Jieling Xiao, Lisa Lavia & Jian Kang (2017): Towards an agile participatory urban soundscape planning framework, Journal of Environmental Planning and Management, DOI: 10.1080/09640568.2017.1331843

Towards an agile participatory urban soundscape planning framework

Jieling Xiao[a], Lisa Lavia[b] and Jian Kang[c]*

[a]School of Architecture and Design, Birmingham City University, Birmingham, United Kingdom; [b]Noise Abatement Society, Brighton and Hove, United Kingdom; [c]School of Architecture, The University of Sheffield, Sheffield, United Kingdom

(Received 2 December 2016; final version received 28 April 2017)

* Corresponding author

Abstract: This paper presents an agile participatory urban soundscape planning process model, which is proposed as a prerequisite on which to build and reference the efficacy of urban soundscape planning. The model was developed through data synthesis and analysis and mapping engagement with diverse stakeholders across four applied soundscape projects in Brighton and Hove, UK. To the best of the author's knowledge, the model is the first of its kind in applied soundscape practice. The data was collected through semi-structured interviews with key stakeholders and document analysis of published resources. The framework used for the analysis of the findings comprised four core urban planning stages: goals and objectives; engagement (e.g. prediction/modelling/design/planning); implications; evaluation. The study found that when integrating soundscape planning with core urban planning stages it was necessary to first identify the appropriate stakeholders in relation to the project context. It was found that these stakeholders could be wide-ranging and unexpected thereby reinforcing the appropriateness of incorporating an agile approach in the resulting model. The study also found that users' perceptions are central to soundscape practice (ISO 2014) and need to be considered at each stage of a planning process to produce an effective and sustainable outcome. A variety of specific events, appropriate to the requirements of the stakeholders, are important for engaging planning authorities, users and other stakeholders at different stages. This study also demonstrated that an evidence based evaluation method is recommended in an agile participatory urban soundscape planning process to assess stakeholders' engagement at each stage and to inform and guide subsequent steps in the planning process relevant to the local context(s).

Keywords: applied soundscape planning, participation process, acoustic management, multi-disciplinary

1 Introduction

Soundscape is defined as 'the acoustic environment as perceived and / or understood by a person / people in context' (ISO 2014), which emphasises the role of the human experience of sound.

The soundscape approach has drawn much attention from city planning officials and design professionals to explore it as a tool to manage urban sound environments (Brown 2014). It is suggested that soundscape planning and management be included in the landscape framework to be appreciated and developed with considerations of wider ecological systems (European Council 2000).

As distinct from noise abatement and control, soundscape planning regards sound as a resource to be managed and used to achieve good quality acoustic environments embedded within the landscape (Truax 1998; Truax and Barrett 2011) and to facilitate human enjoyment and well-being (Brown 2011, 2014). In current urban planning practices, sounds in urban environments have been managed mostly through noise control measures to deal with discomfort and reduce negative health impacts on residents (Brown 2014).

Noise control, as a means of managing unwanted sound, is practiced mainly by using acoustic measurements and computational simulations to assess or predict human annoyance according to sound pressure levels (SPL) taken at source, precedent and professional judgement relative to current policies. However, human perceptions of sounds vary through individual preferences, past experiences, physiological issues, memories and contexts. Therefore these considerations need to be included in urban planning practices to effectively manage the acoustic environment (De Coensel et al. 2010). To address these concerns, the soundscape approach measures and assesses the users' perspective in context based on a variety of non-SPL based acoustic and non-acoustic factors (ISO 2016).

Various cases and issues concerning the acoustic environment revealed in the EU COST Action on Soundscapes of European Cities and Landscapes (2008) showcased the need to control noise types and levels while simultaneously improving the appropriateness of the acoustic environment to enhance people's quality of life (Kang et al. 2013). Sounds in urban spaces need to be considered from the perspective of both unwanted sounds (e.g. traffic noise) and wanted sounds (e.g. sounds of nature) (Brown 2011). As Tuan (1977) emphasised, desired sounds in spaces can enrich human experiences by giving spatial cues such as volume and distance. These can lend particular character to places, such as footstep sounds in a church emphasising its silent and religious atmosphere. The purpose of soundscape planning, therefore, is to change, improve or assess the way people perceive the acoustic environment of a place, by designing, managing or reconstructing its acoustic environment (Brown 2012) to create context specific desired outcomes.

Soundscape can provide effective alternative ways of managing environmental sounds, similarly to landscape planning approaches. In this way it can guide the appreciation of the urban

soundscape for its amenity, restorative, and natural capital values (Raimbault and Dubois, 2005; Brown et al. 2016). However, soundscape planning as a new and multi-disciplinary approach in urban planning practice needs to be tested, structured and guided. Therefore, it is essential that well-evidenced case studies are developed in order to effectively map the causal links, gateways, and relationships necessary for the effective planning and execution of future work.

In practice, since relatively limited case studies have been conducted through established research frameworks, a systematic study on soundscape planning processes in use and the roles of various stakeholders is needed. Different stakeholder engagement processes and roles of users in existing models of soundscape planning are necessary to guide soundscape practice. However, the specific types are not commonly agreed as requisite. This paper aims to develop a participatory planning process model to guide soundscape planning practice.

The process model was developed following the review of a series of successful local government and community engagement partner led participatory soundscape planning practices conducted in Brighton and Hove, UK. The original projects were not studied systematically from inception to identify the engagement process of the different stakeholders involved due to their innovative and applied nature. However, they were conducted and developed with the overt aim of applying the principles of the (at the time) evolving soundscape standard (Lavia et al. 2012a, 2012b) and the subsequent resulting standard (Witchel et al. 2014; Easteal et al. 2014; Lavia et al. 2016a).

The study commenced with documentary analysis of published materials on the four applied soundscape case studies in Brighton and Hove, then the conducting of a number of semi-structured interviews with stakeholders who participated in the cases. As a result of the analysis of the selected applied soundscape planning cases, an agile participatory urban soundscape planning process has been developed. It is intended to be applied within the framework of soundscape standards (ISO 2014; ISO 2016), for four urban planning stages: goals and objectives; engagement (e.g. prediction/modelling/design/planning); implications; evaluation. The model is proposed as a prerequisite on which to build and reference the efficacy of urban soundscape planning.

2 Methods

2.1 Conceptual framework

Soundscape planning, gathering information of local acoustic features and producing plans to achieve a better quality acoustic environment, can be developed into an international planning

system similar to that of landscape planning (Kang 2006; Kang et al. 2013). Ideally, it should be considered at the early stage of an urban planning process to produce more sustainable plans for creating better acoustic environments (De Coensel et al. 2010). Soundscape planning will provide better guidance for managing the acoustic environment and projecting steps ahead. Considerable effort has been made to develop a soundscape planning framework to develop the practice of soundscape planning and train urban sound planners to: 1) obtain basic planning skills, like urban planning, spatial planning, traffic planning and cost benefits analysis; 2) obtain public outreach skills, like communication, project management, teamwork and leadership; 3) develop the ability to create and use methods to predict the influence of certain planning actions on people's use and perception of their living environment; 4) understand the concept of soundscape and be able to use emergent evaluation and design methodologies for the acoustic environment on the basis of a soundscape approach; 5) be able to implement noise control techniques appropriately; 6) have an holistic view of various aspects in planning and soundscape to produce solutions contributing to, supporting, and enhancing sustainable environments (Kropp et al. 2016). In this sense, urban sound planners and soundscape planners should both be able to conduct fieldworks and have basic planning skills, soundscape knowledge and planning policies. However, it is necessary to clarify that urban sound planners, compared to soundscape researchers, are to deliver sound planning schemes and make sound related policies. Soundscape researchers are more aimed at developing new frameworks, technologies and concepts relating to sound planning.

