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Integrating Soundscapes and Community Experiences

The Role of Sound in Public Spaces through Participatory Research in Katendrecht, Rotterdam

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POLICY BRIEFS WRITTEN BY STAFF AT THE FACULTY OF
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THE NETHERLANDS



Executive Summary

This policy brief presents findings from the Resilient Delta NOISE® project, focusing on Katendrecht in Rotterdam. Katendrecht is an emblematic redeveloped harbour neighbourhood where questions of social cohesion and community resilience are increasingly pressing.

The brief demonstrates how participatory research methods can deepen engagement with residents in port cities and generate a richer understanding of the sensory qualities of public space. By integrating subjective sound experiences with conventional noise measurements, the research offers new insights for urban design, policy-making, and redevelopment strategies.

Harbour districts near urban cores, once dominated by industrial activities, are being transformed into high-density residential areas marketed for their improved living quality. While the relocation of the port industry may reduce industrial noise, new sound environments emerge as density and public space use intensify. Increased activity, mo-

bility, and commercialisation can reintroduce high sound levels and reshape everyday acoustic experiences.

Current regulatory approaches rely primarily on objective, instrument-based measurements to verify compliance with maximum permissible noise exposure standards. However, such metrics do not capture how residents perceive and interpret sound in public space. Complementing quantitative measurements with participatory soundscape research allows planners and policymakers to understand how different groups experience redevelopment, and whether these changes contribute to feelings of belonging or alienation.

By grounding its findings in Katendrecht's public spaces, this brief offers locally situated insights with broader relevance for redeveloping port areas in Rotterdam and beyond. It argues that integrating community-based soundscape analysis into planning processes can support more inclusive and resilient urban transformation.

Why Port City Sounds in Public Spaces Matter

Redevlopment of urban waterfronts and harbour areas is high on the agenda in contemporary research and municipal debates [examples]. This is especially the case when abandoned harbour areas are listed for urban renewal.

Critical perspectives on this topic link to tendencies of gentrification of surrounding industrial workers' areas of the past and/or segregation between these areas and the redeveloping harbours, as these processes often occur according to similar redevelopment strategies and phases in various post-industrial urban settings. Redeveloping port city districts often find themselves caught between the noisy 'hustle and bustle' of their industrial past and the intended tranquillity of their 'gentrified' present (Cathcart Frödén, 2023). Local sound experiences nevertheless remain largely overlooked in the context of urban redevelopment. With sound being a ubiquitous factor of everyday urban life, it can provide insights into how people

experience urban space, and particularly public spaces where new and old community groups of a redeveloped area encounter each other. To grasp how sound influences residents' understanding and experience of public spaces in redeveloped harbour areas, the Resilient Delta NOISE® project conducted a case study on Katendrecht, Rotterdam.

Well-known in the Netherlands as a port industry peninsula since the early 20th century, Katendrecht has been subject to various large-scale redevelopment projects over the past few decades. In the process, the neighbourhood's historically marginal and socially neglected identity has been countered by new resident and visitor groups drawn to its newly constructed housing and cultural facilities.

The living capacity of Katendrecht's new building stock reaches up to several thousand, easily surpassing the neighbourhood's original population figures of just a few thousand inhabitants. Newcomers to the neighbourhood

often settle in newly developed building blocks and high-rises by the waterfronts where industry was once located. The consequentially increased density of the peninsula has been laid out in its urban design according to zoning plans that divide the district into areas with different urban atmospheres, yet aim to link the whole together through a preserved character of architectural remnants and materials similar to that of other nearby industrial areas in transition (Gemeente Rotterdam dS+V, 2009; Programmabureau Stadshavens Rotterdam, 2011).

Urban environmental factors, particularly noise, have been and continue to play a prominent role in these zoning plans. This brief presents how sound qualities and experiences have been identified across Katendrecht, and suggests how the resulting outcomes can further inform and stimulate community building and insights among local residents (cf. Gemeente Rotterdam & Wijkraad Katendrecht-Wilhelminapier, 2023).

