WHAT DOES THE CONSULTANCY INDUSTRY NEED FROM ACADEMIA? A SOUNDSCAPE AND PLANNING PERSPECIVE

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1 INTRODUCTION

The practice of soundscapes is well established within academia. While research has extensively shown the benefits to health of positive soundscapes[1], the consideration and mitigation of the adverse effects of noise still dominates acoustics in the context of the planning system[2], with precious few examples of soundscapes being incorporated into development designs[3]. The recent publication by the Welsh Government of their Noise and Soundscape Action Plan[4] could drive progress in the consideration of soundscapes within planning.

In areas of particularly high levels of noise, soundscapes can be enhanced, even where mitigating levels is not possible, giving residents access to more pleasing features[5]. This can enhance the perception of an urban setting[1]. Informational and energetic masking can be used to control emotional responses to soundscapes[6]. While the local context should be considered in the choice of masking sounds[7], water[8] and birdsong[9] have both been shown to be effective at improving soundscapes, as has simply improving the visual landscape[10]. The masking sound can increase perceived naturalness and pleasantness, while decreasing annoyance, even if the perceived loudness of target noise is unchanged[11]. The implementation of such design factors can be cheap in comparison to noise control measures. Any relationship between the perceived reduction in annoyance due to masking (informational or energetic) and the traditional health risks associated with annoyance due to noise exposure should be explored further.

In spite of the significant number of academic research projects into soundscapes, their uptake within design and consultancy has been relatively slow. The consideration of soundscapes within projects is seen by consultants as a hard sell[12] due a lack of any necessity from a policy perspective and a lack of thoroughly evaluated example projects. The needs of the consultancy industry from academia to encourage consideration of soundscapes will be presented. However, the balance of work carried out within soundscapes firmly lies with academia, and as such some needs of academia from consultancy will also be presented.

2 SOUNDSCAPES AND POLICY

The City of London Noise Strategy 2016 – 2023 constitutes an early adoption of the promotion of soundscapes by a local planning authority[13]. A key policy of the strategy is for major developments to consider opportunities to enhance existing soundscapes and include soundscape initiatives within the designs. The strategy also promotes the preservation of lost and disappearing sounds.

The Welsh Government's Noise and Soundscape Action Plan goes further, actively promoting public engagement in soundscapes and promoting the wellbeing of future generations through soundscapes[4]. There is a drive to frame soundscapes from a placemaking perspective with a view to considering the impact on active and social places, productive and enterprising places and distinctive

and natural places. Interestingly, the action plan also suggests that traffic noise should be considered from a contextual point of view rather than solely energetic. For example, would any road traffic noise be appropriate in a remote area of tranquility?

While soundscapes aren't explicitly referenced in NPSE[14] or NPPF[15] their consideration is still of relevance. Along with the avoidance of significant adverse impact and the promotion of mitigating and minimizing adverse impact on health and quality of life due to noise, a key recommendation of NPSE is to contribute to the improvement of health and quality of life where possible, although this is rarely considered[11]. Further, both NPPF and NPSE promote the identification and preservation of prized areas of tranquility.

Similarly, in Scotland PAN 1/2011[16] promotes the protection of quiet areas, as recommended in the END[17]. While the recommendations of PAN 1/2011 focus on adverse impacts, the associated TAN does suggest the consideration of beneficial impacts, which provides a framework in which to include soundscapes. The upcoming National Planning Framework 4 provides an opportunity to follow the lead of Wales and promote positive soundscapes.

The protection of quiet areas is promoted in the END, therefore putting onus on member states to identify quiet areas and ensure their preservation. There are a wide range of tools amongst member states to identify quiet areas[18], although concerns have been raised about methods that rely on noise exposure identified through noise mapping exercise as opposed to perceived tranquility[19]. There is now a growing acceptance that soundscape tools are powerful in the determination of quiet areas[20]. The use of soundscape tools is also beneficial in that it prioritises areas that are valued for their soundscape over areas simply with low noise levels[21].

