence of rubbish: "*It does not smell of anything. Despite there being a rubbish bag, there isn't even a smell that I can identify, of anything*" (Interviewee RL). The interference of vision with the other senses is a challenge recognised in this investigation. Even though the adopted methodology and the focus of the interviews seek to minimise this issue, it still creates an obstacle in the non-visual description of the stimulus.

Ways of describing (under behaviour) – The first category within behaviour. A detail describing hearing the sound of clothes worn by passers-by to express the quality of the acoustics of Bishopsgate that is documented in one interview is an example of the detailed language used to give an account of clear

soundscapes and environments: "*The last one [place], I could actually hear what they were saying and I could hear their clothes ... everything, the bike ... whereas, here, there's not that detail, it's much more generalised." (…) "I do hear people talking as they're going past. I hear people's clothes moving, so I think there's better acoustics here almost because I'm hearing more of people's conversations; it's not just a buzz of chatter*" (Interviewee LN). In another interview, the use of exaggerated expressions or onomatopoeia transmits the idea of a sound continuity causing personal annoyance: "*It's this garage behind us. And the air conditioner. It has that continuous sound, vvvvv....aaa, that's it. It's a sound that we can't escape from. That never leaves us alone*" (Interviewee AC). This category of human behaviour is adopted by Thibaud (2013) who also includes fluctuations in speech, such as pauses, probing, hesitation and stammering.

The threshold between a positive and negative appreciation of a sensory experience is very personal and therefore not always clear. Cases emerge in the interviews where elements are perceived in an ambivalent or contradictory manner. In Chapter 4, when analysing the sensory qualities, these results are simplified to positive, negative, neutral and ambivalent (duality of elements), and to the descriptions of good, bad or neutral. When participants describe their experiences, however, the variety of qualitative expressions that they actually use goes beyond such simple terms. Examples of more complex qualitative descriptions often occur in spaces that contain intense sensory stimuli: "*Sounds ... it's very noisy. It's too noisy, I'm aware of having to speak louder because of the noise. The traffic is really frustrating, but, worse than that, is the roadworks, I can hear the drilling. It's quite frenetic, it's the sort of space you just want to get out of because of the noise. (…) When the traffic moves, I definitely have to talk louder, it's not pleasant, and it's too close*" (Interviewee LN).

In addition to using words to qualify an experience, the importance and intensity of a specific experience can also be indicated by the time spent by the participant explaining it, and the frequent repetition of words and phrases. Such descriptions can include repetitions that use connected terms and elements: "*A lot of traffic, car noise, cars, traffic noise*" (Interviewee RL). The repeated use of onomatopoeia occurs when participants want to describe the unpleasantness of

an experience: "*The air-conditioned "OMMM". The aeroplanes. You know, aeroplanes in London are a constant "rrrr". One or another little bird. And nothing else (…) The sound from the trees, it's good*" (Interviewee PM). In this case, the addition of a diminutive to describe the bird expresses a positive experience.

Elements leading to activities (under behaviour) – Here there is a clear link to the analysis described in Chapter 5 and to the cases in which sensory experiences cause different activities to happen – for example, influencing an individual to remain in, pass through or avoid the same place. This analysis is crucial in a study of urban spaces and densities of use (see Figure 72, section 5.2). Examples documented in the case-study area of Bishopsgate seem to be mostly related to the presence of sun and seating areas, which encourage people to stay outdoors, or rain, which causes people to leave an external space in order to find shelter. The former example is assessed positively and introduces a combination of elements (sun and seating areas). The latter example only relates to one element (rain), a single element that is perceived as negative, dominant and overpowering over other elements.

Other examples of the predominance of one element resulting in a particular action are encountered in analysing the haptic sense: "*For example, this place where I am seating is too cold. It is not very pleasant to be seated…it gives an uncomfortable sensation…but otherwise, if I abstain myself of thinking that I have a cold bum… (…) If I stand…I feel comfortable. In an environment that invites to stay*" (Interviewee RL). Another respondent describes, "*It's nice to pass by, but if it continues for a long time, it can be a bit depressing and claustrophobic because it's too narrow and the height of buildings is quite high, three storey for this narrowness, it can be seen as high in human scale"* (Interviewee BB). Both examples are representative of haptic experiences, but this category of behavioural response is multi-sensory – for example, a strong and negative sound or smell experience may cause someone to avoid that area. Such a reaction may not happen in response to strong negative visual perceptions, however, and this evidences the need to carry out a more multi-sensory and comprehensive analysis of urban space that takes the non-visual senses into account.

Finally, examples are recorded in which a combination of elements within an individual's intensity threshold cause that individual to experience the area as a thoroughfare, just a location to pass through, not a place to remain in: "*You can already notice car traffic, but still relatively limited. I still like the experience of hearing people's footsteps and see people passing by. In the end this is what gives life to a city. I feel a car passing by from time to time. It is a space with a quite tolerable sound and minimally comfortable. But it is not a space for permanence"* (Interviewee GP). Another respondent observes, "*I feel a little more agitated here. I feel it's busier and I wouldn't necessarily linger, it's more kind of passing through...*" (Interviewee LN).

Activities creating difficulties for perception (under behaviour) – This recognises that personal actions and activities have an impact on the way individuals experience space. Changes in individual activities may promote or mask an experience (e.g. when research participants mention that they hear better when they are seated than when they are walking). The activity of the space user, therefore, adds another dimension to this analysis. An example is a movement being described as an activity that makes people less aware of the sensory context unless there is a strong and dominant sensory stimulus. Or, conversely, the use of seating areas or areas where individuals can linger is described as something that sharpens awareness of the sensory context: "*Unless it's something out of the 'normal' that calls our attention by being unexpected people may walk along different places and not be aware of any particular sensation, especially when only passing by. When stopped, standing or seated, people will be more aware*" (Interviewee PM).

An output of this analysis is the identification of eight different generic types of effects resulting from these stimuli–individual interactions (Table 16). These include, in no particular order: appreciation; normality; contradiction/ambivalence; memory; vision as an influence; ways of describing; elements leading to activities; and activities creating difficulties for perception. These dimensions are explored further in this section.

Table 16: Perception and behavioural effects on individuals.

Effect	Interactions
Perception	
Appreciation (also relates to the quality category)	Different ways of reflecting positive neutral and negative appreciation of space (i.e. type, quality, appraisal, importance, spatial) as described in section 6.2.
Normality	Something constant or common also related to weakness of a stimulus.
Contradiction/ambivalence	Same element in the same space promotes different qualities of stimuli; Same element promotes different stimuli in different spaces; Different elements within the same place promote ambivalent qualities of the same stimuli.
Memory (also relates to expectations)	From the similarity of spaces; From one dominant element; From a generic common perception.
Visual	From a non-recognisable stimulus; From an expected stimulus only due to existing visual clues.
Behaviour	
Ways of describing (relates to the appreciation category)	Expressions used by participants to describe a stimulus, which include different levels of detail, onomatopoeia/mimic, repetition, use of connected terms, etc.
Elements leading to activities (relates to reactions)	Combination of elements leading to activities (i.e. stay, pass by or avoid); One dominant element leading to activities (i.e. stay, pass by or avoid).
Activities creating difficulties to perception	Activities promoting or masking an experience (with same elements).

In summary, this section introduces eight new categories – five related to perception and three to behaviour – that help us understand what an experience means to the individual. The different descriptors set out above and in the table are presented here as isolated elements for methodological reasons, but it must be noted that in the interviewees' responses they often

overlap. The overlapping mostly occurs between different descriptors from this same cluster, and usually to complement other descriptors rather than challenge or override them. The order of the descriptors listed in the proposed framework (Table 16) does not imply any kind of rank or hierarchy, it simply reflects the order that the interviewees themselves used when talking and expressing their perceptions which were then reflected on the data analysis.

6.2 'Adjectifying' intensities: a framework for sensory quality meaning

In exploring the impact of sensory experiences on the individual, different dimensions become highlighted. Some of these are directly relevant to planning and urban design as they contribute to or create barriers to the use of space within an urban setting. An assessment of the different reasons why people prefer some places over other places, and the role that the senses play in establishing these preferences, is therefore critical. In particular to those dealing with and managing public space. This assessment should consider the context in which the stimulus is perceived, from the point of view of the individual and how it is perceived (as demonstrated in Chapters 4 and 5), its characteristics, dimensions and patterns, both in isolation and in the presence of other elements. It is the superimposition of all these characteristics that determines the sensory quality of a location and has direct consequences for the type and densities of its use.

The interpretations of the sensescapes that are captured in the fieldwork are personal to the individual participants (space users). The semantic insights captured in their descriptions, therefore, offer the most direct way of understanding any nuances in relation to how sensory experiences are experienced and appreciated (Hedfors 2003; Dubois, Guastavino, and Raimbault 2006; Thibaud 2013). The use of such adjectives as "pleasant" or "annoying" to qualify sensory experiences would appear to reflect the impact and psychological effect of the experience on the individual. This, again, underlines the importance of investigating the terminology that is used by respondents in the interviews: "*Language and text consistently comes up as an*

ideal medium for describing sensory experiences" (Lucas and Romice 2008, 88). Analysis of the expressions of what they perceived and how they feel about it, revealing the meaning of their experience (see the category 'Ways of describing' in Table 16). This section explores and categorises the variety of expressions used by research participants when describing their sensory experiences – examining, per sense, the patterns, commonalities and particularities that occur when sensory experiences are interpreted, described and appreciated.

When asked about their sensory experiences, some respondents not only identify the source element by name but also add a qualification or an adjective that reflects and describes a characteristic or characteristics of the experience. As seen in the previous chapters, the analysis of these additional expressions or adjectives demonstrates the qualities of spaces (positive, negative or neutral). This section, however, will examine the specific characteristics of the stimuli, exploring all the terms used to describe each of the sensescapes and categorising them into descriptive dimensions. Following a similar format as that used by Malnar and Vodvarka in their common vocabulary schematic (2004, 245) or Lucas and Romice in their descriptors for sensory notations (Figure 79), a matrix of words is created that can be used and explored in a variety of ways (Lucas and Romice 2008, 88). It also differentiates words that are unique to a particular sense from those that are common to all senses.

