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Proactive urban design with sounds and smells

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Introduction

Nowadays we see a growing interest in how urban design and planning practices can bring in the sensory dimension of the built environment to contribute to the creation of more sustainable and healthy cities (Heinrichs 2019). However, as the literature shows, there is little applied research in practices that can be referred to as examples of (multi)sensory urbanism as well as tools and techniques that can be leveraged by professionals.

Against this backdrop, this article aims to contribute to this line of inquiry by providing guidelines / a toolkit for designing public spaces with sound and smell, grounding on the analysis of best practices where sound and smell are treated not as pollutants but as resources for creating quality urban environments. These selected projects are taking an appreciative approach providing either innovative solutions or temporary experiences to create new urban values through senses (Birdsall et al. 2021).

The sensorial values should interplay between the professional knowledge of making the space and the lived experiences. However, as Degen (2014, p.98) highlighted, "the difficulty lies not so much in how to communicate sensory, visceral experiences verbally but, more importantly, in how to 'translate' these non-linear and non-narrative moments of experiencing and being-in-the-world."

Sounds and smells are both source-orientated and can be masked by a more powerful source in the same space. Historical urban practices dealing with sounds and smells are mostly driven by pollution control mindsets, guided by policies such as the EU Environmental Noise Directive (2002/49/EC) and the UK Guidance on Nuisance smells: how councils deal with complaints (Defra, 2015). Emerging practices from artists and applied research throw light to the future urban design with sounds and smells. For example, studio Faltazi created Uritrottoir- a red box full of odour-fighting dry straw topped with plants to help reduce the pee smell in Paris from the public urinators (Eldredge, 2017). Sound-wise, the renovation of Nauener Platz- a square park located in the Mitte neighbourhood of Berlin- used soundscape as a core concept and engaged with citizens to identify wanted and unwanted sounds for the site (Schulte-Fortkamp and Jordan, 2016).

By analysing the best practices, we ultimately aim to follow a change in perspective, moving from a reactive design approach (to abate the pollutants) to proactively promoting the quality of the sonic and smell environments (Margaritis et al. 2020), with a human-centred approach.

Proactive design with sounds

Implementing proactive sound design implies treating sound as a resource and acknowledging human beings play an active role in the production of quality sound environments. The contextual and human dimensions are key to the definition of soundscape intended as the acoustic environment perceived, understood and experienced by a person or people in context (ISO 2018). As per this perceptual concept, questions about by whom and for whom the sonic environment is designed should be addressed from the early stage of the design process. Further to this, the large spectrum of different hearing and listening abilities, i.e., auraldiversity (Drever 2017, Drever & Hugill 2023) should be acknowledged if inclusivity and healthy sonic environments are to be aimed to.

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The application of the soundscape approach in the urban design and planning discipline can be traced back to the 1960s (Southworth 1969, Radicchi 2012, 2019), and it has gained momentum among architects, designers and landscape architects especially in the past decade (Southworth 2020) and only in recent years it has been applied within the context of policy making and planning plans by the Municipality of Berlin and Limerick (e.g., Senatsverwaltung für Umwelt, Verkehr und Klimaschutz. 2020) and the Welsh Government (2022). The latter has recently introduced a "Soundscape Design document" as part of the revised planning guidance 'Technical Advice Note 11: Air Quality, Noise and Soundscape' that could serve as a how-to guide for different stakeholders.

For the selection of the two projects presented in this article, we ground upon the Southworth's framework that indicates three areas of interventions for sonic design: *large open spaces* – which are often sonically ambiguous; *small sonically responsive spaces* – such as alleys and small hard-surfaced areas; and *sonic signs* – to create an informative environment, reveal hidden activities and reinforce the identity of places. (Southworth 1969, Radicchi 2012, 2019). Specifically, the two projects fall in the first and third category because they are large open spaces where the acoustic environment was re-shaped using existing natural sounds and landscape and urban elements.