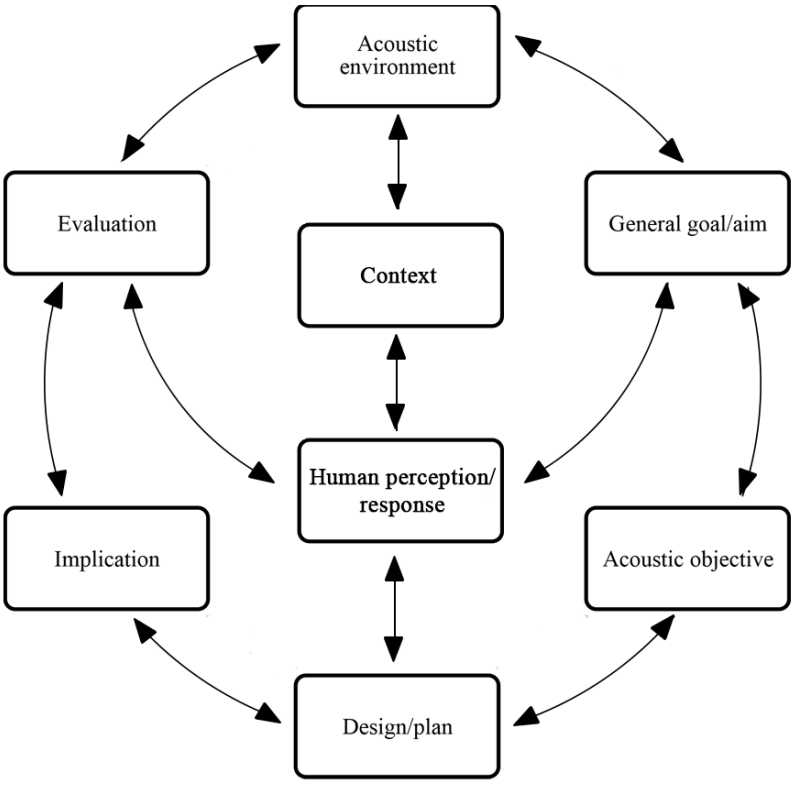
A theoretical process map for urban soundscape planning has been generated covering two stages: selection of a building arrangement, and detailed design of the indoor and outdoor public spaces. The approach emphasises consultation between architects, planning authorities, soundscape experts (i.e. academics and practitioners), and the public (Adams et al. 2009; De Coensel et al. 2010). However, there is no specific definition or scope given to the defined interest groups, nor which types of soundscape experts and citizens associations should be engaged with. A number of techniques are also suggested for different actions, such as focus group discussions at the planning pre-application stage to identify problems and objectives, soundwalks at the investigation stage to inform preliminary plans and designs, and soundscape simulation (e.g. auralisation) to help develop detailed designs. Such theoretical studies of soundscape planning or design processes suggest ways of investigating a context and predicting acoustic changes through modelling.

Brown (2011) suggested an acoustic design process for outdoor spaces should include four steps: 1) site identification and context definition; 2) establishing acoustic objectives; 3) defining 'wanted' and 'unwanted' sounds; 4) specifying management and design criteria. Planners need to take control of the first three steps, while acoustic specialists (i.e. academics and practitioners)

lead in the last step (Brown 2012). However, the management and design of sounds and spaces can inadvertently result in a too narrowly focused stakeholder engagement process.

Therefore, such theoretical work needs to be tested and compared with the actual stakeholder engagement process in applied contexts, which was done for the four studied cases in this paper. It is also unclear in the theoretical studies which criteria are used to evaluate work at different stages and what value(s) should be attributed to each stakeholder's engagement in the decision making process. This is important because a planning process should be continuous and contiguous, including appropriate ways of controlling relevant systems and evaluation methods or even modifications of the evaluated plans or actions to achieve sustainability (Trippett et al. 2007).

Taking these discussions into account, a theoretical (e.g. conceptual) process for soundscape planning that interacts with stakeholders at different stages of the planning process was produced to conduct this work. This theoretical framework aligns with the definition and perceptual process of soundscape (ISO 2014), which positions people's experiences as central to a soundscape approach as demonstrated in Figure 1. The conceptual perceptual process of soundscape provides the basis for understanding and re-constructing a soundscape/soundscapes in a place with a series of sensations, interpretation and responses by a person and/or people to the acoustic environment in context (ISO 2014). This indicates that a soundscape planning and design process should always be context specific and require the engagement of appropriate



stakeholders via an iterative (i.e. agile) process.

Figure 1: Theoretical framework of a soundscape planning process based on people as co-specifiers of the planning goals and objectives

As part of a general urban planning process, soundscape planning should comprise four key stages: establish goals and objectives; make predictions and designs; implement the plan/design; evaluate the outcomes (Chadwick 1971; Hall and Tewdwr-Jones 2010). There is a difference between goals and objectives: objectives are specific, measurable and linked to outcomes (e.g. 'cannot hear traffic noise' or 'reduce noise by 15dB'); goals can be more general and qualitative in nature without predictable results (e.g. 'preserve natural sounds' or 'create a restorative soundscape'). When applied to the soundscape planning process, acoustic objectives need to be identified and informed by a project's goals at the beginning of the process for the proposed space with an understanding of its particular context. Acoustic objectives can take into account relevant factors including soundscape design indicators, sound preferences and masking features (Brown 2011).

In urban planning practice, where physical and objective dimensions are applied, public engagement with users of spaces is often conducted at the early stages to provide vital local knowledge and inform design solutions (Brown 2011; De Counsel et al. 2010). However, in soundscape planning where human perception is centralised, the planning process requires the integration of all stakeholders, including municipal and planning authorities, soundscape experts, architects, designers and relevant members of the local communities of interest. Together the stakeholders collectively develop the soundscape design solution based on their perceptions obtained when identifying the project objectives, making designs and plans, and evaluating the relevance of the engagement process.

This agile collective development process is illustrated in Figure 1 by the inter-connectivity required between all of the stages. A soundscape planning process, in this sense, should be designed on the basis of understanding the human perceptual process of soundscape relative to the engagement process with other stakeholders. By reviewing the applied soundscape practices in Brighton and Hove this approach was tested and explored in detail to generate a process for engagement with key stakeholders at each stage.

2.2 Selection and review of cases

This study used a case study method in order to explore a practical approach for soundscape planning and uncover issues affecting the engagement process of stakeholders in real situations. A case study method can provide a close-up view and deep understanding of stakeholders'

engagement and evaluations of selected cases with rich detailed information (Yin 2009). The chosen cases are from four applied soundscape projects conducted in the City of Brighton and Hove from 2010 to present day. The cases studied were: a citywide soundscape survey (Lavia et al. 2012a); the West Street Story night noise intervention pilot study (Lavia et al. 2012b); the West Street Tunnel community safety experiment (Witchel et al. 2014; Lavia et al. 2016b); the Valley Gardens public realm improvement project (Alves and Estévez-Mauriz 2016; Easteal et al. 2014). These four applied soundscape projects were conducted at three different urban scales: city, street and community scale. In each case a soundscape management and planning approach based on the international standard (ISO 2014) was included as a core element to manage and/or control noise, improve the acoustic atmosphere and create a more amenable environment, as illustrated in Figure 2.

