



## DERIVING A TYPOLOGY OF SOUNDSCAPE DESIGN INTERVENTIONS

Cleopatra Moshona<sup>1\*</sup> Francesco Aletta<sup>2</sup> Xiaochao Chen<sup>2</sup> André Fiebig<sup>1</sup> Helen Henze  
Jian Kang<sup>2</sup> Andrew Mitchell<sup>2</sup> Tin Oberman<sup>2</sup> Brigitte Schulte-Fortkamp<sup>3</sup> Huan Tong<sup>2</sup>

<sup>1</sup> Engineering Acoustics, Institute of Fluid Dynamics and Technical Acoustics,  
Technische Universität Berlin, Germany

<sup>2</sup> Institute for Environmental Design and Engineering, University College London, UK

<sup>3</sup> Head-Genuit-Foundation, Herzogenrath-Kohlscheid, Germany

### ABSTRACT

In the last two decades, there has been a considerable uptick of soundscape studies. With various agents advocating for more diverse and inclusive approaches to urban acoustic environments, the need to establish practical guidelines arises. To support this process, the Catalogue of Soundscape Interventions (CSI) project was initiated, which provides an online repository for data collection and communication of soundscape interventions, globally. Within this framework, a soundscape intervention is understood as a location-specific design, aimed at preserving or enhancing the existing acoustic environment. The criteria that have to be met to classify a project as a soundscape intervention, as well as ways to implement and assess design improvements are currently being debated. To help identify and derive recurring strategies and aims in current practices, this paper categorizes 37 projects collected via the CSI platform by means of a five-type intervention typology, adopted from noise intervention literature. The collected projects are further classified in subtypes, based on the approaches used to influence the acoustic environment, as well as their level and stage of public involvement. Finally, the need to adapt the resulting typology to accommodate all current practices is discussed.

**Keywords:** *soundscape interventions, design, catalogue, typology, classification, ISO/TS 12913-4*

\*Corresponding author: [c.moshona@tu-berlin.de](mailto:c.moshona@tu-berlin.de).

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### 1. INTRODUCTION

The field of soundscape has long surpassed its status as a complementary alternative to traditional noise control and consolidated into an independent research discipline over the years. Indeed, a recent scientometric study confirmed a rapid growth of soundscape studies focusing on urban environments on a global level with research outputs having doubled in the last decade [1]. With various agents of the built environment, including policymakers, advocating for more diverse, inclusive and sustainable acoustic environments [2–6], the soundscape concept has attracted even more attention, because of its holistic, user-centered approach in engaging with local communities [7,8]. However, despite the field's growing popularity, conspicuous empirical evidence showcasing the benefits of the soundscape approach is still lacking. Thus, the need to establish and deliver practical guidelines to implement and assess successful soundscape designs arises. This is also reflected by Part 4 of the ISO/TS 12913 series currently being developed, which focuses on the assessment of soundscape investigation results. To this end, the Catalogue of Soundscape Interventions (CSI) project was initiated to collect and communicate comprehensive information on implementations of soundscape-related measures worldwide [9]. The aim is to identify best practices in soundscape design that could be used as a theoretical basis to develop future design and planning strategies. Within this context, the term “soundscape intervention” is understood as a site-specific design, aimed at preserving or improving an acoustic environment.

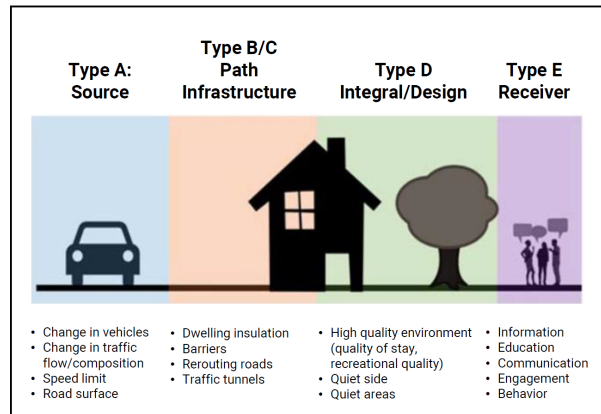
Having published and disseminated an online repository, the CSI project is now in its second phase of de-

veloping a soundscape design taxonomy. To derive criteria that qualify a site as a “soundscape intervention”, it is necessary to document how local practitioners beyond the academic and research context interpret this concept by looking at real-world examples. This may facilitate a better understanding of potential definitions, given that other scholars have been debating about what would qualify as a soundscape intervention, as opposed to an installation [10, 11]. It can also help uncover common design approaches, recurring intervention patterns and levels. In this paper we report on the 37 projects currently gathered in the catalogue and categorize them based on their type, level and stage of public involvement and the acoustic design approaches used.