Research setup

The NOISE® project was linked to environmental soundscape research, sidestepping more technically oriented research domains into sound, such as urban acoustics. The project was rooted in the following elementary question: which sounds are people exposed to in contemporary public spaces of redeveloping harbour areas, and how are these sounds experienced? The conducted research aimed to bridge the gap between objective measurements of sound and subjective approaches, which address several key questions in current soundscape research (Kang et al., 2016), such as: which environmental sounds do people encounter and react to in public urban settings? How can soundscapes be made visible and communicable? How do soundscapes shape people's understanding of their local living environment?

During the project's first research phase, a representative inventory of different public spaces across Katendrecht was identified in terms of location and distribution, as well as the present communities and use within the area, to conduct sound measurements.

All sound recordings for this research phase were conducted in the spring season of 2024, with recording sessions systematically carried out in predetermined morning and evening time slots during both weekdays and weekends. This allowed us to account for temporal differences in the sound recording data while minimising substantial variations based on weather conditions. Insight into seasonal soundscapes changes remains a limitation in our research and can be further investigated in follow-up recording studies that cover multiple seasons.

The identification of environmental sounds across Katendrecht's public spaces served as input for the second research phase, in which mental mapping exercises were set up and conducted among local residents and public space users. 'Mental maps' reveal how an individual perceives and views a specific interactional space (Harteveld, 2021). We adopted this methodology to enable people to capture their experience and perception of Katendrecht's soundscape on a neighbourhood map through drawing and

colour-coding. This method was applied in two settings: in workshop sessions with a group of local residents who were invited in advance, and on an individual basis with public space users in Katendrecht, where we directly approached and asked people if they wished to participate in the research project. Apart from recording whether respondents were either residents or visitors of Katendrecht, the socio-demographic data of interviewees was not recorded, in part to keep the participation threshold low. While the mental mapping activities and outputs provided differences in sound perception based on personal background and local affinity, this limitation of our research can find a fruitful follow-up in studies that further examine interview output in combination with respondents' socio-demographic profiles, as soundscape literature has also increasingly been advocating for (Kang et al., 2016; Carson et al., 2021).

Key findings

Redeveloped Public Spaces in Katendrecht, Rotterdam



Figure 1: Overview of selected public spaces across Katendrecht where sound recordings were conducted. Photos by Sahar Asadollahi Asl Zarkhah and Rosa de Kruif.

Based on previous interview studies of ours on gentrification (Baptist, 2024) and resilience in Katendrecht, we have identified different types and locations of public spaces in the neighbourhood to investigate in terms of environmental sound. Figure 1 illustrates the public spaces selected for our research, which are spread across different local zones as outlined in Katendrecht's recent redevelopment plans. The selected places range from playgrounds and parks to

pedestrian areas along the waterfronts and openly accessible seating areas in between new residences. Several of these public spaces have only been designed as such during recent redevelopment phases and were previously used to host parts of Katendrecht's industrial infrastructure. Some of the selected public spaces are embedded in predominantly residential surroundings, while others have been developed as new hotspots in the neighbourhood, also serving tourist purposes.

The Deliplein, a square in the middle of Katendrecht's historical center (#7 in Figure 1), can be considered both the traditional core of the neighbourhood's public life as well as the newcomers' central meeting place, with new facilities housed in renovated buildings catering to a mix of residents and visitors.

Objective Sound Measurements

To protect and promote the quality of the living environment in the Netherlands, the Environmental Living Quality Decree (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2024), part of the Environmental Act (Omgevingswet), sets noise rules, among others. Concerning noise pollution, this decree sets specific values and measures for permitted sound levels in public spaces for traffic, industry, and construction projects, as well as neighbour noise disturbance, for example, to limit nuisance and health effects for residents.

The responsibility for enforcement typically lies with local authorities in the Netherlands, such as municipalities, and, in cases of vio-

lation, with the police. For noise, the decree applies A-weighted decibel (dB(A)) measurements, sound level units that closely align with the sensitivity of the human ear. Higher decibel values indicate louder sounds. As humans are more sensitive to mid- and high frequencies, and less sensitive to very low and very high frequencies, dB(A) is expressed on a non-linear scale, which can make interpretation difficult.

