Inward

The silence is within

The handbook about designing with sound
\ Volume 01
\ Anne van den Berg

Note of the Author
With this handbook, I tell the narrative of the calm soundscape. Besides stating a new approach towards designing with sound and connecting psychology to urban design, this handbook tries to inspire the reader. This is why the booklet contains lots of photopages that explain the (contrasting) soundscapes of the city of Rotterdam and poems that reflect the perception of sound in space.

In order to translate the information into generic design steps, the pink texts with exercises at the end of each chapter help you to formulate your own calm, inward-oriented design plan.

TU Delft Delft University of Technology

COLOPHON

Inward
The silence is within

Keywords: Soundscapes – Psychological well-being – Innertypology – Places to retreat – Quiet spaces

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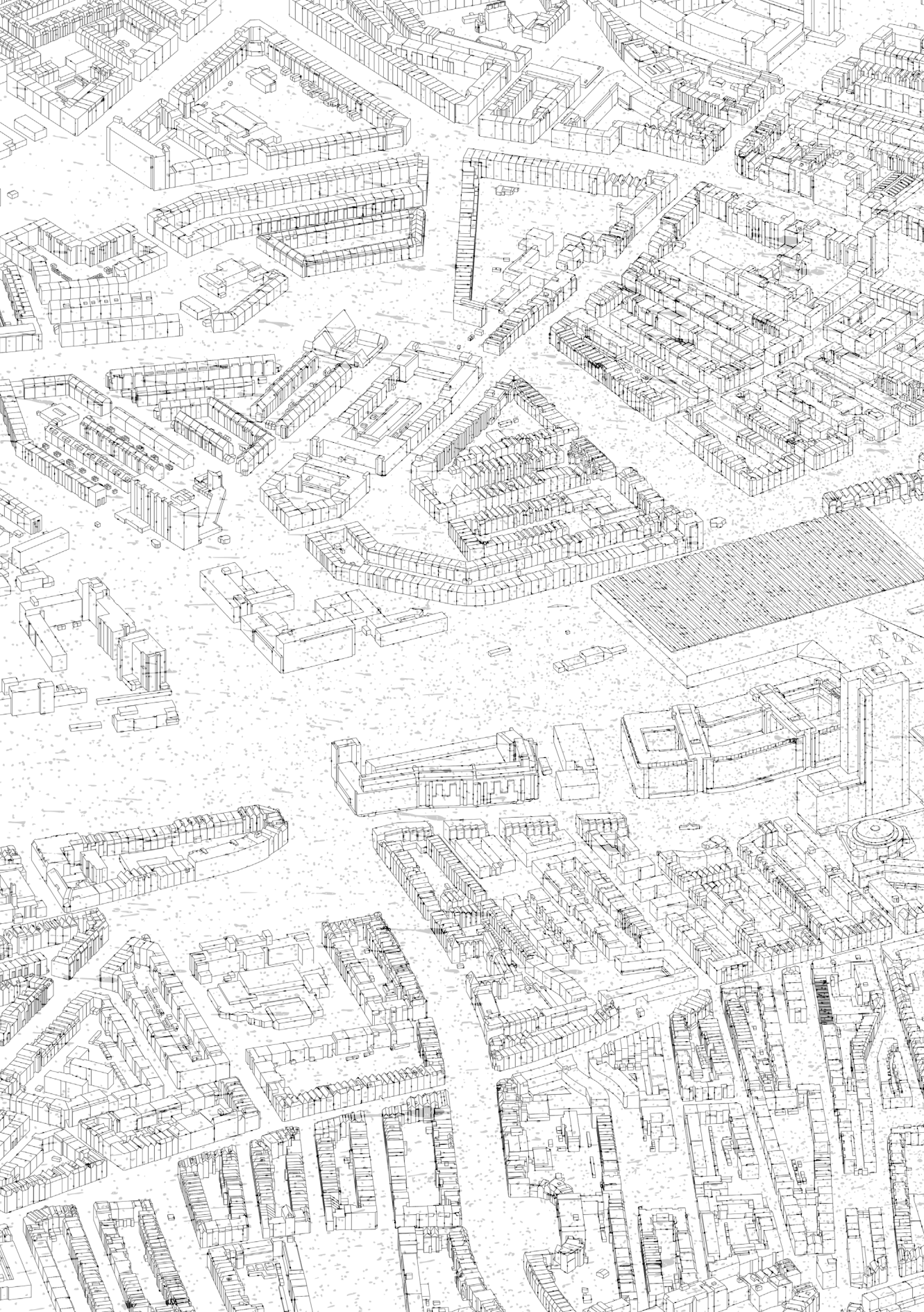
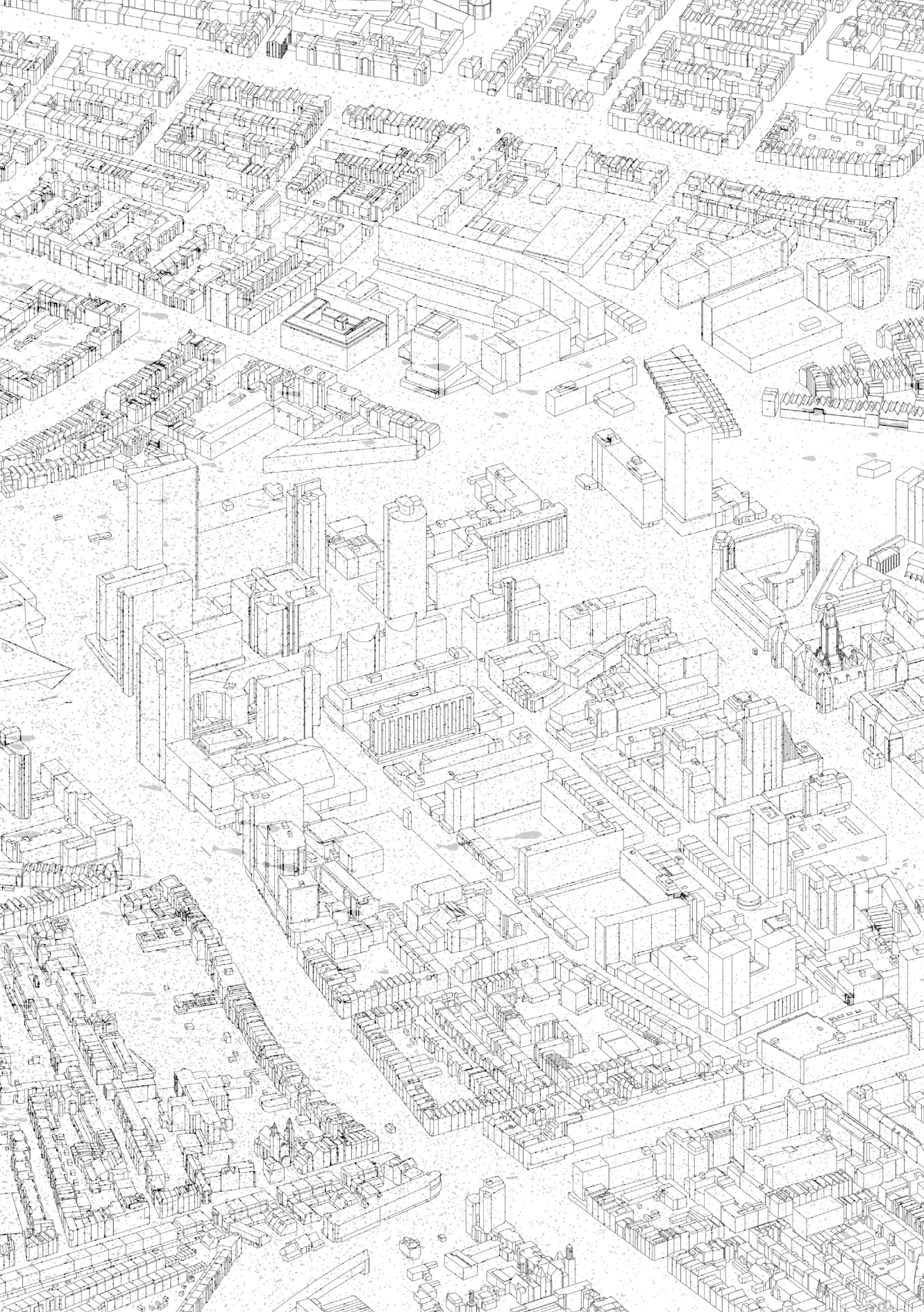
All content is own material, unless stated otherwise.

Inward reflects a direction towards the inside;
1 | The withdrawal of the mind in order to retreat and
2 | The architectural form of inner spaces; supposing
a healing territory of community within the urban scape.

You can interpret it as the physical | pause | in the auditory landscape.





Summary

Designing a calm soundscape

In this summary, I will give a table based on the goal of this handbook; creating a calm soundscape. In this table, the research aims are linked to the pattern language and the design principles are connected to the scales of the soundscape. This complex combination states a simple set of generic steps to take when designing a calm soundscape.

Research aims

Variety in the urban landscape | Transitions and access

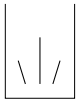
Design principles i.r.t. scale

Work with the current urban structure | District scale

Create diversity in sound (levels) | District to island scale

Design steps

Pattern set: Contrast, continuity



1 \ There is always a place
...and a little bit of music. There is always a place where you can find or create a calm oasis. Look at the empty spaces in the city, like the alleys, the unused parking lots, and all the other spaces that seem to be left-over. There is a beautiful word for that: Terrain vaque or Wanderspace.



2 \ Go searching for the substructure
Don't look for a route from A to B, but let yourself be led by a sub-structure towards scapes of calmness.



3 \ Consider what contrast you want
Location, location, location. Consider the level of contrast based on the position in the city, the embeddedness of building blocks, the urban form and access. In this way, you know if the place will be part of the territory of silence or function as an urban escape.

Pattern set: Variation



4 \ Work through the scales
Make sure the soundscape is approached on multiple scales. Considering the context is important to understand how the inward-oriented space will function on the ear-perspective and what role it plays in the network of the calm atmosphere.



5 \ Surprise on purpose
Adding high contrast will create cognitive dissonance. This is because the transition was not expected. This can be done at strategic positions within the urban network to improve perceptual surprises!



6 \ Add soundmarks
Make people aware of the sound. As a result, consider expectations and whether to work against or emphasize them. Besides, using sound as an element of interaction or an art piece can improve this.

Reducing mechanical sounds | Use and perception of space

Attracting natural sounds | Healing effect of sound

Improve the spatial organization | Island scale

Pattern set: Expectation, control



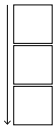
7 \ Create a network

Compose a network of calm, inward-oriented spaces that together create a silent structure within the vibrant city.



8 \ Buffer sounds

Sound should be buffered within the walls! Use the L, O, or U form of urban block to keep the sounds of nature inside and to block the mechanical sounds from outside.



9 \ Improve the sequence

Work within the sounding island with a sequence from public to private. By putting things in sequence, a transition in sound can be contained, and it emphasizes expectation, acceptance, and readability.

Use the inward-oriented space | Island to block scale

Pattern set: Exposure, distance



10 \ Design welcoming entrances

Highlight the transition towards the calm soundscape by choosing different materials, adding vegetation, and taking into account social safety and publicness.



11 \ Keep the scapes hidden

The quality of the inward-oriented scape lies in its ability to be hidden. The ‘coincidential’ discovery enhances the perceptual experience and is appropriate for use in louder urban environments.



12 \ Think smaller

The small things mean the most... also when you look at the hidden space, it doesn’t have to be big to get attention. Furthermore, it is the smallness that is beneficial for the calm inward-orientes soundscape.

Focus on qualitative sounds | Block scale

Pattern set: Time



13 \ Let the city bloom

Vegetation and water add to an association of calmness. Therefore, it attracts natural sounds such as waving leaves and singing birds. These sounds are perceived as positive and help to retreat.



14 \ Set time limits

Not everything has to be accessible at every moment. In order to improve the right behavior, desired sounds, and social safety, it is better to (temporarily) close some inward-oriented spaces. When the sun rises again and the city becomes louder, the gates can be opened as well.



15 \ Work with different textures and materials

Every texture makes another sound. You can use this to add contrast, to highlight a sound transition or emphasize a certain atmosphere. Here, materials and textures are used to mark sound.

Abstract

How many times have you put your earplugs in, headphones on, or closed the window? How often do you hear the birds singing, the wind whispering over roofs, the leaves crackling under your shoes?

Sounds play a major role in the perception of the environment we live in. It directs us to places where we enjoy staying and directs us away from places that over- or under-stimulate us. But what if we do not have this choice? What if there is no balance between the vibrance we want to blend in and the silence we have to breath in? Isn't the quality of our environment such that we can choose the area that our bodies need? We are unaware of the relationship between the urban landscape and our psychological well-being; the experience of the physical environment starts in our head.

I would like to ask you to use your ears in every sentence you read. That voice is a good way to start using this handbook.

Keywords
Soundscapes – Psychological well-being – Inner typology – Places to retreat – Quiet spaces

Wordlist

In the list, the definitions of the main concepts are given in order to explain and define the scope of the project. All sources are based on literature and personal interpretation.

Psychology

Cognitive dissonance: Mental discomfort (such as confusion) caused by two or more conflicting attitudes. Looking at sounds, this can be an unusual sound or contraditory sound in a specific environment (a motor in a park) (Perlovsky, L., et al., 2013).

Human behavior: The way humans act and interact, based on factors such as culture, age, personal characteristics, and values (Schafer, R., 1993).

Human experience: A set of mental, emotional, spiritual, and physical characteristics influenced by its environment and events (Montgomery,C., 2013).

Mental sphere: The mind; a mental space (Schafer, R.,1993).

Psychological well-being: Emotional health focussing on human feeling and functioning (Castro, R., & Carvalhais, M., 2014).

Pattern language: A set of patterns linked to a main theme, that can be used to find relations between each pattern and solutions towards the main problem or challenge (Alexander, C., 1977).

Sound

Auditive environment: The environment of sounds that can be experienced and perceved (Soundscape Design, 2020).

Auditory masking: Masking an auditory stimulus by adding another auditory stimulus (Munch, G.,1972).

Contrast effect: A high differentation or increasing difference in two or more auditory stimulus (Munch, G.,1972).

Decibel: A logarithmic scale on which the relative loudness of sounds are visualized (Munch, G.,1972).

Distal stimulus: A (sound) stimulating source or event that occurs in the surrounding environment (Munch, G.,1972).

Focal sound stimulus: A sound or sounding object that directs the observer's attention (Munch, G.,1972).

Frequency: The number of changes per interval of time, focussing on one source of sound (Munch, G.,1972).

Loudness: The intensity of a sound or a combination of sounds in an environment (Munch, G.,1972).

Interposition: (Partly) Blocking an object by adding another object (Munch, G.,1972).

Noise: A sound or combination of sounds that create a unpleasant perception and/or disturbance (Schafer, R., 1993).

Noise pollution: An unwanted or disturbing (set of) sounds that cause negative effects on human well-being (Schafer, R., 1993).

Overexposing: Perceiving too much sounds or for a too long time durance, which results in overstimulation of the senses (Author, 2022).

Perceptual input: The stimuli of sounds that function as the input to create a certain perception (Author, 2022).

Periodic sound: A repetetive soundwave, such as a water fountain or a traffic light (Munch, G.,1972)

Psychoacoustics: The psychology focussing on the perception of sounds and the psychological effects (Schafer, R., 1993).

Sensory urban ecology: The study of designing (man-made) nature in the city, focussing on the sensorial aspects (Soundscape Design, 2020).

Silence: The absense of sounds (Schafer, R., 1993).

Sone scale: A scale on which the loudness of tones is visualized in a subjective way (Munch, G.,1972)

Sound atmosphere | ambience: The sounds that are connected or fit a certain location or space (Schafer, R., 1993).

Sound perception | Auditory perception: The process of experiencing and interpreting sounds (Author, 2022)

Sound spectrum: The component frequencies and amplitutes that are presented for a specific sound (Munch, G.,1972).

Timbre: The quality of sound (Munch, G.,1972).

Volume: The subjective perception that some tones are more dominant than others (Munch, G.,1972).

White noise: A source of sound that includes all the frequences of the auditory spectrum, for example a humming air conditioning. White noise is mostly perceived negative (Munch, G.,1972).

Sound and space

Architectural atmosphere: A space or district that can be described as a mood, based on physical characterics of a space. These atmospheres have a strong relation to perception and sense-oriented design (Thibaud, J.P., 2011) (Zumthor, P., 2006).

Deafspace: The architectural approach that designs based on the needs of deaf people to live and inhabit in space (Gallaudet University et al., 2010).

Healing landscape: A landscape or artificial landscape that facilitates human health and well-being. Examples are gardens and other green spaces, which can vary in size and function (Author, 2022)

Urban oasis: A small (semi)public area located in between buildings in an urban area, formed by mainly natural elements, such as trees and plants, with a peaceful and pleasant character (Author, 2022)

Urban retreat | Urban escape: An urban scape in which people can withdrawel and recover from the surrouding urban fabric and chaos (Author, 2022)

Sensescapes: An environment designed focussing on the senses. Hereby, not only the functional character plays a role, but also the perception of it (Diaconu et al., 2011).

Sound dichotomy: Contradictory sound enitities, which can be a space, a location that can create conflicts or a (mental) border (Author, 2022)

Soundscapes: An environment focussing on the perception of sound. Hereby, natural acoustic sounds are main source of sound, designed in a holistic way (Soundscape Design, 2020).

Tranquil urban sphere: An urban space with a calm and natural setting. This space goes beyond 'quiet areas' and focusses on sounds that have a retreatful effect on human (Waters et al., 2019).

Urban design concepts

City acupuncture: The concept of redesiging small-scale areas within the urban fabric into meaningful public spaces of spaces of densification (Studio Hartzema & Gemeente Rotterdam, 2012).

City renewal: The concept of replacing or restoring buildings that does not meet the current human needs in order to function within the urban sphere (Author, 2022).

Densification: The process of increasing the number of dwellings in order to accomodate citizens (Gemeente Rotterdam, 2021).

Intensification: The development whereby there is focussed on increasing activities within the existing urban boundary, which can go together with densification (Author, 2022).

Soft city: The development of creating a city focussing on the human quality of the everyday life (Sim, D., 2019).

Spaces of belonging: A space wherein human feel a connection or commitment to the environment. These spaces create a feeling of home, and have mainly a semi-public or private character (Zumthor, P., 2006).

Urbanization: The process of growing cities, whereby more and more people become inhabitant of the urban areas (Gemeente Rotterdam, 2021).

Vibrant city: The development of creating a city or core part of the city that can be decribed as 'full of life and activities' (Author, 2022).

Wanderspace: The built and unbuilt space that has potential to become more qualitative meaningful open spaces. Hereby, the main aim lies in finding potential in the existing urban areas in stead of unnecessary growth (of building stock) (de Ridder, R., Hens, T., & van Broeck, L.,2020).

Inward spaces

Courtyard: A semi-public area enclosed by walls of buildings that have a strong community-based identity (Author, 2022)

Expedition street: A street meant for the packing and unpacking process to provite shops and other commercial functions of storage (Author, 2022)

Inner structures: A connection or sequence of inward-oriented spaces. This structure can be part of the substructure of a city (Author, 2022).

Superblock: A very large commercial or residential block where-in a large pedestrian space occurs. This typology is mostly known in Barcelona (Mueller, N., et al., 2020).

Territory of community: A semi-public space that focusses on the social interaction between people. These people have a direct connection to the space, by its function or the location.These territories are characterized by personal elements, clear borders and close-off possibilities as fences (Author, 2022).

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Appendix



2 Vooraan

COLUMN

Floor Rusman

Complete stilte

Ik ben gek op vaatwassers. Thuis heb ik er geen, maar in het huisje in de Ardennen staat-ie al een uur zijn aangenaam monotone geluid te maken. Alles is onder controle, lijkt het te zeggen. Andere apparaten drijven me juist tot waanzin, denk aan bladblazers en handendrogers. Wél luid, niét nodig, en bovendien onvoorspelbaar – in tegenstelling tot de vaatwasser, waarvan ik precies weet wat zijn volgende move gaat zijn.

Geluid is er altijd, maar we denken er gewoonlijk weinig over na. Hét omkranst ons bewustzijn, om soms plotsklaps op te duiken in het midden. De laatste tijd gebeurt dat vaker, lijkt het. Mensen praten over welke geluiden hen irriteren, ze schaffen *noise cancelling headphones* aan en ze willen stiltecellen op het werk. Hoe komt dat – leven we nu in een exceptioneel luide tijd?

Ik bel historica Karin Bijsterveld, gespecialiseerd in de geschiedenis van geluidsoverlast. Je kunt onmogelijk zeggen wat de luidste tijd was, zegt ze. Vroeger was het op een andere manier rumoerig. „In een vroegmoderne stad had je smidsen, molens, leerlooierijen, gillende dieren die naar de slacht werden gebracht. Je had herbergen met dronken mensen ervoor, daarover werd veel geklaagd."

Tijdens het gesprek komen mijn vakantiehuisgenoten binnen met de boodschappen. Ze kletteren biertjes in de koelkast en kraken met in plastic verpakte tomaten. Weinig geluiden storen mij meer dan krakende verpakkingen, zeker van dat biologisch afbreekbare plastic dat een soort *wall of sound* creëert. Het duurt een paar minuten voor ik weer hoor wat Karin Bijsterveld te zeggen heeft.

Ze vertelt nu over de antilawaaicomités die opkwamen rond 1900. „Het waren toen vooral mensen als jij die klaagden over lawaai", zegt ze. Mensen als ik? „Ja, mensen die denkwerk deden, zich moesten concentreren." Inderdaad klaagde Arthur Schopenhauer in het essay *On Noise* (1902) over knallende zwepen op straat die hem uit zijn concentratie haalden. Concentratie is als een diamant, schreef hij. Eenmaal doormidden gespleten is ze waardeloos.

Dat kan verklaren waarom de gevoeligheid voor geluid groeit. Meer mensen dan ooit hebben een denkend beroep, en tegelijk wordt het steeds moeilijker ons te concentreren. Er is te veel afleiding, vooral natuurlijk van smartphones en sociale media. Onverwachte, harde geluiden zijn dan al snel een prikkel te veel.

Maar er speelt nog iets. Geluid stoort mij meer wanneer ik er geen controle over heb. Neem die elektrische Van Moof-fietsen, die een sissend en toeterend geluid maken wanneer je in de buurt komt. Woedend word ik ervan: zo'n peperduur apparaat dat naar me blaast als een kat zonder dat ik iets kan terugdoen. „Hoe meer controle mensen denken te hebben over het geluid, hoe minder hinderlijk ze het vinden", bevestigt Bijsterveld. Een bladblazer is draaglijker als je hem zelf vasthoudt. Misschien moeten we na de kleine leefwereld van de pandemie weer wennen aan de chaos om ons heen.

Geluid stoort mij meer wanneer ik er geen controle over heb

De bubbels die mensen creëren om tóch grip te houden, bijvoorbeeld met *noise cancelling headphones*, maken het probleem erger, schreef de Amerikaanse mediawetenschapper Mack Hagood in het boek *Hush* (2019). Hoe meer geluid je uitbant, hoe gevoeliger je wordt voor wat je wél hoort. Bijsterveld gelooft niet in Hagoods theorie: je kunt net zo goed betogen dat mensen zó lekker uitrusten in hun bubbels dat ze geluiden daarbuiten beter verdragen.

Het kan allebei waar zijn. En het verschilt ongetwijfeld per persoon. Terwijl de vaatwasser bezig is aan zijn toegift, lees ik een artikel over psycho-akoestiek. Wat blijkt: vaatwassers zijn een enorme stressor! Met hun aanhoudende mechanische geluid verdringen ze rustgevende geluiden, zoals fluitende vogeltjes. En juist die zijn nodig om ons te laten ontspannen. Het gevolg: stress en een vroegtijdige dood. Maar wat nou als de vaatwasser zélf het rustgevende geluid is? Zoals Simon Vestdijk zijn stofzuiger aanzette tijdens het schrijven, zo heb ik ook iets nodig op de achtergrond. Dat is niet vreemd, lees ik bij de psycho-akoestici: als er iéts is waar mensen onrustig van worden, is het complete stilte.

Floor Rusman is redacteur van *NRC*

Facebook, Instagram en Whats... bracht het al langer woedende de... nieuw op gang. In dezelfde week... de macht van Facebook.