## 2. METHODS

To identify project types, we adopted a classification system, which was derived from a review prepared in the framework of the World Health Organization (WHO) guidelines for environmental noise [12] and was slightly adapted in [13]. The framework includes five intervention types: source, path, infrastructure, integral/design and receiver, see Figure 1. We further categorized the projects based on their acoustic design approaches, building on previous work [14]. Four approaches were identified, including: architectural, mechanical, electroacoustic and biological/natural. Architectural approaches include additions of permanent, built structures and transformations of spaces, including redefining and redesigning areas by changing their functionality. Mechanical approaches take advantage of physical and natural forces to create urban sonic experiences. They often include structures and components that are temporary and reversible. Electroacoustic approaches make use of loudspeakers or computer devices to directly play and synthesize sounds. Biological/natural approaches are based on biophony and involve greenery and wildlife enrichment, without additional interference through installations. Finally, we categorized the submitted projects based on their level of public involvement, as well as the stage during which this occurred. It should be noted that in this paper public involvement is understood in the sense of user/consumer participation in research, as defined in the guidelines and brief of the National Institute of Health Research (NIHR) [15, 16], from which we adopted three levels of public involvement: “consultation”, “collaboration” and “user-led”. Stages of public involvement were adapted slightly to fit the field of soundscape and include: (1) formal application, (2) design and

management, (3) implementation, (4) assessment and (5) dissemination of the soundscape intervention. Based on this analysis, we summarize recurring strategies and aims and discuss limitations of the resulting typology.



**Figure 1.** Framework for noise intervention types along the pathway, translated/adapted from [12, 13].

## 3. RESULTS

The geographical distribution of the sites currently listed in the Catalogue of Soundscape Interventions (CSI) is shown in Figure 2. As can be seen, the documented interventions are located primarily in the United Kingdom, Central Europe and the United States of America, while the rest of the world remains underrepresented, with the exception of Canada, Australia and Japan.

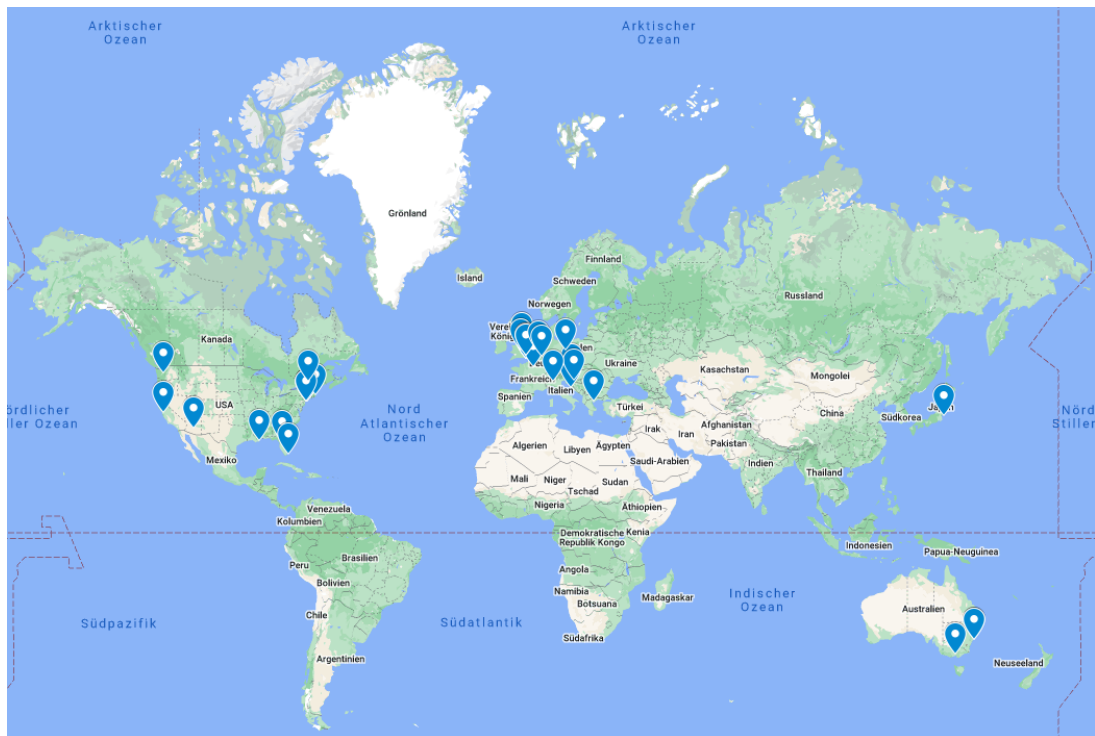
Most of the 37 sites currently listed in the catalogue fall under type D of the classification system, see Table 1. Frequently, sites do not only belong to a single category, but to a combination of categories, with type B/C–D and D–E often complementing each other. Type A is only rarely found among the soundscape intervention designs reviewed. Depending on their type, the catalogued sites seem to focus on different aims. Type A sites mainly aim at reducing noise at the source by introducing speed limits, modifying road surfaces and changing traffic flow. Type B/C sites use sound insulation or barriers to ward off unwanted noise (minus design), but also redirect attention to positive aspects. Type D sites seek to improve the acoustic quality by actively adding positively associated, masking sounds to the environment (plus design) and thereby often adding to its recreational quality through the use of natural elements, such as water or wind or greenery. Motives also