DESCRIPTORS

VISUAL	AURAL	TACTILE	KINETIC	THERMAL	CHEMICAL
Dark	High Pitch	Static	Strong	Hot	Weak
Bright	Low Pitch	Mobile	Light	Cold	Intense
Saturated	Quiet	Rough	Free	Dry	Stagnant
Neutral	Loud	Smooth	Bound	Wet	Fresh
Perspectival	Clear	Light	Indirect	Natural	Musky
Flat	Reverberant	Heavy	Direct	Artificial	Putrid
Intimate	Vocal	Porous	Level	Ambient	Floral
Vast	Non-Vocal	Resistant	Graded	Source	Fruit
Solid	Natural	Hard	Sustained	Radiant	Spice
Void	Artificial	Soft	Quick	Convective	Resin
Detailed	Attack	Warm	Crowded	Constant	Meaty
Blank	Decay	Cold	Empty	Responsive	Oily

Figure 79: Table of descriptors for sensory notation (Lucas and Romice 2008, 88).

It has been discussed above that although there is extensive literature on the vision sense, the visual qualities of space are not such a determinant of space use as other sensory qualities. Extreme sensory experiences related to smell and sound and the degree of their intensity can greatly enhance or restrict the use of public space. If a space is visually negative, incoherent or ugly this fact does not prevent it from being used, and there are many urban examples to support this. Intensities of smell or even sound, however, can be overwhelming and repel people from a particular space. Smell and sound interfere to a greater extent than vision in the use of space. This analysis helps us to understand and structure the different types of personal qualifications of sensory experiences, based on a user perspective on the relationship between senses and spaces.

The results of the semantic analysis of the adjectives or expressions that respondents use to describe the qualities of their sensory experiences are summarised here, adding to the outputs of Chapter 4 which only focused on positive, negative and neutral qualities. Following the work of Malnar and Vodvarka (2004, 245) and Guastavino (2006), these words are then aggregated into semantic categories or themes, which are defined according to variant

forms of descriptive words in their base form, synonyms grouped together or linguistic devices constructed on the same stem grouped. Aiming at helping understand how participants perceive and translate the qualities of their sensory experience, which, in contrast to other authors, is focused on defining a structure to how designers and planners explore the sensescapes of a space. These are then analysed per sense, but similarities and differences between the senses are also pointed out.

Following the analysis of all the words mentioned by research participants when qualifying a sensory experience, these words are categorised into five different themes: type, quality, appraisal, importance and spatial. All of these themes together reflect the variant forms of descriptive words that represent different types of meaning to the individual, through the perspective of the element characteristics or its effect on space. The **type cluster** agglomerates words that relate to the specific characteristics of a stimulus and mainly reflect its variations. The **appraisal cluster** includes words that relate to how the sensory stimuli characteristics are perceived by the individual (mostly words that do not communicate any clear appreciation of the space, although some words that represent reactions from the individuals to the stimulus are included). The **appreciation cluster** comprises the words that are used to reflect a positive, negative, and neutral appreciation of an experience and demonstrate different levels of intensity. These words relate to the qualities of the perception and impressions of a stimulus. Words contained in the **importance cluster** relate to the power relation of the stimulus when analysed in a context that includes other stimuli. Finally, the **spatial cluster** groups together words that relate to the spatial characteristics of the stimulus. Note that this particular cluster doesn't apply to smellscapes as explained below.

6.2.1 Soundscapes

When analysing the soundscapes descriptions, the words quiet and noise are the most used[38]. These words express opposing states, but both describe the

[38] Most used words will be highlighted in this analysis by being underlined in each table.

ambience and indicate a quality of space, although quiet may be used to express a lack of movement (stillness) too. A considerable variety of words are used to appraise the soundscape experience (Table 17) with some used in the description of the same space: "*So, sounds, again there's that drilling which is very unpleasant and it overpowers anything else. If that was to stop, it would just be traffic that I'd be hearing ... very loud and reverberating*" (Interviewee LN) or "*really noisy, very noisy. Too much movement. It turns my head around. Lots of cars, lots of people, too much confusion in general. It's not a pleasant place to be or to come to walk with a friend*" (interviewee 15).

Notable among the variety of words used by the participants are the type cluster words, which mainly reflect the volume and level of the sound, and the appraisal and quality cluster words, which not only describe qualities of the experience but also indicate reactions to it (e.g. alert or tranquil).

Table 17: Clusters qualifying types of soundscapes descriptions.

Clusters	Words used
Type	Loud, high pitch, whining, artificial, and continuous.
Quality	Bustle, tranquil, frenetic, buzz, peaceful, sheltered, racket, low, low level, hustle and bustle, danger, alert, quiet.
Appraisal	**Positive** – Better, like, good, agreeable, pleasant, fine, immensely, it's nice, little oasis, frenetic, refreshing, tranquil, positive, fine. **Negative** – Dislike, unpleasant, rather it wasn't here, horrible, messes with, constant, maddening, turns my head around, confusion, you can never escape from, wrecks my head, reverberating, all the time, aggressive, frustrating, annoying, noise. **Neutral** – Hard to tell, don't bother me, don't mind, don't complain, it's alright, it's ok, don't really notice, normal, not intrusive, used to it, blends in.
Importance	Overpowers, overwrites, imposes, dominant, most important, intensively.
Spatial	Coming towards me, too close.

6.2.2 Smellscapes

When analysing the smellscapes responses, the words good and bad are the most used to describe smell appraisal of the space. Similarly to soundscapes, notable here (Table 18) is the type cluster words that primarily reflect the level of the smell and the appraisal and quality cluster descriptions, which go beyond

just the qualities of the experience and introduce some reactions to it (e.g. not good for you or welcoming). In a few cases, a combination of these words was used by the same participant and related to the same space, such as: "*It's fresher, it's definitely fresher here. I've smelt a few cigarettes around here. I'm more aware of natural smells with plants, they're quite near us, you can actually smell … it's almost like minty which is pretty nice. Much less traffic smell. When we were going round the corner, there was a really strong … the sort of smell you'd get from a printing factory … quite polluted. Whereas, here, it smells a bit fresher and cleaner, definitely"* (interviewee LN) or "*Pollution. It seems there is always smoke but the streets are quite clean*" (Interviewee 15). Note that no spatial references were given in the description of the smellscapes.

Table 18: Clusters qualifying types of smellscapes descriptions.

Clusters	Words used
Type	Fresh, refreshing, clean, not clean, filth, dirtiness, garbage, musty, stale air.
Quality	Pollution, strong, welcoming, not good for you, sharp.
Appraisal	**Positive** – Pleasant, happy, like, nice, lovely, positive, enjoyable, good. **Negative** – Negative, unhappy, dislike, unpleasant, not enjoyable, bad. **Neutrality** – It's fine, neutral, don't mind, used to it, ok, presentable, barely noticeable, not that smelly, doesn't smell much, either good or bad, doesn't bother me, nothing special, very little.
Importance	Not determinant, dominant, unique, heavy, strong.
Spatial	n.a.

6.2.3 Hapticscapes

When analysing the hapticsapes responses, the words comfortable and uncomfortable are the most used to describe the haptic quality of the space. In Table 19, following a pattern that can be seen above with the other senses, the type cluster words mainly reflect the texture and comfort level of the touch stimulus and the words in the quality and appraisal cluster introduce some reactions to the experience in addition to simply describing its qualities (e.g. relaxed or agitated). Examples also include the use of a variety of words when describing one space: "*Quiet, quite narrow streets ... personally, I quite like it, it feels kind of protective actually, you're shielded away from everything, that's kind of my initial impression, yeah*" (Interviewee LA) or "*I don't go around*

touching things in the street. Sometimes I am pushed and have to push people on streets as they are so crowded" (Interviewee 15). Of the three sensescapes, the hapticscape presents the widest diversity of spatial-related expressions (e.g. away from, close, etc.).

Table 19: Clusters qualifying types of hapticscapes descriptions.

Clusters	Words used
Type	Smooth, amorphous, soothing, uneven, crowding, full, busy, not enough personal space, cluttered.
Quality	Cold, freezes, fresh, warm, cosy, gloomy, graceful, narrow, wide, not very well, relaxed, hassled, snuggled, dangerous, insecurity, slip.
Appraisal	**Positive** – Agreeable, like, good, like, nice, pleasant, comfortable. **Negative** – Agitated, dislike, bad, dislike, disagreeable, unpleasant, stop, calm, avoid confusion, disconnected, confusing, crazy, disturbs, horrible, impossible, pain, miserable, intimidating, frightening, not inviting, putting off, oppressive, stifling, uncomfortable. **Neutral** – Used to it, different, feel, don't mind, weird, easy, genuine, interesting, not unusual, nothing out of the ordinary.
Importance	Overload, too many, too much.
Spatial	Away from, stay, don't come out, close, knocking on you, enclosed, cover, shade, refuge, large enough, confined, sheltered, protected, barrier, open, removed, outsized, safe, secluded, shielded.

After analysing the terminology used by participants, while appreciating their sensory experience, a total of five categories emerged. The five applyed to sounds and touch, but only four to smell (as the spatial category was not found to be relevant to smell). Figure 80 illustrates the total number of describing expressions or words included in each group and identifies this total per sense. In this graph, smell, which records the least number of descriptors, appears to be, of the three, the sense with the most limited terminology or the most difficult to describe. Smell is one of the most ambiguous senses to describe. Having no form it makes it challenging to articulate or define. Rather than smell adjectives, individuals describe smell through what it smells like (Degen 2008). As Simmel in Frisby and Featherstone describe *'[i]f we say, "it smells sour" then this only means that it smells the way something smells which tastes sour*" (Frisby and Featherstone 1997, 118). Smell is the sense that reinforces the perceived character of a place and the emotions that someone may feel towards it. Scents can trigger memories, familiarity, attraction to or dislike of people and objects (Degen 2008). In this investigation, however, language limitations from the

participants cannot be discarded, as English was not always the native language of participants.

Hearing is the most dynamic of the senses as it can detect a change in both intensity and tone, and this is clearly demonstrated through the variety of words used across all groups except the spatial, where the description is limited. If clusters are compared across all three senses, perceptions are dominated by elements related to smell and sound, whereas touch is clearly predominant in terms of spatial stimulus – given that space relates to the built environment this is understandable. The sense of touch demonstrates a greater variety of words across most clusters. Touch and sound present comparatively high numbers of negative appraisal terms when compared with positive and neutral descriptors. The difference here for haptic is considerable, demonstrating three times more negative terms than positive ones.