SOCIALE MEDIA

Hec... z... c...

Bij Fa... het b...

Door on... **Juurd Eijs...**

AMSTERDAM... en WhatsApp ... al een paar uur ... precies aan de ha... belangrijkste dien... cebook-concern w... Een technische stor...

Maar op Twitter ... uit de Britse muzi... miljoen volgers al... lijkt dat het afg... cebook". Dat was ... euze argumenten ga... tweet droeg bij aan d... het moment, werd ... ren geretweet en ... keer 'geliked'. A... sprak: Facebo... grond ligt.

Onbegrijpe... er in de voorg... onthulling... fecten v... werk te... Instag... van... v...

1

Scan newspaper (NRC, 2021)

The sense of sound

The inner city of Rotterdam is very dense and contains all kinds of activities and people. It is an area every citizen uses and whereby different purposes and behaviors occur. This makes it an area full of life, but also a fragile place looking at the future and its liveability. As a result, residents who live or work in this area spend a significant amount of time in this area and have a difficult time finding a place to retreat.

This touches on the problem of noise pollution. The growing noise pollution determines the daily life of the citizens. And with it, psychological well-being is under pressure. According to Schafer (1993), there are only two ways to solve this problem: 1. a global energy crisis, which would eliminate the greatest sources of noise pollution; or 2. research into soundscape atmospheres and a focus on an auditory landscape (Schafer, R., 1993, p.181). The second choice seems to be a more optimistic one.

In this handbook, I will look at the role of noise pollution in the everyday lives of urban dwellers. The main focus here is the urban landscape, psychological well-being, and the relationship to sound perception. Urban planners place too much emphasis on vision, with the other senses playing a limited or non-existent role. As a result, the city's image is incomplete (Castro, R., & Carvalhais, M., 2014, p.61).

This study aims to decrease the gap between psychology and urban planning but also to show a different 'image' of the world around us. And let's hope that the composition of the sounds of the city will sound like your favorite song.

Part 1 | Methodology

The problem is screaming

1.1 | Problem field

Motivation

The urban landscape
Noise pollution
Psychological well-being
Noisy Rotterdam
A new approach

To
the <u>man</u>

with the
drums

Which is
my
n
e
i
g
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b
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r

Problem field

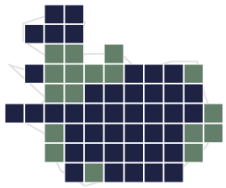
Motivation

My fascination with this graduation research started with the courtyard. In the courtyard, people feel a sense of belonging; a place of home. I like the places for the “community” because they touch the individual and the crowd. Diving into this typology, I realized that there were many more inward-oriented scapes that share this community function. It became a set of inward spaces where I could design with further in the process. The inward typology has a very specific urban form; the buildings function as walls without closing off from the surroundings. They are places to withdraw, places to rest to get energized back into vibrant life. In that case, the urban form, inward orientation, and community function are not enough; it is the whole atmosphere that creates a “healing landscape.”

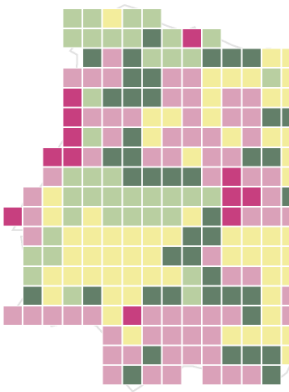
At that moment, the concept of the ‘soundscape’ came to mind. With the soundscape, the design of spaces focuses on the sense of sound and the perception of it. The soundscape became the leading concept in the storyline of my thesis. First of all, because perception of space is too focused on sight, while other senses are not integrated into the design. It is the role of the urbanist to design a place where people feel good. This touches on my second reason: noise. The psychological well-being of citizens is getting worse because of noise pollution. The city’s noise keeps us awake, distracts us, and overstimulates our senses. The vibrant city became a chaotic one, not because there is too much, but because there are no escapes. It lacks balance. Stating this, I come back to inward-oriented spaces. The walled open spaces are small enough to implement in the urban fabric, but big enough to create space for the mind and close off from the overstimulating sounds. The inward spaces make room for inner peace.

The big noisy Europe map

The story of this report starts with a look at noise pollution at the national and European scale level. This is done by analyzing the potential silent landscapes, as done by the European Environment Agency (2016). Thereafter, the psychological effects of noise pollution are explained, with reference to the situation in Rotterdam. The third part zooms in on the plans to manage and decrease noise pollution, which explains the relevance of choosing this area.





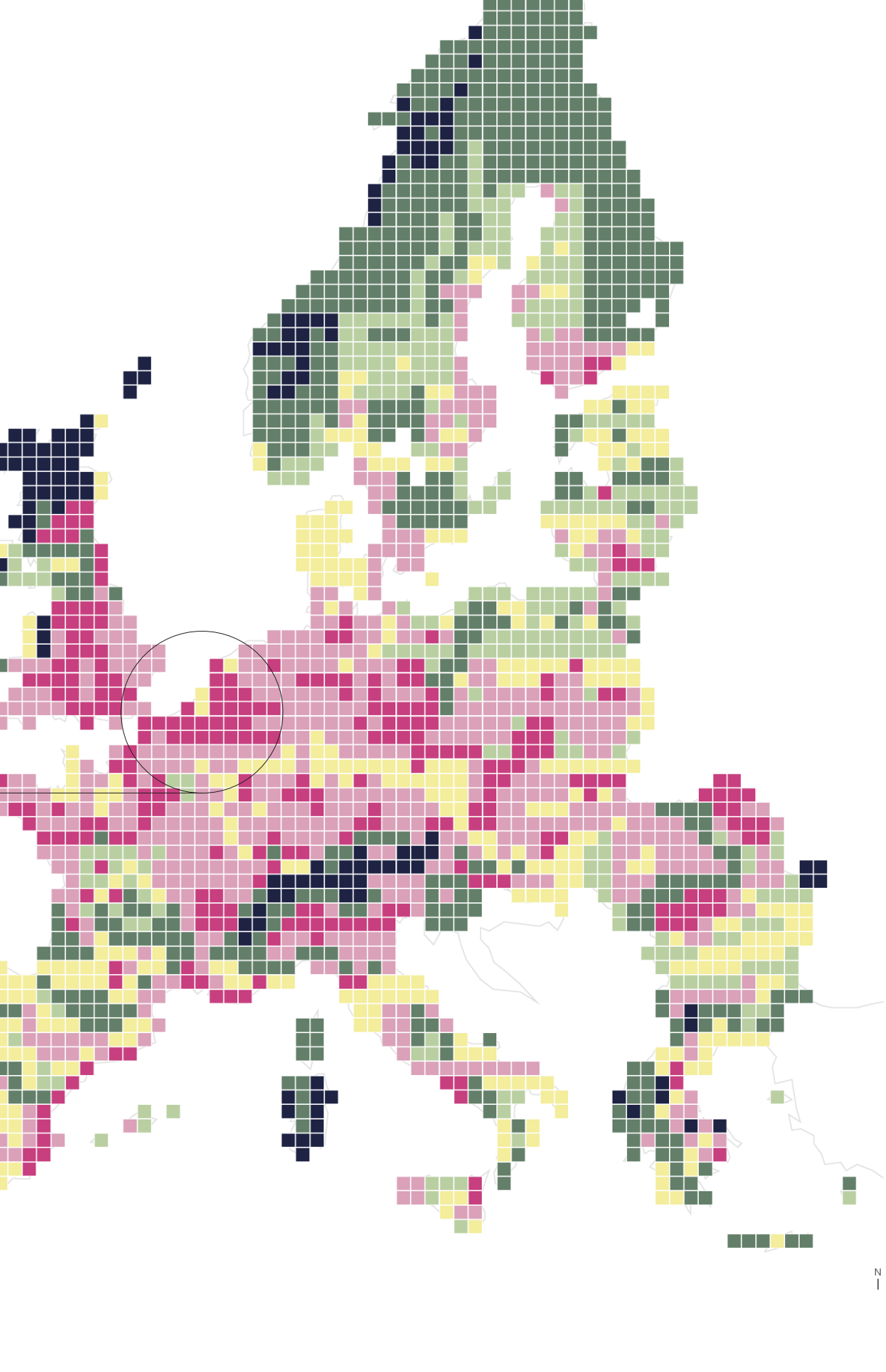


2

... and her loud Dutchies

Quietness Suitability Index (QSI) of Europe (Reproduced from European Environment Agency (2016)). The pink areas imply a QSI of 0, which means there is no 'potential'.

- Very high potential (QSI = 1)
- High potential
- Medium potential
- Low potential
- Very low potential
- No potential (GSI = 0)


N

Noise pollution

The report of “quiet spaces in Europe”, compiled by the European Environment Agency (2016), visualized the potential to create silent spots. The spaces with a lot of potential seem to be the areas with much nature and low density. However, the study urges a lack of potential in the core of central Europe, the denser parts, as well. Strikingly, the Benelux area seems to have the least potential (European Environment Agency, 2016).

This outcome is both alarming yet incomplete; whereas it suggests a lack of quietness, it does not illustrate the perception of it. This step is crucial to state if the absence of quietness is a synonym for the presence of noise pollution. Therefore, it is needed to zoom in.

Loud Dutchies

Densely populated countries, such as the Netherlands, show that sound is everywhere and affects our daily life. The map of the Netherlands gives an illustration of the correlation between population density and a lack of quiet spaces, but also implies a link towards green space. The Randstad forms a stain of pinkness, which can be concluded as ‘no potential quiet zone’. This economic heart forms the signal for the noise pollution of its citizens (Castro, R., & Carvalhais, M., 2014, p.109). This suggests a misalignment; the conditions for developing the vibrant city have a negative impact on the development of the soft city, despite the fact that both concepts aim to increase the citizen’s liveability.

Rising volumes

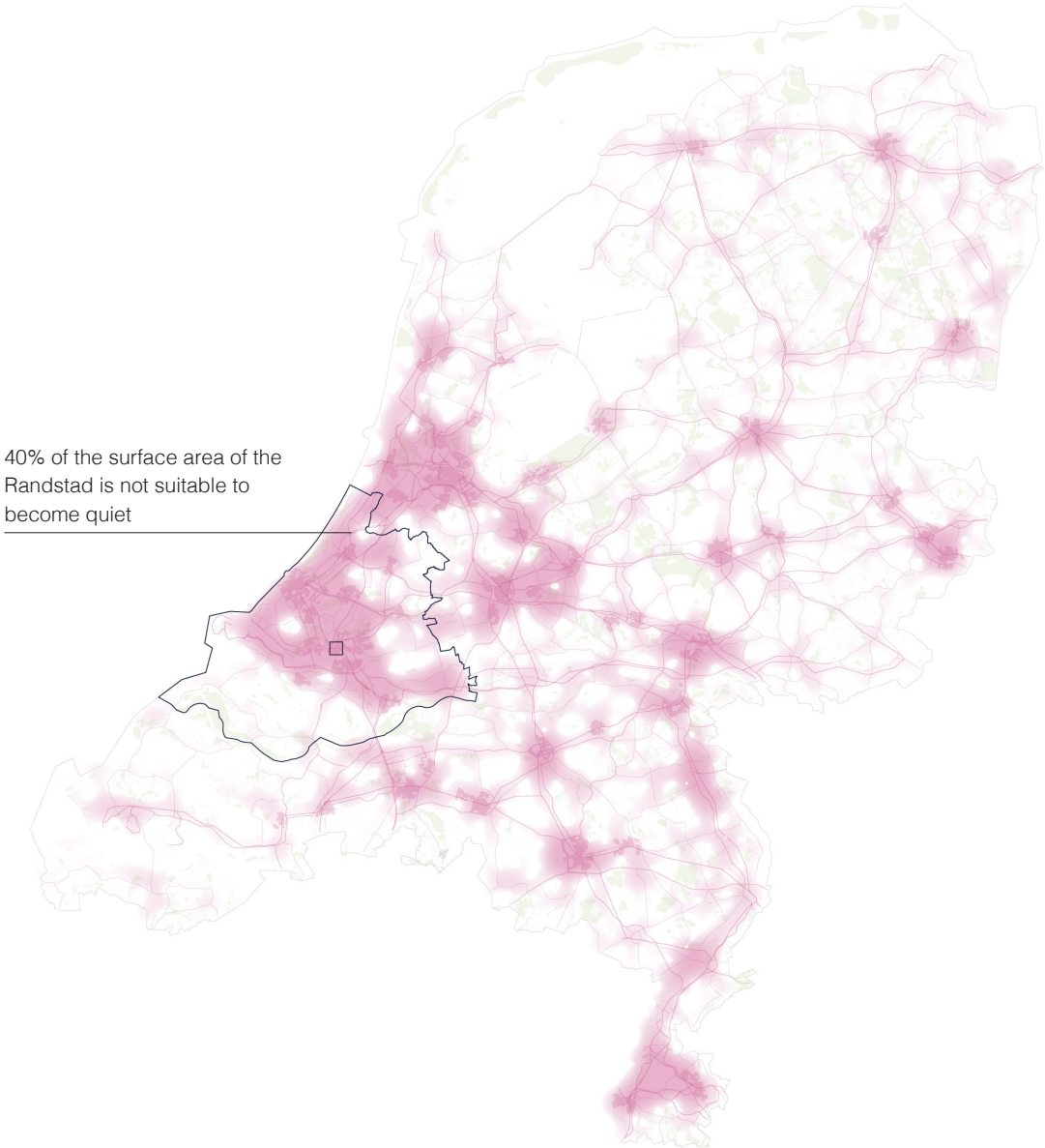
Stating the ongoing urbanization with higher densities, growing mobilities, and 24-hour economies in a future scenario, the realistic consequence involves an increasing number of people and traffic, and thereby a continuous exposure to sound.

Without changing the policies of urban planners or strategies of urban designers, Jabben (2002) states that 28% of the silent areas and 59% of the natural and recreational areas will be damaged by noise in the Netherlands in 2030. Most of all, the lack of quiet places in and around cities seems to be under pressure (Jabben et al, 2002) (Gezondheidsmonitor., 2020).

3

Quietness Suitability Index (QSI) of the Netherlands (Reproduced from European Environment Agency (2016)). The pink areas imply a QSI of 0, which means there is no ‘potential’.

Cities
Railways and highways
Rotterdam city center


40% of the surface area of the
Randstad is not suitable to
become quiet
N

Psychological well-being

Many psychologists believed that the urban crowd was the reason for its socially toxicness and psychosomatic illnesses such as depression, irratability, anxiety, and sleeplessness. However, because the density and psychological well-being show a correlation, it was concluded that the high population density itself was not the reason for the decreasing state of psychological well-being (Montgomery,C., 2013, p.128).

Thereby, human density is not the same as crowding. Human density can be measured and shows a fixed number of physical states. Crowding has to do with experience and is therefore subjective (Charles Montgomery, 2013, p.129).

Feeling crowded

Feeling crowded has to do with the absence of control over escape from people. All people need to have the possibility to retreat and be alone sometimes. Psychologist Milgram goes further into this statement and observed that citizens were less helpful to strangers than inhabitants of small villages and found out that this has to do with the overload of crowdedness causing a lot of stimulus like noise. In order to cope with this, people need to select what to focus on and keep a distance from other stimuli, such as other people. Milgram states, “Pushing us together physically actually pushes us apart socially” (Montgomery,C., 2013, p.128, 129). With this, it became clear the problem lies in the stimulus, whereby this thesis focuses on sound.

Experiencing the crowd

The experience of sound can be created in two ways: volontairy and involutairy. Kaplan (2013) explains volutairy as the experience we intend to have, with the purpose of focusing on the specific goal of use people have. This experience takes energy and becomes involutairy at the moment it becomes harder to focus or keep things in memory. To illustrate, spending time in a crowded street seems acceptable for a short time, but becomes a problem when we are constantly exposed to this crowd.
In cities, this crowdedness is everywhere; opening doors, signals of scooters, flashing stoplights; it forces you to decide where to focus on, instead of what is trying to be ignored. The voluntary experience is effortless and helps to restore and transform the involuntary. This makes human bodies need to escape from the crowd (Montgomery,C., 2013, p.111).

The exposure to sound becomes noise when the cacophony of sounds becomes a chaotic interplay. This exposure to noise has negative effects to the psychological well-being of people. Especially, within urban areas, people do not have the possibility to escape the ongoing noise.

Psychological effects

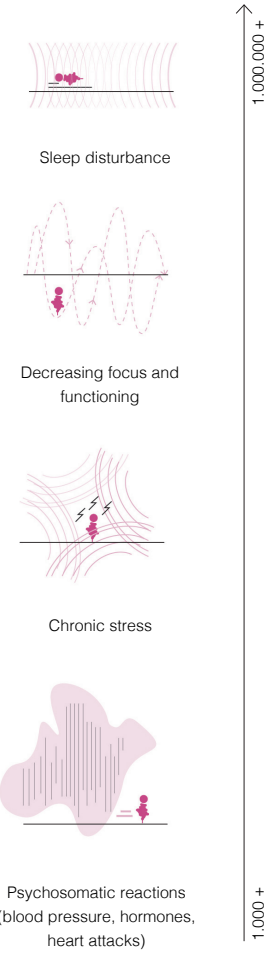
These negative effects are most noticeable when performing an activity that requires concentration or a calm environment, such as homework or sleeping. The noise interferes with the ability to retreat and concentrate, resulting in stress, sleep disturbance, annoyance, elevated adrenalin levels, rising blood pressure, and a decrease in overall functioning (Castro, R., & Carvalhais, M., 2014, p.281).

The level of noise pollution varies according to person and location. However, it should be noted that these effects affect all groups of people, not just those who are sensitive to sound or rely more on their sense of hearing than others (such as blind people). For example, more than a million people in the Netherlands have difficulty sleeping due to noise. Furthermore, decreased focus and functioning, stress, and psychosomatic reactions appear to be general health consequences. Long-term noise exposure can even cause permanent physical and mental harm, such as chronic depression, anxiety, and hearing loss (Gezondheidsraad & Gezondheidsraad,1994) (Castro, R., & Carvalhais, M., 2014, p.281).

Sound and space

Looking at the four psychological effects of noise, a relationship with space can be found. Sound reflects the activities of society, our movements, our habits, and how people live together (Castro, R., & Carvalhais, M., 2014, p.210). (Hossam El Din, et al., 2012).

Therefore, an overload of stimuli results in an individual's response not only psychologically but also physiologically and with a changing behavior in order to cope with the challenging situation (such as a noise event) (Ulrich, R., et al., 1991, p.202). With this, a spiral between behavior and perception can be seen. In order to change the direction of this spiral, the soundscape of the city should be changed.



4

Effects of noise pollution on the pscyhological well-being in the Netherlands and Europe. Effects as psychological illnesses and death are not included, since these effects are based on inspatial reasons (Numbers and effects based on Castro, R., & Carvalhais, M., 2014, p.281; GGD Rotterdam-Rijnmond, 2014; Rtl

The goldmine of mechanical sounds

We examine the citizens' daily environment to better understand their perception of sound. Rapid urbanization has influenced how cities are organized and, as a result, has had a significant impact on city dwellers and visitors. As an integral part of this challenge, the challenge is to keep growth and health in balance with the everyday environment. This was the motivation for Arcadis (2020) to investigate how healthy current Dutch cities are and what elements of a healthy future city are needed (Arcadis, 2020).

The study ranks 20 cities based on a selection of characteristics that indicate how the city's structures relate to health and is divided into five categories: Healthy Environment, Healthy Mobility, Healthy Outdoors, Healthy Environment and Healthy Community. To improve the validity, the index is compiled with RIVM and 150 professionals (Arcadis, 2020).

Rotterdam scores last, together with Zaanstad. Specifically, in the 'healthy community', Rotterdam scores poorly. This states a worrying result on the one hand, but on the other hand, a difficult to interpretable outcome because of the difficulties in measuring health. Yet it can be concluded that the city feels a lack of community: a sense of home.

Furthermore, healthy outdoor space and a healthy environment also score low. This shows that the resident misses functional greenery and experiences sound as a nuisance. When compared to other cities, the city performs well in the areas of healthy mobility and healthy built environment. This combination makes it interesting to further investigate Rotterdam.

When looking at noise pollution, it is striking that traffic in particular is a major source of nuisance. The functionality offered by mobility creates an obstacle to experiencing the city. These nuisances also occur in the city center.

Did you know....

1. In Europe, more than 113 million people suffer from noise pollution.

2. Hearing nature and natural materials seems to have a positive effect on psychological well-being.

3. The perceived sounds will be accepted more when you can see nature, even is if you are not in it.

4. Approximately 82 million citizens in Europe are exposed to traffic above 55 dB. This amount is seen as the limit of decibel looking at well-being.

5. 1 out of 2 people of citizens are exposed to noise (mechanical sounds above 55 dB). This contains half of the population in European cities.

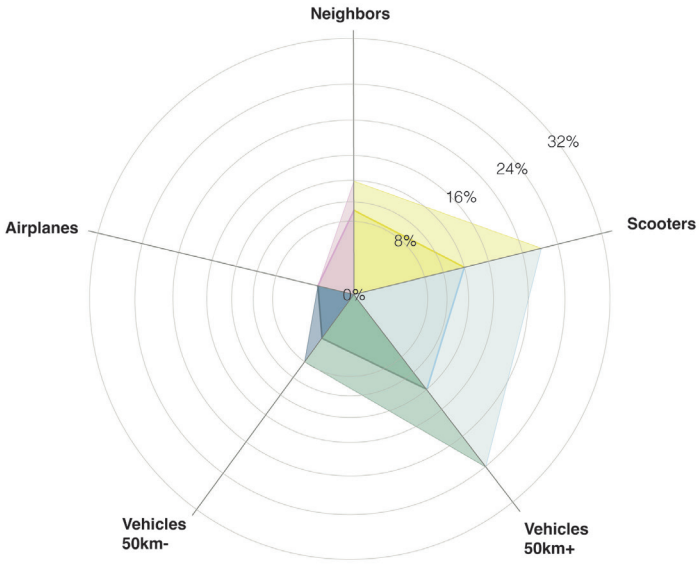
6. Replacing the upper layer of the road by silent asphalt or other noise-reducing layer can reduce the average amount of noise by 2 decibel.(Sweco & Urban insight, 2021)

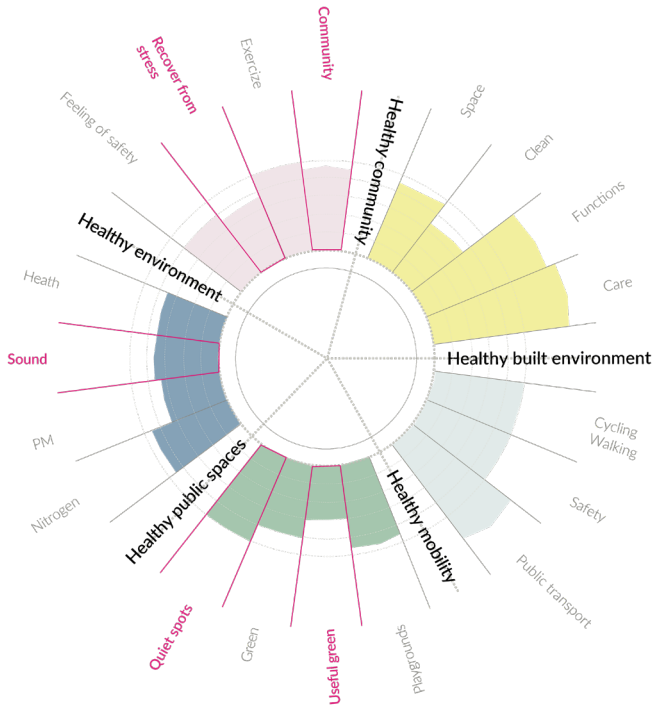
5

Noise pollution in Rotterdam (inner part is Rotterdam City Center, outer part is the average noise pollution in Rotterdam) (Reproduced from Healthmonitor adults and elderly, 2020)

6

The healthy city of Rotterdam (The higher, the healthier). Based on Gezonde stad index (Reproduced from Arcadis, 2020)


Neighbors
32%
24%
16%
8%
0%
Scooters
Airplanes
Vehicles
50km-
Vehicles
50km+


Community
Recover from stress
Exercize
Healthy community
Space
Clean
Functions
Care
Feeling of safety
Healthy environment
Heath
Sound
Healthy built environment
PM
Cycling
Walking
Nitrogen
Healthy public spaces
Healthy mobility
Safety
Public transport
Quiet spots
Green
Useful green
playgrounds

A new approach

In order to find out why Rotterdam scores so low, the following paragraphs elaborate on the urban landscape of the city in relation to noise and liveability-related concepts such as urbanization, greenery, and health. This is done using various policy documents and plans for the city.