To more intuitively compare sound levels, RMS values can be used. This is a recording metric expressed in negative decibels, whereby louder recorded sounds have values closer to a maximum threshold of 0 dB. Figure 2 shows comparisons of selected sound measurements

carried out in Katendrecht. Based on these, some public spaces' differences in terms of sound variation during a day can already be grasped, as well as sound differences across public spaces on similar recording moments. Regarding the latter, the bottom table in Figure 2, for instance, indicates that Katendrecht's waterfront space near the Rijnhavenbrug (#8 in Figure 1), which hosts some popular bars, is comparatively quieter on a weekend morning. Still, recorded decibel measurements do not account for all environmental differences or individual differences in hearing sensitivity (Estévez-Mauriz, Forssén, & Dohmen, 2018). As our study further showcases, the sound experience in and of a public space is not necessarily the same for every individual.

Recording Spot	Moment during Week	Moment during Day	RMS Value (dB)
#4	Weekday	Morning	-18,98
#4	Weekday	Evening	-22,46
#11	Weekday	Morning	-12,4
#11	Weekday	Evening	-30,24

Recording Spot	Moment during Week	Moment during Day	RMS Value (dB)
#1	Weekend	Morning	-13,64
#3	Weekend	Morning	-15,29
#6	Weekend	Morning	-20,51
#8	Weekend	Morning	-24,7

Figure 2: Comparisons of RMS values of selected Katendrecht sound recordings, for public spaces during different (top) and similar (bottom) recording moments. Table by the authors.

Intersubjective Sound Experiences

Sound experiences encompass not only how individuals hear sounds, but also how they are felt, interpreted, and imbued with meaning within a particular context. In addition, the collection of sounds within an environment creates a unique experience, a 'soundscape' (Schafer, 1993 [1977]), transforming physical spaces into sonic ones where listeners engage with memory, emotion, a sense of place, and interpret meaning based on context and socio-cultural norms (Augoyard & Torgue, 2006). To go beyond the sound recording measurements of Katendrecht's public spaces and explore how people internalise and give meaning to the sonic experiences that these spaces provide, we adopted a mental mapping meth-

odology, inspired by Kevin Lynch's foundational work (1960), to help extract and put on paper experiential, rather than strictly geographical, perceptions of public space users.

Using a map of Katendrecht and basic drawing and visualisation tools, respondents were asked to express their auditory experiences of and within the neighbourhood spontaneously. Our guiding question was: How do you experience sound in different parts of Katendrecht? Are there certain areas that you like or dislike in this regard? How would you describe them?

Both in the workshop and individual setting (Figure 3), participants were provided some further guid-

ance by means of a pattern legend with colour stickers that categorised recurring sounds and sound sources in Katendrecht, based on our previous sound measurements. This accompanying document also included a list of sound-related adjectives to help participants express their sonic experiences in words. Participants could freely choose their preferred way of providing input, either covering the entire neighbourhood or rather quickly identifying places they knew or (dis)liked most compared to others on the pre-printed map. As such, the mental mapping exercise and outcomes automatically captured the intersubjective and evaluative dimensions of people's neighbourhood perception.