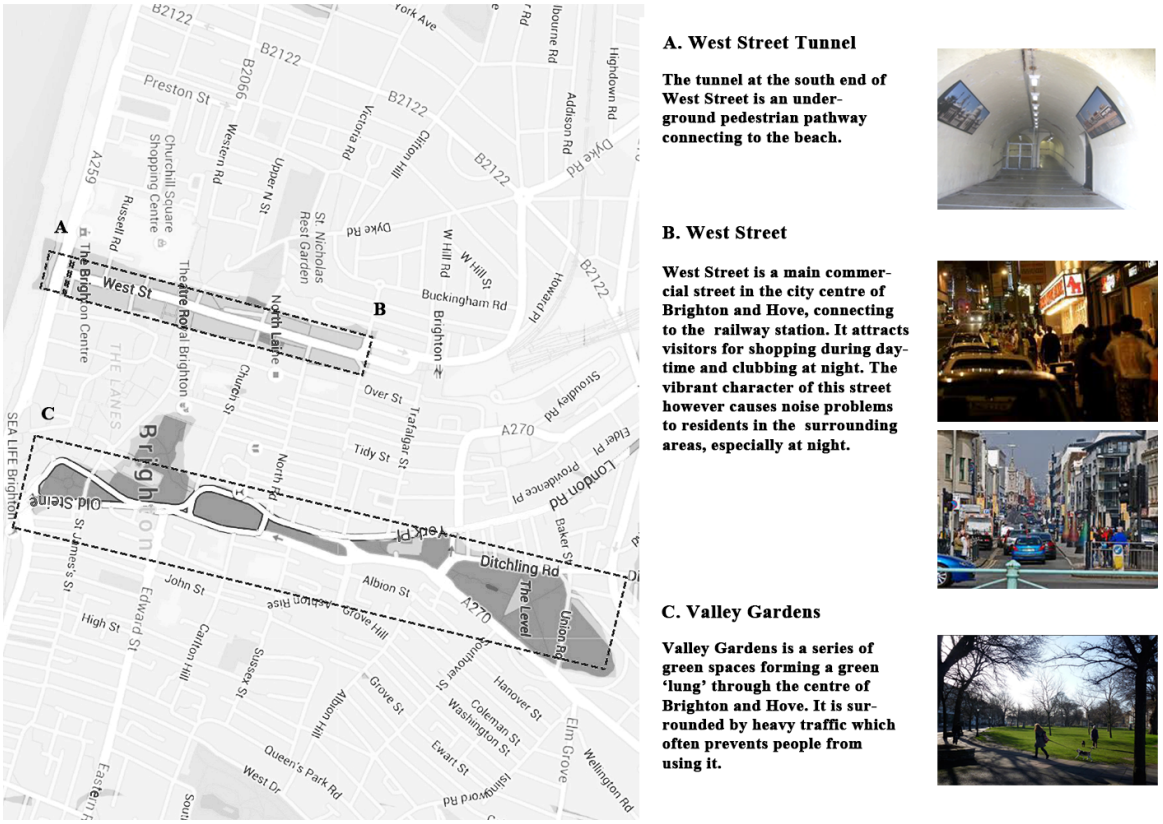


Figure 2 – Location and surroundings of three studied cases in Brighton and Hove City, UK

The study starts with documentary analysis of published journal papers, conference proceedings and reports provided by the community engagement partner around selected projects to supplement information about the aims and findings of these projects. Drawn from these published works, descriptions of the four selected cases are summarised in Table 1, including general project aims and findings. The studied cases were found to be relevant and to contribute to long-term soundscape planning for the city. The selected cases were conducted in a continuous timeline, starting with a citywide soundscape survey to explore soundscape characteristics of Brighton and Hove and residents' preferences for local soundscapes.

Table 1 - Case study descriptions of four applied soundscape projects, conducted in the City of Brighton and Hove, UK, used for the Sounding Brighton stakeholder engagement study

Project	Description	Reviewed publications
1. **A citywide soundscape survey**	A questionnaire study in which members of the public were invited to participate anonymously exploring the possibility of integrating a *soundscape* approach based on a method for spatial planning and land use management called '*sociotope'* mapping.	Lavia et al. 2012a; Lavia et al. 2016a
2. West Street Story night noise intervention pilot study	A project applying active soundscape concepts in the city's busiest clubbing and entertainment district to improve crowd behaviour, reduce aggressive noise, and decrease anti-social behaviour by creating immersive sound 'occupations' to change and soothe the night time atmosphere of a raucous street.	Witchel et al. 2014; Lavia et al. 2012b ; Lavia et al. 2016a ;
3. West Street Tunnel community safety experiment	A study testing the feasibility of a active music-based night-noise intervention and gathering preliminary data on the pro-social, territory-controlling effects of music in a pedestrian subway.	Easteal et al. 2014; Witchel et al. 2014; Lavia et al. 2016a ; Lavia et al. 2016b
4. Valley Gardens public realm improvement project	A project studying how passive urban sound planning can influence the planning, delivery and future management of a major city centre public realm project in the context of the transformation and complete redesign of a major site within the city.	Alves and Estévez-Mauriz 2016; Easteal et al. 2014

2.3 Semi-structured interviews

The study took a qualitative approach to reveal and understand details of different stakeholders' experiences (Mason 2002; Wagenaar 2014). This helped to investigate the complexity of the stakeholder engagement process in the Brighton soundscape projects. Rather than interviewing the local action teams (LATs), which included residents from different local communities volunteering to represent their communities and participate in meetings organised by the local planning authority, this study focused on how other stakeholders responded to the LATs' perceptions and requirements of the acoustic environment around the targeted spaces.

Sample:

An initial interview was conducted with the project leader (in this case a soundscape practitioner and public engagement specialist) to understand how the soundscape framework was applied in the selected cases and identify the key stakeholders who were engaged throughout. In total, nine representatives from different stakeholder groups were interviewed for an average of 45 minutes; these included three representatives from the city council (i.e. the planning authority), two soundscape specialists (in this case academics), one psychologist, one physiologist and two representatives from the community engagement partner.

Process:

Nine semi-structured interviews incorporating open-ended questions were conducted to collect qualitative data by asking interviewees a list of pre-determined questions around six general themes relative to key stages identified in the theoretical framework, as shown in Table 2. Semi-structured interview methodology enables researchers to control the direction and content of the conversations, while also providing the flexibility to explore in depth details of people's experiences (Charmaz 2006). Each interview was recorded using a handheld voice recorder and transcribed for analysis through coding and memo writing.

Theme	Questions
Background	• Could you tell me something about your work and educational background? • How did you come to engage with the soundscape project(s)?
Objectives/goals	• Do you have any objectives for doing this project? • What is your personal interest in doing this?
Engagement	• Could you tell me more about what you did for this project? • How do you find working with other disciplines in this project?
Outcomes	• What did you achieve from this project? • Do you think it can be applied to other soundscape practices?
Evaluations	• Do you think it has achieved the intended objectives? • Do you think there are any limitations for this project or this approach?
Further development	• Do you think you will be engaged in the further development of this project? • Do you have anything else to share regarding your engagement in this project?

Table 2: Semi-structured interview questions for stakeholders in this study

3 Results

3.1 Applied soundscape planning process in the studied cases

The four studied cases showed a continuous agile participatory planning process for applied urban soundscape planning in the city of Brighton and Hove. Collectively the cases have formed the initial exploration of applied soundscape practices in the city. From designed experiments

and sound installations to integrating findings into an urban design scheme; the soundscape projects progressed from a remedial to a design-led approach. Stakeholders were engaged through a series of meetings, workshops and conferences and participated in the decisions and steps taken forward throughout the process. Based on reviews of the selected cases and analysis of interviews with key stakeholders, the resulting agile participatory urban soundscape planning process model was derived (Figure 3). The main participatory events, participants, and the methods or approach(es) used in the studied cases are illustrated in Table 3.

Stage	*Main participatory event*	*Participants*	*Methods/approach*
Start-up	• Introduction Meeting	• Soundscape experts, police, residents, community group, city council	• Presentation and discussion
Preparation	• Sound art exhibition • Soundscape engagement	• Community group, sound artists, public, city council, soundscape experts	• Public event • Soundwalks
	• Soundscape online residents' survey • Face to face interviews	• Residents, community group, soundscape psychologist, city council, other soundscape experts	• Online survey • 1:1 (Face to face) interviews
Preliminary Exploration	• EU COST Soundscape Workshop 1	• Community groups, soundscape experts, city council, residents, other academics, policy makers	• Presentation and discussion
	• EU COST Soundscape Workshop 2	• Community group, soundscape experts, city council, residents, other academics, policy makers	• Presentation and discussion
	• Problem-focused Meeting	• Residents, city council, community group	• Focus groups
Experiment	• West Street Story	• City council, community group, sound artist, arts council, physiologist, police, residents, general public	• Sound installation • Behaviour analysis • Stakeholder observations • Police validation
	• West Street Tunnel	• City council, community group, soundscape technicians, physiologist, police, public	• Sound installation • Behaviour analysis • Stakeholder observations • Police validation • Acoustic measurement
Implementation	• Valley Gardens Project	• FP7 Sonorus, soundscape experts, city council, community group, public	• Acoustic measurement • Soundwalk • Soundscape design • Urban design

Table 3: The participatory process of four applied soundscape projects studied in the city of Brighton and Hove, UK

The four studied cases, as illustrated in Table 1, evolved as a result of initial engagement activities between the planning authority, the Noise Abatement Society (NAS; in this case an NGO), residents and researchers. From these preliminary steps several stages commenced. The development of the stages utilised an agile method (Figure 1). The progression of the stages, as described below, formed the basis of the resulting agile participatory urban soundscape planning process model (Figure 3).