**Table 1.** Intervention types, acoustic design approaches, levels and stages of public involvement of the 37 catalogued sites.

Site	Type	Approach	Public involvement
Arizona Science Center	D	(m)	–
Bamboo Garden	B/C, D	(a), (e)	–
Biophony: SoundGarden	D, E	(e), (b)	–
Birrarung Marr Park	D, E	(e), (m)	collaboration (5)
Blue Moon	D, E	(e), (m)	–
Ellen Reid Soundwalk	E	(e)	–
Garden of Sound	D	(a), (m)	–
Harmonic Bridge	D, E	(m), (e)	–
Harmonic Conduit	D, E	(e), (m)	–
Heaven's Cloth	D	(e)	–
Hen Klankenbos Sound Forest	D, E	(e), (m), (b)	–
Imagination Playground	D	(a)	–
Jim Ellis Freeway Park	B/C, D	(a)	–
Lincoln Park	D, E	(a), (e)	–
Musikiosk	D, E	(e)	collaboration (1,2,3,4)
Musical Roads	A, E	(m)	–
Nauener Platz	B/C, D, E	(a), (e)	collaboration (2,3,4)
Neville Stress Underpass	B/C, D, E	(e)	–
Pavilion of Echoes	D	(a)	–
Pedalling SeaSides	E	(e), (m)	–
PS 244 Primary School	D, E	(a)	–
Salesforce Transit Center	B/C, D	(a), (m)	–
Sea Cat Tail - Umi Tsukushi	D, E	(m)	–
Sea Organ	D, E	(m)	–
Sempione Park	D	(e)	–
Sheaf Square	B/C, D	(a)	–
Sustainable Urban Village	A, B/C, D, E	(a), (e)	consultation (2,3)
Sydney Modern Project	D, E	(a), (e)	–
The Music Box Village	D, E	(a), (m)	collaboration (2,3,5)
The National September 11 Memorial	B/C, D	(a)	–
Thames Barrier Park	B/C, D	(a)	consultation (2,3,4)
Time Piece	D, E	(e)	–
Urban Light Contacts	E	(e), (m)	–
Urban Sound Planing - Brighton & Hove	A, B/C, D, E	(a), (e)	consultation (2,3,4)
Vertical Water	D	(e)	–
War Damaged Instrument	E	(e)	–
Warwick Bar Master Plan	D, E	(b), (e)	consultation (2,3)

Approaches key: (a) = architectural, (m) = mechanical, (e) = electroacoustic, (b) = biological/natural

Involvement key: (1) = application, (2) = design & management, (3) = implementation, (4) = assessment, (5) = dissemination



**Figure 2.** Geographical overview of the 37 sites currently listed in the Catalogue of Soundscape Interventions [17].

include encouraging exploration, redefining urban space, reconstructing location-specific soundmarks, preserving historical aspects, improving aesthetics and fostering a deeper connection to the surrounding environment and nature. Sites which classify as type E interventions are often art projects with a particular focus on creating immersive experiences and promoting engagement, awareness and social cohesion through the sonic environment. In this context, awareness is synonymous to being more attentive of the sonic environment, but is less concerned with didactic/informational aspects that directly influence individual behavior. Among the acoustic design approaches used, electroacoustic approaches seem to be the most popular way to influence the acoustic environment, followed by architectural and mechanical approaches or mixed. Biological/natural approaches are rarely used and if so, only in combination. Overall, it is difficult to assess public involvement, because only very few interventions provide clear and concise documentation. Usually, only direct stakeholders or clients are included in the roll-out process. In those cases, in which public involvement docu-

mentation is available, it primarily entails consultation or collaboration and mostly takes place during the design, implementation and to a lesser extent, the assessment of soundscape interventions.