Additionally, the assessment of soundscapes may have a role with respect to industrial noise assessments. It has been proposed that the use of soundscape assessment tools could be useful in aiding commentary regarding context in accordance with BS 4142[22].

3 ADOPTION OF SOUNDSCAPE PROCEDURES

The ISO 12913 series provides definitions of soundscape terminology as well as standardised approached to the collection and analysis of soundscape data. However, any adoption of soundscapes within a policy framework is likely to require procedural guidance. There is currently no such adopted guidance[3], although the revision to TAN 11 might address this.

3.1 Conserving Soundscapes

Beyond quiet areas, there remains ambiguity in who is responsible for determining which soundscapes require conservation or protection. Recent studies have suggested strong support for preservation of soundscapes, with 79% of respondents in one study stating an urgent or very urgent need for action[23]. During the Covid-19 lockdown, The New York Public Library released an album of typical urban soundscapes for those isolating to provide some normality[24], highlighting the importance of vibrant soundscapes to city dwellers. The City of London Noise Action Plan is clear that developers are responsible for the inclusion of soundscape initiatives within masterplan areas, but not so clear in who is responsible for protecting soundscapes of cultural or economic value. The policy of preserving lost and disappearing sounds is well intentioned, but also provides little guidance on which soundscapes are of particular importance, nor the fact that changing urban soundscapes are an inevitability of the development of cities[25].

However, without considering the impact of development on existing soundscapes, continued focus on the avoidance of adverse noise impact could lead to adverse soundscape outcomes. For example, in Scotland a new housing development in proximity to a community hall that hosts a weekly pipe

band rehearsal may require to carry out mitigation works to the hall to comply with the agent of change principle. This could affect the audibility of the pipe band rehearsal in the existing locality, without considering whether it is cherished by the local community.

Public bodies, aided by academia, need to identify and define soundscapes to be conserved. Guidance is also necessary on when additional soundscape assessments might be necessary to determine cherished soundmarks, and how stakeholder engagement should be approached. Without this guidance it is unlikely that developers will actively identify and conserve soundscapes that might complicate projects. The guidance should also seek to ensure appropriate soundscape protection while promoting sustainable economic growth.

3.2 Designing Soundscapes

There has been a long-reported lack of connection between soundscape research, design and planning practice[26]. Adams, Davies and Bruce proposed a method of integrating soundscapes into UK planning system in 2009[27], which was expanded by Xiao, Lavia and Kang in 2018[28]. Initial work acknowledged the challenges of integrating a subjective field like soundscapes to a planning system dominated by scientific rationality, although it has been suggested that if subjective qualities in the visual field can be incorporated, so too could soundscapes[29].

Soundscapes would be most effectively included within a design at the masterplan stage for large developments[27]. They should be considered through the life of the project, from pre-application to detailed design.

The identification of key stakeholders is integral to the success of planning soundscape interventions[30]. Stakeholders should be involved in the setting goals and objectives, promoting public participation[29]. Following this, a more detailed approach of defining wanted and unwanted sounds can be conducted, informing the soundscape management and design[31]. Consultants should consider the influence of the environment on the defined sounds[32] and provide recommendations on how to achieve the desired outcome.

The evaluation of proposed features during the design process is important. As users' perception of the soundscape is key to the success of the project, relatable tools such as auralisation and virtual reality are powerful predictive evaluation tools. Artificial neural networks, which are increasingly useful in the determination of perceived acoustic comfort[32], could also be used to evaluate designs while reducing the need for labour intensive stakeholder engagement. Any such evaluation methods, particularly artificial neural network tools, should be available to consultants to drive progress and innovation in soundscape design.