Project 1: Schipol Airport Amsterdam the Neth Noise Reduction landscape

- Location: Amsterdam
- Designer: Design H+N+S landschapsarchitecten in close collaboration with Paul de Kort, Witteveen en Bos and TNO
- Type: public park
- Opened in 2013
- Link to the project: <http://www.hnsland.nl/en/projects/land-art-park-buitenschot>
- Highlights:

- 1, created a ribbed landscape structure that effectively absorbs low-frequency noise from the aircraft taking off
- 2, a cross-disciplinary collaboration between artists, landscape designers, noise engineer
- 3, incorporate different recreational activities and cultural events across the site
- 4, minimizing the impacts on the original landscape

Description

The Buitenschot Land Art Park is a 36-acre green make-like space located southwest of Amsterdam's Schiphol Airport, "that exists by the grace of low-frequency ground noise caused by aircraft taking off". The park landscape's design in fact originates from the necessity of reducing low-frequency ground noise that planes made after that the Polderbaan runway, the longest at the airport, was built in 2003.

Because of the complaints made by the residents, the airport commissioned a study that ultimately found out a correlation between noise reduction perceived by the residents in the fall and the changes occurring in the surrounding fields due to the ploughing. An interdisciplinary team, led by H+N+S Landscape Architects and artist Paul De Kort, was then invited to redesign the area to reduce the noise and create a recreational area as added value. Paul De Kort, who designed the park, was inspired by 17th-century German scientist Chladni patterns and historic farming techniques in the local Harlemermeer area "to create a symbiosis between a purely functional landscape of horizontal ridges and a pleasant environment" (Hansman, 2015).

The park is composed of 150 perfectly straight and symmetrical 3-metre-high embankments which are 1,10 metres below the land surface and distribute the noise. Between the

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embankments, there are 1-metre broad paths used for walking (and maintenance of the ridges) with a 4 m wide cycle path cuts through the ridges in the middle of the park. De Kort also incorporated art pieces such as the "Listening Ear," a parabolic sculpture which amplifies the ambient sound, an acknowledgement of the park's purpose of deflecting that noise.

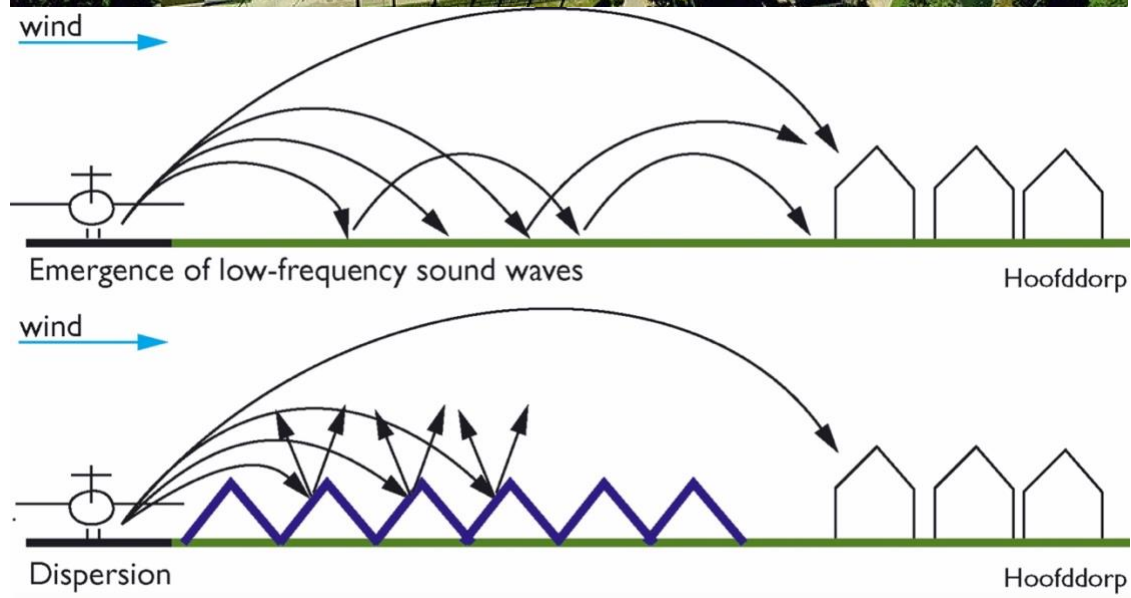


Fig 1 Photo of the noise reduction landscape near the Schiphol Airport Amsterdam the Neth designed by H+N+S Landschapsarchitecten in collaboration with artist Paul de Kort. Source of image: <https://www.smithsonianmag.com/innovation/crazy-land-art-deflects-noise-from-amsterdams-airport-180955398/?no-ist>