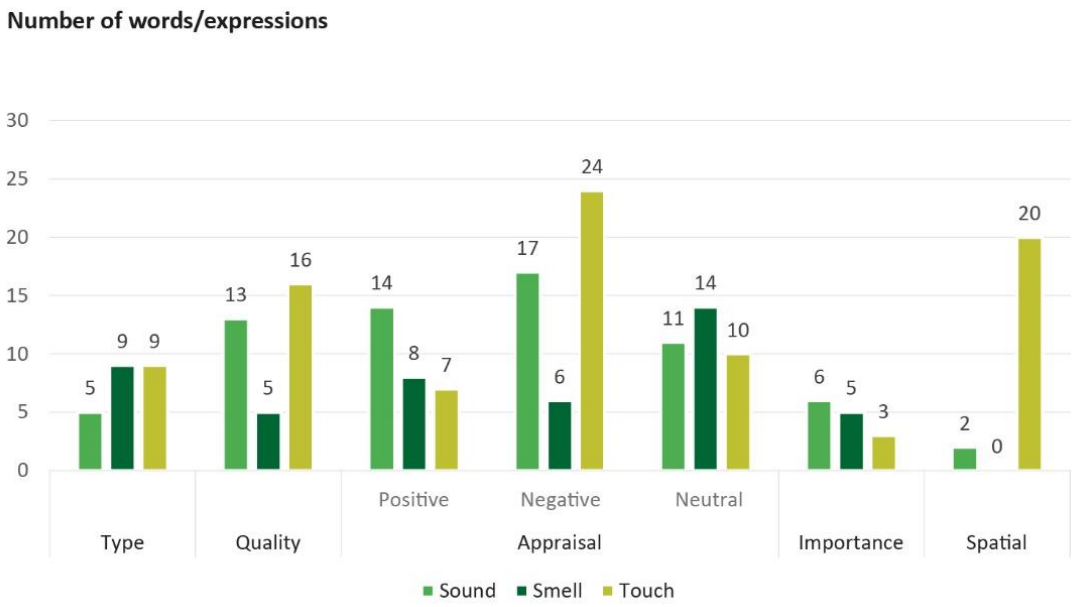

Figure 80: Number of words and expressions per sense.

The words that appear in the type and quality clusters are very specific in describing intrinsic characteristics of stimuli from the same senses (e.g. *loud*, *high pitch* for sound). The appraisal cluster appears to be less specific, with the neutral category being the least related to any particular stimulus and indicating the least impact on the individual (e.g. *don't mind*, *don't complain*, *it's OK*). The

words that form the appraisal cluster are also more common across descriptions and often used for more than one sense (e.g. *bad*, *good*, *like*, *agreeable*). The quality cluster includes words related to safety and danger, stronger terms that emerge most clearly when the sound and touch senses are described. Sound is principally related to perceived risk and safety issues (e.g. *danger*, *alert*) and touch is linked to danger, slippery surfaces and feelings of insecurity. Similarly, negative words carry greater intensity when describing soundscapes and hapticscapes than when referring to smellscapes (e.g. *maddening*, *wrecks my head* for describing sound). Across all three senses positive words on the appraisal cluster are generally more moderate in their reflections of favourable appreciation (e.g. *like*, *pleasant*, *refreshing* to describe sounds). These findings support Guastavino's view (2006) in that the verbal data collected and the association of meanings to the object source indicate that a simple analysis of physical descriptions is insufficient – the inclusion of cognitive representations of the sensescapes in such analyses is necessary.

6.3 Summary

This chapter completes the analytical section of this thesis. Having previously investigated the elements and their characteristics (Chapter 4) and the mediation of the sensory experiences through space and the urban realm dimensions (Chapter 5), this last piece of the framework examines individual perception.

Through verbal analysis of the research participants' language and expressions, this structural element of the research presents perception and behaviour as two key elements that convey how the individuals react to sensory experiences and what meaning these experiences hold for them. At the same time, the ways in which individuals express themselves and the terminology they use to communicate a qualification of the experience – this qualification occurs through the use of some of the most prominent verbal terms and expressions, which are then analysed to define sense characteristics and assess them individually and comparatively. The selected categories of analysis of individual perception – type, quality, appraisal, importance and spatial – enable the association of

meanings to the object source, offering insights into the relationship between space and space users that can usefully inform urban planning and design policies (Figure 81).

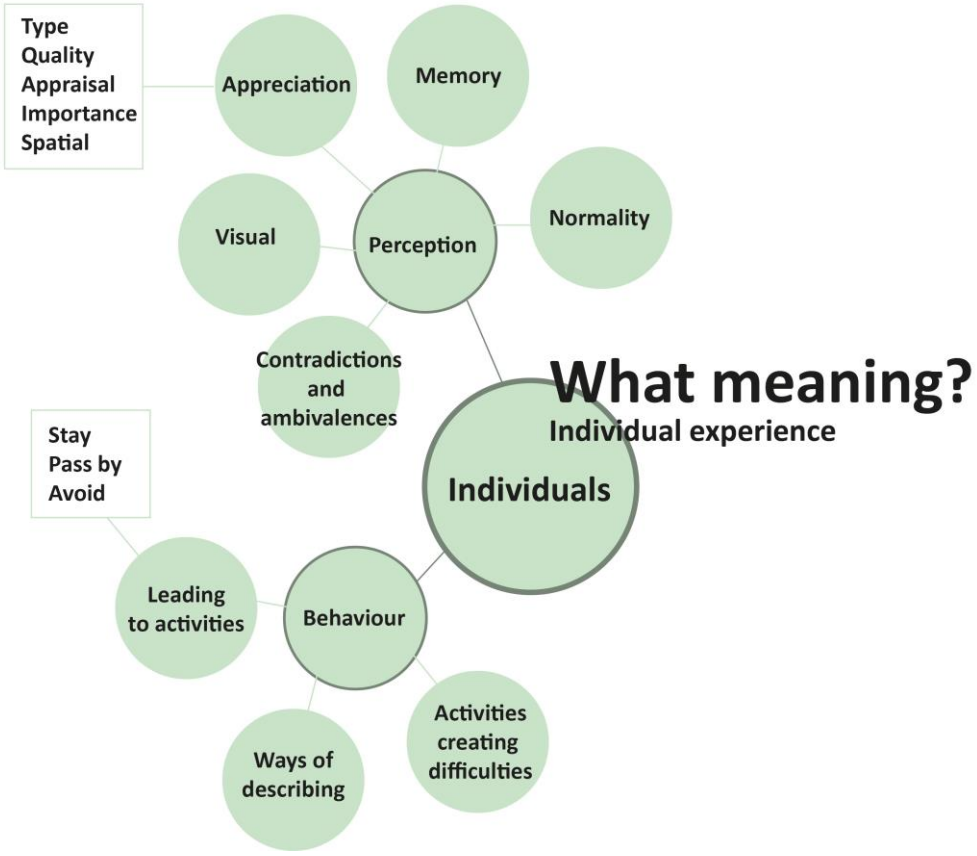

Figure 81: Framework of analysis - individual experience.

The analysis highlights the importance of exploring how people describe their experiences to understand how they perceive it. It advocates the investigation of contradictions, ambivalence and normality when reflecting on the sensory qualities and includes consideration of expectations, memories and the use of vision to support different ways of experiencing. Individual actions and activities are also recognised as being both a mediation factor in the experience and a result of that same experience. In summary, this section introduces eight new categories of semantic analysis – the five related to perception and the three concerning behaviour – that help understand what a sensory experience means to the individual. The semantic analysis considers the different nuances that should be acknowledged in any interpretation of how people experience the

different sensescapes and demonstrates that the quality of a sensory experience can be expressed in many different ways. The final section of the framework created and presented here in Chapter 6 (Figure 81) establishes the fourth and final dimension of a methodology that facilitates comprehensive analysis of the sensescapes of a place. The framework in its entirety, which addresses the elements, the space and the individual, will be discussed in the next chapter (Chapter 7). A framework that can be used to support designers, planners, and researchers to properly understand and analyse the triangular relation at the base of sensory experiences.

As has been seen in Chapters 4 and 5, experiences occur directly via the element source itself or indirectly through mediation (an element–element connection). This chapter demonstrates that both experiences will have an impact on individual reactions (element–individual relation) and, therefore, that those reactions must be considered in any assessment of the sensescapes of a place for it to be sufficiently comprehensive. At the same time, exploring the semantics of the descriptions reveals that sensory experience also depends on previous factors of experience (memories) or interaction with the urban environment (e.g. being in motion can interfere with the quality of the experience). This demonstrates that variables, such as time and movement, are also important aspects to take into account when investigating how people understand the sensory contexts – although these are not considered in this study they must be acknowledged here. Finally, this investigation supports the user-centred analysis of public space in sensory research. The adoption of a more qualitative analysis with in-situ interviews is important and this is acknowledged by research participants themselves, one of whom observes that it is necessary "*to be forced to communicate our perceptions [as it] increases our awareness of sensory perceptions in a place*" (Interviewee PM).

7 Conclusion

It's... it's a movement zone, it's not meant to be an area to stay. It's just to eat and walk, or to buy and walk, or to catch the bus. And I have to be there waiting for the bus, and because it's raining, hey, it's a problem, because I don't have cover, or I go inside, or...well, it's an annoyance (Interviewee PM).