Soundscape engagement and assessment tools, such as soundwalks and auralisation, are also beneficial in that they can serve to inform and educate planners and stakeholder[15]. While there has been progress in the use of auralisation tools in planning[33], there has been hesitancy in the adoption of soundwalks in accordance with the ISO 12913 series due to the associated costs[3] and accessibility to acoustic consultants[34]. Recent progress in the development of soundscape indicators could address these concerns. The correlation of indicators with perceived attributes increases with complexity, and should include visual and contextual factors[35]. Further work to identify and validate indicators along with standardised definitions of those most effective could aid consultants in the assessment, design and evaluation of soundscapes.

Mapping of soundscapes has received increasing attention in recent years, which should be used complimentary to noise exposure maps[36]. Early examples presented road traffic noise maps alongside positive sound maps, with positive soundscape areas inferred from the combination of the two[37]. Recent projects have mapped by source, by psychoacoustic parameter and by perceptual attributes relevant to soundscape study[38]. This allows a more detailed understanding of the

soundscape of an area which has been shown to be reasonably accurate[39], allowing the identification of vibrant, tranquil or annoying areas, for example. Additionally, crowd-sourced tools can be used to generate maps[40,41], however these tools raise concerns of user bias due to the lack of user instruction[39]. Soundscape maps have even been produced based on the analysis of sound-associated words used to tag pictures on social media[42]. The use of data collected through smart city initiatives could, in combination with soundscape indicators, provide accurate and up-to-date soundscape maps of urban areas[39]. The evaluation of different mapping techniques and standardisation of the most effective tools would encourage the assessment and design of soundscapes within consultancies.

Any soundscape interventions should be confirmed in planning through the use of binding agreements or planning conditions. However, planning conditions would need to be enforceable[15], which presents a challenge for a subjective field. It is likely that any conditions would only be able to regulate the inclusion of design features rather than their perceptual effects.

4 IMPLEMENTATIONS OF SOUNDSCAPE INTERVENTIONS

Despite the potential benefits of soundscapes being widely understood, along with a framework in which to consider soundscapes in the planning process, there remains a long-standing lack of project examples that encompass soundscape as opposed to solely noise exposure[3,12,26,43].

A number of example projects were summarized by Payne, Davies and Adams in 2009[26], with the projects being roughly evenly split between temporary and permanent installations. While the majority of projects summarized were urban parks, a common trend among soundscape intervention projects[43], a conceptual proposal for a residential area in Gainsville, Florida, was also presented. The soundscape in Gainsville was surveyed using acoustic measurements and soundwalks with stakeholder engagement carried out with focus groups. Following this, recommendations were made in the form of mitigating existing noise levels, zoning activities to direct users to more positive soundscapes and the design and installation of positive natural and cultural sound sources[44].

Eleven years on and there are still precious few examples of soundscapes considered within planning in the UK[3], despite a number of consultancy firms offering soundscape services. In 2019, Bureau Veritas were highly commended in the ANC Awards for their consideration of soundscapes in a quiet courtyard of a care home. The project considered the adverse effects of road traffic noise as well as recommendations for a water fountain to increase the perceived quality of the soundscape in a quiet courtyard within the development. The report mapped both road traffic noise and waterfall noise separately[45].

Various international soundscape projects were summarized by van Kamp and Brown[12]. A number of different soundscape design techniques were found, including:

- Informational and energetic masking using
    - Natural sounds such as flowing water, birdsong and vegetation
    - Human sounds through the placement of agricultural works with associated rural sources
    - Reproduced natural noise sources, such as bird song, automatically varied in level depending on local traffic noise
- Noise control measures, including:
    - Use of absorptive surfaces and acoustic barriers
    - Dispersive landscaping for low frequency noise
- Increasing the perceived visual quality of the area

Throughout these projects, stakeholder involvement and a sense of ownership were found to be key input parameters[12]. There appears to be a shift within the projects towards a more interdisciplinary, as opposed to multidisciplinary, way of working, a key recommendation identified in earlier work[26].