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Fig 2 Illustrations of the noise propagation from the aircraft take-off before and after the designed embankments and pyramid-shaped landscape onsite. Source of image:

<http://www.hnsland.nl/en/projects/land-art-park-buitenschot>

Project 2: Sea Organ

- Location: Zadar, Croatia
- Designer: Nikola Bašić
- Type: waterfront renovation
- Opened in 2005
- Link to the project: <https://soundscapedesign.info/2018/03/26/sea-organ-in-zadar-croatia-nikola-basic/>
- Highlights:

- 1, creating site-specific signature sounds powered by the sea waves
- 2, embracing the power and rhythms of nature
- 3, using architectural language to build the 'instrument' to create sounds

Description:

The Sea Organ is an award-winning project in the seaside Croatian town of Zadar, designed by architect Nikola Bašić and completed in 2005. Since then, the project has gained popularity and has been acknowledged as a touristic destination included in prime touristic guides and websites. It is part of a bigger waterfront renovation which has restored the connection of the residents to the seaside, by replacing a concrete wall - that was built along the seaside after WW2 - with a renewed promenade composed of multi-sensory public spaces, like the Sun Salutation, that "capture sunlight to power their own light show that is a tribute to the solar system" (Atlas Obscura, nd).

The Sea Organ is a 70-meter long natural pipe organs in the shape of a white marble staircase that is played by the sea. It's composed of 35 musically tuned organs' pipes which are carved in the staircase's steps with whistle openings on the sidewalk. The organ is activated by the movement of the sea waves, which pushes air through, and plays musical chords, hence the waves create random harmonic sounds (Oddmusic, nd). As sea conditions are dependant from natural variables, such as tides and winds, the Sea Organ "offers never-ending concert of numerous musical variations in which the performer is nature itself" and the listener humankind.

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Fig 3 Photo of the Sea Organ project along the new marine parade of the Zadar peninsula designed by Nikola Bašić. Source of images in the figure: <https://landezine.com/198/>

Fig 4 Illustration of the Sea Organ pipes underneath the stairs transforming the sea waves into flows of melodies. Source of image: <https://landezine.com/198/>

Proactive design with smells

“During every breath we take, we inhale smell molecules that give us important information about the micro levels in our surroundings” (Tolaas, 2010: 147). The concept of smellscapes is dissimilar from the soundscape concept, emphasising on the human experience of smells in the environment, being contextual, emotional and imaginary (Porteous, 1985). In reference to soundscape studies, smells in the environment can be documented via smell marks, smell events, smell walks and smell maps (see McLean, 2017). When designing with smells, it is inevitable to talk about the air quality, considering air pollutants, temperature, humidity and air flows, etc. It provides an ambient layer that is also core to the sensation of smells in the built environment, closely linked to the olfactory and aspiration systems. Advocating for natural scents in the built environment is not only beneficial for human well-being but also critical to the ecosystem (Bentley, et al., 2022).

The basic principles of designing with smells are all aimed at the smell sources, including 1) introducing a new smell to the existing environment, 2) removing the unwanted smells, 3) masking the weaker smells with a stronger smell, and 4) diluting the overpowering smell in the existing environment (Henshaw, 2013). The two projects selected in this article have very different approaches: one is dealing with the smell medium, the air, whilst the other is about managing the way to smell, a narrative experience.

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Project 1: Jade Eco Park

- Location: Taichung, Taiwan, China
- Designer: Philippe Rahm
- Type: landscape design/ climate modification/eco-systems
- Opened in 2018
- Link to the project: <https://www.architectural-review.com/buildings/building-with-heat-humidity-and-light-jade-eco-park-in-taichung-by-philippe-rahm>
- Highlights:
 - 1, use climatic analysis to make precise design decisions to modify the airflow, temperature, and humidity
 - 2, responding to the user dynamics and walk paths
 - 3, modifying the olfactory perceptions through a non-scenting strategy
 - 4, create a range of climatic devices to modify the air

Description:

Jade Eco Park is designed to provide a sensational and enjoyable environment responding to central Taiwan's humid and hot climate. Phillippe Rahm's team analysed the topography of the site to understand the existing microclimate and created three types of climatic devices (cooling, drying and depolluting) to modify the air and create more comfortable spaces for visitors. For example, the cumulus cloud device emits mist in the air to refresh the surroundings and the temperature reduces when the mist turns into gas. These devices are "planted" and designed to respond to the site and different types of activities and users. For example, where the river passes through the dry device is implemented and a waterscape is designed for kids and families, making use of the natural resource.