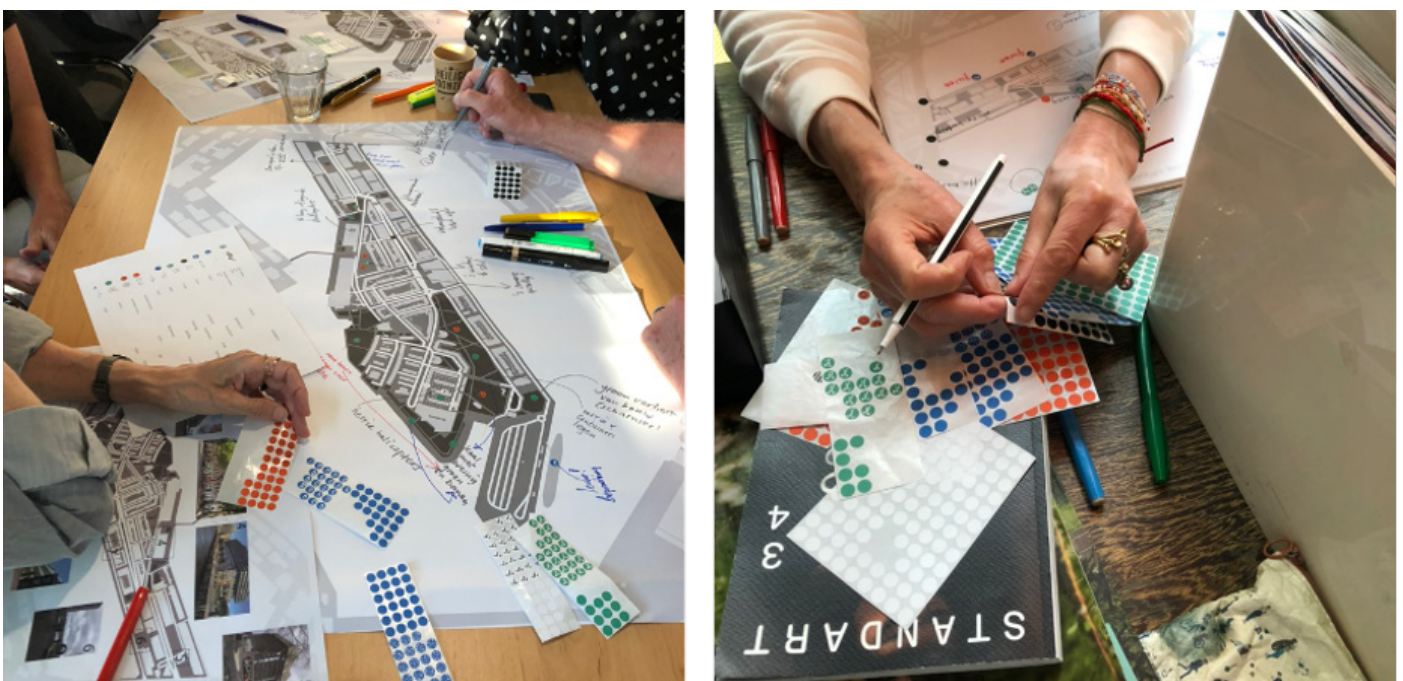


Figure 3: Implementing mental mapping methodology during collaborative workshop and individual sessions in Katendrecht. Photos by Sahar Asadollahi Asl Zarkhah.

This setup proved successful in creating an accessible and engaging way for participants to express their sonic experiences of Katendrecht. During the mental mapping exercise, it became evident that the colour stickers were the easiest to use, with many participants supplementing their sticker placements with descriptive text on the Katendrecht map. On the other hand, the sound-related adjectives we had prepared beforehand were used only rarely. Respondents preferred to use and base themselves on their own vocabulary in describing

sonic situations, and not merely sound qualities, in the neighbourhood. Instead of only using explicit sound-related words, such as 'noisy' or 'quiet', other adjectives that characterised the broader context and experience of specific places and situations, such as 'cozy' or 'dead', were often mentioned and written down. In this way, the mental maps were filled up with information that not only connected to the aspect of sound in public space, but also offered further insights into the broader context of Katendrecht's public life. One par-

ticipant, for instance, positively described the presence of loud radio music in garages near Katendrecht's entrance as 'worker vitamins' (top map in Figure 4), which links back to the area's dominant port labour history. Another respondent literally expressed the occasional honking sound of a stationed historical passenger ship on Katendrecht's tip, and described that spot's overall sonic ambiance as 'commotion' (bottom map in Figure 4).