Omgevingsvisie

The Omgevingsvisie of the municipality of Rotterdam combines 5 perspectives: the healthy city, the sustainable city, the inclusive city, the compact city, and the productive city. These perspectives show the spatial vision for the city in the long term. Trends such as urbanization, individualism, and noise pollution are integrated within these perspectives. Looking at sound perception, the compact city, the productive city, and the healthy city are the most important. In the following paragraphs, I will explain these perspectives, and their relation to sound, shortly.

The compact city

Rotterdam tries to find a combination between qualitative architecture and enough green (accessible) spaces for citizens. Therefore, the differentiation in functions and clusters of functions gives direction where development is expected. The central area of Rotterdam, especially the central district and the shopping heart, plays a key role within this perspective (Gemeente Rotterdam, 2021, p.68).

The productive city

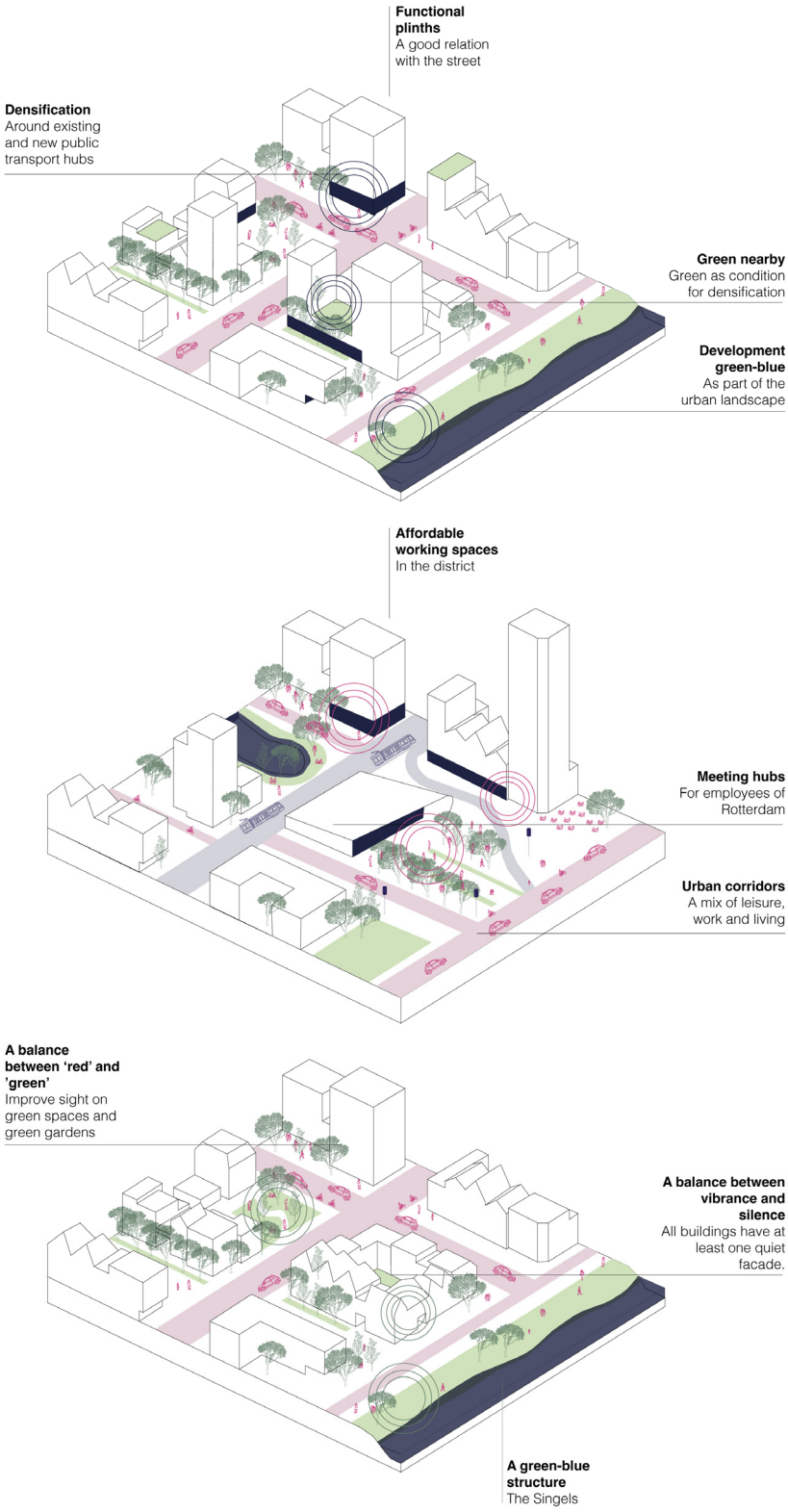
The city center of Rotterdam plays a key role in the economic welfare of the city. From a productive perspective, the municipality wants to invest in small maker-spaces, education, and innovation. This economic driver translates itself spatially in mixed-use areas, which can be connected to different sounds. (Gemeente Rotterdam, 2021, p.69).

The healthy city

The city of Rotterdam aims to improve the liveability and health of its citizens. Noise pollution and a balance between vibrance and silence play a key role in this perspective. This balance plays a role on different scales and is implemented in different ways. Most importantly is the reduction of noise pollution, mostly caused by mobility, industrial activities and nightclubs. Residential areas and sensible functions (such as schools and health-related functions) should have enough distance from these noise-sources. Next to this, creating silent spots is important to improving the liveability of

7

A schematic interpretation about the pillars of the Omgevingsvisie and their relation to sound. From top to bottom: the compact city, the productive city and the healthy city (Author, 2022)


Functional plinths
A good relation with the street
Densification
Around existing and new public transport hubs
Green nearby
Green as condition for densification
Development green-blue
As part of the urban landscape
Affordable working spaces
In the district
Meeting hubs
For employees of Rotterdam
Urban corridors
A mix of leisure, work and living
A balance between 'red' and 'green'
Improve sight on green spaces and green gardens
A balance between vibrance and silence
All buildings have at least one quiet facade.
A green-blue structure
The Singels

citizens (Gemeente Rotterdam, 2021, p.82).
The fact that this vision emphasizes the need for places to shelter and find silence demonstrates that noise pollution affects the entire population, not just the sound-sensitive.

The noise action plan

The noise action plan of Rotterdam, made in 2009, acts on 3 pillars: 1. preventing noise pollution and negative health effects; 2. improving the overall acoustic climate (soundscape) of the city; and 3. integrating noise in the field of spatial planning and urban design. These goals were set for the period of 2019–2023 and try to create a balance between liveability and economic activity, with interventions such as “silent” asphalt, improved insulation of facades, and an increasing area of 30 km zones.

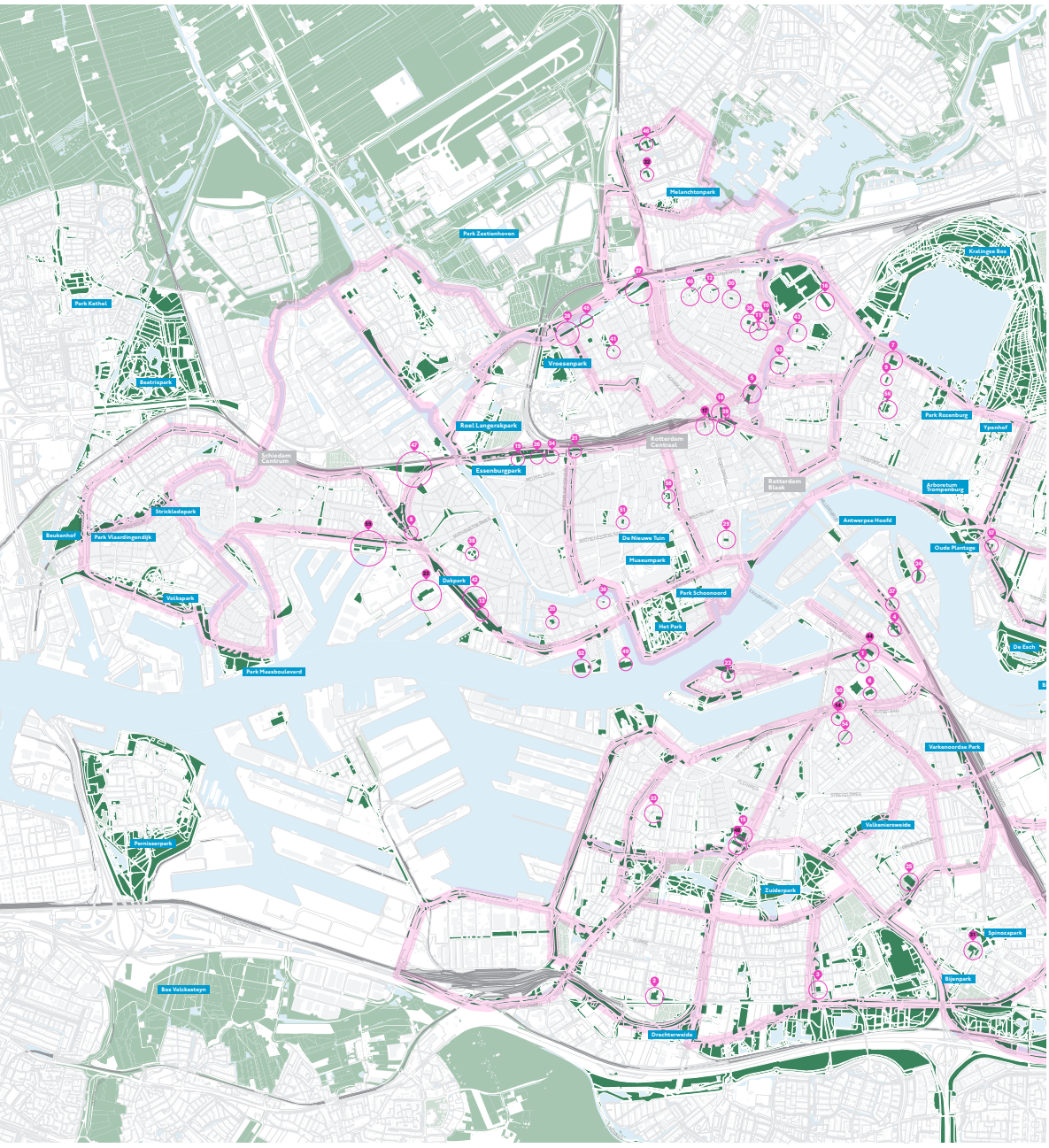
This ambition, in combination with the density of the city and the harbor activities, makes this action plan a plan with challenges and dilemmas. As a consequence, not all areas have the ability to lower their sound level or decrease the multitude of sounds. As compensation for noise, the municipality focuses on providing green, quiet areas close to the citizens. Compensation seems to have high importance in the city center and harbor areas (Weber, M., Luzzi, S., 2010) (Gemeente Rotterdam, 2019).

Urban Nature Map Rotterdam

In the urban nature map of Rotterdam, green zones are connected to silent zones.This map was an initiative to show the (increasing) green zones in Rotterdam in order to create a patchwork of green spaces. It should be mentioned that these spaces are mostly artificial land, whereby the term “nature” is more closely related to “greenness” than “heritage”. Most of these scapes are urban parks, but others show a more woody appearance.

The increasing patches of green and the connection of these green areas do not only create a more livable space but also contribute to the natural sounds in the city, which helps to bring back the balance between silence and vibrance (Lola Landscapes, Vereniging Deltametropool, & Stimuleringsfonds creatieve industrie, 2016).





8

Urban nature map (Lola Landscapes, Vereniging Deltametropool, & Stimuleringsfonds creatieve industrie, 2016).

1.2 | Problem statement

Statement

Position
Theoretical framework
Relevance

Statement

‘The inner city of Rotterdam is very dense and contains all kinds of activities and people. It is a vibrant area whereby different purposes and behaviors occur. This makes it an area full of life, but also a fragile place looking at the future and its liveability, related to the perception of sound. Citizens that live or work in this

part, spent much of their time in this area and face difficulties in order to find a place to retreat. It seems there is a misbalance between vibrance and silence, not only in Rotterdam but also in other cities, effecting the daily life of citizens in a negative way. The psychological well-being of human beings is under pressure, and urban design can affect it'

Theoretical framework

The theoretical framework is based on sociologist and philosopher Lefebvre's (1991) original framework. This framework illustrates how built environments are produced in a conceptual way and focuses on 'social superstructures', which emphasizes the societal relevance of design.

Because of the psychological-spatial relation of this thesis, the social space communicates both. In that way, this framework functions as the conceptual connection of multiple spaces and makes clear that "space" in itself can be both "spatial" and "mental". For an urbanist, this understanding is needed to work with the complexity of design and its social and psychological consequences.

The framework consists of four parts: the social space, the lived space, the perceived space, and the conceived space. These aspects show the variety and multi-approachable definition of space. The combination of spaces for these subjects explains the psychological-societal relationship to physical spaces without defining scales. The scales of the conceived-perceived-lived spaces differ per situation, even as the ratio space-sound-individual.

The first diagram shows the original framework of Lefebvre (1991) combined with critique. This critique is adjusted and translated into the second diagram, whereby the division of conceived, perceived, and lived space is connected to the main topics of this thesis: space, sound, and the individual. This is done because the original framework can not be translated completely.

Social space

The social space is the center-point of the diagram and represents the combination of the spaces explained above. The social superstructures that are formed within this space represent the daily experience of space. In this thesis, this space is taken as the daily living environment of citizens, in which soundscapes are embedded.

Conceived space

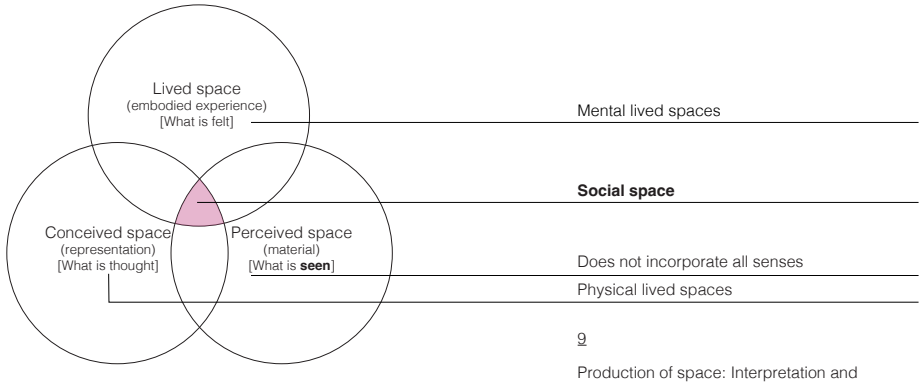
Conceived space is the 'representation of space'. Designers have a certain idea and vision when designing. This is related to context-based goals, principles, and aims. The design, based on knowledge, science, and ideology, reflects how physical spaces work in general. In the translation of the framework, I interpret conceived as the urban environment.

Perceived space

Perceived space is the space wherein interaction, movement, and actions take place; it forms the space of the (social) network and thereby goes deeper into how people use space in their daily rhythm and positions the network of the individual in the context of society. In the original diagram, Lefebvre (1991) limits this space to “what is seen’’. However, an image of experience is based on every sense, which would suggest just a part of the whole experience. In the theoretical framework used for this thesis, the component sound is placed within this space, considering that other senses also play a significant role.

Lived space

Lefebvre (1991) explains Lived space as the image of space. This space is subjective and different for every individual using it. Therefore, lived space is non-spatial; the space is in our mind, formed by experience, memories, and perception.



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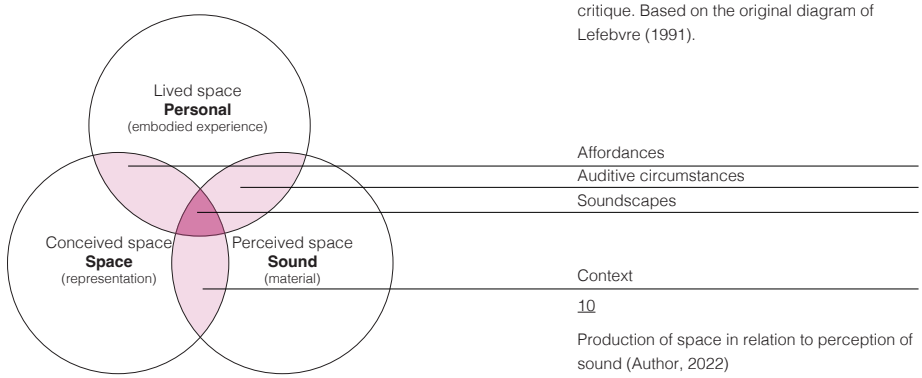
Production of space: Interpretation and critique. Based on the original diagram of Lefebvre (1991).



10

Production of space in relation to perception of sound (Author, 2022)

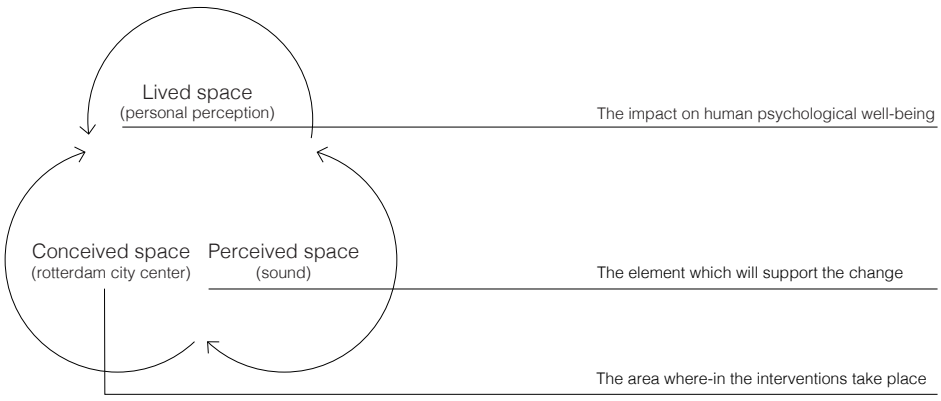
Position

With this theoretical framework, the position of this thesis is explained. This as the framework in its whole, suggesting the three main topics of space, sound and the individual, related to social-superstructures that will be part of the design scape; the areas of interventions.

Furthermore, the model shows a position per topic. For the position of space (conceived space), this thesis suggests working with the existing urban fabric. This means that the report focuses on small local interventions, mostly inward-oriented atmospheres. Hereby, the theory of city-acupuncture will be used as well as theories about the inward urban form like expedition streets and courtyards.

For the position of sound (perceived space), it should be emphasized that the design focuses mostly on the qualities of the existing soundscapes. Hereby, the approach is to produce more of the “good” sounds (natural and human sounds) instead of reducing noise.

The last position is about the role of the individual in this thesis. In order to understand perception, it is needed to start from an individual’s point of view and work towards more generic components of perception. The field of environmental psychology is connected best to the personal perspective and therefore is used as a starting point of research.



11

Production of space: Explaining the position of this thesis (Author, 2022).

1.3 | Research plan

Research questions
Research aims
Design goals
Conceptual framework
Overview methodology

Main question

In what way does the urban design of calm, inner soundscapes contribute to the psychological well-being of citizens, focusing on the area surrounding Rotterdam Central Station?

This question combines the aspects of perception, sound and urban design and tries to find an answer to improve the connection of space and perception by looking at sound.

Research aims

Research aims

With the main question, I aimed to achieve the following outcomes:
(A) Finding balance in the composition and gradience of vibrance and silence.
(B) Turning the consequences of urbanization into opportunities for changing living environments.
(C) Decrease the gap between psychology and urban design, focussing on sound. And thereby improve the psychological well-being by urban design.

Subquestions

The subquestions for this research are divided into 5 parts and 3 categories, in order to structure the project. These parts and categories are:

Analysis
1. The sounds of Rotterdam

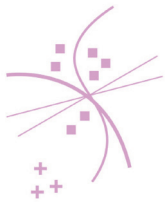
Integration
2. The concept of the calm soundscape
3. Pattern language

Design
4. Inner areas
5. Design of soundscapes



12

Finding balance in the composition and gradience of vibrance and silence (Author, 2022)



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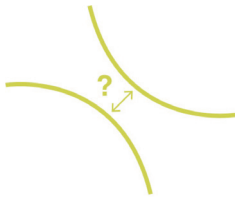
Turning the consequences of urbanization into opportunities for changing living environments (Author, 2022)



14

Decrease the gap between psychology and urban design, focussing on sound. And thereby improve the psychological well-being by urban design(Author, 2022)

Research questions

Analyzing subquestions
Goal: Perceive an overview of the physical and psychological components of sound in order to define how to visualize sound and the location of current frictions in space.

Part 1 | What | Perception of Rotterdam?
(PE-01)
What is the perception of sound and how can this be interpreted?
The perception and measurement of sound is done by generic literature and location-specific field research. Besides, interviews and questionaries form an important method for this subquestion.

(PE-02)
How do Rotterdam City Center and Rotterdam Noord show their contrasts in vibrance and silence?
Looking at the diversity of sounds, it will become apparent what the vibrant and quiet landscapes are. This question will be answered by spatial analysis such as mapping urban structures, sound documentation, and sound maps.

Integrative subquestions
Goal: Combine the knowledge of the analyzed subquestions into spatial-psychological relations and design guidelines.

Part 2 | What | The calm soundscape
(IS-01)
What are soundscapes and how are they perceived?
This subquestion is about the perception of soundscapes and especially focusing on inward-oriented spaces. Here, theoretical research about perception, reference studies, and sound recordings are part of the methods.

Part 3 | How | Integration theory and design
(TD-01)
What are the elements that link the connectivity between psychological research and urban design?
Specific sound elements of the design are highlighted and explained according to their connection to space and perception. This is done by the Pattern Language and is based on data from previous subquestions.

Design-oriented subquestions
Goal: Design a soundscape integrated into a network of soundscapes in order to bring back the balance between vibrance and silence and thereby improve the psychological well-being of the citizens of Rotterdam city center.

Part 4 | Where | Inward-oriented spaces
(IO-01)
What areas can become calm, inward-oriented soundscapes?
With this subquestion, the conclusions of the first part are translated into conclusions for spaces of change. Besides, some of the existing inward-oriented spaces are taken as examples or in-depth field-research. This is done by sketches, combining maps and implementing design guidelines at the district level.

Part 5 | How | Design of soundscapes
(DS-01)
How can these areas be transformed as a place to retreat?
The design of a soundscape is done by zooming in into an inward scape and sounding island. This design consists of visual documentation as 3D drawings on block level and neighborhood level and other forms of representation such as poems, and photos.

(DS-02) How do these spaces establish a network of inner soundscapes?
With this question, the places that could be potential soundscapes are placed in a route that shows the gradient from vibrant to silent spaces. Methods used are implementing the Pattern Language, mapping routes and visual documentation. The designed soundscapes are part of this route.

Design goal and objectives

Main design goal

The main design goal is to achieve a balance between vibrance and silence in the Rotterdam Central Environment. This goal is reflected to the research aims by the design-oriented subquestions. The design objectives below explain how this goal is intented to be reached.

Design objectives

The underlying design objectives, which determine the approach towards the main design goal, are:

[1] Creating inward-oriented spaces

The inner typology functions as community scapes in between public and private spaces and provides a certain behavior and use.

[2] Facilitate diversity in sound(levels) | Contrasts

Create a network of spaces that improve the interplay of vibrance and silence, human interaction and individual retreat.

[3] Improve spatial organization

Select strategic locations as soundscapes to provide all citizens with a place to retreat.

[4] Focus on qualitative sound

Design interventions that focus on improving the quality of sound instead of decreasing the amount of noise.

[5] Work with the current urban structure

The existing urban structure shows a lot of potential to create local soundscapes. These spaces can be taken to be turned into or tweaked into a more meaningful space.