The citywide soundscape survey (i.e. Case Study 1; Lavia et al. 2012a), based on the Swedish soundscape survey protocol (ISO 2016), was co-designed by soundscape specialists (in this case academics and the NAS) and conducted by the planning authority and the NAS. It provided essential information to generate acoustic objectives for soundscape planning and design in Brighton and Hove. The decision to conduct the survey was made based on prior engagement with residents (users of the local spaces) which identified the need to understand the soundscape characteristics of the city and how residents were being affected by them. The public engagement activities during the start-up phase (Table 3) helped to establish a basis for trust between residents, the planning authority, the NAS, and the soundscape specialists (i.e. academics and practitioners) to trial new solutions. The improved dialogue between the stakeholders also raised awareness and understanding of urban soundscape planning and management concepts to new audiences.

The soundscape survey and residents engagement results summarised socio-physical types of soundscapes perceived by the general public in Brighton and Hove, and identified target areas for improvement and further soundscape exploration. In particular, the results highlighted the West Street (Lavia et al. 2012b) and West Street Tunnel (Witchel et al. 2014; Lavia et al. 2016b) areas at night (i.e. Case Studies 1 and 2 respectively).

Individual, face to face interviews were then conducted to interpret people's preferences for the acoustic environmental quality (i.e. wanted versus unwanted sounds) in the targeted areas by the planning authority and the NAS. The key interviewees were the club owners in West Street, police, planning authority representatives, elected officials, and the residents [who were selected from an organised and open network of groups called Local Action Teams (LATs); the LATs represented each of the wards in the city and were comprised of residents from these wards].

Following these interviews, noise disturbance in West Street at night was found to be emanating mainly from crowds outside of the clubs when people were entering or leaving the area, or queuing or loitering outside. The scenario on West Street was posited to be that visitors to the area talked loudly, shouted and displayed aggressive and highly territorial behaviour because they had either a) become accustomed to the high ambient noise background inside of the clubs and were experiencing temporary threshold shift; b) were uncomfortable generally in the acoustic environment experienced outside of the clubs because of its harsh and aggressive sounding characteristics; c) a combination of these factors.

As a result of noise from people and crowds in West Street at night, residents in the area were upset, highly annoyed and distressed. This resulted in residents' sleep deprivation due to noise over prolonged and unpredictable periods of time, concern over the causes of the noise (e.g.

personal safety incidents and potential harm to visitors to the area), and a perceived lack of support from the planning authority in its ability to control or stop the noise. These problems radiated beyond West Street as the noisy crowds traversed the narrow streets surrounding area at night. Corresponding anti-social behaviour (actual or perceived) also contributed to strong feelings of insecurity in residents and visitors to West Street and the surrounding areas at night.

Additional anti-social behaviour issues were found in relation to West Street Tunnel, a pedestrian subway located at the end of West Street connecting the street to the seafront where additional clubs are located (Figure 2). The NAS and the planning authority engaged with the police, transportation authority, the arts and cultural authority, artists, psychologists, physiologists, and soundscape specialists to look for appropriate methods to improve the social and acoustic conditions at the two sites.

The applied soundscape experiments and practices in West Street and West Street Tunnel raised awareness of the positive potential that soundscape planning and management could have in Brighton and Hove. As a result of this, the subsequent FP7 Sonorus project (FP7 Sonorus 2013) leaders decided to accept Valley Gardens in Brighton and Hove as a case study site (i.e. Case Study 4) to explore practical passive soundscape design methods (Alves and Estévez-Mauriz 2016; Easteal et al. 2014). This decision changed Brighton and Hove City's original plan for re-generating the test site to include investigating how a soundscape approach could address long-standing noise issues in the area. As a result, the planning authority in Brighton and Hove included soundscape planning and management as one of many elements in a complex public realm improvement scheme for the area.

This approach differs from the first three cases which had soundscape planning and management as core development concepts. However, the Valley Gardens project illustrates the role of soundscape design in an evolved general urban design structure. In this project the soundscape specialists (i.e. academics and practitioners) assessed the site through acoustic measurements and soundwalks with residents. The results from these assessments informed the area's final design scheme (Alves and Estévez-Mauriz 2016; Easteal et al. 2014). Participation in Sonorus (through the Valley Gardens case study) by the planning authority is one of the outcomes of the results from the previous three applied soundscape projects in Brighton and Hove.

3.1.1 Stakeholder engagement in the process

In each of the four studied cases (Table 1), stakeholders participated on the basis of their expertise. This included knowledge exchange meetings to ensure their views were understood and taken into account in the decision making process. As discussed, a good understanding of soundscape concepts by stakeholders was found to be an essential first step before conducting work at any of the stages. The role of residents, which are the main users of the places in each case, was given priority in determining the soundscape features / interventions needed.

Soundscape experts (i.e. academics and practitioners) in these projects provided consultancy to the planning authority and general public regarding soundscape planning and management. This included introducing the concept of soundscape (ISO 2014), investigating the acoustic

environment of the sites and providing suggestions of possible methods of planning and design. Psychologists and physiologists involved in the project helped stakeholders understand people's perceptions and behaviours within the existing acoustic environment and during the added sound interventions. The engagement of these experts was integrated via applied research and onsite assessments, soundwalks, acoustic measurements, behaviour analysis and soundscape surveys.

Close collaboration was found in all cases amongst the stakeholders through engagement with a specialist organisation (in this case an NGO), the Noise Abatement Society (NAS). The NAS performed an objective, independent applied soundscape co-design specification, mediation and co-ordination role among the stakeholders. Collaboration with planning authorities, soundscape specialists (i.e. academics and practitioners), other academics, and the general public were found to be necessary elements for implementing the soundscape planning process. Activities including meetings, workshops and exhibitions, were found to be essential in developing effective social networks and facilitated engagement and knowledge exchange activities (Table 3). A wide range of stakeholders were engaged with including from national government, local government, academia, industry, special interest groups, and the public.

The supportive and open attitude of the planning authority was mentioned as a key element in making this project successful. The planning authority partnered with the community engagement partner (i.e. the NAS) and held an introduction meeting with Local Action Teams (LAT) and a soundscape exhibition. These activities served to help residents gain awareness and understanding of soundscape planning and management. These activities, as outlined in Table 3, were co-designed and facilitated with EU COST Action TD0804 on Soundscape (Kang et al. 2013; COST Brighton 2011; COST Brighton 2012) colleagues and the NAS. They demonstrated the importance of a commitment to and respect for collaboration between different stakeholders as necessary elements in an applied soundscape planning process.

Work provided by different stakeholders was designed and interpreted with regard to particular contexts in the studied cases, including night noise problems from crowd dispersal in West Street and traffic noise in Valley Gardens (Easteal et al. 2014). The work was conducted inline with the concepts and framework of soundscape planning and management relevant to the respective contexts (ISO 2014).

Soundscape is a trans-disciplinary science, which requires engagement with stakeholders from a wide community of interest including planners, architects, soundscape specialists (i.e. academics and practitioners), residents and artists. Generally, in a soundscape planning process, stakeholders can be identified as

- the planning and administration authorities, which specify, make decisions on and coordinate activities;
- soundscape specialists (i.e. academics and practitioners), who provide consultancy and co-design expertise to the planning, administration and design authorities, make qualitative and quantitative site assessments of the acoustic environment and analyse collected data;

- the design authority, which makes design proposals for implementation;
- local residents and members of other relevant communities of interest who act as co-specifiers of projects;
- specialist groups, identified in relation to the particular contexts (for example in the Brighton cases this included artists, culture experts, the highways authority and the police).

The planning authority, as a key stakeholder throughout the process, should coordinate with the other stakeholders. Following an agile process, the composition of stakeholders may change as needed at each stage for a particular purpose. A reciprocal relationship is needed between the planning authority and other stakeholders; this requires an open, empathic, responsive and supportive attitude at all levels.

Generally, once goals and objectives are identified, there should be an action plan to guide the process of forecasting, design, modification and implementation. Forecasting involves site assessments, laboratory experiments, modelling, onsite experiments and analysis of data collected from the work. The results from the forecasting stage can be used in project design and planning applications. There may be a circular, agile process between the design, modification and implementation stages, according to the requirements of the actual situation.