However, as first identified in 2009[26], there still remains a lack of post completion evaluation of the projects[12]. Any evaluation of soundscape interventions would preferably come from academia to provide unbiased results. Academia would benefit from an increased number of projects incorporating soundscape design driven by consultancy, which could be used to evaluate outcomes. This would further provide a means to appraise and improve on proposed methods to integrate soundscapes into the planning system. The consultancy industry needs thoroughly evaluated example projects to ensure that a reliable and proven concept can be delivered, resulting in the current stalemate.

While soundscape projects might be in shortfall, the large number of public sound art installations could be used in the interim to drive evaluation. While there are examples in earlier publications of the manipulation of soundscapes with sonic arts[26,46], this aspect has been less explored in recent years, with the exception of post-hoc analysis by Oberman[47]. There has been increasing work in the arts to evaluate the effects of sonic art on the users of the spaces[48,49]. This analysis could be enhanced by evaluating the impact of manipulation of soundscapes through sonic installations. Findings from any such evaluation process could provide additional guidance and even comfort within consultancies in the effectiveness of soundscape design.

Examples of sonic installations that could benefit or could have benefited from evaluation include Susan Philipsz's installation at nine locations along the coasts of Denmark, Sweden and Norway intended to provoke introversion[50]; Rolf Julius' installation on the Manny building in Nantes designed to promote relaxation through metallic sounds and birdsong reflecting on the building's architecture[51]; Emeka Ogboh's LOS-MAN project prompting memories amongst the Nigerian immigrant population transporting the soundscapes of Lagos to Manchester[25]; and Kirkby, Perman and St. John's exploration of a site's industrial past[52]. While the goals of such projects might be different to those of urban design, there is potential to evaluate the design or any stakeholder engagement associated as well the effects of such projects to inform future designs.

5 CONCLUSIONS

While soundscapes are a well-established field in academia, there remains a longstanding shortfall of examples of incorporating soundscapes in project design and planning. Research into any correlation between reduced annoyance due to positive soundscape in high noise exposure environments and the traditional health effects of noise might encourage the consideration of soundscapes in more projects. The recent Welsh Noise and Soundscape Action Plan 2018 – 2023 might also encourage the adoption of soundscape practice within consultancy. However, while the action plan considers soundscapes, guidance is necessary to ensure the policy is adequately and appropriately adopted. Work is necessary to understand what soundscapes, other than quiet areas, require conservation along with a framework to ensure they are appropriately protected in a sustainable manner.

Numerous soundscape indicators and mapping procedures have been proposed within academia. Further work towards defining a standardised set of reliable indicators or artificial neural networks along with mapping processes would be beneficial to acoustic consultants to increase confidence in soundscape design and evaluation. This would address concerns within the industry about the inherent costs associated with surveying soundscapes in accordance with the ISO 12913 series and quantify expected outcomes, reducing risk.

Various strategies to consider soundscapes in the planning system have been proposed within academia. Example projects driven by acoustic consultancies are necessary to allow for evaluation of these planning procedures. Moreover, example projects are necessary to enable thorough evaluation of the successes of projects, both from an academic and commercial point of view. In the meantime, it is proposed that academia could evaluate successes of soundscape installations from the arts with a view to translating findings to the built environment.