#### 4. DISCUSSION

The geographical distribution of the projects currently listed in the Catalogue of Soundscape Interventions confirms that soundscape approaches are mainly used and communicated in first world countries that have clearly formulated environmental policies, supporting infrastructure and funding possibilities. These are at the same time countries that share a network of soundscape communities. In future, a greater effort should be made to investigate soundscape interventions outside this network and to encourage dissemination of soundscape interventions outside the academic context.

Though the adopted classification system is useful for identifying common practices, it is not always clear where to draw a line between different types. Based on

this systematic evaluation, it becomes evident that practitioners use mixed methodology when designing soundscape interventions. Types seem to flow into and complement each other, rather than being categorically different. This becomes clear when reviewing the formulated aims of the different projects and the strategies practitioners use to achieve these. Unfortunately, problems and aims are not always clearly formulated, making difficult to assess whether a solution has been reached and whether the intervention significantly contributes to the betterment of the acoustic environment. There also seems to be very little information available in regards to the curation and maintenance of soundscape interventions. However, this aspect is particularly important, because the long-term value of soundscape interventions directly depends on it. The absence of concise information on the aforementioned topics might also explain why validation studies to determine the impact of soundscape interventions in the long run are lacking, even though they are sorely needed. In some cases it is also unclear whether the intervention is still in place or whether it was temporary. It is therefore necessary to communicate these points more clearly and more openly in future.

Regarding the different approaches used, it becomes evident that the potential of biological/natural approaches, such as renaturation, which promotes biodiversity and ecological balance, has not yet been sufficiently tapped into, although this type of approach would be the most sustainable and efficient of them all, given that it requires no maintenance, has little to no energy costs, is a natural form of interference, leaves no litter behind and can contribute to better thermal comfort (temperature cooling in cities). Green also supports physiological and psychological restoration, thereby contributing to healthier environments [18].

Finally, the analysis shows that public involvement is still underused, which seems paradoxical given that the soundscape approach calls for more user-centered, inclusive designs. This could perhaps be explained by the fact that urban planning projects often have a strict time plan and that involving the public can be quite time-consuming. The possibility to include the public increases when methods are mixed and is highest with interventions of the type D and E. Best practice examples, which are nevertheless over or almost a decade in place, are the projects Nauener Platz (2009) and Urban Sound Planning in Brighton and Hove (2014), see Table 1. These projects have involved the public, including residents, in form of focus groups, local expert interviews, soundwalks and surveys during

several stages of the soundscape design intervention process. A more recent example is the Music Box Village (2016) project, which promotes community engagement and is open to voluntary work. A temporary, but nevertheless iconic intervention in terms of methodology and public involvement was the Muiskiosk, which was launched in 2015 and followed a democratic soundscape approach. All in all though, these projects are the exception to the rule. Public involvement in all stages of soundscape interventions should therefore be encouraged more, embracing aspects of fairness and equality across underrepresented populations, interest groups, areas and countries.

## 5. CONCLUSION

Although the soundscape approach has gained considerably in significance over the last decades, practical guidelines that could serve as a theoretical basis to develop, implement and assess future soundscape designs are still missing. Therefore, an online repository was created and disseminated with the aim to identify and collect best practices. In this paper we derived a soundscape design intervention typology for 37 projects currently included in the CSI. Our analysis showed that almost all projects were implemented in first world countries, often without reported intensive engagement of the local communities. Most of the soundscape interventions were related to intervention types addressing the infrastructure (B/C), design elements (D) and the receiver (E) and thus went beyond conventional noise control measures at source or path level. Among the acoustic design approaches used, electroacoustic applications seem to be the most popular way in soundscape interventions, followed by architectural and mechanical approaches. In several cases, more than one approach was applied indicating the integral design concept to enhance the acoustic environment as much as possible. Surprisingly, nature-oriented design approaches in reported soundscape interventions are rarely included in the database so far, although these approaches offer several advantages in regards to city climate, biodiversity or increasing the level of restoration. To develop a meaningful soundscape design taxonomy and to determine real world examples indicating successful design and intervention practices, it is necessary to extend the database further. Therefore, soundscape researchers and practitioners around the world are invited to add soundscape intervention entries not reported so far, even if they were of temporary nature.

## 6. ACKNOWLEDGMENTS

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