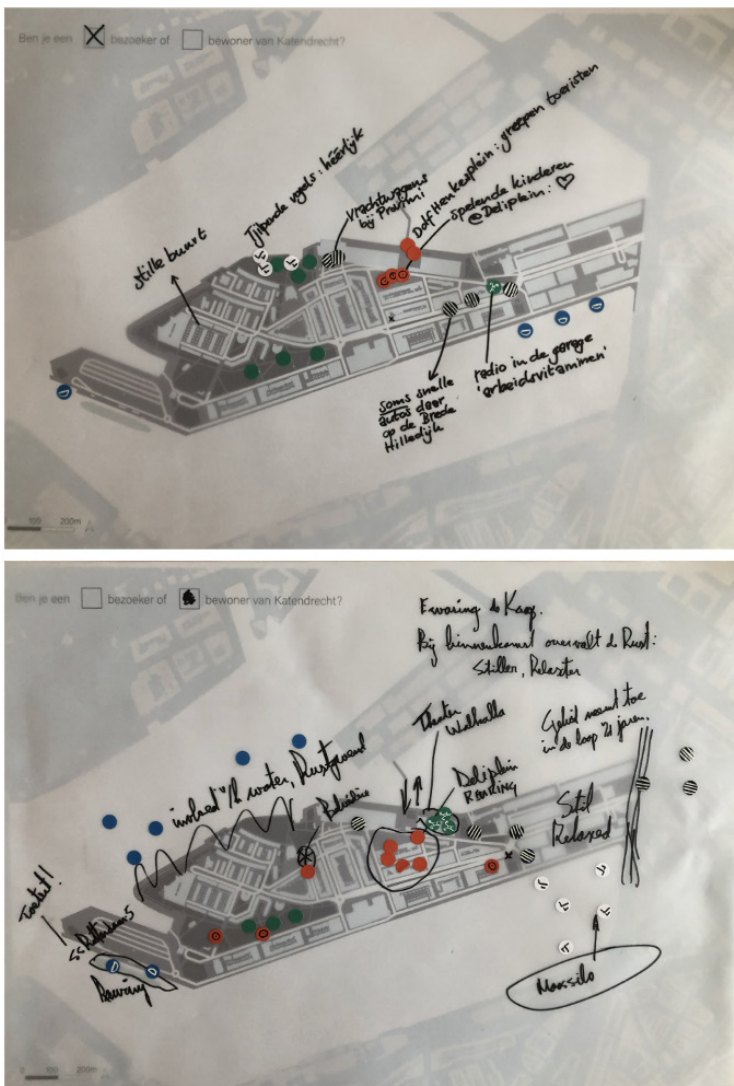


Figure 4: Selection of collected mental maps on sound experiences in Katendrecht. Photos by Sahar Asadollahi Asl Zarkhah and Rosa de Kruijff.

Societal Potential for the Future

The research findings reveal aspects of sound experiences in Katendrecht that can assist the municipality and local policymakers in shaping the area's planning and identity. More importantly, they can foster new dialogues and understanding among the gentrifying neighbourhood's residents and visitors (cf. Prosser, 2024). As respondents each created their own sound map of Katendrecht, they often shared anecdotal stories of specific neighbourhood experiences that helped make the concept of sound in public space more tangible. In doing so, they also frequently reflected aloud on whether or why others in Katendrecht would recognise or disagree with their personal

viewpoints. The mental mapping approach encouraged creativity and interest among participants, and this potential can be further shared with wider audiences.

The collected output from the NOISE® project was ultimately transformed into an exhibition, for which artist Nadia Nena produced a multi-layered 'soft map' of Katendrecht based on the project's empirical data. This artwork further explores the complex relationships between sound and place and how layers of auditory and urban rhythms influence residents' connections with their environment. The piece presents three interwoven layers, each representing

different elements of Katendrecht's sonic landscape, which together evoke the multifaceted experiences that sound generates in this port neighbourhood (Figure 5). Visual artworks like these can promote awareness and long-term research on sound in public spaces (Williams & Morrow, 2021). Such initiatives can be adopted by municipal stakeholders and policymakers working with local communities to monitor and sustain soundscapes alongside urban development, including ongoing renewal and urbanisation plans for harbour areas in the Netherlands and beyond.