Conceptual framework

The conceptual framework illustrates the main concepts of the project and how they are related to each other. Urban trends (drivers of change) have consequences for human psychological well-being. This subject is illustrated by perception and touches the field of spatial justice shortly. Choice, balance, and belonging form the psychological components related to space, whereby city acupuncture, inner typology, and networks of space are main topics. All these concepts are combined into the concept of the soundscape. In the following paragraphs, the concepts are explained briefly by their definition and role in the project.

Developments | Drivers of change

Urbanization

The world we live in is changing faster and faster. The number of urban residents will increase immensely over the coming decades, which leads to higher densities, pressure on cultural landscapes and open (natural) land (Barthel, S., et al., 2013, p.9). The growing populations in cities change the way we (can) live and affect the liveability of spaces. The creation of “places to retreat” for citizens is the focus of urbanization in this graduation project. This means that people should have the ability to withdraw from the vibrant city, even if the population grows.

Spatial justice

When combining urbanization and places to retreat, spatial justice is a concept that automatically arises. Do citizens have spatial justice to withdraw? Or will the lack of places to retreat be part of the life of the new urban population? The topic in itself, spatial justice and the right to have silence, can be a graduation project on its own. However, this graduation project limits the topic by only urging the need for places to retreat and stating the consequence of ongoing urbanization by looking at spatial justice. Hereby, ‘Inward’ demonstrates how the urbanization of society can go hand in hand with the retreat of the urban individual.

Diversity of sound

Sound can help us in order to find the route from a to b, to be aware of danger and to guide our behavior (for example, the tapping traffic

lights ‘allow’ people to start crossing the street and to stop when the sound stops as well) (Schafer, R., 1993). Therefore, sound influences how we experience space. This can be positive, mostly in green environments, but can also lead to negative feelings, mostly in dense urban areas. Exposure to this type of sound for a longer (permanent) period is harmful for the well-being of people, even though chaos fits the identity of the vibrant city. Therefore, diversity in sound, spread over the city, should be integrated into the future urban landscape. The diversity of sound, in this report, plays a role in finding a balance between vibrant and silent spaces and is connected to psychological well-being.

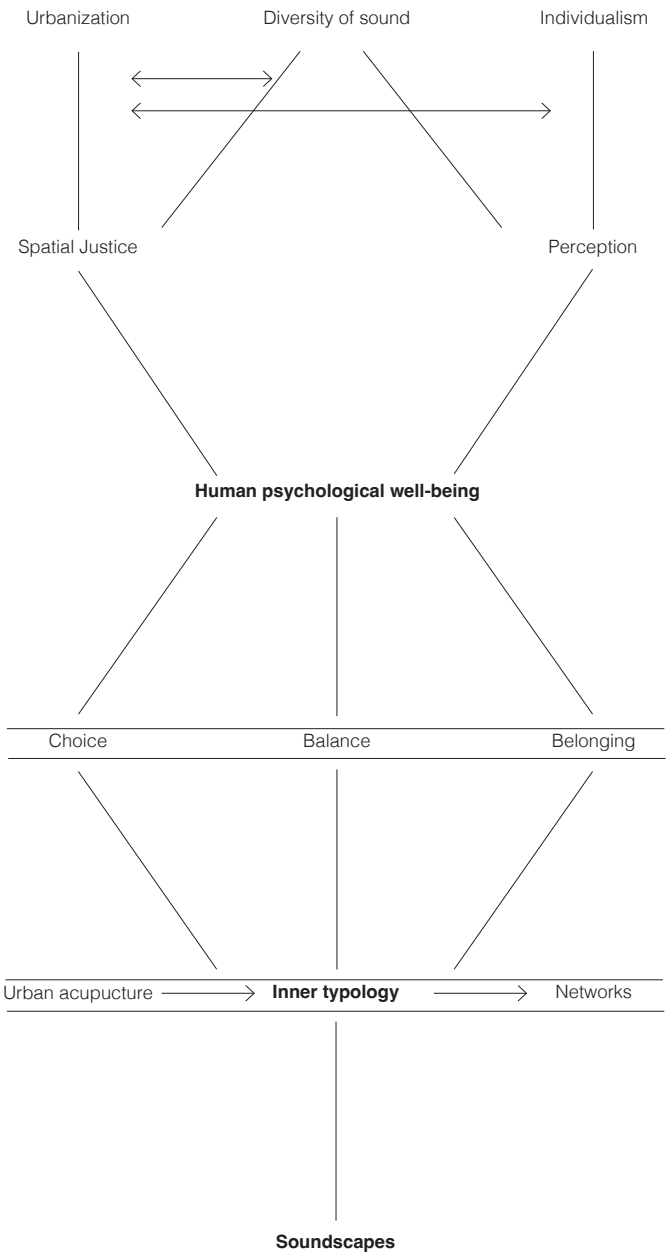
Individualism

The third and last development touched upon is the concept of individualism. Over time, people have become more individualistic. Personal freedom, self-development, and independence are topics related to the growing individual lifestyle and show a more self-related society. However, a more individual-oriented lifestyle does not have to reflect less social cohesion; people need choice in having interactions. The crowd is an individual place, even in the private sphere, because of the absence of interaction between people (Montgomery, C, 2015). The spaces in between the crowd and the individual form the spaces of community. It is key to find a balance between these spaces within the urban network and to foresee citizens’ variety in interactions within the public sphere (Centraal Bureau voor de Statistiek, 2017). This concept contextualizes the theme of this report but is not the focus of the project.

Psychological components

Perception

The experience of space influences perception and reflects human movement and behavior (Schafer, R., 1993). This perception of space is built up from the senses of sight, hearing, touch, taste, and smell. Because of this design relationship, taste is excluded and movement is added as a sensory aspect. This is done because perception focuses on the relationship with urban design. This report focuses on the sense of sound, whereby it focuses on the relationship between space and perception in three ways: 1. Perception places (the soundscape | inner places), 2. Perception elements (Pattern Language), and 3. The sequence of atmospheres (gradients and soundscape networks).



Drivers of (urban) change

(PE-02) How do Rotterdam City Center and Rotterdam Noord show their contrasts in vibrance and silence?

Psychological relation

(PE-01) What is the perception of sounds and how can this be interpreted?

Goal | psychological component

(TD-01) What are the elements that link the connectivity between psychological research and urban design?

Psychological elements

(IS-01) What are soundscapes and how are they perceived?

Approach | spatial relation

(IO-01) What areas can become calm, inward-oriented soundscapes?

(DS-02) How do these spaces establish a network of inner soundscapes?

Result | spatial design, psychological influence

(DS-01) How can these areas be transformed as a place to retreat?

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Conceptual framework Diagram (Author, 2022)

Human psychological well-being

Combining the drivers of change, a friction in liveability can be concluded. This friction lies in psychological well-being. Negative effects such as sleep disturbance, lack of concentration and stress are some of the negative consequences (Gezondheidsraad & Gezondheidsraad, 1994) (RIVM, 2019). Only the psychological effects that have a relationship with space are integrated in this research. Therefore, the terms “balance,” “choice’’ and “belonging” are main spatial pathways looking at psychological well-being. 1. Choice explains the possibility to visit different atmospheres with a variety of different experiences. 2. Balance has to do with the distribution of these atmospheres within the urban fabric. 3. Belonging is about the urban form of space and the social function that comes with it, as well as the outlook of space. The concept of human psychological well-being is integrated into the report by stating the negative effects of noise pollution.

Urban concepts

Urban acupuncture

In order to create a balance between vibrance and silence within the Rotterdam city center, it has been chosen to focus on urban acupuncture. Urban acupuncture is the concept of finding left-over spaces or wander-spaces within the urban scape that could be transformed into more meaningful places. With this, the solution lies in small-scale interventions, whereby drastic interventions in the urban fabric are not needed. Therefore, the drivers of change illustrate that these (underused) spaces can be seen as the only growing spaces the city has. Giving these local spaces a (retreat) function can have a big impact on the city atmosphere as a whole (Studio Hartzema & Gemeente Rotterdam, 2012) (Ridder, R., Hens, T., & Broeck, L.,2020).

Inner typology

‘Inward’ focuses on the implementation of the inner typology. This typology is a set of inward-oriented scapes, such as the courtyard and the expedition street, that are part of the substructure of the urban sphere. Most of these spaces have underused potential and are, because of that, mostly wanderspaces. On the other hand, the position in the urban network and the ‘coat’ of buildings suit the circumstances for social spaces of belonging and silent spots. Therefore, the inner spaces have a great opportunity to become soundscapes (Gemeente Rotterdam, 2018).

Urban atmospheres

Networks

In this handbook, the inward-oriented spaces form a network of places aiming to enhance the counterparts of the vibrant network. With this, citizens do not only have a space to retreat, but also the choice to take a route within a more calm atmosphere. The network forms the gradient between lively and calm and, thereby, a sequence of spaces.

Soundscapes

The soundscape focuses on designing with the perception of sounds by attracting the “right” sounds in order to retreat. Natural and human sounds are the dominant sounds whereby the ratio differs per soundscape and position within the soundscape (Ulrich, R., et al., 1991) (Parry-Jones, W., 1990). In this research, the soundscape is the end design of the project and bundles the psychological part (perception and psychological well-being) with urban design (a balance between vibrance and silence and places to retreat).

Intergration research approach

Research questions

Main research question
In what way does the urban design of calm, inner soundscapes contribute to the psychological well-being of citizens, focusing on the area surrounding Rotterdam Central Station?

Subquestions
Analyzing subquestions
Part 1 | What | Sounds of Rotterdam
(PE-01) What is the perception of sound and how can this be interpreted?

(SR-01) How do Rotterdam City Center and Rotterdam Noord shows their contrasts in vibrance and silence?

Integrative subquestions
Part 2 | What | The calm soundscape
(IS-01) What are soundscapes and how are they perceived?

Part 3 | How | Integration theory and design
(TD-01) What are the elements that link the connectivity between psychological research and urban design?

Design oriented subquestions
Part 4 | Where | Inward-oriented spaces
(IO-01) What areas can become calm, inward-oriented soundscapes?

Part 5 | How | Design of soundscapes
(DS-01) How can these areas be transformed as a place to retreat?

(DS-02) How do these spaces establish a network of inner soundscapes?

Aims and design principles

Main design goal
The design of soundscapes in order to achieve a balance of silence and vibrance in the Rotterdam city center.

Aims
(A) Finding balance in the composition and gradience of chaos and silence.

(B) Turning the consequences of urbanization into opportunities for changing living environments.

(C) Decrease the gap between psychology and urban design, focussing on sound. And thereby improve the psychological well-being by urban design.

Design principles
[1] Creating inward-oriented spaces
The inner typology function as community scapes in between public and private spaces and provide a certain behavior and use.

[2] Facilitate diversity in sound(levels)
Create a network of spaces that improve the interplay of vibrance and silence and human interaction and individual retreat.

[3] Improve spatial organization
Select strategic locations as soundscapes to provide all citizens of a place to retreat.

[4] Focus on qualitative sound
Design interventions that focus on improving the quality of sound in stead of decreasing the amount of noise.

[5] Work with the current urban structure
The existing urban structure shows a lot of potential to create local soundscapes, these spaces can be taken to turn into or tweak into a more meaningful space.

Methods

(1) Visual documentation (primary)
A combination of photography, drawings and sketches representing the current situation of the area and human behavior.

(2) Sound documentation (primary)
Recordings, observations and soundwalks that show the current situation and variety of sound, chaos and silence.

(3) Analytic mapping (primary)
Maps, sections and diagrams that represent several topics of the current situation of the area or reference areas.

(4) Analytic sound mapping (primary)
Maps, sections and diagrams, showing the translation of the sound documentation in space.

(5) Other forms of representation (primary)
Poems, collages, models and other media to explain the connection of psychological well-being and urban design.

(6) Interviews and dialoques (primary)
Interaction with actors within the area of with a sound related expertise in the form of conversations, walking tours and interviews.

(7) Data review (secundairy)
Psychological and sound related data showing current and future expected circumstances, related to the citizen of the area of Rotterdam.

(8) Literature review (secundairy)
Academic information about perceiving sound, healing environments and the combination of psychological well-being and urban design. The pattern language is part of this method.

(9) Case study (secundairy)
A selection of area's with the same issues as the core location that show examples of interventions and prepositions within the combination of psychological well-being, sound and urban design.

(10) Design (primary)
A combination of maps, sections and 3d visuals, that show the future state of an inward-oriented soundscape and a network of soundscapes.

Method limitations

(1) Visual documentation
- Difficulties towards non-accessible inner typologies and human sensitive observations.

(2) Sound documentation
- Difficulties towards non-accessible inner typologies
- Difficulties with making sound spatial and visual, since vision is another sense.

(3) Analytic mapping
- Limitied data about specific locations within the area.

(4) Analytic sound mapping
- Subjectiveness of perceiving sound and translating this into general information.
- Difficulties with making sound spatial.

(5) Other forms of representation
- Limited opportunities to visit and construct the site, due to the pandemic restrictions.

(6) Interviews and dialoques
- Difficulties with approaching actors
- Limitied opportunities to visit the site and actors.
- Limitied opportunities looking at availability of stakeholders.

(7) Data review
- Difficulites with acces to several sources
- Outdated or incomplete sources
- Data that only focusses on sound during the pandemic situation and excluded other timeframes.

(8) Literature review
- Limited access or limited design related articles that develop the connection of psychological and physical.
- Outdated literature or literature not integrated with current developments.

(9) Case study
- Difficulties with visiting the case study area
- Limitations in drawing conclusions from general information.
- Differences in the perceiving of sound, looking at cultural differences.

(10) Design
- Limitations in integrating conclusions from analysis and theory.
- Difficulties with approaching actors

Prospect outcomes

(i) An expand knowledge of the combination of urban design and psychology.

(ii) An expand knowledge about the sound atmospheres in Rotterdam.

(iii) A set of tools and elements (pattern language) as possible interventions or guidelines towards creating soundscapes

(iv) An overview of a network of soundscapes that can bring back the balance between vibrance and silence, at district level.

(v) A route as gradience between vibrant spaces and more silent spaces, and their interaction.

(vi) A soundscape design that shows the components of designing with sound in order to increase human well-being.

(vii) A critical reposition of urban design within the field of psychology and sociology.

(viii) A discussion on the future pathway towards designing with senses.

Approach

Formula: Outcome = question(s) + aim(s) (+ design principles) + methods

(i) = (PE-01, IS-01, TD-01) + (C) + (6,7,8,9)

(ii) = (PE-02, IO-01) + (A, B) + (1,2,3,4,5,6)

(iii) = (TD-01, DS-02) + (A) + [4] + (1,5,6,7,8)

(iv) = (PE-02, IO-01, DS-02) + (A,B) + [1,2,3] + (2,4,5,6,10)

(v) = (IO-01, DS-01, DS-02) + (A,B) + [2,3] + (1,2,3,4,5,10)

(vi) = (PE-01, TD-01, DS-01) + (B) + [1,4,5] + (5,6,10)

(vii) = (TD-01, DS-01, DS-02) + (B,C) + (6,8,9)

(viii) = (PE-01, IS-01, TD-01, DS-01) + (A,B,C) + (5,6,7,8)

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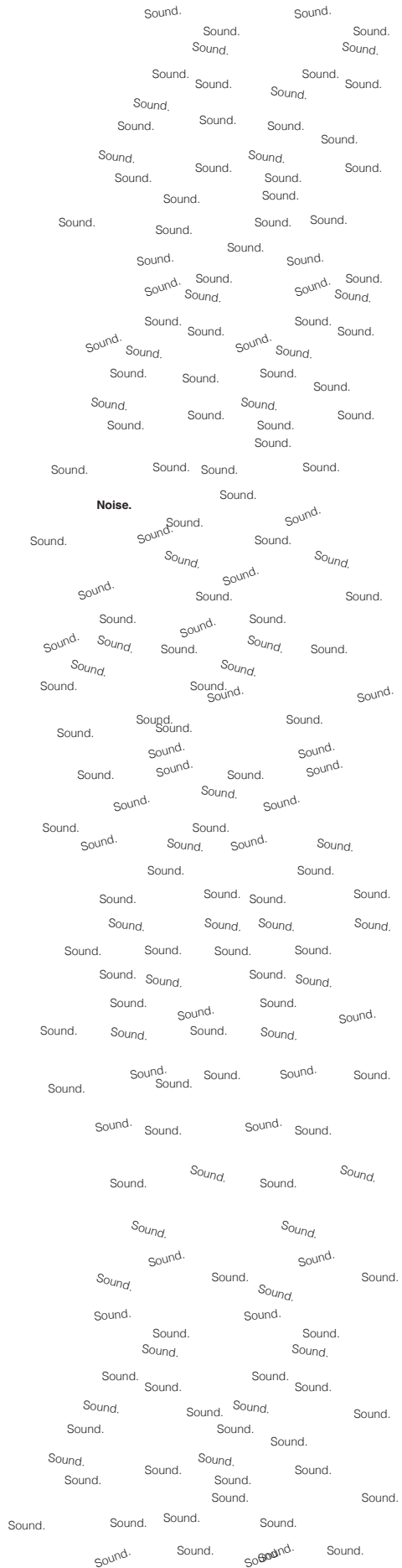
Integration diagram
(Author, 2022)

On this page, the intergration of the research components can be seen. By combining the research questions, aims, principles and methods, there is made a formula in order to achieve the prospected outcomes.

Silence.



Part 2 | Analysis

Sounds of Rotterdam

Answered subquestion

(PE-01) What is the perception of sound and how can this be interpreted?

(PE-02) How do Rotterdam City Center and Rotterdam Noord show their contrasts in vibrance and silence?

Content of this chapter

2.1 Current perception
2.2 Psychological input
2.3 Perceptual input
2.4 Conclusion

What is perception?

Sound perception differs from sound measurement. Measuring sounds provides an objective overview of data and indications for experience, but it does not account for how people perceive sound. First and foremost, this is due to the subjective nature of sound perception; everyone perceives sound differently. As a result, the context of the space and the users' culture change the overall perception; a general formula to'measure' perception is impossible. On the other hand, some spatial variables and psychological components share a common perception and effect on human well-being. I will explain these components separately in this chapter, and then combine them in the following chapter.

Perception, in general, can be defined as the individual processing of stimuli into a meaningful frame of the environment. This demonstrates that perception of space is based on all senses and the interaction of the physical and psychological (mental) spheres. This individual selection process is what causes perception to be subjective (Broshuis, L., 2019, p.4).

Stimuli and experience

The next question that arises is: why does this handbook limit the perception to the sense of sound? I want to explain this by the theory of Zumthor (2006) and Thibaud (2011).

The perception of sound is based on a stimulus (the source of sound) being translated into something that is heard (the sound itself). In this process, sound is the sense that comes closest to the space of the mind. Zumthor (2006) explains that the sound of a space contributes highly towards a "feeling of home": A sound has a close relationship to an atmosphere. With this meaning, it can be concluded that sound forms a natural distribution between space and mind. (Thibaud, J.P., 2011) (Zumthor, P., 2006).

A categorization of sound

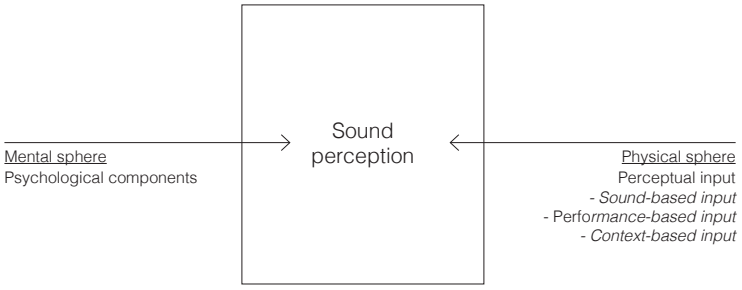
To explain how we perceive sound, I used and interpreted the soundperception categorization of Schafer (Schafer, R., 1993, p.133). Schafer (1993) does not state a formula but defines four categories that influence sound perception in a holistic way. I used this categorization as a guiding thread through this chapter and as basis for the Pattern Language, that will be introduced in part 3 of this handbook. The following categorization of sound is an interpretation of this categorization and can be linked back to the process of stimulus that gives, thereby, grip to working with the perception of sound. Hereby, the first category is mainly based on the mental sphere, while the other 3 categories have a strong relationship with the physical sphere.

[1] Sound perception (psychoacoustics) | Psychological components

The psychological input indicates components that describe what themes are important when considering the mental sphere of sound perception. Hereby, there is a focus on the relationship of the individual in relation to the sounds they hear.

[2] Physical characteristics (acoustics) | Sound-based input

Physical characteristics can be seen as the measurable category that gives indications of perception. Examples are decibels, which give an indication of the intensity and loudness of sound; distance to sound objects, which indicates the reach of sound and texture of the ambiance; and what describes the type of sound, such as mechanical-human-natural and lo-fi and hi-fi (Schafer, R.,1993, p.136, 137).



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Interaction psychical sphere and psychological sphere (Based on the Western perception model of Ingold, T., 2000)

[3] Sound in relation to function and meaning (semiotics and semantics) | Performance-based input

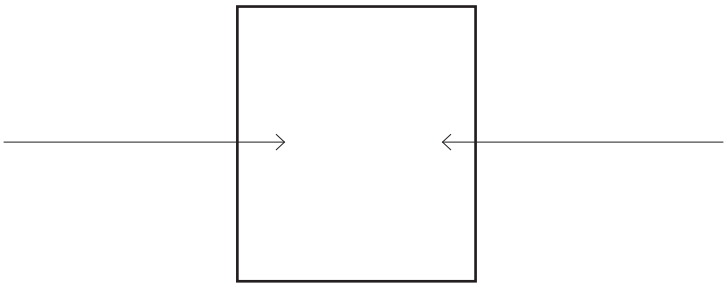
The performance-based input describes the function and meaning of sounds that occur in or interact with space. Furthermore, sound is in this category connected to time; the function of sound gives a prediction of what functions are in space and at what time they are active.

[4] Emotional qualities (culture and context) | Context-based input

The emotional qualities of sound can be approached as the contrast between beautiful and ugly. However, this definition is highly subjective and thereby very personal. Because of this, I interpret this category as context-based input, which illustrates how the atmosphere of space can influence our feelings. In this way, the context of sound can be approached in a more generic and spatial way. (Schafer, R., 1993, p. 146).

In the following pages, the current sound perception of the plan area of Rotterdam is given, whereafter it is linked back to these categories that explain why the soundscape is perceived in this way.

2.1 | Current perception



(1) Sound of Rotterdam
Current perception

Sound of Rotterdam

For the understanding of the perception of sound and its stimulus, I investigated in conversations, walks, and interviews with residents, sound experts, health centers, and experienced the soundscape myself. In this way, it became possible to draw common conclusions about the current sound perception of the area surrounding Rotterdam Central Station. The psychological components and perceptual input that will be part of the next pages explain why people perceive space in this way.

On the map on the right, you can see a collection of spaces to retreat and spaces of noise. I asked 11 citizens living in the visualized area to draw their spaces of retreat and their spaces of noise on the map. Besides, I asked them some generic questions about their sound perception of this area in general (these questions can be found in the appendix). In order to understand why some spaces were drawn as 'space to retreat' or as 'space of noise', I visited some of these residents in order to perceive their sound perception myself. This allows for some conclusions about current perception, stated in the following paragraphs.

The Central Station as sound icon and the Central District as cluster of noise

Looking at the places of noise, the immediate surroundings of Rotterdam central station were drawn multiple times. The citizens visited in this area named the freight train in the morning, the trams during the day, and the party area (Biergarten and Annabel) in the night as the main noise sources (Author, 2022).
However, the Central Station itself functions as a sound icon and divides two parts of the city, which results in big contrasts in the soundscapes of the surrounding area. In that way, this area is interesting to take as an area of research.