Engagement with stakeholders' in the studied cases was a primary element informing the resulting design, scope, specification, and outcomes of the project, inline with the international soundscape standard (ISO 2014). Therefore, the applied soundscape planning process in this case was different from the theoretical soundscape process and enriched the outcomes and learnings of the study by the demonstration of its practical application.

The practice of applied soundscape planning and management utilised in the four case studies in Table 1 revealed the practicality of the soundscape approach for use in urban planning, from the piloted experiments to the large-scale urban regeneration project. As stated, the results of these projects, trialled in the 'urban laboratory' of Brighton and Hove, were translated into the output from this study: an agile participatory urban soundscape planning process, as illustrated in Figure 3.

3.1.2 Goals and objectives

To achieve optimal results and benefits, soundscape principles should be applied through the framework of urban planning specifications, whether at local or national level, at the start of any urban planning and design project. Due to the emergent nature of the science of soundscape, it's trans-disciplinarity, and the applied context of the studied cases, the soundscape practice in Brighton and Hove has been, by necessity, an exploratory approach rather than a pre-defined project with a pre-determined structure.

As such, specific acoustic objectives were not defined at the beginning of each studied case. Rather, the qualitative goals of improving the quality of the acoustic environment in order to

reduce or eliminate complaints from residents and improve feelings of safety were sought. Therefore, the project actions in the four applied soundscape cases were conducted within the agreed aim of achieving an improved acoustic environment in Brighton and Hove.

Given the innovative nature of the work, goals in the studied cases were the initial objectives. This agile development approach could not be translated into a consistent linear planning process based on existing experience. Therefore, the goal was to understand and define how an applied soundscape community engagement process could be conducted within the framework of the (then recently introduced) international soundscape standard (ISO 2014). This approach was decided in order to define and document an evolved, iterative (i.e. agile) soundscape process in a real world context.

One key rule found in the studied cases was the need to respect the context of the studied areas in all projects. The citywide soundscape survey (Lavia et al. 2012a) was conducted as a start-up action to understand user's perception of the soundscape in the city of Brighton and Hove. It was designed to identify soundscape characteristics and people's preferences for their favourite sounds in the city. The purpose of conducting this survey was to engage with the planning authority and general public as local experts in the process and identify problem areas and what the next steps should be (aligned with residents' expectations of the respective areas) and experiment with possible approaches.

The West Street Story (Lavia et al. 2012b) and West Street Tunnel (Witchel et al. 2014; Lavia et al. 2016b) projects both experimented with different sound installations and their effects on people's behaviours. The West Street Story project tested whether appropriate added sound interventions could reduce instances of aggressive behaviour in West Street on a Saturday night. An objective was developed in the West Street Story experiment to demonstrate whether it was possible to evaluate people's perceptions of the acoustic environment through their behaviour, using a soundscape approach and non-participatory observation methods. Based on the validation of this hypothesis, the West Street Tunnel project was conducted afterwards, with the clearly defined objective to analyse the acoustic environment in the tunnel and identify the influences of different types of added sound interventions on users in the space through behaviour analysis, again using non-participatory observation methods.

The defined soundscape perceptual process suggests that the acoustic environment and people's perceptions are shaped by site / area specific contexts (ISO 2014). It is, therefore, crucial to have a comprehensive understanding of the acoustic environment within particular contexts at the start of any project. Users' perceptions, as central to soundscape, should also be studied concurrently from the beginning of a project to guide and inform the project's design specifications.

Public engagement should be iterative throughout the different stages in a planning process to ensure users' perceptions are evaluated and re-evaluated, including at the project start-up meeting, during site assessments, project testing and implementation stages, and when evaluating outcomes during project completion and post-completion stages. Meanwhile, public engagement in soundscape planning can be accomplished through various methods, including focus group interviews, sound art exhibitions, soundwalks, surveys and lectures.

This study found that all stakeholders interviewed shared the general goals of reducing noise problems and improving local environmental quality regardless of their professional or demographic identification (Lavia et al. 2012a). For example, the local planning authority and the NGO were interested in finding effective solutions to noise control through inclusive methods and enhanced placemaking tools; the soundscape specialists (i.e. academics and practitioners) were hoping to test theoretical soundscape methods in applied scenarios; other academics, like the soundscape psychologist and physiologist, were interested in new ways of understanding and explaining human perceptions of soundscape as well as identifying the soundscape features of a place; the public's interests were the same as the general goals; the police were interested in whether soundscape could help reduce anti-social behaviour at night; the artists involved had an interest in creating recreational environments and new forms of engagement with audiences through sound.

'There might be conflicts between the government's methods of controlling noise and people's needs. Because current noise control methodologies can provoke conflicts because they are concerned with objective levels, which can be either too high or low depending on varying stakeholders' requirements, like those of residents and industry. That's why the engineering noise control approach is not appropriate for community noise management. Up until now, this has been the primary approach [to managing environmental noise], and has not been successful. However, soundscape provides a set of tools that are holistic with both objective and subjective dimensions.' (F, Soundscape specialist).

However as previously stated, this review notes that not all of the projects studied were defined with clear objectives from the start. This is because soundscape as a practical citywide approach had not been extensively explored at the time and therefore outcomes for the applied local projects could not be predicted. Also not all stakeholders had a common understanding of how to achieve the desired results within the existing contexts. The knowledge and objectives of these exploratory sub-projects, therefore, were consciously developed to be overtly aligned with the structure of a scientific soundscape approach as identified by the (then proposed and since adopted) new soundscape standard (ISO 2014).

As explained, the term 'soundscape' refers to the acoustic environment of a place, like a residential area or a city park, as experienced and/or understood by a person or persons in context (ISO 2014). Soundscape can be described as the acoustic equivalent to 'landscape', and includes all sound sources, wanted as well as unwanted (Brown 2011, 2016). With this in mind, the general goal of incorporating soundscape with urban planning should not be limited to solving noise problems, but should help to (re)create good quality soundscapes with locally characterised sound sources, and preserve meaningful soundscapes in historical areas.

Therefore, objectives should be developed through a series of preparation events conducted at the start-up stage. These events should include investigations of the general context and people's perceptions of the existing acoustic environment, identification of key desired soundscape features in the context and discussions of possibilities of different soundscape methods.

Objectives can be both exploratory and specific, and need not be limited to the acoustic features. For example, in West Street Story the objective developed was to explore whether certain sound

interventions could reduce aggravation and whether people's reactions to such sound interventions can be analysed and interpreted through using non-participatory observation methods and behaviour analysis. Project objectives can be multi-dimensional and incorporate acoustic, social, physiological and psychological aspects.

3.1.3 Forecasting and Evaluation

Forecasting in the studied cases are mostly based on existing literature which guided the project design. However, evaluation in the studied cases are mostly based on stakeholders' reflections on the project outcomes. Considering the results achieved in the four cases studied, stakeholders interviewed generally felt positive about applying soundscape methods in future planning and development in Brighton and Hove.

The first case study, the soundscape survey (Lavia et al. 2012a), was considered successful because it provided important, and previously not understood, contextual information about soundscapes in the city of Brighton and Hove. Its findings formed the basis of the three subsequent projects. The second case study was an onsite experiment called West Street Story. The study was conducted by a mult-disciplinary team which included an applied soundscape practitioner, a psychobiologist, and an experienced sound artist (Lavia et al. 2012b). Unlike laboratory experiments in controlled conditions, real world situations are difficult to predict and control. In this case, the sound artist composed and curated ambient sounds based on parameters provided by the soundscape practitioner (based on soundscape stakeholder surveys). The sounds were curated live on the night of the experiment and designed to create a calm atmosphere. The team filmed and observed the effects on people in the street and found that they were more calm and friendly during the experiment than during the control night. Body language analysis of the filmed evidence and post event interviews with residents, police, and the local authorities provided strong evidence of the positive outcomes of the experiment. This study demonstrated that people's reactions to sound interventions could be identified and understood through behaviours and non-participatory observation methods. The experiment provided evidence for using soundscape principles to design added sound interventions as a way to reduce territorial behaviours (and thereby, potentially, aggression) in urban entertainment areas at night.

However, forecasting in this case was purely empirical and unable to produce predictions in a different context; although the outcomes supported the research hypothesis. The design of onsite studies in this sense are important in determining the forecasting methods for future experimentation. For example, repeated soundscape designed acoustic installations of this nature could provide a robust dataset of different responses in different contexts. This could then be developed into a prediction model.