Apart from the artificial devices, trees with specific qualities are also used as natural devices such as broadleaf trees to create large areas of shadows, trees with white flowers and waxy leaves to reflect sun rays and give a subtle scent, and trees that absorb oxides of nitrogen and other aerosols (Scuderi, 2020). Working with the environmental principles and technology to control the air, the smell transmission medium, engineers the smell environment for comfort.

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Fig 5 Conceptual drawing of the Jade Eco Park with a photo and section showing the cumulus cloud device designed for evaporative cooling. Credit: Taichung Central Park, Taichung, Taiwan, 2012-2020 / Philippe Rahm Architectes, Mosbach paysagistes, Ricky Liu & Associates / Photos: Courtesy Philippe Rahm Architectes

Project 2: Hyper-Natural: Scent from Design To Art (fig 6)

- Location: Melbourne's National Gallery of Victoria's gardens, Melbourne, Australia
- Type: art exhibition
- Curators: Chandler Burr and Ewan McEoin
- Duration: 2014 OCT-NOV
- Link to the project: <https://dailyreview.com.au/the-hyper-natural-scent-from-design-to-art/>
- Highlights:

- 1, the use of scent in the space is experimental and educational
- 2, using mist "clouds" as a visual attraction to draw people to smells
- 3, curating a smell journey with refreshing gaps to enable the dynamic experience

Description:

The Hyper-Natural exhibition is curated to show scent as design materials through an interactive 'making' and 'smelling' journey across the Grollo Equiset Garden in front of the National Gallery. Seven synthetic scent molecules were chosen, and each was displayed in a white tube-like scent station. Visitors can take a paper stipe to dip into the molecules and then compare it with the fragrance that contains it following a sequence given by the

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numbers marked on the scent stations. Starting from the first molecule, the journey builds up layers of olfactory sensations and explorations leading to a complex cognitive process.

Walking from one scent station to another across the "clouds" of mist from the irrigation system onsite refreshed people's sense of smell to enable the changing and dynamic smell experiences designed in the exhibition. Otherwise, the adaption nature of olfactory sensation will reduce the sensitivity to detect different smells in the same space after being exposed to a strong scent. The visual attention from the "clouds" also contributed heavily to the experience, creating a synaesthetic experience in the garden and transforming the invisible into the visible. The scent selected has nothing related to the site context which is debatable in a non-exhibition everyday context when introducing smells into public spaces.



Fig 6 Photo of the Hyper-Natural exhibition in the Victoria's gardens outside the Melbourne's National Gallery in Australia curated by Chandler Burr and Ewan McEoin. Source of image: <https://perfumepolytechnic.wordpress.com/2014/10/06/chandler-burrs-hyper-natural-exhibition-at-ngv/>

Conclusion

Setting out the sound or smell design objectives is essential at the start of the design process. Rather than controlling noise and smell nuisance, the proactive design approach may aim for appreciation via restorative, recreational, and educational purposes. It has gone beyond identifying wanted and unwanted sources of smells and sounds, to modify the environmental settings through both active and passive design methods.

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Designing with natural forces and elements with specific sound and smell properties, such as the wind, tide, fragrant plants and soil, reduces the harm to the ecosystem and natural environment is critical in the context of the climate crisis. Protocols, such as the smellscape pleasantness perceptual model (Xiao, et al., 2018) and the questionnaire in ISO/TS 12913-2:2018 Soundscape part 2, can be used to engage citizens to assess the existing sonic and smell qualities of the environment. A field survey to understand the climatic and landscape features related to the possibility of creating and modifying the sound and smell environment is equally important. Meanwhile, addressing the inclusive design agenda, understanding the auditory and olfactory diversities to design within the thresholds of comfort using urban spaces needs to be further explored and reflected in the urban design practice (Radicchi et al. 2021, Xiao et al. 2021), particularly in the context of post-covid restorations and the ageing society.

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