→
Further conclusions are stated on the next pages
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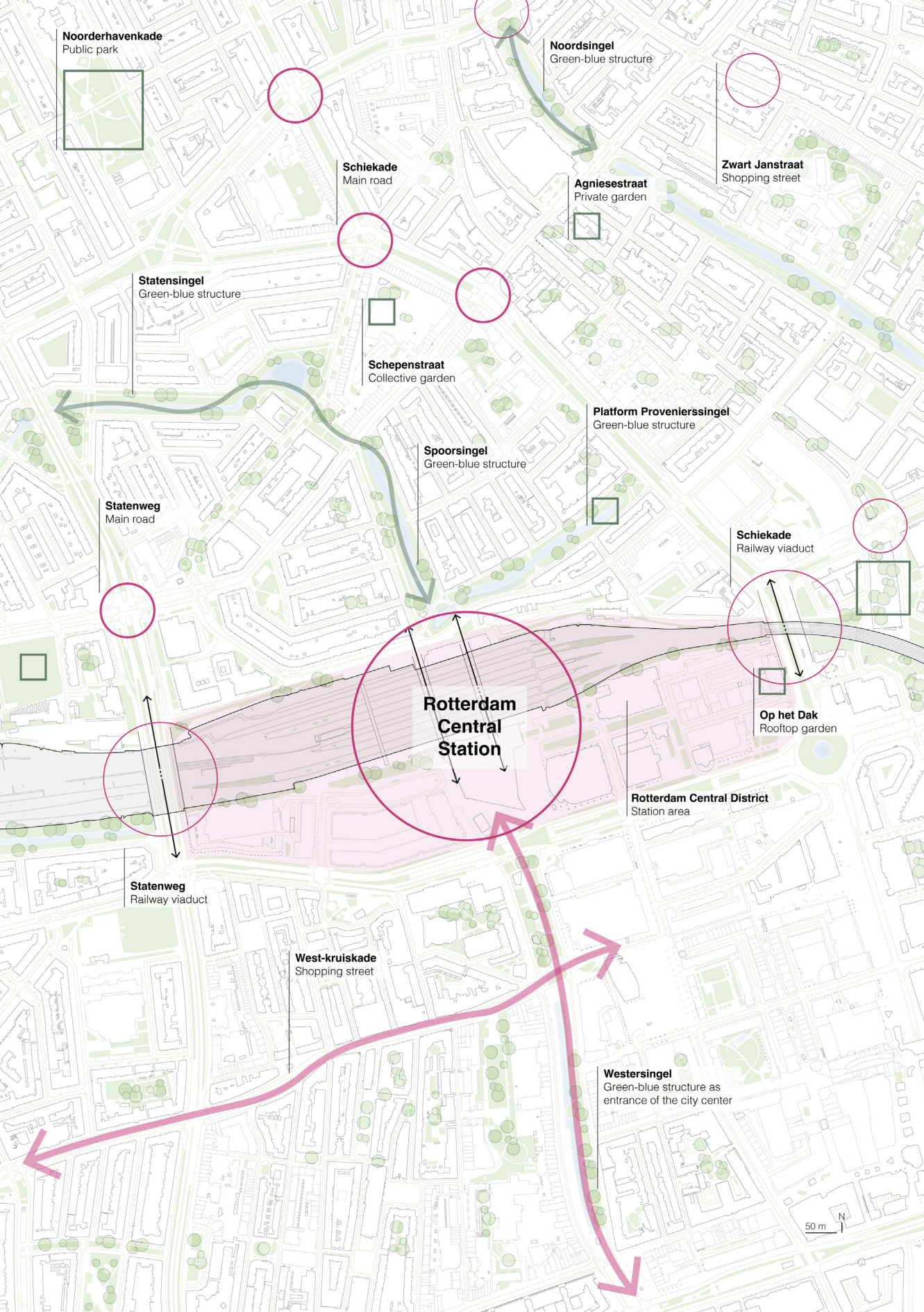
Outcome of the questionaries and interviews: Spaces of noise and spaces to retreat (Author, 2022)

- Traintrack
- Crossovers traintrack
- Spaces of noise
- Structures of noise
- Spaces to retreat
- Structures of retreat


Noorderhavenkade
Public park
Noordsingel
Green-blue structure
Schiekade
Main road
Zwart Janstraat
Shopping street
Agniesestraat
Private garden
Statensingel
Green-blue structure
Schepenstraat
Collective garden
Platform Provenierssingel
Green-blue structure
Spoorsingel
Green-blue structure
Statenweg
Main road
Schiekade
Railway viaduct
Rotterdam
Central
Station
Op het Dak
Rooftop garden
Rotterdam Central District
Station area
Statenweg
Railway viaduct
West-kruiskade
Shopping street
Westersingel
Green-blue structure as
entrance of the city center
50 m
N

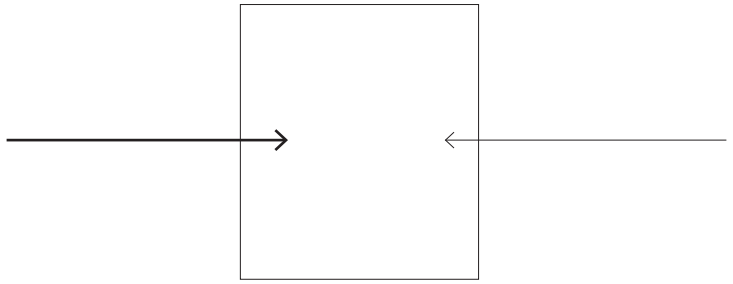
Spots in the North and streets in the city center
Citizens who live north of the railway station or in the city center have quite different replies when it comes to finding stillness or vibrance. People in the north encircled little green spots to withdraw close to their homes, while the interviewed in the city center drew nothing or, in one case, an arrow outside the ground plan, referring to the Vroesenpark. Surprisingly, no one sketched a tranquil location to retreat in the shopping center, although there are calm environments, such as the courtyard of the Stadhuis (Author, 2022).

The importance of vegetation
One of the main takeaways from the interviews is that living near a green environment has an impact on one's impression of the environment as a whole. This appears to be explained by the fact that these citizens have a place to retreat to at all times. The same holds true for noise: inhabitants who live in or near a loud location perceive the district as a whole as being noisier (Author, 2022).

Perception in relation to psychological well-being
Overall, more than half of the interviewed people experienced some kind of psychological effect, such as sleep disturbance and lack of concentration, which results in differences in behavior such as not opening windows for ventilation, using earplugs, or avoiding parks because of crowds and 'yelling children' (Author, 2022).

In the appendix, the interviews and questionaries can be found. The filled in answers and notes from the conversations are not part of this appendix for privacy reasons. For this information, the author can be contacted.

2.2 | Psychological components



(1) 1. Psychological components

[1] Psychological components

With the current perception of Rotterdam in mind, we understand, broadly, what types of spaces are perceived in a positive way and what types of spaces are perceived negatively. To understand why we perceive sound this way, I will explain the psychological components. These components are based on theory, interviews with residents, and interviews with sound experts, and form the basis for the psychological part of the Pattern Language.

The sound experts

The sound experts represent blind people, sound-sensitive people, and people who support sound-sensitive people. These groups relate more to sound than other people and therefore focus more on the perception of sound. Because of this, their hearing ability is not better, but they are able to combine sounds, explain sounds, and use sounds in a better way. This means that interviewing these people gives valuable information about sound perception.

To get in contact with these people, I approached the organizations of VISIO, Robert Coppes Stichting, and HerSenz. Visio is an expertise center for blind people located at several locations in the Netherlands. Robert Coppes Stichting supports people with a visual impairment and other disabilities such as autism. This foundation is located in the north of Brabant. HerSenz, located in Leiden, supports a program to recover or deal with the effects of acquired brain injuries as an absence of filtering stimulus caused by a cerebral infarction.

In this way, it was possible to contact eight people by phone with different backgrounds, ages, and expertise in sound perception. I purposely decided to call these people, since questions do not fullfill the possibility to explain a perception and, thereby, are difficult to fill in for sound experts.

Besides, all the interviewed people live in or close to a city and are familiar with the location around Rotterdam central station, which made it easier to talk about the sound perception of the city.

In general, the main answers showed both a validation towards the findings in the current perception of Rotterdam, explained in the previous pages, and an explanation of the components that not only supplement this perception but also the perception of sound in general. The main findings are stated left, while the components are explained in the following pages.

Symphony of nature
To begin with, natural and human sounds are perceived more positive than mechanical sounds. This category of sounds will be explained in the paragraph of perceptual input, but illustrates that the characteristics of sounds relate to perception (Author, 2022).

Importance of substructures
People prefer to walk in calmer streets to orient themselves, which implies the roadway substructure. As a result, people choose or adjust their routes based on the sounds they hear, even though the destination remains the same (Author, 2022).

Uncontrollable crowds
Furthermore, congested areas like train stations and shopping centers generate a lot of noise, and the longer the duration, the more unpleasant the perception. The signals, in particular, are considered as noise (Author, 2022).

Silence should not be quiet
Lastly, the sound, or absence thereof, from electric scooters and cars appears to pose a risk when crossing roadways. Some participants explained this by stating that silence is scary, especially when the memory of space involves sounds (Author, 2022).

More details about the interviews can be found in the appendix. In this appendix, personal answers are left out due to privacy. Please, contact the author for more information.

The components of perception

The following set of components can be seen as the generic themes that form the psychological part of perception. In this way, they do not state the arising perception itself, but the stimuli behind it that influence the perception. Later in this handbook, we will use the components to speficy the design interventions.

1.Contrast

An important factor that the sound experts mention is contrast. A strong contrast creates awareness of sounds and makes people alert. A low contrast can become a background sound or an 'invisible' gradual sequence of sounds. Both categories can be perceived as positive or negative and, thereby, depend on the situation, context, and the message the sound is used for.

2. Expectation

The function of space gives implications for what sounds people could expect. These components are especially important for blind people or people who are unfamiliar with their surroundings.
To give an example, during a concert, loud mechanical sounds are expected and thereby more easily accepted than the same loud music in a quiet park. Expectation is not only related to the function but also the purpose the user has for visiting the area.

3. Control

Control informs what the perceiver can change about the sound they hear. During the fieldwork, some citizens mentioned they had a garden and therefore perceived other parts of the city as less noisy. This can be clarified by the fact that these people always have a choice to withdraw. Other examples of control are distracting from it, creating it or turning it off. Control focuses on interventions in the public space and thereby does not focus on noise-cancelling objects such as headphones.

4. Continuity

Continuity indicates the role of sound in its context. Some sounds are always there; other sounds are new and emphasize a change of activities or a dangerous situation. To illustrate, the continuing sounds can be cars on the road or the mechanical ventilation from buildings.

Possible perception
1.Contrast
Surprisement, attraction, amazement, relief
2. Expectation
Recognition, trust, acceptance
3. Control
Trust, security, focus, confidence.
4. Continuity
Understanding, comfort, calmness
5. Variation
Amusement, excitement, joy, stress, fascination
6. Exposure
Retreat, calmness, inpiration
7. Distance
Trust, acceptance, security
8. Time
Fulfillment, relief, excitement.

5. Variation
Variation is about the composition of sound. This part of perception is about hearing a set of sounds that match or clash with the situation. The sound experts state that variation is a good experience since it arouses joy and surprise. However, too much variation can lead to a lack of readability. As a result, the sounds in the space should be balanced.

6. Exposure
Exposure is about the duration of hearing a specific sound or a set of sounds. A short exposure does not have the same effect on psychological well-being as a long exposure. The effect itself is dependent on the type and level of sound and the coping ability of the user. Sounds of nature have the ability to create a feeling of retreat and are, in every interview, mentioned as positive perceptions that increase when the exposure is longer.

7. Distance
The distance between the sounding object and the user gives insight into how loud the sound reaches the perceiver and if the sound becomes background noise or a dominant factor. One of the interviewed residents, living in a building block, mentioned that the road as a background sound feels calming since the rustle sounds like the sea. However, when she enters the road, the sounds become so loud that people experience difficulties focusing.

8. Time
Time and sound have a strong connection when looking at the experience of sound. Some sounds are completely accepted throughout the day, while the same sound becomes noise at night. Besides, the season and weather show a differentiation as well. Some sound experts mentioned that during winter the sounds of the city reverberate more, whereby it is harder to find the source of sound. As a second example, one of the residents lived near the Central District of Rotterdam. She mentions being unable to sleep on weekends due to the music and yelling of people coming from the clubs. This was the reason she moved away, while she now enjoys this area when she wants to go out.

Together, this makes clear how the perceptual components are related to sounds and how they influence our psychological well-being. In order to find out how to design with these components, and re-adjust perception, I will explain the perceptual input, the relation of space and sound, in the following pages.

Handbook exercise
1 | Invest in fieldwork
Talk with residents and sound experts. They help to understand the perception of your location and maybe illustrate other components.

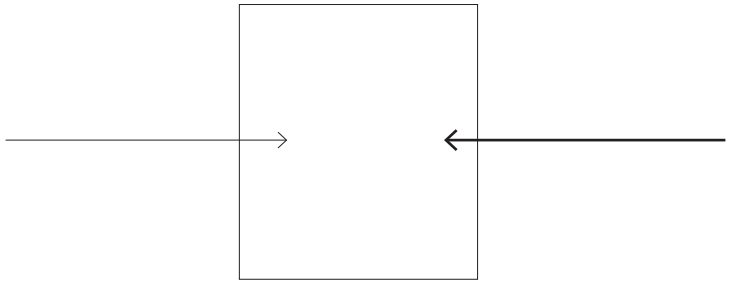
2 | Use the 8 components
...and conclusions of your fieldwork and visualize them on a map.

3 | Make a map of spaces of noise and spaces to retreat
They help you to find spaces of interest for designing with a new calm soundscape.

4 | Frame your own perception
Does it emphasize the outcomes or does it contrast the outcomes?

Need help? The themes of the Pattern Language are based on the psychological components and help you finding a starting point of discussion.

2.3 | Perceptual input



(1) 2. Sound-based input
(2) 3. Performance-based input
(3) Fieldwork Schepenstraat and Spoorsingel
(4) 4. Context-based input
(5) Fieldwork contrasts Noord and city center

[2] Perceptual input: Sound-based

Perceptual input to perceive sounds is based on the physical sphere and explains how space, the soundscape, influences our psychological well-being. I will start with explaining the sound-based input, as category of the perceptual input.

The characteristics of sound

The sound-based input is about the characteristics of the sound-source itself. These characteristics do not have a direct relation to the atmosphere of a space but form the basis for perceiving sounds. Therefore, the sounds are categorized in order to get a first overview.

As an example, when the volume is too high or the volume is exposed for too long, negative perception effects arise. As a consequence, the stimulus remains indifferent while the sensation of it turns negative (D.Glass, J. Singer, 1972). This explains that decibel in itself does not create a certain perception, but the exposure and loudness of it can have a harmful effect for the ear.

With this, we can conclude that the characteristics of sound play a dominant role in perception. As stated before, sounds of nature are perceived mainly as positive, while mechanical sounds create a negative perception. Therefore, Schafer (1993) states that this division is not only based on the characteristics of sound but also on what function they occur in (Schafer, R., 1993, p.137).

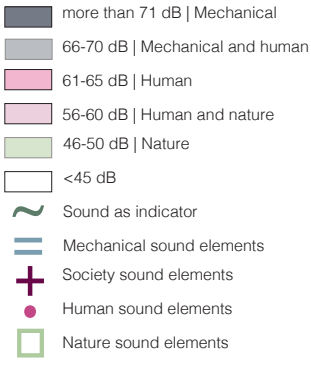
Character and perception

Schafer (1993) divides the characteristics of sound into 6 categories that illustrate the source of the sound (the object) and, simultaneously, give insight into the perception of it. The categories: sounds of nature, human sounds, sounds of society, mechanical sounds, silence, and sounds as indicators, are displayed on the map on the left and in the table on the next page. The category of “silence” is left out at this scale level because of the lack of silent areas.

Besides, the highlighted areas in the map, the Schepenstraat and the Spoorsingel, show two zoom-in locations that will be used throughout this chapter. With this, the variety in scale and dominance of the type of sound becomes clear. Besides, in these locations, the contrast between mechanical sounds and the sounds of nature becomes more explicit.

19

Type of sounds and decibel (Author, 2022)




50 m
N

Category	Elements	Related theme
Natural sounds	Wind, breezes Natural materials Insects, birds Other animals Rain, snow Trees, vegetation	Weather Climate Seasons
Human sounds	Speaking Yelling Laughing Footsteps Clapping hands Coughing Singing Eating, drinking	Activity Behavior
Society sounds	Shops Entertainment (radio, sports, theater) Music Fountains Closing doors Unlocking bikes (Public) toilets	Activity Identity
Mechanical sounds	Machines Vehicles Scooters Trains Trams Aircrafts Construction equipment Ventilation and air-conditioning	Activity Mobility
Silence/quiet	-	Dead
Sound as indicator	Sirenes Horns Bells Sounds of time (clocks) Telephones (other) warning systems	Peaks Danger

20

Categories of sounds (Based on Schafer,R, 1993, p.141-144)



21

The collective garden at the Schepenstraat (Author, 2022)

Urban form
Collective garden
Position
Location in between the main-structure and the sub-structure
Publicness
Via dwellings and entrance tennis court. Garden only accessible by residents (school can acces in consultation).



22

Type of sound detailed (Author, 2022)

Urban form
Urban block, no collective zone
Position
Pedestrian main structure, car sub-structure.
Publicness
The space in between the block is only accessible by the private gardens and balconies.

[3] Perceptual input: Performance-based

The performance-based input for perception is about the conditions of the urban environment and the implications it has for perception. This is done by focusing on the relationship of sound towards time and space and by giving indications of what spatial circumstances change elements of sound.

Sound is context-sensitive

Because sounds occupy and occur in scapes, it gives an indication of how to orientate and how to localize the sound itself. This goes together with an interpretation, recognizing and understanding of the area, but also enhances a feeling of the space people are in. Hence, the perception of sound is intertwined with the characteristics of space. Herein, time and space play a main role (Thibaud, J. P., 2011).

Time

We wake up to the morning rush, emphasized by the sound of moving cars, voices of people, and a running coffee machine. It illustrates the day has begun, and when the time passes, the symphony of sounds changes as well. In this way, time is not abstract but gives an indication of its quality and daily rhythm (Thibaud, J. P., 2011).

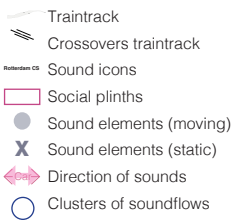
Looking at time and sound, it becomes clear that there is a strong connection between social culture and the built environment. The citizen plays a crucial role in creating their own activities, which makes observing their behavior an interesting point of view. Thibaud (2011) rightly states that when approaching sound in this way, sound is not the source, but the result of a (social) action, which questions who the perceiver or perceived is.

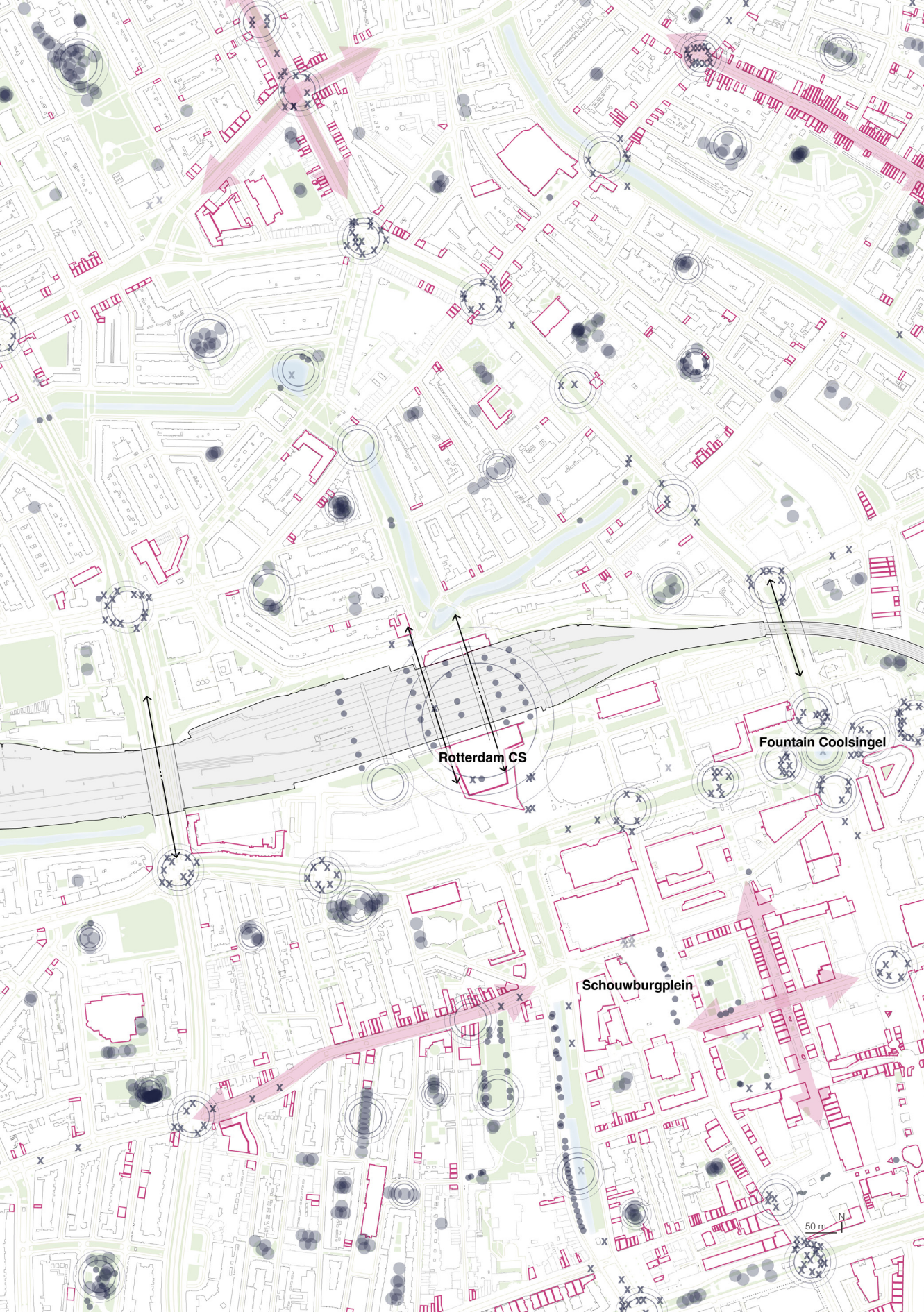
The circumstances of the weather form an interesting component, looking at the behavior of people and the emergence of “other” sounds. It demonstrates that temporary events can highly influence the functioning and perception of space in relation to movement and usage (Thibaud, J. P., 2011).

The map on the right shows the elements, such as social plinths, benches, and traffic lights (static elements), that are connected to time and sound. This gives an indication of where clusters of sound arise during specific timeframes.

23

Sound and time (Author, 2022)




Rotterdam CS
Fountain Coolsingel
Schouwburgplein
50 m
N

Space

The second connection I want to illustrate is the sonic-space relationship. Where the relationship time-sound emphasizes temporarily, the relationship space-sound focuses on the permanent conditions in which the temporary events occur.

To illustrate, I want to take the sidewalk as an example. The materiality and texture create a certain sound, which is, in general, unnoticed. However, when the materials change, for example, gravel, the change in sound becomes notable as well. Especially when being in the role of a pedestrian, this makes a difference in the overal perception of space.

Secondly, the materialization of the buildings and the type of vegetation show a relationship with the tone of sound as well. This is mostly related to the direction of sounds and their reverberation and absorption. The space, therefore, does not always create the sound but can adjust the sonic interplay as well, which points out the ambiance of the environment. To give an example, big trees in a street in between the crosswalk and the road create distance from the traffic noise, partly absorb the sounds and attract other sounds, like a singing bird. This can be a small design tool to improve the sound perception of space and makes clear that sound can be a very powerful medium (Thibaud, J. P., 2011).

The last combination of space and sound, which I want to emphasize, is the urban form of enclosed space. These specific urban forms, like courtyards, show a sound-wall in itself, whereby the sounds from outside hardly meet the atmosphere within. This shows that within another atmosphere of sounds, a totally different soundscape can arise. By this, the symphony of sounds does also change when approaching another scale level. Urban form, therefore, can be used as a continuation of sound but also as a border (Thibaud, J. P., 2011). At the map, these spaces are collected as well.