In the third case study, the West Street Tunnel experiment, behaviour analysis was used to understand and explain influences of the acoustic environment on people through comparing their walking speed and loitering activities (Witchel et al. 2014; Lavia et al. 2016b). A resulting protocol was developed to identify relevant behaviours and their relations to sense of safety; these findings are instructive for stakeholders from other professional backgrounds to learn from and use in future soundscape studies.

However in the fourth case study, the Valley Gardens project (Easteal et al. 2014), use of available soundscape methods was limited to potential solutions for traffic noise at a city scale by the planning and design authorities. It was therefore difficult to build on the research results from the other Brighton cases within the pre-determined practical design methods required for Valley Gardens:

'It is very difficult to mask traffic noise in Valley Gardens since we don't have much space for landscaping or other interventions. Because there are so many trees, we have to stay fairly flat. We can't really create barriers to separate from noise. We also can't try different surfaces, due to the constraints imposed by the planning authority on materials specification (which must be in line with their pre-described protocols due to cost and public safety issues). So, there are very practical limitations for what we can do in an applied context, because of the nature of the issues we are trying to address. But, at a smaller scale, there are certain things we can change. For example, potentially, we are looking at building bus shelters or taxi shelters and pieces of street furniture which might be able to provide localised levels of benefit to people. ' (J, Design authority)

Other limitations and challenges of the Valley Gardens project were considered as part of the stakeholder review. For example, the planning authority wondered how much further the soundscape approach could be developed in Brighton and Hove beyond added sound installations and how it could be balanced with other parameters in the city's urban planning systems. The soundscape experts were concerned that if soundscape was only taken into consideration as a secondary or remedial element in urban planning it would not be viewed as essential, nor incorporated into final planning and design decisions.

The design authority was concerned that the biggest challenge to bringing soundscape into current design practice was the lack of specific expertise available for it to be integrated into the design and specification process. Soundscape, as an acoustic discipline, was considered a robust science and therefore difficult to understand by landscape and urban designers and thus presented a barrier to implementation in current practice.

Another issue addressed by all of the stakeholders was the lack of further evidence and funding to support such experiments and practices. For example,

'Our work demonstrates some of the potential that soundscape can offer and how it can work in the long term. But these experiments were just the beginning. Once people understand the value and applicability of the soundscape approach in urban planning, design, and development they will be willing to invest greater resources into applied research and larger scale projects. The potential is huge. It is a exciting approach.' (G, NAS)

However, the main concerns were around evidence gathering and the practicalities of an applied soundscape approach. Since soundscape planning is new to the field of planning practice, there are no equivalent examples against which to evaluate the outcomes of the four studied cases. The planning authority and general public in the studied cases, used an 'evidence-based' criteria for evaluation. For other stakeholders, whose work was conducted within a theoretical basis, like soundscape academics, the outcomes were evaluated through established rules and standards.

To support future work, there is therefore a need for more detailed and structured guidelines to define each stakeholder's scope of work and evaluation criteria for soundscape planning. These issues are being addressed in part 2 of the international soundscape standard (ISO 2016) and will help to provide a structure for future work. In order to establish evaluation criteria and methods for soundscape planning inline with the international standards (ISO 2014; ISO 2016), it is important to understand, when evaluating cases, whether the project objectives are achieved.

In the studied cases, evaluations were carried out during the process, assessing each step through panel meetings and discussions with the planning authority and soundscape specialists (i.e. researchers and practitioners). The criteria they used was an 'evidence-based' approach, including acoustic measurements, body language analysis and stakeholder interviews and surveys. This method enabled the identification of stakeholders' reflections and users' perceptual changes affected after completion of the projects. Further actions can be taken through evaluation surveys or interviews with users of the space. This 'evidence-based' approach, as required by the planning authority and applied soundscape practitioners in Brighton and Hove, proved to be an effective and convincing evaluation method in the studied cases.

Meanwhile, outcomes can also be evaluated according to technical reports and established standards or recognised methods in particular aspects (e.g. sound insulation of acoustic barriers). For example, designing an improved acoustic environment for communities near airports with an objective of minimising the adverse effects of jet engine noise on sleep disturbance. The metric of sound pressure levels to evaluate the project could refer to the World Health Organization's night noise guidelines for Europe (WHO 2009).

3.1.4 Further development considerations

Prior to the studied cases, considerations for good soundscape quality were not found in Brighton and Hove City's design plans for urban projects. Whereas other aspects in general design and planning guidelines were given priority, like transportation and security. The applied soundscape projects in the Brighton and Hove cases worked with the acoustic environment at different urban scales (Lavia et al. 2016c). However, the soundscape experiments and designs at a street level seemed more successful and feasible than at the larger urban scale in the Valley Gardens project.

This study found that structured post evaluation case studies of implemented applied soundscape schemes, aligned with the international standards (ISO 2014, ISO 2016), can be useful to build the evidence base and explore methods and criteria for coordinating a soundscape approach within more complex and large-scale urban design projects.

Soundscape planning in the studied cases represents a much needed change in the approach to managing the acoustic environment by involving residents and local experts as co-specifiers of the project throughout its life cycle rather than just as consultees at specified points (Lavia et al. 2016c). In doing so, it is essential to take into account the opinions and experiences of local experts at a project's design and specification stage.

An understanding of soundscape concepts and the ability to value users' perceptions is required as the first step in a soundscape planning process and can be obtained through initial explorations

and user survey methods (ISO 2016). Other stakeholders such as planners, designers, and soundscape specialists (i.e. researchers and practitioners), can then be engaged with and interact with users of the target spaces to design and conduct onsite applied experiments. The engagement process, using appropriate methods and with a relevant panel of representatives from the communities of interest, is crucial to the successful identification of the issues, the desired future state and the subsequent co-design process of the solution(s).

3.2 An agile participatory urban soundscape planning process

Based on the actual planning process in the studied cases from Brighton and Hove (Table 3), an agile participatory urban soundscape planning process was developed, shown in Figure 3; underlying the process is the theoretical (i.e. conceptual) soundscape framework (Figure 1). The new process (Figure 3) presents urban soundscape planning as an agile and sustainable method involving stakeholders as co-specifiers at different stages of the urban soundscape planning process. It uses relevant engagement styles and methods and can be applied to different urban scales: street level, community scale and city scale.

The process illustrates that start-up and preparation stages are necessary at the beginning of a soundscape planning process in order to introduce soundscape concepts to local stakeholders and identify the soundscape characteristics (both wanted and unwanted) of importance to them. This initial stage serves to inform the next stage in the process, goals and objectives, and any subsequent soundscape planning activity by the planning authority.