This chapter discusses the main outputs from the research in relation to the research questions and objectives stated in the Introduction while reflecting on some of the current gaps in urban planning and design literature. Under the theme of urban studies and aim at bringing a more empirical contribution to urban design knowledge, were four aims:

(1) To address the dominance of the visual in urban studies through conducting a multi-sensory analysis of space. To address this point, the investigation adopted a methodology of street users' in-situ experiences to demonstrate the importance of the non-visual senses in their sensory perception, and consequently in how that perception relates to their decisions regarding the use of public space. Nevertheless, the presence of visual cues in the descriptions from participants demonstrates the challenge of a non-visual analysis when participants keep their eyes open;

(2) To achieve a better understanding of the characteristics of the sensescapes of a space. This was an important focus of the investigation, as the selected methodology with in-situ interviews supported a combination of outputs that result in the creation of a framework of analysis that explores a set of dimensions to be explored when trying to understand the complexity of place-based sensescapes;

(3) To investigate human interaction with the urban realm through the senses. This investigation used participant's descriptions to identify and categorise elements of the urban realm that influence sensory experiences, and in so

doing explore the role these play in those experiences and how the relationship between sensory stimuli influences sensory perceptions in different ways; and

(4) To support the urban design and planning sector in the (re)creation of more sensory fitting urban spaces. This last point is achieved through a multiplicity of elements. The methodological approach, the categorisation of the urban realm elements, the discussion of their levels of manageability and finally, the framework of analysis, will offer urban designers and planners a structure that supports the understanding and analysis of the complexity of sensescapes. These aims were explored in an empirical way to address their potential use by those influencing the design of public space.

The four objectives are related to three research questions, the first exploring (a) the multi-sensory characteristics that people experience when using urban public space; the second examining (b) the role of the urban realm in mediating those experiences; and finally, the third trying to understand (c) how this knowledge can contribute to urban planning and design.

This investigation examined the relationship between the urban realm and the individual through a multi-sensory approach. It focused its analysis on the case-study area of Bishopsgate in London, an area of the city that includes a unique variety of urban morphology types and land uses within walking distance of one another. One of the distinctive characteristics of this research is in the combination of variables that are considered, in particular, the integration of three non-visual senses (sound, smell and touch) while exploring the comprehensive and complex system behind the sensory perception of urban space (element characteristics, space characteristics and perception, and the individual). This included the analysis of the positive, negative and also neutral qualities of the space. The final output is a framework of analysis that challenges the oversimplicity of existing definitions of sensescapes, highlighting the need to incorporate sensory analysis into current urban policies and offering a comprehensive, adaptable tool that can be used in urban design and planning research and practice.

This study also integrated a powerful and user-centred alternative methodological approach – based on methods developed by scholars and their

work as Adams (2008), Thibaud (2013) and Bruce et al (2015) – which promote the total immersion of participants and the researcher in the case-study area. This is an approach that exploits an embodied multi-modal experience, enriching the participants' descriptions of their experiences while they are experiencing it. Participants were requested to pay attention on purpose to what they were experiencing live and in a particular location. This approach directly informed the choice of the analytical method, which was to explore the verbal content of descriptions given by respondents and to examine the language and expressions they use (Dubois, Guastavino, and Raimbault 2006; Raimbault and Dubois 2005). A method that enabled a more comprehensive and in-depth understanding of the structure and complexity of the sensescapes, and of how individuals perceive and react to them.

This investigation, therefore, challenges the prevailing and simplistic definition of sensescapes and develops a framework that more accurately represents sensescapes, transcending existing work presented by Wankhede and Wahurwagh (2017), Sarıbaş, Kömürcü, and Güler (2017) and Rodrigues et al. (2019). This framework highlights the need for a better definition that reflects the complexities of sensescapes and a more comprehensive, but flexible, approach to the sensory analysis of urban public space. The creation of an open and adaptable framework of analysis helps us to describe and categorise the different dimensions of the sensescapes. At the same time, the study of the nature of the elements and their role in promoting and mediating sensory experiences emerged as being something that is fundamental for research and effective practice and policy going forward. Acknowledging the different levels of manageability of the elements can support prioritisation and decision-making in the (re)design of urban space and help to achieve a more enjoyable and inclusive public space for all.

This research is framed by its methodology and the three subsequent stages of analysis, covered in Chapters 3 to 6. It is only through considering the results from across these chapters that the thesis can respond to the research questions and existing gaps in the relevant literature. The outputs of these chapters are the four key pieces of the final framework of analysis (as illustrated in section 7.1). Chapter 3, on methodology, introduces the urban realm

elements that form the basis for analysis and provides one of the sub-sections of the framework. Chapter 4 presents a detailed depiction of the sensescapes through the descriptions provided by research participants and focuses on understanding what are the elements and characteristics that promote sensory experiences. Chapter 5 explores the mediation of the relationship between the human and space through the senses and investigates three sensorially diverse areas, classifying the most relevant elements and characteristics that create different qualities of space. This chapter acknowledges the elements that have greater relevance in these spaces and highlights conditions that can create positive, negative and neutral sensory qualities of space. The last analytical chapter, Chapter 6, aims to improve our understanding of the impact of the sensescapes on individual perception and behaviour. Consequently, Chapters 4 and 6 explore the multi-sensory characteristics that people experience when using public space (first research question) and Chapter 5 investigates the role of the urban realm in mediating these experiences (second research question). The process and results of these analyses combined lead to a framework that can be adapted and used for other spaces.

This final chapter, Chapter 7, is organised in three sections. The first introduces the full final framework of analysis resulting from the analysis presented in this thesis. The second section summarises the main outputs and contributions of the study and discusses them in the context of academic literature and theory, reflecting on the contribution this research can make to the field of urban studies and urban policy. The final section discusses some of the limitations of this research and highlights future research opportunities. A concluding section closes the arguments.

7.1 The framework of analysis

Though there is an important set of literature addressing the bias of the visual and exploring sound, smell and touch in public space, bringing debates and arguments to the field, and shaping empirical studies through their in-depth and detailed exploration of each sense, these still tend to separate the senses and miss the multi-layered complexity of analysing public space. A mono-sensory

and incomplete perspective, and of restricted use for planning and urban design policy and practice. This simplicity is challenged in this investigation through the analysis of the triangular relationship between humans, urban space and the senses. This research reveals a more complex picture and points to where the existing definitions could be changed to better reflect reality. The exploration of the different guises of the sensescapes concept will also allow the creation of a more comprehensive framework of analysis that can be adapted and adopted to other urban public spaces.

A framework that explores and "*identif[ies] components and subsystems of urban spaces, while understanding its sensory experience*" (Wankhede and Wahurwagh 2017, 742) in a comprehensive and multi-sensory way. The framework of analysis includes four clusters that fully integrate the space and human factors into the sensory analysis and represent a deconstruction of the sensescapes in their different dimensions. It aims to present greater depth and structure than found in other recent similar studies (Wankhede and Wahurwagh 2017; Rodrigues et al. 2019; Sarıbaş, Kömürcü, and Güler 2017) and ensure a focus on multi-sensory perception, rather than on a single sense (Piga and Salerno 2017; Adams 2009; Agapito 2013).

The first dimension of analysis, related to the element's characterisation of the sensory experience (what people perceive), was explored in Chapter 4. The second and third, representing the geography of the sensory experience (how people perceive it) and the characterisation of the space (the urban realm elements and how these mediate the sensory experience) were part of Chapter 5. Finally, the individual experience (what is the meaning of an experience) emerged in Chapter 6. Focusing on three non-visual senses the analysis leads to a deeper understanding of the importance of each of these senses (sound, smell and touch) as well as some of the inter-dependencies between them. The resulting framework and graphic tools presented in this study tackle the challenge of representing non-visual sensory research in a visual format. In overcoming this difficulty, our understanding of what can be a complex analysis is facilitated by transforming the research findings into a structured set of clear visual diagrams.

This analysis revised our understanding of the characteristics of the elements, including categories that go beyond designation and qualities (Guastavino 2006), while organising and including other factors, such as dominance, continuity, diversity, doubt and absence, for example. Some of these are already mentioned in existing literature (Table 10) but they are not structured and organised in any comprehensive way. Without knowledge of how these different factors contribute to the sensory stimulus, it is not possible to fully understand the variants that influence sensory experiences. With this information, however, this study can recognise that some elements influence sensory perception directly (as elements source) and indirectly (as promoters or barriers).

The analysis also explored the role of the urban realm in mediating sensory experiences as another dimension and does this through a more in-depth investigation of the space characteristics (elements, their features and interactions) that considers the negative, positive or neutral impact they have on sensory qualities. This is an approach that has been missing in urban studies (Adams et al. 2006; Rapoport 1977; Carmona 2004). It acknowledges the impossibility of a correlation between space characteristics and sensory qualities but finds clear patterns and links between some elements, space qualities and human behaviour. At the same time, it recognises the ambivalence that some elements present when perceived (e.g. crowds were perceived as positive and negative elements). It finds that sensory neutrality seems to relate to a low variety or absence of elements, negativity to dominance and intensity, while positivity is connected to equilibrium, provides a richness of sensory (language) descriptions and is principally linked to space appreciation and desirability to stay in a location.

Being a non-visual, multi-sensory study but one in which the research participants have their eyes open, as they would in their normal behaviour when in a public space, it is possible to recognise the constant presence and importance of visual cues that are contained within participants' responses (Rodrigues et al. 2019), even when the focus of a question is deliberately non-visual. This improved understanding of how the urban ream mediates sensory experiences, together with the understanding of the structure of the elements

within the urban environment (degrees of permanence, temporality and naturality), facilitates an examination of their levels of manageability – knowledge that can lead to better decision-making and prioritisation during the process of (re)designing public urban space.

Finally, this study acknowledges that sensory experiences have meaning for individual humans; the different impacts that sensory experiences create are reflected in how people describe them and the ways in which they respond to them. Therefore, investigating types of expressions, judgements and adjectives are crucial in order to achieve a better understanding of how the senses impact individual behaviour. The full framework of analysis with its dimensions and categories is presented next in Figure 82. The diagram encompasses four sections, each equally important in the analysis of the sensescapes of urban space. Although there is no hierarchy between the four sections, starting from the centre of the figure there is an internal hierarchy in each section, given by the size of the circles and the level of connections that emerge.