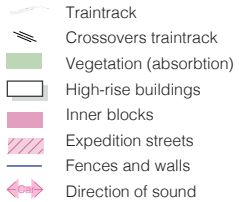
Behavior

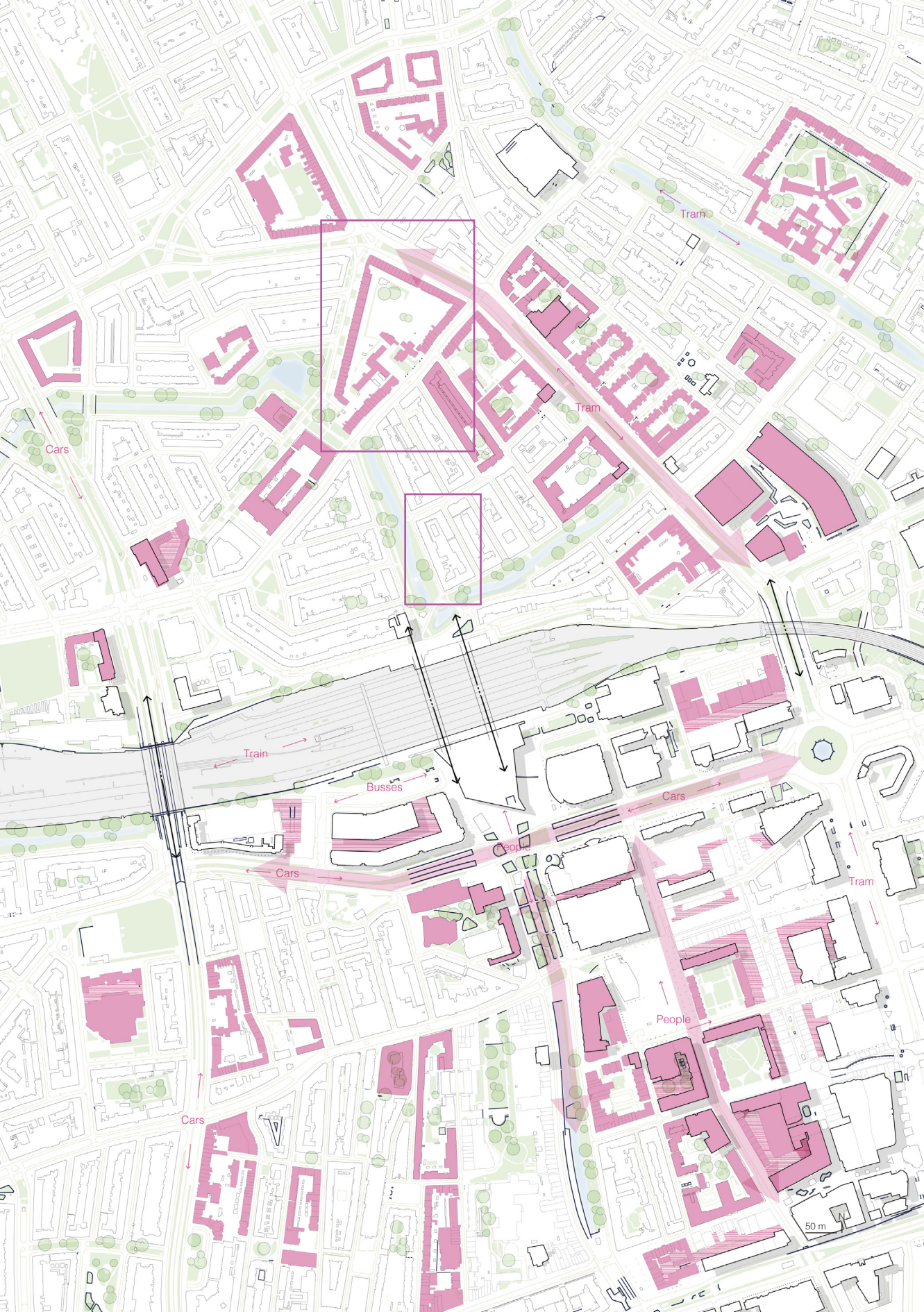
Perceptual information influenced by time and place has a direct impact on how individuals behave, interact, and live. It shows a combination of social, spatial, and psychological elements in which sound pervades all.

The Schepenstraat and Spoorsingel are, again, revisited on the following pages. These places demonstrate how the urban block serves as a sound barrier. Furthermore, further sites that direct or block sound can be discovered in the appendix.

24

Sound and space (Author, 2022)




Tram
Tram
Cars
Train
Busses
Cars
People
Cars
Tram
People
Cars
50 m

Schepenstraat

The urban block is located in Rotterdam Noord at the Schepenstraat. On two sides the block is situated next to the main roads Walenburgerweg and Schiekade, on the other two sides the block connects to the residential street Schepenstraat and the pedestrianed street in between the statensingel and noordsingel. Within the block, there is a tenniscourt and collective garden. At a sunny day friday afternoon, I visited Liliane, on of the residents of this urban block.

Curious how it looks? Go to pages 90-93

1. The courtyard
2. The courtyard
3. The tennisyard
4. The entrance to the tennisyard

De laatste zon bevindt zich

buiten mijn tuin maar

in mijn hangmat.

Waar tussen Neergedaalde schuttingen en muren

een spontaan gesprek begint.

Gé´lik Gé´lik ik

tennis tot het donker.

het d'o m m e/t me de nacht in.

tot de wijzers het racket SLAAN

tot de dag begint.

Of

tot ik wakker schrik van

OPRUKKENDE SCOOTERS & STEMMEN

van stoere jongens

Ze zingen nachten vol in ~~verlaten~~ straten

op weg naar huis.

Mijn thuis is allang begonnen

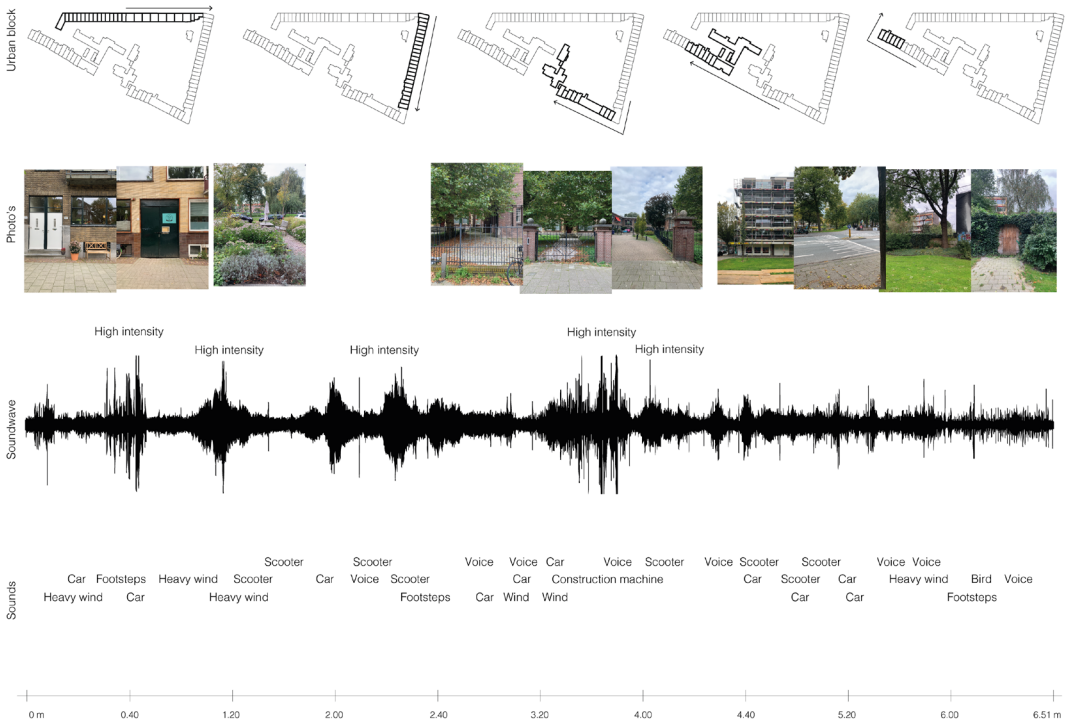
sluipend is ze doorgedrongen.

Als ze zachtjes miauwt tegen de deur

Als de koffiemaler luidkeels

DE WERELD WAKKER SCHUDT.

Contrast of the block



Sound observations

School | Sounds of children | Human sounds

The sounds of children are heard during weekdays in the morning and in the afternoon. The sounds fit their function and are therefore not considered as noise. However, some residents do experience the sound as noise, mainly because of the use of the playground in the evening (people climbing through the fences to play football). For most residents of the block, this is not seen as noise.

Tenniscourt | Sounds of tennis | Human sounds

The court is used only during the day because light is not allowed due to the surrounding homes. This means that daylight affects the use and, thereby, the sounds. During the winter period, fewer sounds are heard. The court is used all hours of the day and fits its function.

Communal garden | Sounds of wind and voices | Human and nature sounds.

The wind, birds, and background noise of vehicles and scooters on the Walenburgerweg and Schieweg are ongoing sounds in the area. Besides, infrequent sounds are heard, formed by cats, dogs, music, accelerating scooters, cars, and airplanes. All the accelerating vehicles and scooters are perceived as noise.

25

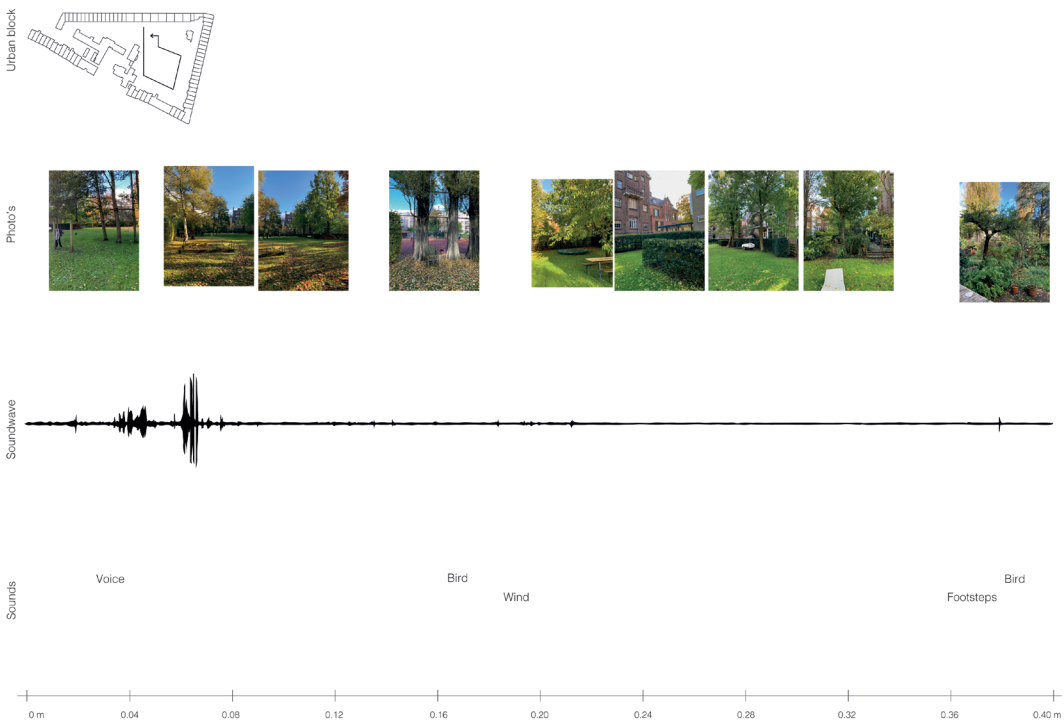
A diagram of the fieldwork at the Schepenstraat (Author, 2022)

Practical information

Location: Schepenstraat
Time: Friday, 2pm
Weather: Sunny, 12 degrees
Continue sound: Cars and scooters
Background sound: Wind and voices
Rec. 6.51 minutes

A walk around the block

The left and southern roads around the block have mostly natural and human sounds. In contrast, the right and Northern part have dominant mechanical and indicator sounds.



26

A diagram of the fieldwork at the Schepenstraat (Author, 2022)

Practical information
Location: Schepenstraat
Time: Friday, 2pm
Weather: Sunny, 12 degrees
Continue sound: Wind
Background sound: Cars and a cat
Rec. 0.34 minutes

A walk in the block
The foreground sounds are the wind, birds and the road next to the block. Also, human activities of the tennis-court can be heard.

Spoorsingel

Next to Rotterdam Central Station, the urban block of the Spoorsingel rises. The dense block contains a lot of contrasts; a very green, calm singel in front, the absence of sound within the block, and the sound of the train activities as continuous white-noise in the background. I visited Marie-Claire; through all her paintings and a beautiful spiral staircase, we found her balcony: A perfect spot to record the urban sounds on a higher level.

Curious how it looks? Go to pages 88-89
1. The view from the balcony to the right
2. The view from the balcony to the left

G o e d e r e n t r e i n e n

in de nacht,

langer dan ik dromen kan.

De veren van de trampoline

s p r i n g t s e i z o e n e n d o o r

Blaadjes opgeveegd

en [bij elkaar] geraapt,

zoals we ons elke dag herpakken.

De vogel sjielpt, de kraai kraait

voelt hetzelfde als gelach in de z o m e r n a c h t

en een sneer

in de ochtendhaast.

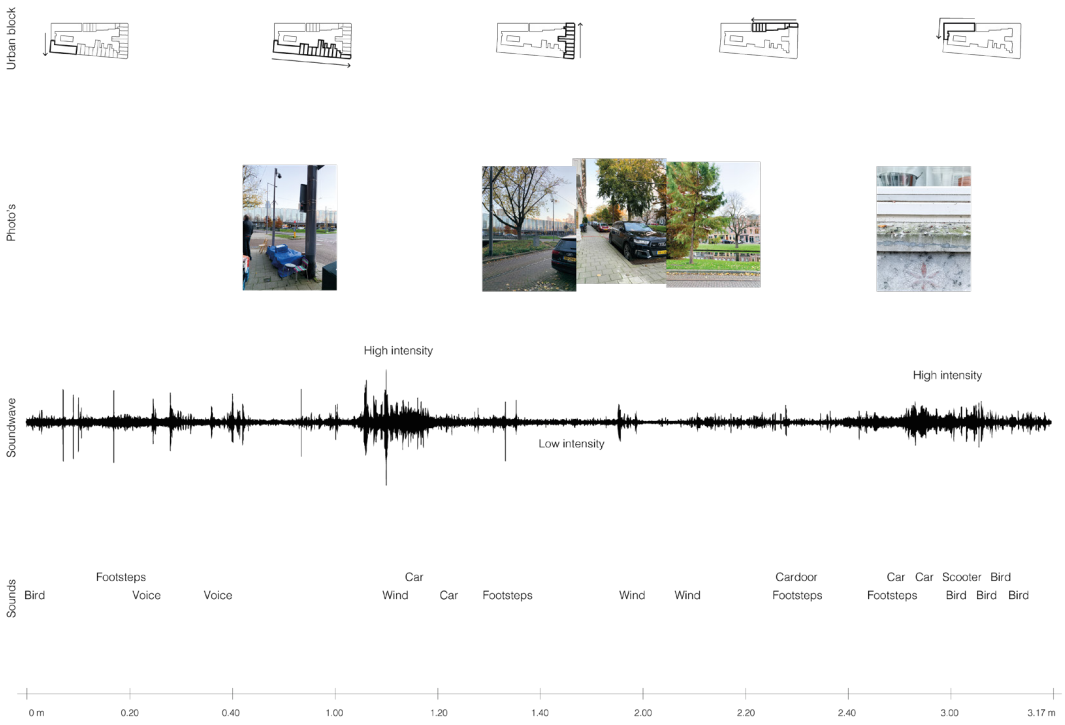
D e w e g v e r d e r o p i s a l s d e z e e

kalme ruis op de achtergrond,

Afgezonderd van het geweld van dichtbij

[of er midden in]

Contrast of the block



Sound observations

Central station | Mechanical sounds

The sounds of the central station play a dominant role in the streetscape, but are a background sound within the block. Mostly, the signals indicating a train is leaving or arriving are frequently heard but not considered as noise. Freight trains, on the other hand, are considered noisy because they arrive early in the morning and their duration is longer than other trains. In this way, the residents of this block can not sleep anymore.

The trampoline | Human sounds

A sound icon within the block is the trampoline. Marie-Claire mentioned that one of the boys living in the blocks uses the trampoline all year long. The springs of the trampoline make more sound than the boy itself. However, because this sound has a soft cracking sound and the rhythm and source are clear, the sound is considered calm.

27

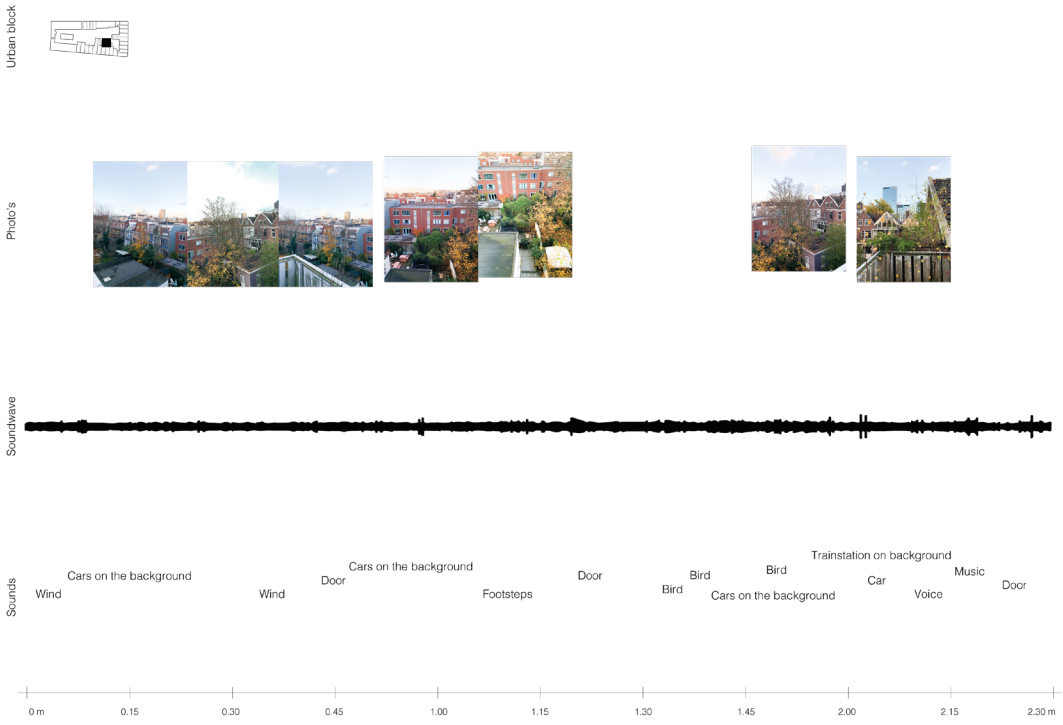
A diagram of the fieldwork at the Spoorsingel (Author, 2022)

Practical information

Location: Spoorsingel
Time: Wednesday, 4pm
Weather: Sunny, 6 degrees
Continue sound: Trains, people and scooters
Background sound: Wind
Rec. 3.17 minutes

A walk around the block:

A lot of 'signs of sound' could be heard, as the voice-over of the central station, horns of scooters and sirenes. Also human sounds are heard at the Spoorsingel. This singel gives natural sounds.



The space within the block | Human activities | Human and nature sounds
The sounds of the wind and the train station play an ongoing background sound within the block. These sounds create a soft hum, which is perceived as neutral. The human activities within the block, mainly those of the people with a garden, are considered positive, in a lifely or calm way. These activities include gardening, voices, and groups of people enjoying the sun. Because these activities are temporary, the sounds are perceived in a positive or neutral way.

28

A diagram of the fieldwork at the Spoorsingel (Author, 2022)

Practical information
Location: Spoorsingel
Time: Wednesday, 4pm
Weather: Sunny, 6 degrees
Continue sound: Wind and tampoline
Background sound: Cars and the train
Rec. 2.30 minutes

In the block
The foreground sounds are the wind and the road from farther away. Also, human activities can be heard.












14
TENNISPARK
WALENBURG

[4] Perceptual input: Context-based

The third layer, context-based perception, is about the identity and the atmosphere of spaces. In this paragraph, the atmospheres will be explained by the theoretical studies of Böhme (2013) and Thibaud (2011) and by zooming in into the contrasting soundscapes of Rotterdam. These theories and case studies demonstrate the relationship between atmosphere, urban design, and psychological well-being. With this, the atmosphere can be seen as the physical space in which a symphony of sounds occurs.

The atmosphere

To begin, I will explain the term “sphere” because it describes the relationship with the human body and, as a result, psychological well-being. Böhme (2013) explains that the human body, located in a spatial area, can be defined by “being there”. In Dutch, this can be named “(be) vinden”. In this way, the human body within a space can be interpreted in two ways: 1. the position in space, and 2. the sense that the human body perceives as being shaped by the sphere (welbevinden). Both definitions show a relationship with each other; the sense of place comes forth from the position of the human body in the sphere. This implies that there is a connection between sense and space, with place forming the generic atmosphere (Böhme, G., 2013).

Sense generators

In order to design with the senses, I would like to state the “sense-generators.” These generators are related to the physics of space (urban design) but also suggest non-physical elements such as sound (Böhme, G., 2013). This is divided into 3 categories:

1. The overall impression of movement, as influenced by physical structures such as urban form, height, and composition.

2. The perception of the senses, which involves the relationship of the human body to, in this report, the sense of sound.

3. Association of sound. For example, the fountain at the Coolsingel, whereby the sound and the physical outlook refer to the Rotterdam football club Feyenoord.

As a conclusion, for a complete definition of atmospheres, urban designer Jean-Paul Thibaud (2011) explains the atmospheres as follows:

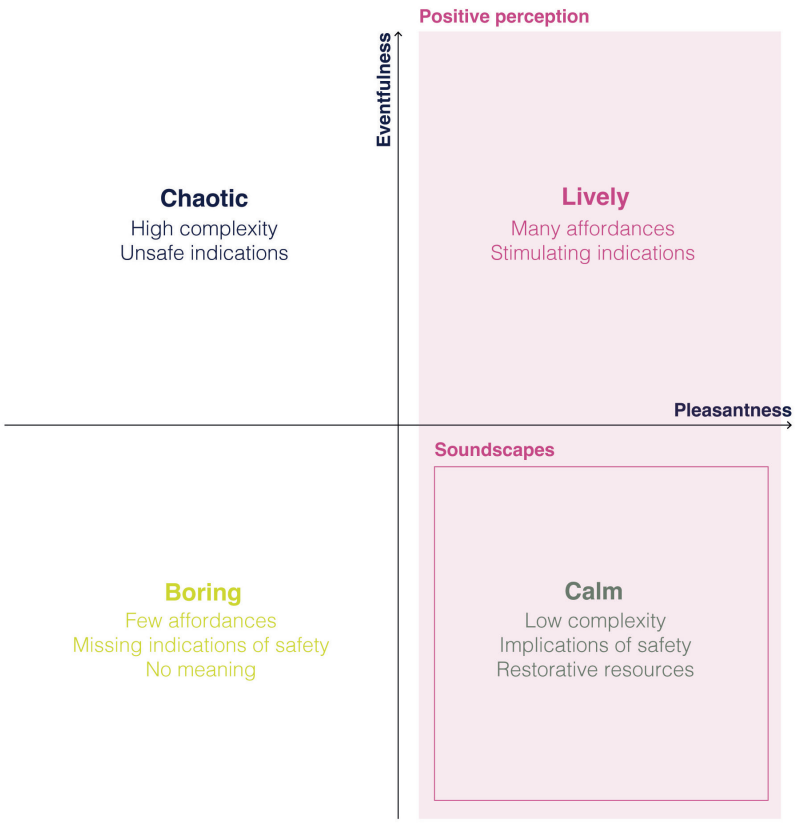
"...an atmosphere can be defined as a space-time qualified from a sensory point of view. It relates to the sensing and feeling of a place. Each ambience involves a specific mood expressed in the material presence of things and embodied in the way of being of city dwellers. Thus, ambience is both subjective and objective: it involves the lived experience of people as well as the built environment of place." (Thibaud, J.P.,2011).

Positioning atmospheres

For the positioning of atmospheres, I use the theory of Russel (1988). He divided the symphony of sounds into 4 general atmospheres that, on the one hand, are related to general components of perception and, on the other hand, rely on personal circumstances. These atmospheres are named Chaotic, Lively, Boring, and Calm and describe the space as if it were a feeling, which already gives an idea of the general perception.

To work with, I placed these 4 atmospheres in a quadrant. Boring and chaotic atmospheres are, in general, perceived as negative since there is a cacophony of sounds or an absence of them. What differs from the other atmospheres, lively and calm, is the symphony of sounds. This implies that the perception of sound is not based on loud and quiet but on the quality of sound shaped by the physical environment (van den Bosch, K., & Andringa, T., 2014) (Russel, J., A., 1988).