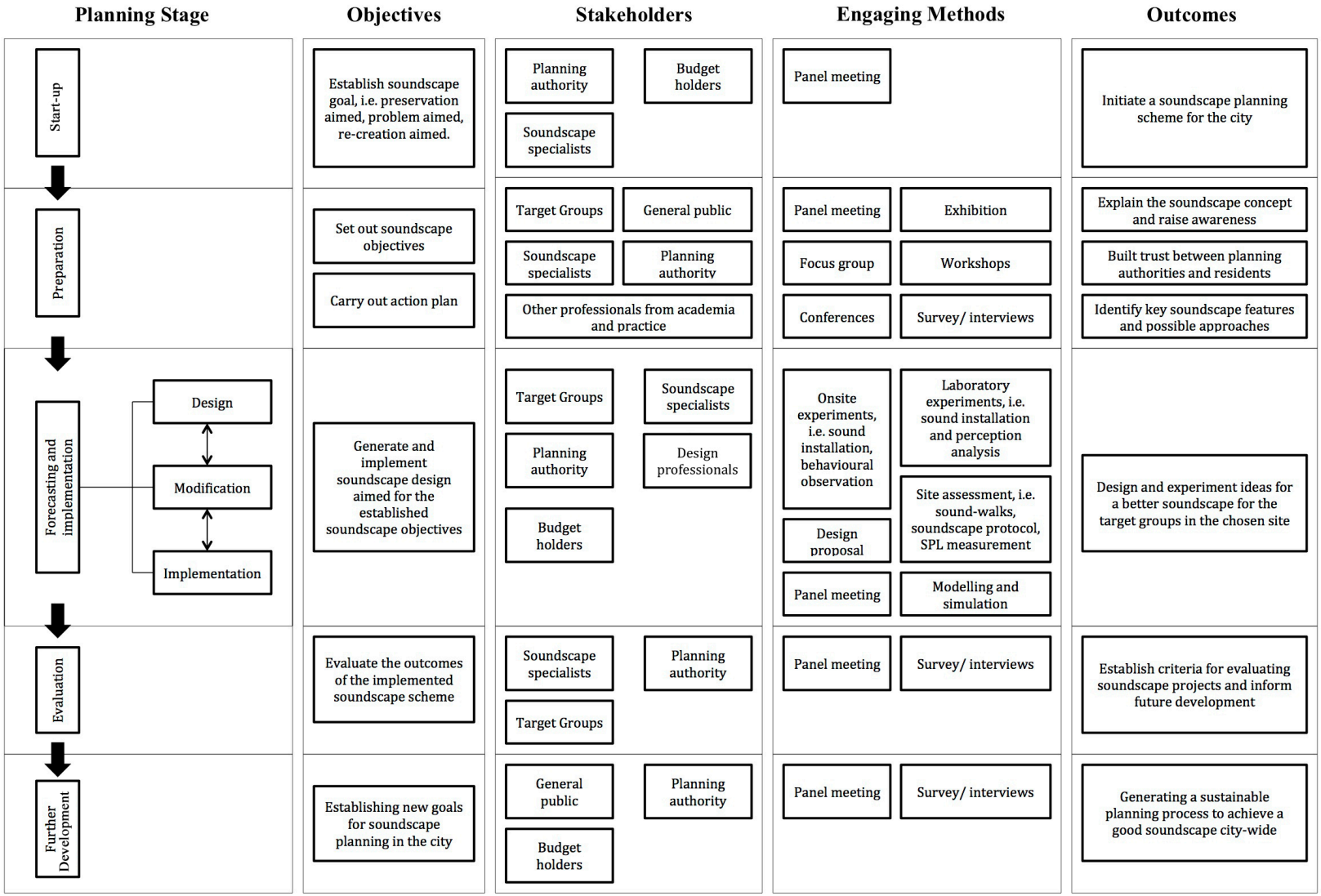
During the start up and preparation stages, it is important that engagement with stakeholders is in response to the established goals and objectives and uses a variety of different engagement methods - e.g. panel meetings, conferences, soundswalks, and face to face interviews - in order to gain a clear understanding of the local context and the issues from the perspective of the relevant stakeholders. Detailed plans to achieve the established objectives need to be carried out before any further steps are taken to provide guidance and reference for evaluations.

Forecasting can be developed through onsite assessments, experiments, simulations and other emerging participatory and non-participatory techniques, such as sound installations and behavioural analysis. Updated frameworks of assessing soundscape qualities in different urban and rural contexts (EEA 2014; Bento Coelho 2016; Kang et al. 2016; Aspuru et al. 2016) as well as modelling methods (e.g. Ricciardi et al. 2015; Hong and Jin, 2015) can also contribute to the forecasting and implementation and the evaluation stages.

Results from the forecasting and implementation stage should then inform the design stage. However, regarding the Valley Gardens case study in Brighton and Hove this stage could not be conducted due to the local constraints of the planning authority. When referring to a theoretical soundscape planning framework (Figure 1) the additional recommended steps are identified in Figure 3 as part of a circular process, e.g. design, modifications, and implementation; these activities then inform further development activities as/when they are undertaken.

Jieling Xiao, Lisa Lavia & Jian Kang (2017): Towards an agile participatory urban soundscape planning framework, Journal of Environmental Planning and Management, DOI: 10.1080/09640568.2017.1331843

Figure 3 An agile participatory process for urban soundscape planning



This agile participatory urban soundscape planning process merges theoretical concepts and applied results. In doing so it proposes several rules for engaging stakeholders and making the decisions summarised in the studied cases:

- urban soundscape planning should be a sustainable process, where each stage can be referred back to the last stage and re-developed to meet the objectives;
- emergent data and developments should be incorporated into urban soundscape plans relevant to local contexts and requirements;
- the existing soundscape projects should be re-developed sustainably according to changes in the local environment, policy and stakeholder requirements;
- urban soundscape planning requires new agile management skills, insights, standards and approaches from the industry and those pioneering the paths ahead;
- the application of soundscape principles should not be limited to management and control of noise in urban spaces but rather incorporated into city masterplans and design guidance.

However, such rules are only for general guidance purposes. An agile participatory urban soundscape planning process, as presented in Figure 3, relative to local contexts and experts, needs to be developed with detailed specifications for each stage.

As emphasised in the beginning of this paper, soundscape planning is an iterative, agile and circular process which should be carried out in the context of contemporary sustainable urban development (Lavia et al. 2016a). This study's recommended agile process was successfully employed in the studied cases in Brighton and Hove because the planning authority valued a process of engagement with stakeholders from a wide community of interest, consulting on the results and supporting relevant projects to test and apply, evidence and evaluate soundscape planning theories and recommendations. For future work, this process, when applied, needs to establish goals and objective that fit within a city's wider sustainability framework to enhance people's wellbeing and improve liveability at all times of day or night.

4 Conclusions

Through application of a theoretical soundscape planning framework and review of stakeholder engagement activities in four applied soundscape case studies in Brighton and Hove a new agile participatory urban soundscape planning process was developed, as illustrated in Figure 3. To the best of the author's knowledge, the model is the first of its kind in applied soundscape practice.

The study of the four applied cases was conducted using post-implementation analysis through interviews and documentation. The stages in the new process model were identified as: start-up, preparation, forecasting (comprising design, modification, and implementation in a circular process), evaluation and further development. It was found that each stage needed to be

evaluated before proceeding to the next or repeating the previous stage. All of the stages have equal w and importance and are designed to be applied using an agile process.

This new agile participatory urban soundscape planning process will enable better identification of the environmental acoustic issues that need to be considered when planning new projects, deciding which experts to involve, and which tools and methodologies to employ. The process when applied can help to enable holistic environmentally and socially sustainable outcomes for urban planning and engagement.

It is expected that this type of agile participatory urban soundscape planning process can help fill the existing gaps between current technical and practical approaches to designing for soundscape planning and management. It is anticipated that this approach may provide practitioners with practical guidance and an agile applied collaboration model for managing interactions with citizens as co-specifiers of projects.

Acknowledgements

The authors wish to thank the citizens of Brighton and Hove, UK, Brighton and Hove City Council, the members of ISO TC43/SC1/WG54 Perceptual assessment of soundscape quality and the EU COST Action TD0804 on Soundscapes of European Cities and Landscapes for their time, support and mentorship.

Funding

This research was supported by the EU COST Action TD0804 on Soundscapes of European Cities and Landscapes; the Innovation, Impact and Knowledge Exchange (IIKE) Collaborative R&D Award scheme, funded by the Engineering and Physical Sciences Research Council (EPSRC); Brighton and Hove City Council, UK; EU FP7 SONORUS Urban Sound Planner project, the People Programme (Marie Curie Actions) of the European Union's 7th Framework Programme FP7/2007–2013; Santander research mobility awards scheme and White Rose Doctoral Development Scheme at the University of Sheffield; FORMAS, Sweden; The UK Noise Abatement Society.

Author Contributions

The original study design was conceived by Lisa Lavia (the overall project leader) and refined under the supervision of Jian Kang. For the resulting final study, all listed authors: Jieling Xiao (who was carrying out PhD research at The University of Sheffield at the beginning stage of this study), Lisa Lavia and Jian Kang, designed the study, analysed the data, wrote the paper and approved the final manuscript. Recruitment and interviews in Brighton and Hove City were carried out by Lisa Lavia and Gloria Elliott (original study), and Lisa Lavia and Jieling Xiao (final study) in conjunction with Brighton and Hove City Council (original and final study). The planning and interview models in the paper were developed by Jieling Xiao and Jian Kang based on co-created content and study design with Lisa Lavia. The studied cases were co-designed and led as noted by the co-authors in the referenced papers.