6 REFERENCES

1. F. Aletta, T. Oberman and J. Kan, Associations between Positive Health-Related Effects and soundscapes Perceptual Contructs: A Systematic Review, International J. of Environmental Research and Public Health, 15, 2392-2404 (2018).
2. L. M. Anderson, B. E. Mulligan, L. S. Goodman and H. Z. Regen, Effects of Sounds on Preferences for Outdoor Settings, Environment and Behavior, 15(5), 539-566 (1983).
3. Institute of Acoustics, Call for Evidence: Review of Technical Advice Note 11 Noise to incorporate Air Quality and Soundscape - Response from the Institute of Acoustics (2020).
4. Welsh Government, Noise and Soundscape Action Plan 2018-2023 (2018).
5. European Environment Agency, Quiet Areas in Europe - The Environment Unaffected by Noise Pollution, Publications Office of the European Union, Luxembourg (2016).
6. M. Yang, J. Kang, Y. Hao and L. Lavia, The effects of transportation noise on the people's emotional feelings of the community environment, J. of the Acoustical Society of America, 141(5), 3801-3801 (2017).
7. A. L. Brown, J. Kang and T. Gjestland, Towards Standardization in Soundscape Preference Assessment, Applied Acoustics, 72, 387-392 (2011).
8. J. Y. Jeon, P. J. Lee and J. You, Perceptual Assessment of Quality of Urban Soundscapes with Combined Noise Sources and Water Sounds, J. of the Acoustical Society of America, 127(3), 1357-1366 (2010).
9. Y. Hao, J. Kang and H. J. Wörtche, Assessment of the masking effects of birdsong on the road traffic noise environment, J. of the Acoustical Society of America, 140(2), 978-987 (2016).
10. M. Lugten, M. Karacaoglu, K. White, J. Kang and K. Steemers, Improving the Soundscape Quality of Urban Areas exposed to Aircraft Noise by adding Moving Water and Vegetation, J. of the Acoustical Society of America, 144, 2906-6917 (2018).
11. Y. Hao and Y. Shao, The Roles of Soundscape Approached in Landscape Design, Landscape Architecture Frontiers, 8(1), 72-83 (2020).
12. I. van Kamp and A. L. Brown, Soundscape and Restoration: Observations from planning case studies, Inter.noise, Madrid (2019).
13. City of London, City of London Noise Strategy 2016 to 2026, London (2016).
14. Defra, Noise Policy Statement for England (NPSE), London (2010).
15. Ministry of Housing, Communities & Local Government, National Planning Policy Framework (2019).
16. Scottish Government, Planning Advice Note 1/2011: Planning and Noise (2011).
17. The European Parliament, Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 Relating to the Assessment and Management of Environmental Noise, Official J. of the European Communities, L189EN), 12-25 (2002).
18. European Environment Agency, Good Practice Guide on Quiet Areas, Publications Office of the European Union, Luxembourg (2014).
19. S. R. Payne and N. Bruce, Exploring the Relationship between Urban Quiet Areas and Perceived Restorative Benefits," International J. of Environmental Research and Public Health, 16(9) (2019).
20. European Environment Agency, Environmental Noise in Europe - 2020, Publications Office of the European Union, Luxembourg (2020).
21. W. J. Davies, M. D. Adams, N. S. Bruce, R. Cain, P. Jennings, A. Carlyle, P. Cusack, K. Hume and C. Plack, A Positive Soundscape Evaluation Tool, Euronoise, Edinburgh (2009).
22. J. Smyrnowa and G. Brown, Soundwalks in Industrial Areas: A Pilot Study, Acoustics Bulletin, 46(4), 32-44 (2020).
23. Y. Jia, H. Ma and J. Kang, Characteristics and Evaluation of Urban Soundscapes worthy of Preservation, J. of Environmental Management, 253 (2020).
24. The New York Public Library, Missing Sounds of New York (2020).
25. E. Ogboh, Lagos Soundscapes, Bielefeld: Kerber Art (2019).
26. S. R. Payne, W. J. Davies and M. D. Adams, Research into the Practical and Policy Applications of Soundscape Concepts and Techniques in Urban Areas (NANR200), Defra (2009).