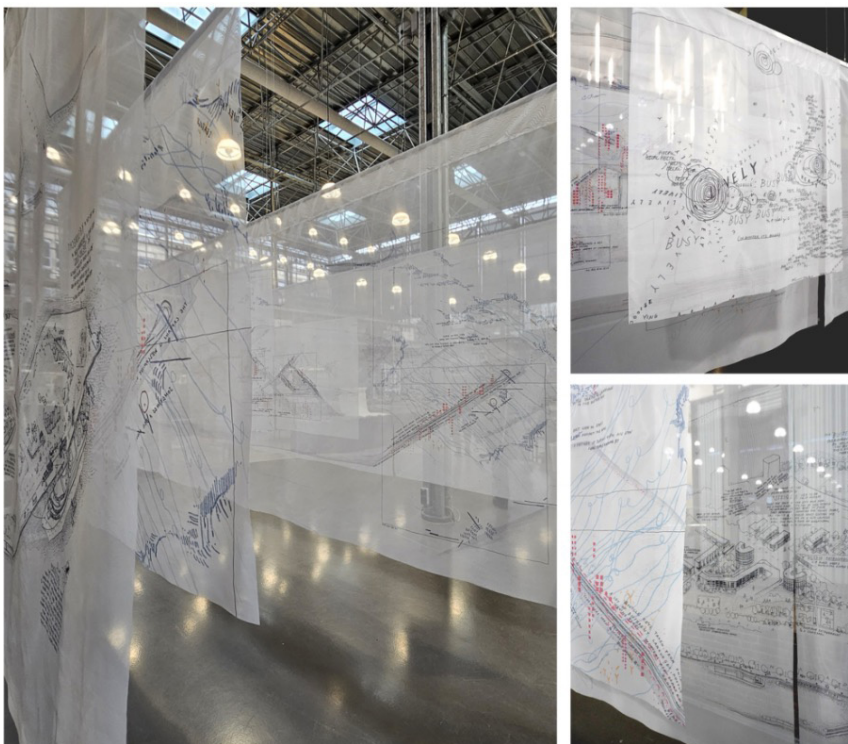


Figure 5: Impression of final project exhibition at BK TU Delft, December 2024. Artist: Nadia Nena. Curators: Sahar Asadollahi Asl Zarkhah, Rosa de Kruif. Photos by the authors.

Key take-aways

1. Port city areas are undergoing redevelopment processes that can introduce tensions of gentrification. In this respect, special attention needs to be paid to public spaces and their experiential qualities, such as sound, to maintain the balance between a neighbourhood's past and future identity for port city communities.

2. Insights into what constitutes 'sound' and 'noise' in public space require more localised and intersubjective approaches. New knowledge and future monitoring of soundscapes should be based on data that is gathered 'on the ground' and among local respondents.

3. Local sound data can and should not merely be measured by means of standardised decibel-based metrics. Complementing quantitative sound measurements with accessible interview and mapping methods allows for the construction of both more detailed and overarching perspectives on sound in public spaces.

4. Participatory research methods hold potential that can be further translated into meaningful outreach formats. Collected materials, such as mental maps and other interview data, can be collectively re-envisioned and shared again as creative outputs to stimulate further conversations, awareness, and understanding among local stakeholders.

***Sound* in redeveloping port-city neighbourhoods cannot be reduced to decibel levels alone; it must be understood as a lived, social, and meaning-laden experience that shapes belonging, identity, and community cohesion.**

By combining objective sound measurements with participatory methods such as mental mapping, the NOISE® project demonstrates that residents interpret and value public space through intersubjective soundscapes that reflect both industrial histories and gentrifying futures. Integrating these experiential insights into planning and policy can help municipalities move beyond compliance-based noise regulation towards more inclusive and socially resilient urban redevelopment.

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***Integrating Soundscapes and Community Experiences:
The Role of Sound in Public Spaces through Participatory Research in
Katendrecht, Rotterdam***

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Ethics and Conflict of Interest

The research upon which this policy brief is based was reviewed and approved by the relevant Ethics Committee of Delft University of Technology.

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