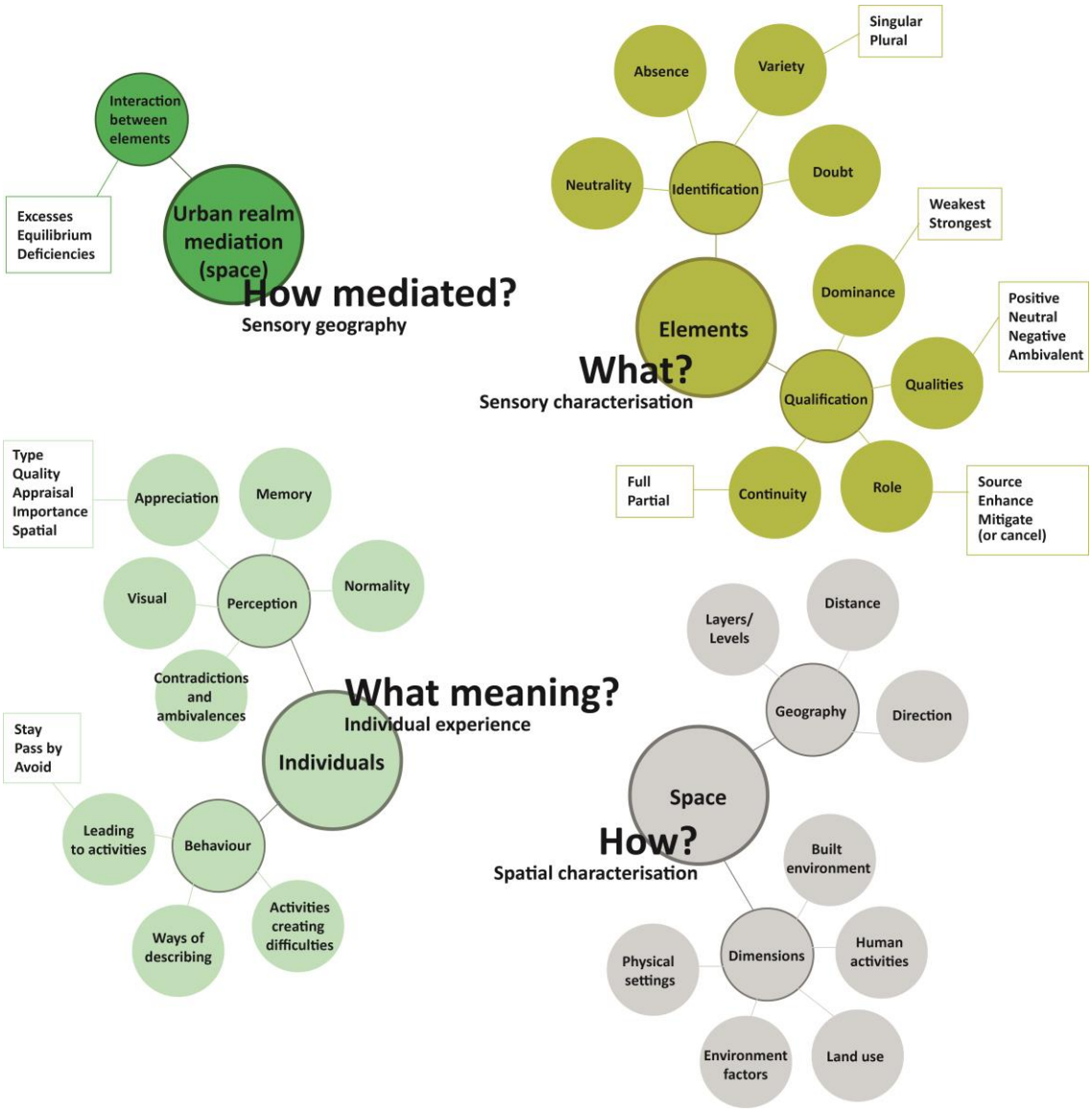

Figure 82: Final framework of analysis - sensescapes of an urban space.

To effectively analyse the concept of the sensescapes of a space, a set of four dimensions should be explored. Each dimension broadly represents the answer to a key question: WHAT, HOW, HOW MEDIATED and WHAT MEANING? These focus on the analysis of the triangular relation elements-space-individuals. More specifically, on the identification (the characteristics of the stimuli), mediation (spatial geography and the characterisation of the space) and impact (with the subsequent individual experience) as described in Figure 17 in Chapter 3 methodology.

These four dimensions establish a pathway that can be followed to achieve a better understanding of the sensory landscape of space. However, in doing so, it is important to understand the relationships between some of these dimensions and categories across the different senses, as a comprehensive sensory awareness can only be achieved when the complete knowledge of the set of characteristics is fully reached.

This framework intends to be comprehensive and sensory-inclusive, but this does not necessarily mean that all the categories that it presents apply to all the senses. As it happened with the sensory elements as per analysis in section 4.5.2. As this research aims to explore the multi-sensory characteristics of the sensescapes, the relationships between the identified categories and the different non-visual senses is an important factor to investigate. Consequently, this investigation also presents a comparison between descriptions relating to three individual senses (sound, smell and touch) and underlines which descriptors are common to these senses. A first attempt to do this is presented below. As with the final framework, also the list of categories is not intended to be exhaustive, as they can only represent the information collected through the sample of interviews conducted in the case-study area of Bishopsgate. Instead of aiming for a complete list of categories, this analysis seeks to establish an empirical base for discussion that recognises that not all the categories that have been identified apply to all senses – an important factor to consider in both mono-sensory and multi-sensory analyses.

From the analysis of which categories would apply to which senses, two main classes are defined: inter-sensory and intra-sensory. The **inter-sensory** class comprises the categories that are common to two or more senses, as identified from the respondents' sensory descriptions. These are present in four main dimensions (i.e. built environment, human activities, land use and environmental factors). When exploring the relation to the mediation of space, touch seems to be excluded from the geographic description of the characteristics of space, which only relate to two senses, sound and smell – as touch can only be perceived through direct contact, which requires no distance. Distance and direction, for example, are characteristics that were also only common to sound and smell. However, it is important to highlight that not all

sub-categories within the framework can apply to two or more senses and, therefore, not all sub-categories are inter-sensory. The second class is defined as **intra-sensory**[39], corresponding to categories that are unique to only one sense. This class reveals how specific some characteristics can be to one sense, and consequently how some sensory experiences can be promoted or cancelled out through the management of a single sense.

An example of an intra-sensory category is that of absence, in which the use of the word "*nothing*" seems to relate to smell. "*Nothing really at the moment. Generally you often get smell of drains*" (Interviewee 18). Smell is the only sense that can be absent from descriptions of urban environments, especially in a city such as London. The "non-existence" of a sense can reflect cases where repeated exposure to odours can induce habituation and lack of perception, or spaces where concerns about sanitation lead to the nullification of sensory characteristics through specific regulations (e.g. pollution, odour control). It would, however, be difficult to cancel out senses such as sound and touch in urban space, which occur regardless of location, culture and policy.

The inter-sensory categories (common categories) are those related to the elements, identification, variety, and qualification as well as to characteristics of space mediation and, finally, the individual experience, which includes ways of describing perceptions, appreciation and the use of visual cues. Reference to visual cues is one of the most paradigmatic categories as it is fully inter-sensory, referenced in relation to all three of the analysed senses (sound, smell and touch) and is directly related to a fourth sense, vision, which reinforces the current dominance and importance of this sense in urban studies, practice and policies. "*Visual impact. Visual impact as I think that in this situation, always marks the experience we have of this space. I can try to close my eyes and have another kind of experience, but in a city...[people] don't walk with your eyes closed"* (Interviewee GP). Of the three senses analysed here, however, the intensity of the use of visual cues is much greater when describing touch than when talking about the other two senses. This occurred because

[39] The concepts of inter-sensory and intra-sensory also apply to the elements as explored in section 4.5.2.

respondents often refer to the textures of buildings and façades when asked to describe their haptic experiences, apparently forgetting that the exteriors of the building are not usually directly experienced by touch in 'normal' use of public space: "*The bullet building (Gherkin) here on my left makes the rest of the space interesting. It makes you wake up to a succession of different materials that are around here from brown glass with stainless steel, or iron, to cement and even brick, to the cleanest glass of the 21st century bullet (building)*" (Interviewee FA).

Of all the senses that interviewees are asked to describe in this study, touch seems to be the hardest stimulus to understand, describe and explain. Here, vision often takes over as the preferred mode of understanding and expression. Some participants also mentioned, "*I don't go around touching things in the street*" (Interviewee 9) forgetting the complexity of the haptic sense. A sense that in its conceptualisation, included the tactile, thermal and kinetic. In contrast, smell is the sense that appears least related to visual identification; here, participants seem to have fewer doubts and problems in identifying and describing it. 'Doubt' is an identified category that relates specifically to smell and sound – where participants may have had doubts about what they were touching or feeling their eyes were instead able to compensate and identify an element through vision. The visual sense also emerges when a space characteristic is expressed through the use of a colour reference, for example, descriptions of green spaces rather than vegetation are very common results. Finally, visual cues and visual characteristics are also used to support an individual's perception of safety: "*Cold. No [not comfortable] ...today is cold. Now's cold. In visual terms it doesn't give you a strong sense of safety…it seems a bit unsafe, I think…it has no people, not many people walk through here, and also, it has no much sound besides some works. It's too silent, also too narrow, it's tight, it's old*" Interviewee PM.

This analysis supports the understanding that senses can be perceived differently, and that the urban realm promotes different experiences. The dominance of the inter-sensory descriptors highlights the importance of multi-sensory research of the urban environment to ensure that information is not overlooked. The framework of analysis presents itself as a deconstruction of the

elements of the sensescapes of a space. This concept is not dissimilar to an artwork: the street space shapes the sensescapes just as the material of a canvas gives texture and intensity to the brushstrokes applied to it. Similarly to how an individual responds to a painting, the sensescapes give meaning to and enhance the street environment and cause a reaction in those experiencing it. An understanding of the contextual setting is necessary to grasp what is taking place; in the case of a street, this means its urban realm needs to be explored. Only through the exploration of alternative methods can awareness be raised so that the non-visual senses can become more 'visible'.

7.2 Key findings

The contributions of this research include:

(1) The direct results from the multi-sensory analysis of public urban space, in particular from Bishopsgate in London;

(2) The use of a set of innovative methods of data collection inspired by authors such as Pink (2008b), Adams (2008) or Degen and Rose (2012), to cite just a few. These methods provide new forms of analysing the impact of non-visual multi-sensory (and not mono-sensory) experience, and go beyond the classic observational approach; and

(3) The creation of a framework of analysis that facilitates future exploration of the sensescapes through its different dimensions (see also section 7.1). The framework of analysis creates a baseline for further academic discussion, and promotes an empirical tool for use in future urban development, or to be explored within the fields of environmental psychology, sensory analysis, urban design and spatial planning. A user-centred framework designed with users and for users.