In this quadrant, you can see words like "intensity," "implications of safety," and "complexity." In order to make these words more spatial, the publicness of spaces, urban structures, and social safety of the Rotterdam area are analyzed. However, these maps still depict a more general perception; they do, however, depict the themes that influence personal perception. Looking at the areas to the north of the central station in Rotterdam and the city center of Rotterdam central station, it gives a good insight into why these spaces are perceived in a contrasting way.



Contrasting soundscapes

In the map on the right, we can see clear differences between the northern area and the city center of Rotterdam. While both area contain chaotic atmospheres, the main roads that create a lot of mechanical sounds, we can conclude that the other atmospheres differ a lot. The northern area suggests a variety of lifely and calm atmospheres with less contrast. Meanwhile, the city center area shows a variety of lifely and boring atmospheres, whereby the boring atmospheres create friction in the perception and readability of the soundscape.This indicates that the perception should be different as well and therefore, we dive a bit more into these contrasting soundscapes.

29

Quadrant of soundscapes (Interpret by author (2022), based on van den Bosch, K., & Andringa, T. (2014)) and Russell, J. A., (1988).

30

Atmospheres in Rotterdam (Author, 2022).


50 m
N

Contrasting soundscapes

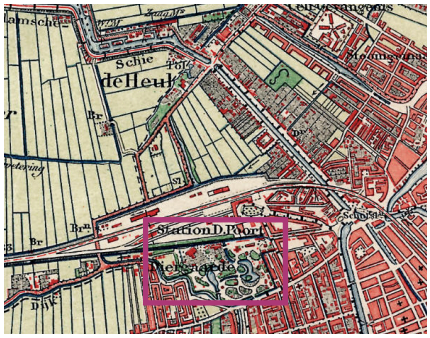
In order to find out what the atmospheres in the plan area are, the nothern and southern part are analyzed. The division of the traintrack creates big contrasts in the perception of sound, which is related to the urban structure and functional identities of the place. This analysis is based on a historical view of the urban structure and its development. Secondly, the functional and structural entities are explained, whereafter the contrasts in functions and publicness are visualized. With these contrasts, I tried to give an insight into the differences in atmospheres.

History

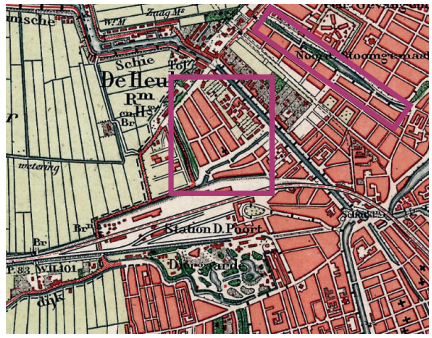
One of the reasons why the areas differ in sound lies in their history. The city center part of the central station was bombed during the Second World War. During the reconstruction period, the zoo moved to Blijdorp, and the new building blocks were bigger and much more oriented towards creating a city center. The biggest changes over time are visible on the page on the right.

31

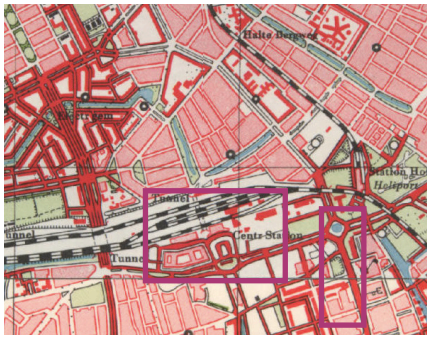
Historic maps of Rotterdam (Topotijdreis)



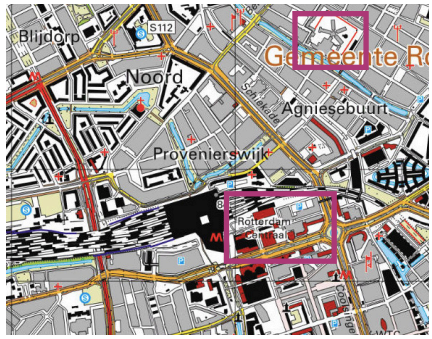
Sound safari
1850-1940
In history, the Rotterdam Central District was a zoo. Because of the needed expansion and the bombing of the Second World War, the zoo of Rotterdam has moved to the neighborhood of Blijdorp (Rotterdam Noord). However, the public functionality remained. Nowadays, this area functions as the entrance boulevard of the central station and the starting point of the shopping area.



Calm structures
1870-1900
Between 1870 and 1900, the “singels” were realized. This plan, made by Rose, had the aim of purifying the water and creating more livable neighborhoods for its citizens.
The singels of Rotterdam survived the bombing and are still an important element of the calm green structure of the area.

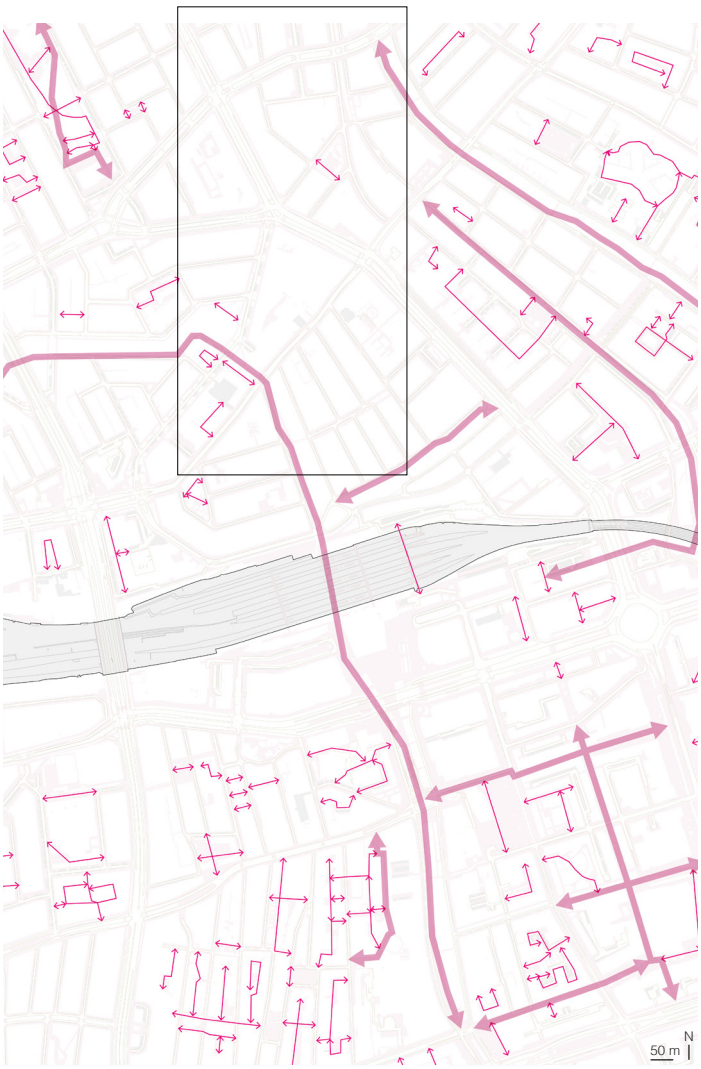


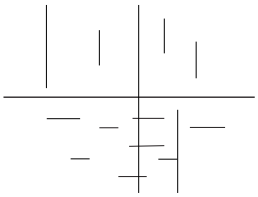
Roaring cars
1960-now
With the bombing and the movement of the zoo, the inner city of Rotterdam changed a lot. The central station expanded, and the Coolsingel and the Groothandelsgebouw were realized. These elements determine the face of the city today and show a different vision towards “growing as a city” than the structures before. In that way, the road structures in this area became more and more dominant. The two highlighted areas function as nodes of public transport and main car-roads, which create a lot of mechanical sounds.



Transforming identities
Now-future
These days, the development of Rotterdam Central District mainly consists of redesigning and repurposing, resulting in a more calm structure. The ‘Biergarten’ area (east side of Rotterdam Central District) will undergo a new area development, which will influence the identity of the area as a whole.
Besides, smaller developments show the continuous change of the city. The jail in the northern part of the Agniesebuurt, shows a recent repurposing towards a residential area with a collective courtyard.

Substructure





32

Slow-traffic
The pedestrianized structure is mostly located within building blocks as small parks, alleys, and playgrounds.

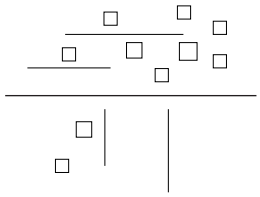
Rotterdam Noord
In the northern area, you can see small patches of slow-traffic zones and longer vertical structures. Besides, there seems to be a gap in the pedestrian structure in the north.

Rotterdam City Center
In the city center area, the slow-traffic zones create a connected substructure on their own. This is created by small horizontal structures and longer vertical structures.

Main structure | Pedestrianized structures
Sub structure | Secundary pedestrianized connections

Green-blue structure





33

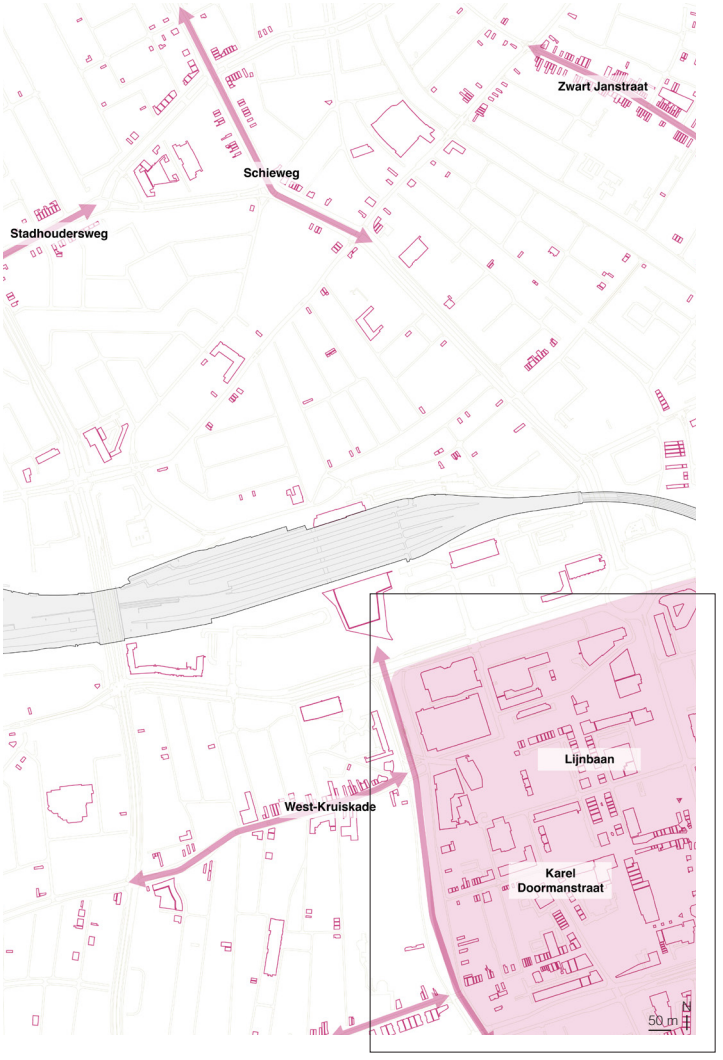
Green structures
The green structure is based on semi-public green spaces, public parks, and green structures.

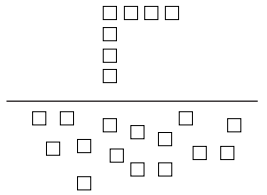
Rotterdam Noord
The green structure in the northern area is based on the singels, alternating with a patchwork of inner spaces.

Rotterdam City Center
In Rotterdam city center, the green structure is missing. There are small green spaces, mainly in the eastern part, while in the core of the shopping area the green patches seem to be absent.

Green structures
Public and semi-public green spaces

Function





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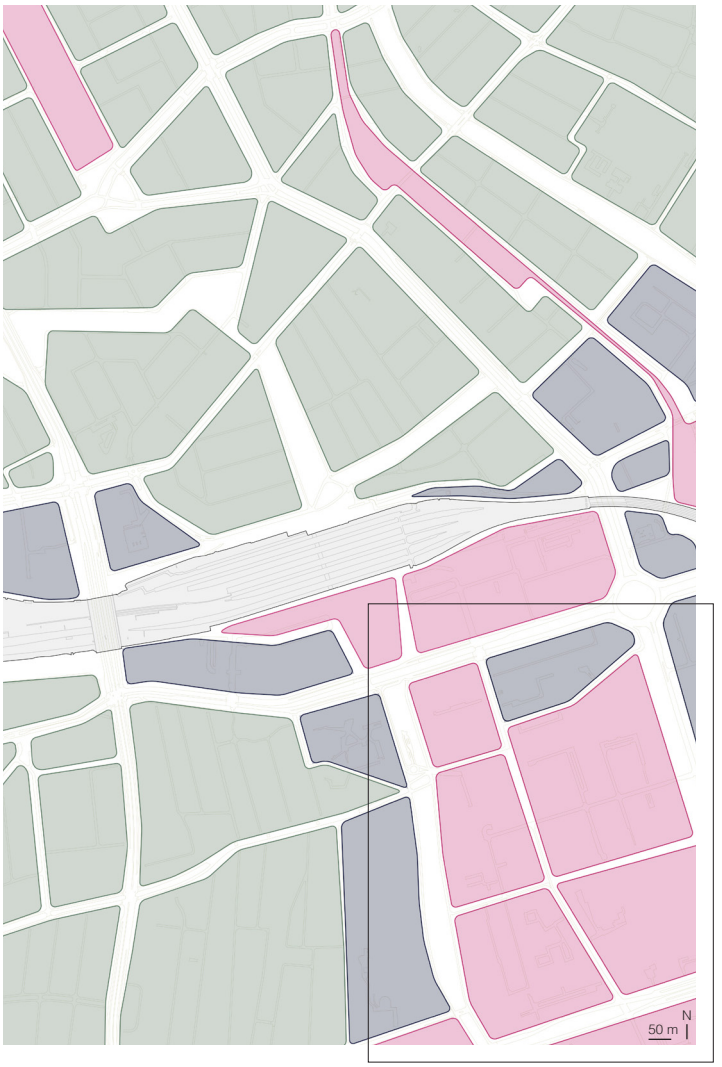
Leisure in the plinth
On the map, the leisure-related functions are visible.

Rotterdam Noord
The leisure-related functions in the northern area are located near the main streets. These streets form a louder structure.

Rotterdam City Center
The city center area has many more leisure functions, which are more clustered as well. This indicates that these spaces and their sounds are highly dependent on time.

Public function
Public structure
Public area

Entities





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Sound islands
The structures of the plan area show different entities of space. This is formed by the urban structure as building forms, height, and footprint and, secondly, by function, which implies residential, leisure, and business structures. Combining these gives an insight into the borders of the sound islands.

Rotterdam Noord
The northern islands are mostly based on physical structures and are mainly residential.

Rotterdam City Center
The islands in the city center area are mainly dependent and formed by function.

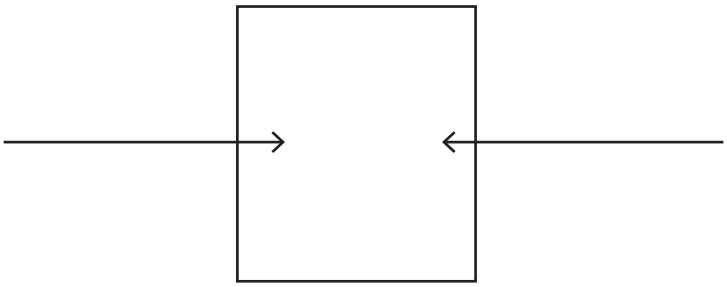
Residential entity
Commercial entity
Business entity

Handbook exercise
1 | Define the 3 parts of the perceptual input (the sound-based input, the perfromance-based input and the context-based input).
This input will give you information about the clusters of sound, the direction of sound and the use and behavior that comes with it.

2 | Define the atmospheres
Are the very contrasting soundscapes over your area, The chaotic or boring soundscapes are the spaces you possibly can change.

Need help? The Pattern Language is related to these parts and can help you to start analyzing or take the step towards designing.

2.4 | Conclusion



(1) Sound Perception Map
(2) Urban symphony

Sound perception map

To conclude the analysis of the current soundscapes in Rotterdam, I made the sound perception map. In this map, I will show an overview of the different soundsources, -elements, and spatial conditions that all influence how the sounds are perceived and came up during the analysic. As a result, indicating where the friction occurs based on sound becomes easier. In the following chapters, these spaces will be transformed into more meaningful, calm soundscapes and used to describe actual sound perception.

1. Cross-overs I Clusters of soundflows
The spaces where moving sounds and static sounds come together are the cross-overs. In these spaces, you can hear cars, trams, and scooters, which create mechanical-clusters. Therefore, the traffic lights increase the amount of mechanical noise. Because of the need to cross the street and the waiting time to actually cross the street, there is a misbalance between the exposure of sound and control over the heard sounds. This is why people perceive the cross-overs as areas of noise. Improving the cross-overs or adding spaces to withdraw nearby would be recommended.

2. The city center as core domain of loudness
I want to highlight the city center that functions as a contrasting soundscape compared to its surrounding environment. The sounds generated in this area do not predominantly come from traffic, but instead are generated by people and leisure functions. The public plinth and pedestrianized streets seem to overrule all other sounds. In contrast, the streets and spaces behind the main shopping routes are devoid of people; these expedition streets and ‘forgotten green islands’ can be possible spaces of intervention.

3. The importance of nature
Next to the structures of noise, the calm structures become clear as well. There seems to be a strong relationship with

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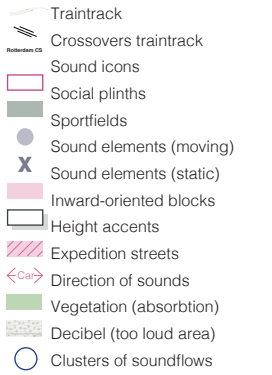
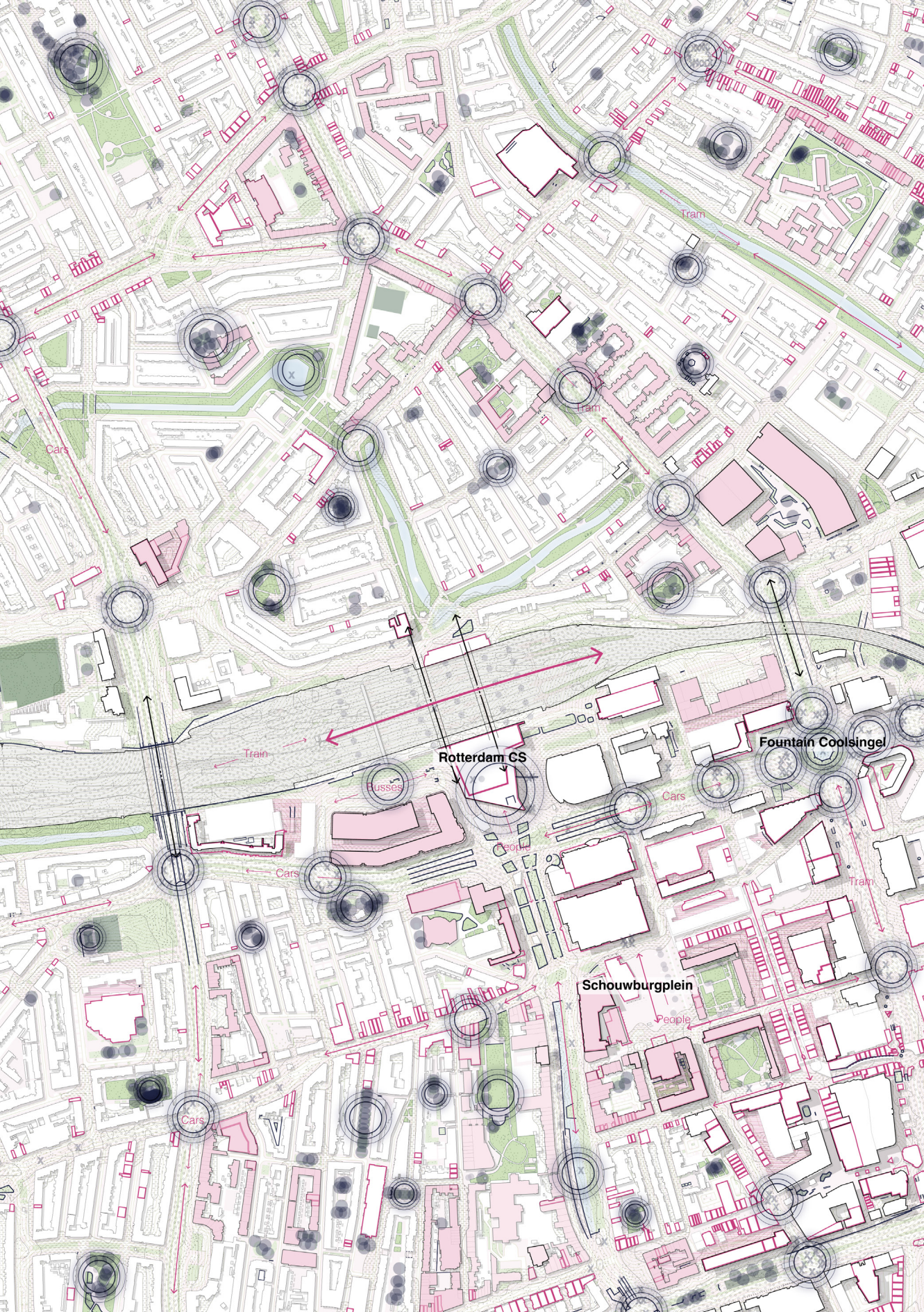
Soundperceptionmap (Author, 2022).




Tram
Tram
Cars
Train
Rotterdam CS
Busses
Cars
People
Fountain Coolsingel
Cars
Tram
Schouwburgplein
People
Cars

nature in order to retreat from the noisy areas. On the one hand, these are natural structures, such as the singels, and on the other hand, natural spaces, such as urban parks and semi-public gardens. In these spaces, it is not the actual volume but the association with calm sounds that functions as the retreatful factor.

4. Hidden scapes
Strikingly, a lot of calm natural scapes are positioned within building blocks and function as collective gardens. From the interviews, it seems that these spaces function as existing places to retreat while they are not accessible or known to everyone. This implies a lack of access and a gap in the soundsequence, resulting in a misperception of the variety of soundscapes. On the other hand, these spaces suggest the potential to create calm spaces without changing the existing urban landscape. In the next chapters, I will explain the potential of these spaces further.

5. Symphonies of scale
The perceived soundscape (as a place) is influenced by the sounds of its surrounding environment. The quality of the city is determined by balancing these four atmospheres. The role of the calm soundscape not only affects wellbeing on a local scale but also influences the auditory perception of the city as a whole.

Interpretation | Urban symphonies

The relationship between scale and sound is represented by three scale-levels: the urban block, the neighborhood, and the district. The connections in-between the scales are also discussed: the transitions between the urban block and the neighborhood, as well as the transitions between the neighborhood and the district. These scales function next to each other and influence the total symphony of the auditory landscape. In that way, you can interpret the following scales not only as physical layers but also as sound spectrums. This combination is visualized on the following page.

The urban block

The sounds of the semi-public and private areas are represented by the urban block. The collectivity of the inner open area, the presence of vegetation, and the height of the block itself all have a strong influence on these sounds. Because the block is a repeated physical element in the city's urban fabric, it generates a rhythm of sound.

From urban block to neighborhood

The transition from urban block to neighborhood focuses on the shift from the private to public domain. The level of interaction and (contrasting) sequenses influence the dynamics between these two scales.

The neighborhood

The neighborhood creates a melody of sounds. In this case, the level of interaction between users of the neighborhood and its functions are the main points of interest. Therefore, the interaction between places to stay and scapes of movement form an interesting component in this melody and determine clusters of sounds and the direction of movement.

From neighborhood to district

The dynamics of sound in relation to the use of space and use in relation to time are explained by the transition between neighborhood and district. In this way, the interaction between these scales indicates what places and time periods suggest peak moments or clusters of sound.