References

Adams, M.D., Davies, W.J. and Bruce, N.S., 2009, *Soundscapes: an urban planning process map* , in proceedings of Internoise 2009, 23-26 August 2009, Ottawa, Canada.

Alves S. and L. Estévez-Mauriz, 2016, Applied urban sound planning, in Kropp, W., Forssén J. and Mauriz E. eds, 2016. Urban soundscape planning: the SONORUS project. Swiden: Chalmers University of Technology Press. pp. 63-116.

Aspuru, I., Garcia, I., Bartalucci, C., Borchi, F., Carfagni, M., Governi, L., Bellomini, R., Luzzi, S., Wolfert, H., Gaudibert, P., 2016. "LIFE+2010 QUADMAP Project: a new methodology to select, analyze and manage Quiet Urban Areas defined by the European Directive 2002/49/EC" Noise Mapping. (2016); 3:120–129.

Bento Coelho, J. L., 2016. Approaches to Urban Soundscape Management, Planning, and Design. In Kang J. and Schulte-Fortkamp B. eds., Soundscape and the Built Environment. London: CRC Press.

Brown, A.L., 2011. Advancing the concepts of soundscapes and soundscape planning. In *Proceedings of the Conference of the Australian Acoustical Society 2011,* 2-4 November 2011, Gold Coast, Australia.

Brown, A.L., 2012. A review of progress in soundscapes and an approach to soundscape planning. *Int. J. Acoust. Vib*, *17*(2), pp.73-81.

Brown, A.L., 2014, Soundscape planning as a complement to environmental noise management. In *Proceedings of InterNoise* 2014, 16-19 November 2014, Melbourne, Australia.

Brown, A.L., Gjestland, T. and Dubois D., 2016, Soundscape and the built environment. in Kang, J. and Schulte-Fortkamp, B. eds., 2016. *Soundscape and the Built Environment*. London: CRC Press. pp. 1-16.

Chadwick, G. 1971. A systems view of planning: towards a theory of the urban and regional planning process. Oxford: Pergamon Press.

Charmaz, K., 2006. Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis. Sage: London.

COST Action TD0804. 2008. Soundscape of European Cities and Landscapes, Memorandum of Understanding for the Implementation of a European Concerted Research Action, http://soundscape-cost.org; accessed 13 April 2016.

COST Brighton Soundscape Workshop, 2011. Available at: http://soundscape-cost.org/index.php/activities-16/previous-activities/26-brighton-soundscape-workshop-2011. Accessed 02 March 2017.

COST Brighton Soundscape Workshop 2012, available at: http://soundscape-cost.org/index.php/activities-16/previous-activities/38-cost-brighton-workshop-2012. Accessed 02 March 2017.

Council of Europe, 2000. European landscape convention. European Treaty Series, no. 176, 2000, pp.1–9. Available at: http://conventions.coe.int. Accessed 14 April 2017.

De Coensel, B., Bockstael, A., Dekoninck, L., Botteldooren, D., Schulte-Fortkamp, B., Kang, J. and Nilsson, M.E., 2010. The soundscape approach for early stage urban planning: a case study. In *Proceedings of Inter· noise conference 2010, 13-16 June, Lisbon, Portugal*.

Easteal, M., Bannister, S., Kang, J., Aletta, F., Lavia, L. and Witchel, H., 2014. Urban sound planning in Brighton and Hove. In *Proceedings of Forum Acusticum 2014, 7-12 September, Krakow, Poland*.

EEA technical report No. 4/2014: "Good practice guide on quiet areas". European Environment Agency. Available at: http://www.eea.europa.eu/publications/good-practice-guide-on-quiet-areas. Accessed 6 April 2017.

FP7 Sonorus, 2013. Initial Training Network under the FP7 People Programme. Available at: http://www.fp7sonorus.eu/. Accessed 11 April 2017.

Hall, P. and Tewdwr-Jones, M. 2010. Urban and Regional Planning. London: Routledge.

Hong, Joo Y, and Jin Y Jeon. "Influence of urban contexts on soundscape perceptions: A structural equation modeling approach." Landscape and Urban Planning 141(2015):78-87.

ISO/FDIS 12913-1:2014 Acoustics — Soundscape — Part 1: Definition and conceptual framework. Geneva, Switzerland: International Organization for Standardization.

ISO/CD 12913-2:2016(E) Acoustics — Soundscape — Part 2: Data collection and reporting requirements. Geneva, Switzerland: International Organization for Standardization.

Kang, J. 2006. Urban Sound Environment. London: CRC Press

Kang, J., Chourmaouzidou, K., Sakantamis, K., Wang, B. and Haom Y. eds., 2013. Soundscape of European Cities and Landscape. Oxford: COST.

Kang, J., Schulte-Fortkamp, B., Fiebig, A., Botteldooren, D., 2016. Mapping of Soundscape. In Kang J. and Schulte-Fortkamp B. eds., Soundscape and the Built Environment. London: CRC Press.

Kropp, W., Forssén J. and and L. Estévez-Mauriz, eds, 2016. Urban soundscape planning: the SONORUS project. Swiden: Chalmers University of Technology Press.

Lavia, L., Axelsson, Ö. and Dixon, M., 2012. Sounding Brighton: Developing an applied soundscape strategy. In proceedings of *AESOP Conference 2012, 11-15 July 2012, Ankara* Turkey.

Lavia, L., Easteal, M., Close, D., Witchel, H., Axelsson, O., Ware, M. and Dixon, M., 2012. Sounding Brighton: Practical approaches towards better soundscapes. In *Proceedings of InterNoise* Conference 2012, 19-22 August 2012, New York, US.

Lavia, L., Dixon, M., Witchel, H.J. and Goldsmith, M., 2016. Applied Soundscape Practices. In Kang J. and Schulte-Fortkamp B. Eds., Soundscape and the Built Environment. London: CRC Press.

Lisa Lavia, Harry J. Witchel, Jian Kang, Francesco Aletta, 2016. A Preliminary Soundscape Management Model for Added Sound in Public Spaces to Discourage Anti-social and Support Pro-social Effects on Public Behaviour. In conference proceedings; DAGA 2016, 17 March 2016, Aachen. German Acoustical Society (DEGA)

Lavia, L., Xiao, J., Kang, J., 2016. August. Sounding Brighton: Practical approaches towards better soundscapes. In *Proceedings of InterNoise* Conference 2016, 21-24 August 2016, Hamburg, Germany.

Raimbault, M. abd Dubois, D., 2005. Urban soundscapes: Experiences and knowledge. *Cities, 22*(5), 339-350.

Ricciardi, P., Delaitre, P., Lavandier, C., Torchia, F., Aumond, P. "Sound quality indicators for urban places in Paris cross-validated by Milan data." The Journal of the Acoustical Society of America 138.4 (2015):2337-2348.

Mason, J. 2002. Qualitative researching. London: Sage.

The WHO (World Health Organization), 2009. Night Noise Guidance for Europe, ed. C. Hurtley. Copenhagen (2009). Available at: http://www.euro.who.int/__data/assets/pdf_file/0017/43316/E92845.pdf. Accessed 6 April 2017.

Tuan, Y. F. (1977). *Space and place: The perspective of experience*. University of Minnesota Press.

Truax B., 1998. Models and strategies for acoustic design. In *proceedings of "Stockholm, Hey Listen!" conference, June 8-161998, Stockholm, Switzerland*.

Truax, B. and Barrett, G.W., 2011. Soundscape in a context of acoustic and landscape ecology. *Landscape Ecology*, *26*(9), pp.1201-1207.

Tippett, J., Handley, J.F. and Ravetz, J., 2007. Meeting the challenges of sustainable development—A conceptual appraisal of a new methodology for participatory ecological planning. *Progress in Planning*, *67*(1), pp.9-98.

Witchel, H., Lavia, L., Easteal, M., Westling, C., Goodhand, D., Lopez-Mendez, A. and Odobez, J.M., 2014. Music Interventions in the West Street Tunnel in Brighton: A Community Safety and Night-Noise Soundscape Intervention Pilot: Unpublished Preliminary Report. *Brighton and Hove City Council, Brighton and Hove, UK*.

Wagenaar, H., 2014. *Meaning in action: Interpretation and dialogue in policy analysis*. London: Routledge.

Yin, R.K., 2009. Case Study Research: Design and Methods (Vol. 5). London: Sage.