These contributions not only add to the academic literature in the fields of urban design and planning but also support aspects of analysis and research, practice and policy (i.e. design codes and policy making). Nevertheless, the multi-sensoriality (excluding the visual) approach of the research, and the comprehensiveness of the method designed (which includes the analysis of

divergent qualities of space) are key outputs. This investigation of the sensescapes of space challenges some of the current simplistic definitions and seeks to redefine and restructure its knowledge in order to better control and understand the different factors involved in the creation of urban sensory landscapes. This was the main challenge but also the biggest motivation for undertaking this research.

At the starting point of this investigation there were four main aims identified: (1) overcome the visual dominance in urban studies through a multi-sensory analysis of space; (2) achieve a better understanding of the characteristics of the sensescapes of a space; (3) investigate the built environment – human interaction through the senses; and (4) help urban design and planning professionals to (re)create more sensory fitting urban spaces. These four aims led to three research questions that have been addressed within the different chapters of this dissertation. The first, principally explored in Chapter 4, was the exploration of the multi-sensory characteristics of what people experience when using urban public space. This provided the opportunity to explore the sensory realm through the way people perceive public space, using a multi-sensory approach that included sound, smell and touch. The uniqueness of the methodology enabled the analysis of verbal data, demonstrating the complexity of the sensory analysis and graphically exploring its patterns through the visualisation of the sensory responses to the Bishopsgate case-study area. This permitted the structure of the first section of the ‘Sensory Characterisation’ framework, which is based on the urban realm elements and their characteristics.

The second research question, mainly addressed in Chapter 5, investigated the role of the physical environment in mediating these sensory experiences (positive, negative and neutral). This looked beyond the designation and quality of the urban realm elements and established a better understanding of how they mediate sensory experiences. From the analysis of divergent qualities of space (spaces dominantly assessed as negative, neutral and positive) it was possible to understand how the elements within the contextual conditions around them, appear to influence sensory perception and how the qualities of sensory experience relate to the different types of space use. This complemented the

framework of analysis with the ‘Sensory Geography’ and ‘Spatial Characterisation’ sections of the framework, exploring the characteristics of the space.

The final research question, mainly addressed through the combination of the core analytical chapters (including Chapter 6, with the analysis of the impact of perception on space users), considered the contribution of the research to current and future urban planning and design practice. This question on its own could warrant another PhD. Nevertheless, the methodological approach with its immersive, in-situ semi-structured interviews has demonstrated the need for a more user-centred approach in urban planning and design as it sheds new light on the whole process of sensory research. It is a process that may require further user engagement so that it can be adapted and replicated across other spaces and build a more extensive source of information for policy makers. The alternative method and the resulting framework of analysis created for this study are privileged tools that can create new knowledge and contribute to spatial planning and urban design in a more sensory fitting way. Finally, Chapter 5’s exploration of the nature of the elements and classification of them was done in such a way as to support researchers and policy makers in identifying and prioritising management interventions within the urban environment.

7.3 Key contributions

Having introduced the main findings from this study, this section provides greater detail about some of the key contributions of the investigation. These are methodological, as they add to and refine the existing methods of sensory analysis; theoretical, as they challenge existing concepts and present new frameworks of analysis, providing a new structure and approach to thinking about the sensescapes of a place; and, finally, empirical, as these comprise a set of new findings based on a systematic approach. The study of Bishopsgate provides new insights into human behaviour and its relationship to space through the senses.

Methodological

The adopted method is based on a user-centred approach and qualitative analysis of public space. It introduced the sensewalks and sensetalks, two methods of data collection that required immersive in-situ semi-structured interviews with participants and the researcher on location. The immersive experience provided participants with a more comprehensive awareness of the urban experience and enabled them to give more detailed descriptions of their sensory perceptions. At the same time, the variety of the participants, which included people familiar with the space as well as visitors, introduced a range of aspects to the responses that included, for example, memory, as well as greater openness to the less common sensory stimuli. The presence of the researcher allowed for a better understanding of the responses – the format enabled follow-up questioning, if and when needed – and meant that the absence of an element in a participant's description could be noted.

These are flexible and adaptable methods that can easily be adapted or replicated to fit any other urban space, giving urban planners and designers the opportunity to gain a better understanding of how people experience public space. The detailed analysis of the participants' responses (from a total of 50 short and long interviews), through examination of the language and semantics of how people express their perceptions, achieved a level of detail that would not have been possible using a more quantitative approach. The methods used here have resulted in a broader understanding of the concept and meaning of the non-visual sensescapes of a space. Such awareness can only be achieved through alternative methods that help the non-visual senses to become more 'visible'[40]. In addition to the distinctiveness of its methodological approach, this research also brought important outputs that provided guidelines for a more sensory design and planning.

Theoretical

One of the key challenges of this research is related to the idea of a sanitised and hygienic city of the future; the notion that human senses must be combated

[40] The word visible is used here on purpose, to highlight that non-visual senses might be as relevant (and in some cases, more relevant) than sight, in the way they influence public space use. This is also a direct reference to the title of the literature review (chapter 2).

and masked in the urban space. This research hoped to illustrate that pursuing an absence of stimuli is not necessarily the right future direction and that there are consequences for individual behaviour and space use. As demonstrated in this study, street users do not necessarily appreciate spaces that are neutral or lack a variety of stimuli. This research also suggests that rather than erasing stimuli, urban planning and design approaches should better understand how the sensescapes work and, consequently, how to better manage them. It is hoped that the combination of analyses in this investigation, the practical multi-sensory framework of analysis (see section 7.1), and the data generated through the interaction between humans and space will provide value for urban design and planning practice.

Empirical

The main empirical contributions made by this investigation relate to the exploration of the case-study area of Bishopsgate, which has provided new insights into the relation between space characteristics, space use and user behaviour. As Nick Tyler mentions *"We should think about how to make cities for everyone, this means employing the full range of cognitive, physical and perceptual variety so that everyone can create the city they want, every time they experience it."* (Camargo, Artus, and Spiers 2020, 4).

This research also highlighted spatial patterns, continuities and the uniqueness of some sensory stimuli (elements), providing, through a set of graphic visualisations, a better understanding of the intensities of elements related to the built environment, human activities, land use, environmental factors and natural settings encountered along the case-study route. It also drew attention to the fact that positive, negative and neutral spaces are not only dependent on the existing type of elements but also on their interrelation. Finally, it introduced a management classification identifying the nature of urban elements, which is aimed at guiding and supporting relevant decision-making and policy making.

7.4 Future research agenda

The suggestions for a future research agenda should focus not only on the limitations identified throughout this research but also on using the outputs and

knowledge of this investigation as a starting point to initiate new strands of investigation, strands that take forward or add to the main outputs of this study. Eight research proposals are presented below.

Collecting additional in-depth data

Applying the same methodology of analysis to particular groups of society could also be interesting. Focusing on different age groups, ethnic groups, a particular gender or people with sensory disabilities. This research has only focused on engaging people familiar and not familiar to the space and aimed to engage the Bishopsgate space users. By including additional, alternative groups to the existing sample of participants, the current results could be complemented or focused through different perspectives. Finally, applying the framework of analysis to the same location, or different locations, under different weather conditions, days of the week or times of the day (e.g. exploring nighttime experiences) could also be a fascinating opportunity. This analysis could use as a starting point for some of the data already collected during the case-study area interviews and analysis.

Undertake a deeper multi-sensory analysis of urban space

While most academic work explores one sensory mode, this investigation has expanded the multi-modal analysis of urban space through the exploration of patterns, interactions, differences and commonalities. Although this can be considered a comparative multi-sensory analysis, it still has the limitation of not exploring in greater depth how the different senses can interplay. Some attempts were made in a few sections, and in particular in chapter 5. In future research, a better understanding of how these are integrated and interact to promote different atmospheres (see Lucas and Romice (2008)) would be beneficial in establishing how one mode can affect or influence the other and change the nature of place perception. This analysis would be supported by the knowledge already collected, in particular in Chapter 5, the framework created in this investigation and the focus on the interactions between the senses.

Complementing with a quantitative approach or other more visual methods

Although this research introduces the dominant quantitative focus of most sensory analysis as being a limitation of sensory research, activities to record and measure either sound and smell (or both) could complement this study, while also confirming or challenging some of the results. Adding a quantitative element could help to measure and better understand differences in intensities, and question the idea that sensory intensity results in poor quality of space. Another idea related to a more quantitative approach would be to add a proper statistical sample to the analysis of the sensescapes of Bishopsgate. In this case, with the use of a survey, a representative statistical analysis of what people experience in public space could be achieved and this could be used, again, to confirm or challenge existing results. Or it may even add new results if other elements emerge and influence change in respect of the current outputs. In this case, however, attempts to compare, confirm or confront the current results might prove limited as London, like many other cities, experiences continuous renovation and changes to its urban areas. With buildings being demolished or constructed all the time, such urban areas are in a state of continual transformation.

Finally, the use of other more visual qualitative methods, such as photography and video (see for example Pink (2007)), could be used as tools for research and sensory education. These visual methods could offer new lenses through which to consider the current outputs, complementing and illustrating the impact of sensory experiences in everyday life. These can be explored comparatively, focusing on different case-study areas, even areas from different cities or countries. Or a more historical approach may be taken, focusing on one area and using archival material to illustrate changes that have occurred.

Using the created framework for a comparative approach

One of the main outputs of this investigation is the framework of analysis – and the hierarchical structure that it establishes – that applies to the exploration of sensory environments. Adopting this framework and method for use in another location could confirm the adaptability of this study's method. This framework

can serve as a baseline for comparison with other locations, or the same location in a different moment in time. This would also permit the consolidation of the framework and methods of analysis while exploring the sensory landscapes of another place; perhaps a simple comparison between spaces or a comparison between locations of particular qualities. It would be also interesting to undertake a more detailed analysis of spaces that are dominantly positive or negative in their qualities. This would complement this current research and consolidate the new knowledge it offers on how the urban realm mediates sensory perception and, in particular, the positive and negative sensory qualities of space.

Impact of technology on sensing public space

As digital technologies already dominate individual life and are becoming increasingly important in social relations, a discussion of how public space is mediated by technology and its impact on the individual is important. New digital experiences can turn the individual into a passive receiver of what technology has to offer and while digital technologies and social media can improve individual and social interaction they can also alter or remove the full sensory experience of a place. As public space becomes more and more mediated through technology and becomes increasingly weighted towards the visual culture, investigation in this field is important.