27. M. Adams, B. Davies and N. Bruce, Soundscapes: An Urban Planning Process Map, Inter.noise 2009 - Innovations in Practical Noise Control, Ottawa (2009).
28. J. Xiao, L. Lavia and J. Kang, Towards an Agile Participatory Urban Soundscape Planning Framework, J. of Environmental Planning and Management, 61(4), 677-698 (2018).
29. A. L. Brown, An Approach to Soundscape Planning, Proc. of Acoustics, Gold Coast (2004).
30. T. C. Andringa, M. Weber, S. R. Payne, J. D. Krijnders, M. N. Dixon, R. V. D. Linden, E. G. L. de Kock and J. J. L. Lanser, Positioning Soundscape Research, J. of the Acoustical Society of America, 134(4), 2739-2747 (2013).
31. A. L. Brown, A Review of Progress in Soundscapes and an Approach to Soundscape Planning, International J. of Acoustics and Vibration, 17(2), 73-81 (2012).
32. J. Kang, Urban Sound Planning - A Soundscape Approach, Acoustics 2019, Cape Schanck (2019).
33. Association of Noise Consultants, Case Study 1 - Environmental Infrastructure, https://www.association-of-noise-consultants.co.uk/environmental-infrastructure1-19/, accessed 25/08/2020 (2018).
34. M. Allen, What Should a City Sound Like?, Arup, https://www.arup.com/perspectives/what-should-a-city-sound-like, accessed 24/08/2020 (n.d.).
35. M. Lionello, F. Aletta and J. Kang, A Systematic Review of Prediction Models for the Experience of Urban, Applied Acoutics, 170 (2020).
36. A. L. Brown, Soundscape Planning as a Complement to Environmental Noise Management, Inter-noise: 43rd International Congress on Noise Control Engineering, Melbourne (2014).
37. F. Aletta and J. Kang, Soundscape Approach Integrating Noise Mapping Techniques: A Case Study in Brighton, UK, Noise Mapping, 2, 1-12 (2015).
38. E. Margaritis and J. Kang, Soundscape Mapping in Environmental Noise Management and Urban Planning: Case Studies in Two UK Cities, Noise Mapp, 4, 87-103 (2017).
39. J. Kang, F. Aletta, E. Margaritis and M. Yang, A Model for Implementing Soundscape Maps in Smart Cities, Noise Mapp, 5, 46-59 (2018).
40. Tranquil City, Tranquil City - Curating Urban Calm for Healthier City Living, https://tranquilcity.co.uk/, accessed 25/08/2020 (n.d.).
41. A. Craig, Glasgow 3D Sound Map, http://www.glasgow3dsoundmap.co.uk/, accessed 25/08/2020 (n.d.).
42. L. M. Aiello, R. Chifanella, D. Quercia and F. Aletta, Chatty Maps: Constructing Sound Maps of Urban Areas from Social Media Data, Royal Society Open Science, 2016.
43. M. Lippold and B. Lawrence, Soundscape Planning as a Tool for Urban Planning, 23rd International Congress on Acoustics, Aachen (2019).
44. G. W. Siebein, Y. Kwon, P. Smitthakorn and M. A. Gold, Case Study of Soundscape Assessment and Design Methods, Inter.noise and Noise-Con Congress and Conference Proceedings (2006).
45. Bureau Veritas, Proposed Care Home, St. Asaph Business Park, St. Asaph - Noise Assessment Report (2019).
46. W. J. Davies, M. D. Adams, N. S. Bruce, R. Cain, A. Carlyle, P. Cusack, K. I. Hume, P. Jennings and C. J. Plack, The Positive Soundscape Project, 19th International Congress of Acoustics, Madrid (2007).
47. T. Oberman, B. Bojanić Obad Šćitaroci and K. Jambrošić, Post-hoc Analysis of Two Temporary Acoustic Shelters in London, Inter.noie, Hamburg (2016).
48. K. Wells and A. Bailey, Sound Art and the Making of Public Space, Social & Cultural Geography (2018).
49. C. Stirling, Sound Art / Street Life: Tracing the Social and Political Effects of Sound Installations in London, J. of Sonic Studies, 11 (2016).
50. S. Philipsz, The Distant Sound, Stockholm: Art and Theory Publishing (2014).
51. Estuaire, Île de Nantes, Manny Building, "Air", Rolf Julius, https://www.estuaire.info/en/oeuvre/air-rolf-julius/, accessed 31/08/2020 (n.d.).
52. S. Kirkby, T. Perman and R. St. John, Concrete Antenna, https://www.concreteantenna.org/, accessed 31/08/2020, (n.d.).