Exploring the non-visual aspects of visual media

The need to explore hapticity or other non-visual aspects of photography and film often described as “Haptic Visuality”, has been raised by authors exploring visual media (Royer 2019; Marks 2000). The analysis of how non-visual senses connect to sight is however still mostly related to haptic reactions. Consequently, a more comprehensive multi-sensory exploration of how images are experienced could be an opportunity for future research.

Creating better spaces for all

This study’s framework of analysis can be explored to create better spaces for people with disabilities, poor mental health or neurodiverse people. Working in collaboration with one or more of these groups would focus on their sensory

experiences and highlight the key elements that may need to be addressed through making improvements or changes in public space. This would raise awareness of some of the challenges that different groups face in public space, and contribute to relevant social, spatial and health-related policies. This would require higher levels of social engagement and participatory methodologies: design with people for people.

This would be an opportunity to highlight the importance of awareness and prevention of mental health issues through public space. Helping prevent or manage mental illness by building more valued and adapted public space. Tackling ongoing mental health inequalities in cities and within cities through the analysis of urban public space design. Trying to better understand how health and public space connect.

Towards more Sensory Oriented Design

Sensory Oriented Design can challenge and confront the increasingly popular idea among policy makers and space managers of sanitisation and 'hygieneisation' of the urban realm. It requires a confrontation between policies and the user experience in order to introduce a more sensory-inclusive approach to planning and design. Based on TOD - Transit Oriented Design principles (i.e. walkable communities, compact planning and design, etc.), a more detailed exploration of the sensory presence in current policies and design codes could lead to better integration of the sensory analysis in future policy and design changes and acknowledge the importance of the sensescapes on public space use and individual behaviour. Following the idea of spaces with contrasting sensory levels related to specific planning areas. The aim of new research here would be to understand how the elements may be manipulated to promote different sensory environments and to (re)design urban spaces accordingly in more sensory fitting new ways that add to the identity of a space and create a sensory sense of place.

COVID-19 impact on the sensory experience of space

As this thesis is being completed during the COVID-19 pandemic, some of the premises on which it was based and outputs highlighted during this investigation may have changed (temporarily or permanently). Studies have

lately emerged exploring the impact of COVID on urban life and urban design (Sepe 2021; Stevens, Tavares, and Salmon 2021), but more research is necessary to fully understand the role of key factors, such as changes in human density and car traffic, on highlighting and/or masking other sensory experiences in urban space. Therefore, a multi-sensory study of the impact of COVID-19 and in particular of the effect of the lockdown measures on public space use and its impact on sensory experience, would contribute to knowledge around the importance of the non-visual senses on urban life and personal interaction (with physical distancing, touching and smelling becoming harder and potentially having an impact on social purpose and interaction).

Summary

These proposals for future research include pieces of investigation that build upon the findings of this research, address some of its limitations, re-assesses the framework of analysis through a comparative approach or expand into other demographic groups (age, gender or health-related) and or cultural settings. COVID-19 was added due to the impact it has had on how people live and experience public space.

7.5 To conclude

This research is aimed at understanding how the non-visual senses influence the use of public space, the space where most city life happens. Non-visual sensory experiences frame how people understand the environment surrounding them and, therefore, should be central in the design of public space. The intention was to recognise the importance of the non-visual senses, and to further articulate and explore the impact of sensescapes on the individual. In doing this, it is hoped to influence the planning and urban design disciplines – practice and policy – by creating a methodological and empirical approach. One that disaggregates the concept of sensescapes into different components; from a conceptual description, to “mapping” and structuring. A methodology that, like the research, needs to include people’s engagement and takes into account the sensory landscapes of the wider community when decisions are made. A tool for a more comprehensive understanding of, for

example, what makes one space feel different from another through the interplay of body, senses and urban environment. Ultimately, all this impacts our individual and collective sense of place.

To conclude, the research provides the basis for further related studies in planning, design and sensory studies as well as many other related fields. While helping inform practice, promote awareness, and instigate public debate around the role of the non-visual senses. This could be extended and potentially developed to facilitate the creation of normative regulations on the non-visual senses, particularly given that the initial interest came out of a gap in the planning and design process that needed to be filled. Accessing the sensory impact of design alternatives can contribute to more confident decision-making. Moving design from the (aesthetic and functional) configuration of space towards the creation of a place attachment: "*I would happily have my lunch here, it wouldn't be my favourite spot, it would just be a very functional, nice place, not unpleasant, quite safe. I feel, not entirely relaxed, but I don't feel stressed or bothered by this place at all*" (Interviewee LN).

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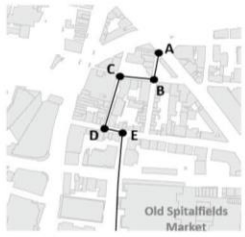
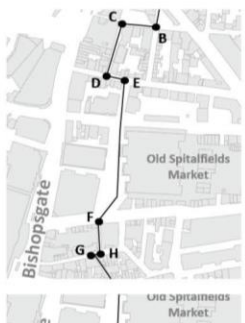
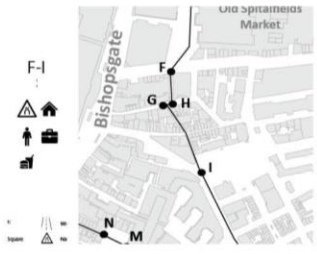
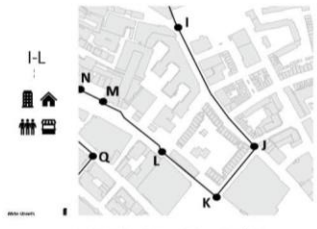
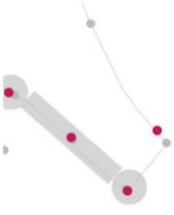
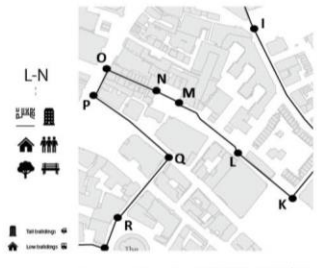
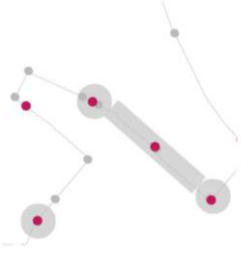
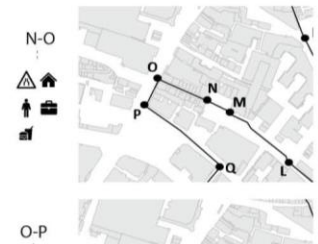
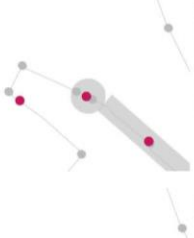
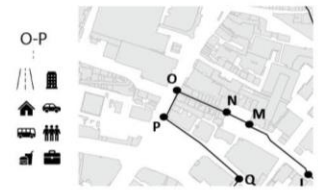
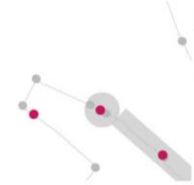
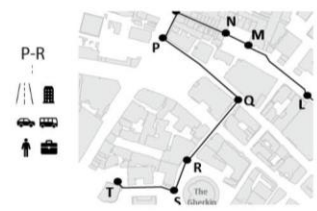
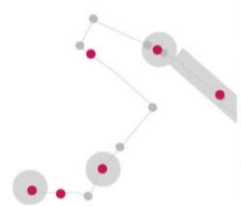
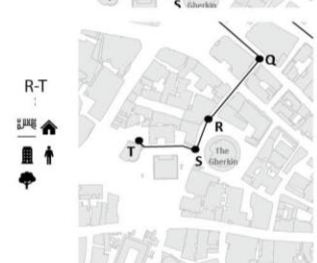
9 Appendix

This summary table (Table 20) provides a short compilation of the key comparable characteristics of the different route locations. This was a result of the researcher's own observation and survey. The table uses the same group categories defined in the urban realm elements framework to facilitate its integration in the analysis (i.e. morphology, land use and human activities).

Table 20: Area characteristics.

Case-study area			Characterisation		
Sections	Aerial view	Open space & seating	Urban realm & environment	Human activities	Land use
A-E 			Frontages not active Street Street pattern B-type Pavement type A Direct connection to a main street [A-B/D-E] Not directly connected to a main street [B-C/C-D] Minor street Average of 3-storey buildings [A-B/D-E] Average of 4-storey buildings [B-C/C-D] Irregular pavement (road and side paths) Car parking allowed [A-B/D-E] No car parking allowed [B-C/C-D] Orientation N-S [A-B/C-D] Orientation E-W [B-C/D-E]	Car traffic area Enables efficient movement of people and goods Sporadic pedestrian movement [A-B/B-C/C-D] Sporadic human activities although the pub and museum can promote some intermittent (higher) Pedestrian movement [D-E] Large rubbish bins [C-D]	Mostly offices but also residential on one side of the street [A-B] Offices [B-C] Offices and warehouses [C-D] Offices and residential [D-E] Creative industries area (design, clothes, etc.) [B-C/C-D] Pub in the end corner of the road [C-D] Pub in the starting corner; museum house on the right side of the street [D-E]
E-F 			Active frontages Water source Vegetation Art elements Birds Temporary events along the year (music, art, etc) Street, Path and Square Covered structures Street pattern C-type Seating areas Pavement type B Not directly connected to a main street Pedestrian area Regular pavement Irregular height of buildings No car parking allowed Orientation N-S	Encourages environmental sustainable transport modes Proximity to the Old Spitalfield market Temporary market areas in spring and summer Temporary open air activities in spring and summer Sporadic activities during the rest of the year High density of people seating and walking	Office buildings with retail at the ground level (Restaurants and Cafes, Shops, etc.)
F-I 			Frontages not active [F-G] Active frontages [G-H/H-I] Street (mainly a crossing) [G-H] Street [F-G/H-I] Street Pattern B-type [F-G/G-H] Street Pattern A-type [H-I] Average of 4-storey buildings Not directly connected to a main street [F-G/H-I] No car parking allowed Mews lane [F-G/H-I] Part of the historical area [H-I] Minor street [G-H] Orientation NS [F-G] Orientation EW [G-H] Orientation NW-SE [H-I]	Car traffic area Intermittent (higher) pedestrian movement	Offices [F-G] Offices and retail [G-H/H-I] Religious building [H-I]
I-L 			Active frontages [I-J/J-K] Half the area with Active frontages and second half with frontages not active [K-L] Not directly connected to a main street [J-K/K-L] Street Street pattern C-type Seating areas Minor street [J-K/K-L] Irregular height of buildings Transverse street Orientation NE-SW [J-K] Orientation NW-SE [I-J/K-L]	Enables efficient movement of people and goods Car traffic area Petticoat Land market on Sundays Intermittent (higher) pedestrian movement [J-K/K-L] High density of people walking [I-J]	High density residential area, offices, and retail at the ground level (Restaurants and Cafes, Shops, etc.) Offices, retail and residential [J-K/K-L]
L-N 			Active frontages [L-M] Frontages not active [M-N] Square/Garden area [L-M] Square [M-N] Stairs and Ramps Vegetation [L-M/M-N] Birds Path Street pattern C-type [L-M/M-N] Irregular height of buildings Average of 5-storey buildings [M-N] Not directly connected to a main street [L-M/M-N] Pedestrian area [L-M] Seating areas[L-M/M-N] Orientation NW-SE [L-M/M-N]	Car traffic area [M-N] Intermittent (higher) pedestrian movement [L-M] High density of people seating and walking [M-N]	Offices and retail [L-M/M-N]
N-O 			Active frontages [N-O] Street [N-O] Street pattern A-type [N-O] Irregular height of buildings Average of 4-storey buildings [N-O] Directly connected to a main street [NO] Pedestrian area [N-O] Orientation NW-SE [N-O]	High density of people walking [N-O]	Offices with retail at the ground level (Restaurants and Cafes, Pubs, Shops, etc.) [N-O]
O-P 			Active frontages Street Street Pattern C-type Main Street Irregular height of buildings Orientation N-S	Intensive car traffic area Public transports traffic area Intensive pedestrian fluxes High density of people walking	Offices and retail (restaurants, cafes, shops, etc.) Religious building
P-R 			Active frontages [P-Q] Half the area with active frontages and second half with frontages not active [Q-R] Street [P-Q/Q-R] Street pattern C-type [P-Q/Q-R] Seating areas Covered structures [Q-R] Transverse street [P-Q/Q-R] Location of a bus stop Average of 6-storey buildings [Q-R] Orientation NW-SE [P-Q] Orientation NE-SW [Q-R]	Car traffic area [P-Q/Q-R] Esplanade in the middle corner [Q-R] Public transports traffic area [P-Q] Presence of works (building site) [P-Q] Intermittent (higher) pedestrian movement [P-Q] High density of people walking [Q-R]	Offices and retail [P-Q/Q-R]
R-T 			Active frontages [R-S] Frontages not active [S-T] Starts with narrow path (between the buildings and the parking entrance rails) [S-T] Vegetation [R-S/S-T] Ends in a square [S-T] Pedestrian area [S-T] Street [R-S] Street pattern C-type [R-S/S-T] Transverse street Seating areas [R-S/S-T] Car parking area around the square [S-T] Irregular height of buildings [R-S/S-T] Orientation NE-SW [R-S] Orientation E-W [S-T]	Car traffic area [R-S] High density of people walking [R-S] Esplanade in the starting corner [S-T] Intermittent (higher) pedestrian movement [S-T]	Offices and retail (mostly restaurants and cafes) [R-S] Offices and retail [S-T] Religious building [S-T]

LEGEND:

Warehouses/offices · Square · Offices/shops · Wider streets · Narrower streets · Food and drink shops · Taller buildings · Lower buildings · Market · Car traffic · Bus traffic · Green areas · < pers/area · > pers/area · Covered areas · Seating areas

Natural settings: All locations are flat (with no land elevations)

These tables provide a small sample of the coding process with some worked examples (see Section 3.6 for a more detailed explanation of the process). The first two tables relate to the thematic analysis of the Sensewalks (Table 21 and Table 22) while the third table refers to the Sensetalks (Table 23).

Table 21: Sensewalk coding sample – step 1.

Smell		
Location E–F		
Participant	**Question: What do you smell? What smells do you associate with this place? What do you think about this/these smells?**	**Coding 1 (sample)**
BB	"I smell a bit of fresh air coming from maybe the greenery around. I expect to have some smell from motor, because it's so green, but it doesn't smell at all. I can't notice maybe. No, nothing, just some fresh air. Some perfumes coming from people."	Elements being experienced Reference to distance from elements Elements mediating experiences (wind and greenery enhance fresh air) Expectation of experience
LA	"I smell cigarette smoke, there seems to be a few people around having sandwiches and taking a few minutes break. It's quite windy. Not much else."	Reference to distance to elements source Elements being experienced Reference to elements mediating smells (people eating – smell of food/ variety – wind enhancing/barrier)
LN	"It's fresher, it's definitely fresher here. I've smelt a few cigarettes around here. I'm more aware of natural smells with plants, they're quite near us, you can actually smell ... it's almost like minty which is pretty nice. Much less traffic smell. When we were going round the corner, there was a really strong ... the sort of smell you'd get from a printing factory ... quite polluted. Whereas, here, it smells a bit fresher and cleaner, definitely."	Qualitative description through freshness, pollution Reference to distance to elements source Descriptive tone Reference to elements experienced during walk to location Elements being experienced

Table 22: Sensewalk coding sample – step2.

Theme emerging	from Coding 1 (sample)	Detail
Dominance	through distance	
	through continuity	on location
		on the background
		general (walk)
	through intensity	
	quality	positive
		negative
		neutral
	by 2 elements	one through continuity
		one through intermittency
	through the variety of experiences promoted from same element source	
	through distinctiveness	
	through imposition, overpowering other	
	no clear dominance	
Intermittency	by passing by elements	
	by temporary sounds	
	often related to closer elements (first plan)	
	related to singular elements (car vs traffic)	
	by change of volume	
	by not being continuous	
	may lead to the intermittency of other sounds too	
	related to movement of elements (cars, people, etc)	
Continuity	as a temporal characteristic	
	as a geographical continuity	local
		general (walk)
	may lead to dominance	
	often related to background sounds (more frequent and less intense)	
	often associated to 'white noise' and normality	
	not being intermittent	
	reference to a permanent movement (continuity of car and people traffic)	
	often considered as artificial and unpleasant	
	something more noticeable if you are paying attention to it	
Distance	to the elements source	
	direct reference	e.g. just behind me, etc
	indirect reference	e.g. close, far off, middle distance, etc
	related to the different levels and distances to different elements	

Table 23: Sensetalk coding sample.

				SOUND			
sub-areas	Interview	categories	categories	transcript	when	qualification	adjective
A-E	5	Human activities	traffic	traffic	moment	bad	noise
A-E	5	Human activities	people's presence	drunks and prostitutes shouting	evening	bad	
A-E	25	Human activities	traffic	traffic	moment	neutral	used to it
A-E	36	Human activities	traffic	traffic sounds	moment	neutral	
A-E	18	Human activities	traffic	traffic noise	moment	bad	
A-E	18	Human activities	works, building sites	buildings noise	constant	bad	annoying
A-E	24	Human activities	traffic	sirens	moment	neutral	
A-E	24	Human activities	works, building sites	building lorries	moment	neutral	
A-E	24	Human activities	works, building sites	builders shouting	moment	neutral	don't mind
A-E	3	Human activities	works, building sites	building work	moment	bad	busy, loud
E-F	1	Human activities	people's presence	chatting	moment	bad	noisy
E-F	1	Human activities	traffic	cars	moment	bad	noisy
E-F	2	Human activities	people's presence	conversations, bits of people talking	moment	neutral	
E-F	4	Human activities	traffic	traffic	moment	bad	loud
E-F	4	Human activities	works, building sites	lorries	moment	bad	loud
E-F	19	Human activities	works, building sites	construction	moment	bad	noise
E-F	19	Human activities	people's presence	people	moment	bad	
E-F	19	Built environment	water sources	water	moment	good	I like the water, it's quite peaceful
E-F	26	Human activities	other activities and attractions	jazz band	moment	good	nice
E-F	26	Human activities	people's presence	people talking	moment	good	it's alright
E-F	35	Built environment	water sources	water	moment	good	the most important
E-F	35	Human activities	traffic	traffic sound	moment	neutral	
E-F	35	Human activities	people's presence	people	moment	neutral	
E-F	37	Human activities	people's presence	people talking and walking (...) people activity	moment	good	it's nice
E-F	37	Land use	commercial use	sounds of forks and knifes from restaurants	moment	good	it's nice
E-F	37	Environment factors	air movement (breeze, wind)	wind	moment	good	it's nice
F-I	12	Land use	commercial use	chinese karaoke (restaurant)	night	bad	I can't sleep
F-I	12	Human activities	people's presence	people standing outside and drinking	night	bad	I can't sleep
F-I	12	Human activities	people's presence	people going to work	day	neutral	
F-I	12	Built environment	air conditioned	air conditioned	constant	neutral	that you hear all the time
F-I	27	Human activities	people's presence	people laughing, interactivity and talking	moment	good	all very noisy, hustle and bustle (...). It feels good!
F-I	34	Human activities	traffic	cars, buses, taxis, basically all public transports	moment	neutral	
F-I	34	Human activities	people's presence	people talking, people on their phones	moment	good	it's nice!
I-L	20	Human activities	people's presence	mostly people talking	moment	good	quite quiet (...) quite refreshing for London
I-L	20	Human activities	traffic	traffic	moment	bad	although still a bit of
I-L	6	Human activities	people's presence	shouting	weekends	neutral	
I-L	21	Human activities	traffic	engine cars	moment	neutral	
I-L	21	Human activities	people's presence	heels, funny when I see a man walking on heels	moment	neutral	it's alright
I-L	21	Human activities	works, building sites	building construction	often	neutral	I don't complain, it has to be taken care of
I-L	28	Human activities	people's presence	people	moment	good	today even though it's quite noisy it's quite peaceful cos no one is rushing about
I-L	28	Human activities	traffic	cars	moment	good	today even though it's quite noisy it's quite peaceful cos no one is rushing about