The district

Based on the urban structure and dominant functions, the district embodies the genre. This explains why the soundscape in the northern area of Rotterdam's central station differs from the soundscape in the city center area; not only do the neighborhoods differ in relation to one another, but also the spatial configuration and function differ significantly.

In the following pages, a series of photos explains how the block level is part of the island and/or district scale. Hereby, a calm inward-oriented space is visualized, whereafter a photo of the location where it is embedded in is showed. This makes clear that multiple soundscapes (in this case the calm and lifely soundscape) cooperate next to each other.

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For designing with these scales and sounds, I start with the smallest physical scale: the urban block. This scale level is closest to the ear's perspective and, as such, is an important parameter for determining the current soundscape and, potentially, symphony.

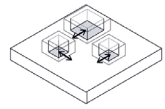
In the following pages (page 112-121) you can see how the soundscape of the block-level can be contrasting to the island or district soundscape they are embedded in.

1. Stadhuis courtyard | calm soundscape - city center | chaotic and lifely soundscape
2. Station Hofbogen | calm soundscape - Traintrack Rotterdam Central Station | chaotic soundscape
3. De Kok en de Tuinman | Calm soundscape | Neightborhood Oude Noorden | Mixed soundscapes
4. Parallel streets: Schepenstraat | Calm soundscape - Walenburgerweg | Chaotic soundscape



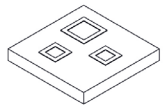
Rhythm

The inward oriented spaces within the island that shape the semi-public and private domain of the soundscape



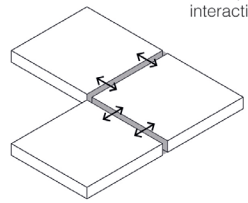
Dynamics

The physical elements that set the basis for interaction between different private and public domains. In this case the interaction between space and island.



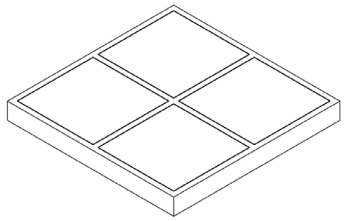
Melody

The interaction of movement and staying within an urban sound island that shape the collective sounds



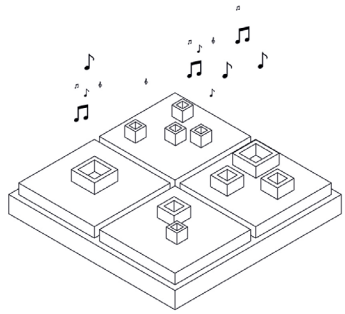
Dynamics

The physical elements that set the basis for interaction between different private and public domains. In this case the interaction between different islands.



Genre

Sounds of the city district formed by the main urban structure and functions that shape the public sounds



The musical masterpiece

The complete symphony of the soundscape of Rotterdam

Notes

Sound elements that create, soften, increase and blocks sounds belonging to a space


Allianz


WORLD TRADE CENTER




Vaenahuis




David Lloyd








VH JBLOED

Handbook exercise

1 | Make your own sound perception map!

This map illustrates an overview of all the sounds in the urban landscape you choose and indicates spaces of interest

2 | Use your map to communicate

When talking with residents, experts or other designers, the sound perception map is a good way to start your conversation about designing with sound.

3 | Connect it to the scales of the urban symphony

The scale you work on determines the focus of sounds as well.

4 | Use the Pattern Language and the map together.

With this, you can draw conclusions and indications for designing that important for your project location.

Part 3 | Integrating space and perception

The calm soundscape

Answered subquestions

(TD-01) What are the elements that link the connectivity between psychological research and urban design?

(IS-01) What are soundscapes and how are they perceived?

Content of this chapter

3.1 The calm soundscape
3.2 Re-adjusting perception in space: The Pattern language

Design instruments

To design with atmospheres, I decided to concentrate on the atmospheres associated with sound. Thibaud (2011) rightly states that limiting to the sense of sound does not foresee the whole ambiance, but states as well that sound plays a main role in the creation of perception. Therefore, architects that work mainly on designing atmospheres underpin the role of sound. As an example, architect Peter Zumthor (2006) emphasizes working with the senses in design and describes that sound plays a main role in the “feeling of home” and the perception of the atmosphere.

In this chapter, I will explain the instruments we have to design calm soundscapes. In the first paragraph, I will introduce the concept of the soundscape. The calm soundscape functions as the design concept throughout this handbook in order to design the inward-oriented spaces as calm spaces to retreat in the auditory narrative of Rotterdam. Herein, the ways to design with sound are explained as well.

To use these types of design in a strategic way, I will introduce the Pattern Language in the second paragraph. This language combines psychological theory and spatial input into indications for designing with sound.

In this way, the soundscape concept and the Pattern Language form a bridge between theory and design.

3.1 | The calm soundscape

(1) The calm soundscape
(2) Design with sound
(3) Case-study Paley park

The concept of calmness

As mentioned earlier, the calm soundscape is a place to retreat, mainly by focusing on natural sound. Now that we know that Rotterdam needs calm soundscapes and where the frictions of noise are in the current soundscape, the question remains; how do you make such a soundscape?

Creating calmness is not the same as creating silence. With calmness, the focus is on natural sounds, whereby silence focuses on the absence of sound. The Organization of Soundscape Design (2020) mentions three design aims to create this stillness. In this handbook, I interpret them as follows:

1 | Consider the function of the auditory landscape
In this handbook, I interpret this as the four atmospheres and their interactions, we touched upon in the analysis.

2 | Decrease unwanted sounds
In this handbook, this is interpreted as reducing, blocking or overruling mechanical sounds, from ventilation and vehicles.

3 | Focus on natural sound
Natural sounds are used to increase the healing effect of the place and thereby the value of the places to withdraw. (Soundscape design, 2020).

In order to translate these aims to spatial outcomes, the aims can be achieved by three different methods of designing with sound; 1. by association with sound, 2. by adding or reducing sound and 3. by the relationship between the built environment and sound. This is shown in the diagram on the right and gives a first direction into the translation from theory to design.

To illustrate this, I want to highlight the soundscape of Paley-Park, which makes it easier to see how these generic principles land in an actual design.

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Diagram instruments to design with sound in space (Author, 2022)

Categories	Elements | space	Conditions | perception
△ Associative **Sound-based**	1 Elements that create a certain **perception** with sound Purpose: accepting and functioning	[1] Elements that create a perception with sound are not required to produce or facilitate actual sound. Seeing these elements increases the expectation of a certain sound (scape). Examples are trees and vegetation (that introduce a more quiet area) or (open) fences (that introduce a slow-traffic zone)
	2 Elements that determine **behavior** Purpose: accepting and direction	[2] The elements that shape a certain behavior do not facilitate or create an actual sound as well, but can create certain sounds that belong to the behavior. A disorganized street leads to more aggressive behavior, while a green lane causes more relaxed behavior. Therefore, the behavior that occurs is very personal and related to the behavior of other people.
□ Intervening **Performance-based**	3 Elements that make sound **in itself** Purpose: stimulating and compensating	[3] Some elements within the urban landscape can cause sound in and of themselves. Look at the fountain, water-wall, or ventilation machine. These objects have a fixed position and create sound without a specific human activity of use. The sound circulates around the object.
	4 Elements that make sound by **using** Purpose: stimulating and functioning	[4] Some elements of the urban structure do not generate sound in and of themselves, but rather enhance use that generates sound. For example, a tennis court does not create sound, but during moments of use, the sounds of human voices, footsteps, and tapping tennis-balls can be heard. The sound-reach is dependent on the moving area of the user.
○ Facilitative **Context-based**	⑤ Elements that **block or direct** sound Purpose: avoiding and decreasing	[5] Elements that block sound create a direct transition in sound. The main elements that block or direct sound are the walls and heights of buildings or fences. These urban forms set boundaries for sounds. Sound, like wind, cannot pass through buildings, closed fences, or dense greenery. This intervention does not work for lo-fi sounds, since they bend around buildings.
	⑥ Elements that **absorb/decrease** sound Purpose: decreasing	[6] Some elements absorb or decrease sounds. Mainly vegetation, specific materials and differences in height asborb and/or decreas sounds. Besides, creating distance in the spatial organization can decrease certain sounds.
	⑦ Elements that **reverberate/increase** sound Purpose: stimulating	[7] The last sub-category are the elements that reverberate and/or increase sound. For example, water surfaces or specific materials (as aluminium) can increase the sounds.

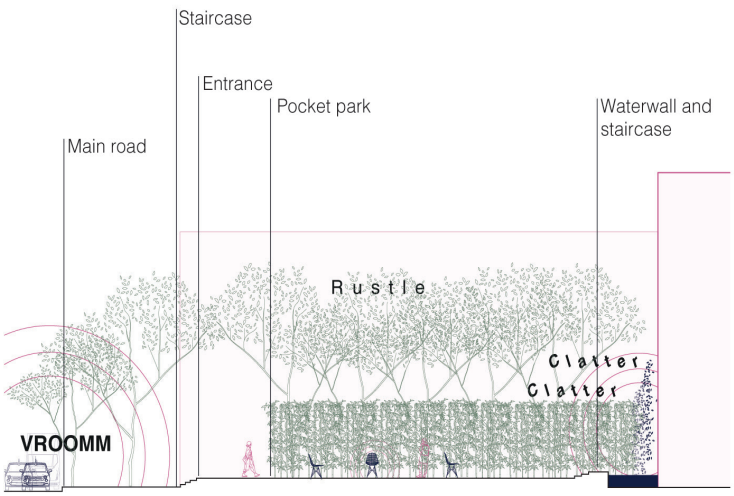
Case study | Paley-park

Paley Park, New York

Paley Park, a calm soundscape in New York, was designed in the 1960s as a u-shaped park within the current urban fabric. The surrounding area has many high-rise buildings and busy roads. The park, which is only 30 meters deep and 13 meters wide, shows that a place to retreat does not have to be large (de Wit, S., 2018) (Deganello, G.,2021).

What is particularly striking is the waterfall positioned on the back wall of the park. This waterfall, which can be as loud as 87 dB, can be heard from the street. It drowns out the sound of the cars on the road while at the same time creating a sense of calmness. The waterfall is accompanied by a row of trees that both block sound (from the road) and attract sound (birds). The subtle difference in height from the entrance to the trees and from the trees to the waterfall makes the sound transition even more noticeable.

In addition, the fence at the entrance of the park and the loose chairs (under the trees) give a sense of control over sound. In the evening, the fence can be closed and the chairs can be placed so that you can sit exactly where you like to experience the sound.



The soundscape

Urban form

Inward-oriented space, Urban escape, U-form.

Transition

High contrast because of the soundmark (waterwall), height differendes, fence and changing material

The aims

Functional identity

Paley Park functions as calm space (block-level) within a lifely island.

Reduce mechanical sound

There is no reduction of mechanical sounds, but all interventions block or absorb these sounds.

Increase natural sounds

All elements have a natural character and generate natural sounds, such as the waterwall and trees.

The elements

1 | The waterwall overrules other sounds

2 | The trees and green wall block and absorb sound and attrack animals

3 | The staircases emphasize materialization and a transition in space

4 | The chairs give a feeling of control over sound

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Interpretation of the soundscape of Paley Park (Author, 2022)



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Image of Paley Park
(Deganello, G.,2021).

Handbook exercise
1 | Look for other references of calm soundscapes and get inspired!
Besides Paley Park, there are many more calm soundscapes. If it is possible, visit the area to perceive the sound yourself.

3.2 | Re-adjusting perception in space

(1) The language of poetry
(2) The patterns

Re-adjusting perception in space | Pattern Language

The previous goals, methods for designing with sound, and case studies show us what tools we have to create a calm soundscape. However, it does not offer enough support to determine perception and come up with a context-specific solution. Because of this, I will introduce the Pattern Language that connects perception to space and theory to design, which is used to, in this handbook, design with the calm soundscape.

The language of poetry

The Pattern Language was realized by Chistopher Alexander (1977) as a way to approach architecture and planning in an alternative way. He describes the language as the quote on the right side of the page.
The quote kept my attention for two reasons. Firstly, because a poem can describe a certain feeling or perception without defining the exact pathway you should follow to experience it this way. In that way, using poetry to describe the perception of sound is a good medium. Second, interpreting the Pattern Language as a poetic language indicates that the patterns do not provide the solution in and of themselves, but they do clarify the goal that it intends to achieve with it. Therefore, the urban designer keeps the freedom to achieve this goal with different design solutions.

The language to design with perception

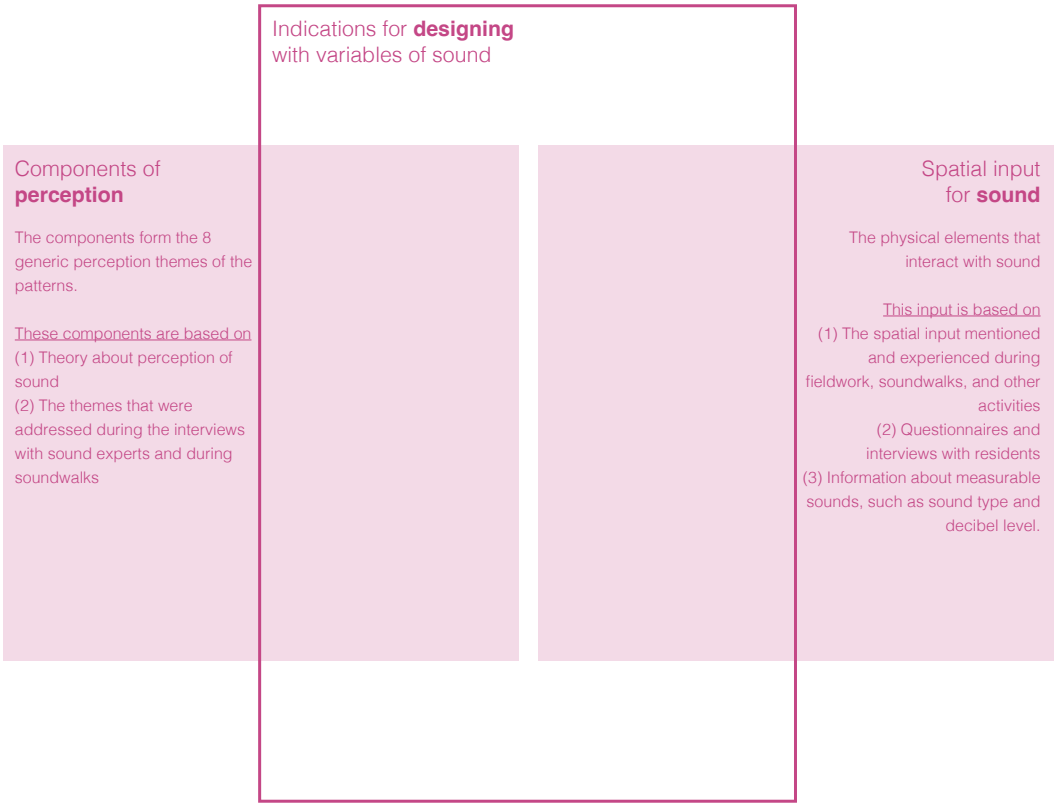
The goal of this Pattern Language was to connect the theory of psychological well-being to the design of sound in space. Hereby, the patterns are scale independent but relate to each other in order to make the design outcome location specific. Because the patterns are linked to each other, the language functions as a network. In the following pages, this network is visible. Hereby, the patterns are linked to the previous named aims in order to design a calm soundscape and the instruments that urban designers have to approach design with sound. But before diving into this network, it is necessary to know what components of perception and what spatial input they connect.

The psychology of sound in space

The patterns are divided into 8 categories that represent the psychological components and are formed by the previous perceptual input analysis based on literature studies, fieldwork, observations, interviews with residents, and conversations with sound-experts.

‘This language, like English, can be a medium for prose, or a medium for poetry. The difference between prose and poetry is not that different languages are used, but that the same language is used, differently. In an ordinary English sentence, each word has one meaning, and the sentence too, has one simple meaning. In a poem, the meaning is far more dense. Each word carries several meanings; and the sentence as a whole carries and enormous density of interlocking meanings, which together illustrate the whole. The same is true for pattern language’

(Alexander, C., 1977, p.41)



Each pattern is connected to a spatial input that relates to the aspects of space. The spatial input is divided into sound-based input (characteristics of sound), performance-based input (sound in relation to space) and context-based input (sound in relation to surrounding soundscapes) and reflects back on the analysis done to understand the soundscape of Rotterdam. Combining the psychological components and spatial input forms a generalized set of indicators (the patterns) that function as a guiding language for designing with sound. However, since they cannot predict a certain perception, it makes it easier to link psychological well-being to interventions in space.

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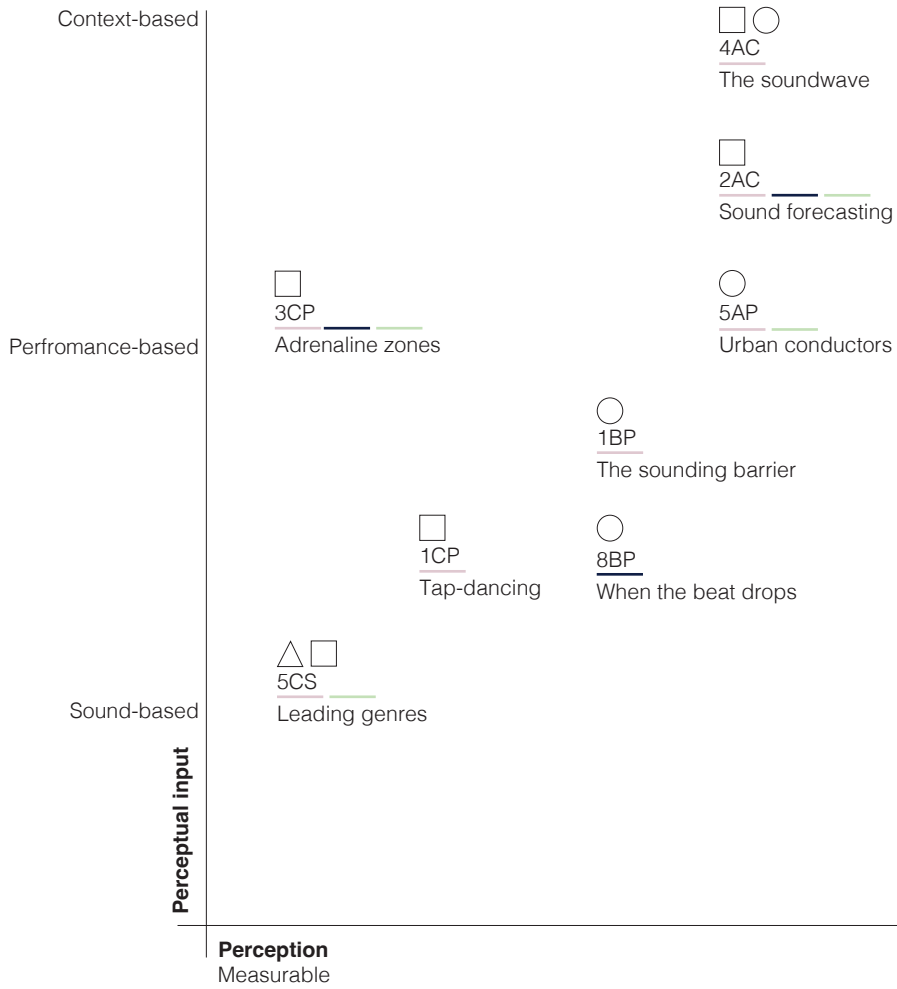
A conceptual vialization of a pattern (Author, 2022)

The pattern language consists of 24 patterns. This set can be found as seperate set of patterns in order to communicate with it during designing.

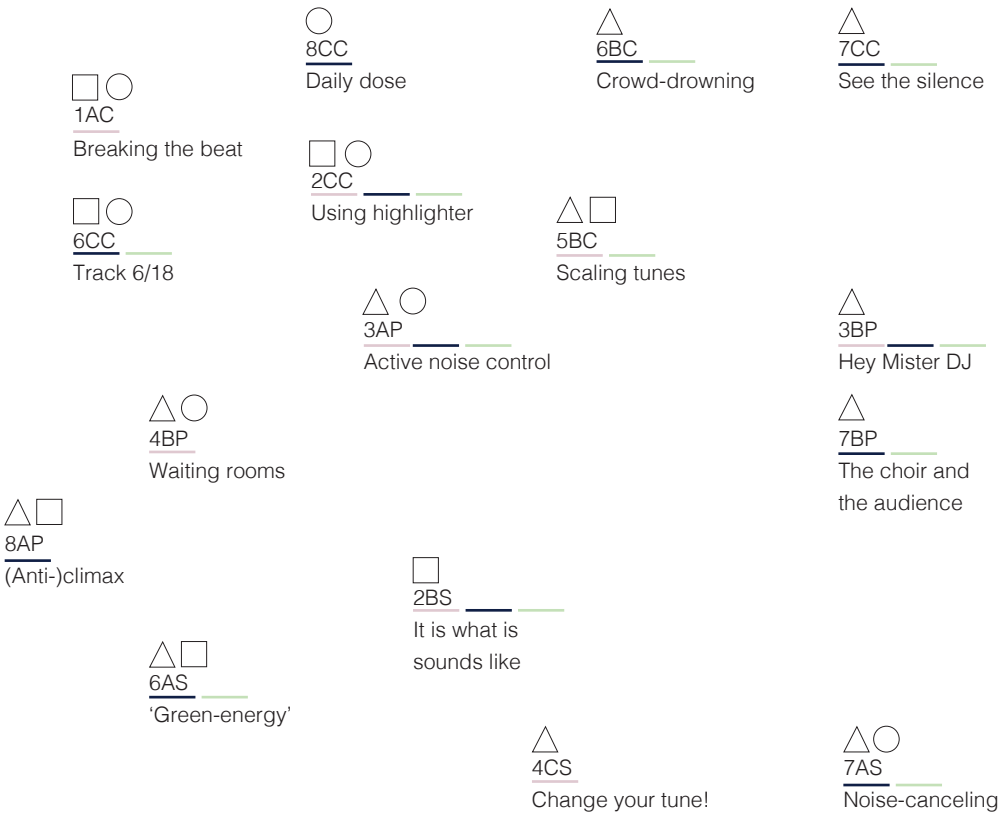
The patterns



The more sound-based and measurable the patterns are, the more generic outcomes they imply. The more context-based and perceptive the patterns are, the more the outcome depends on the location and the people living in it.

Instruments to design with sound

△ Associative
□ Intervening
○ Facilitative



The network of patterns (Author, 2022)

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Individual perception

Soundscape aims connected to psychological components

Contrast Continuity Variation Expectation Control Exposure Distance Time

Variety in the urban landscape | Transitions and access

Reducing mechanical sounds | Use and perception of space

Attracting natural sounds | Healing effect of sound

Handbook exercise

1 | Use the patterns throughout all parts of the design process

The language is a useful medium to keep to the scope of the project, to communicate with others and to reflect on your design choices.

2 | Use the table

Use the measurable and sound-based patterns for generic interventions and the patterns based on context and personal perception for specific outcomes. The combination of patterns you use should at least consider each of the design aims for a calm soundscape.

3 | Extend the language

In case your analysis shows other psychological components and perceptual input, use them to create new patterns. This will be beneficial to generate context-specific design interventions.

Part 4 | Design element | Spaces to retreat

The inward-oriented space

Answered subquestions
(IO-01) What areas can become calm, inward-oriented soundscapes?

Content of this chapter
The inward typology
4.1 Hidden spaces in Rotterdam
4.2 Conclusion

The inward typology

What if we turned it inside out? What if we made the hidden space explicit without changing the atmosphere and the urban structure? It would give a voice to what we cannot see directly but what plays a major role in the experience of the soundscape of the city. In this chapter, the inward-oriented space is explained, mapped, and analyzed in order to give an overview of inward-oriented spaces, calm hidden gardens, and potential new silent hotspots.

The inward-oriented typology

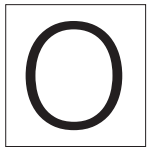
To begin with, it is necessary to know what inward-oriented space means. The typical urban form, orientation, and position within the urban landscape in relation to its publicness play a crucial role in the quality of it and thereby its experience. The strength of the inward-oriented space lies in its hidden identity.

The urban form: enclosed structures

The inward-oriented space can be divided into 3 categories: the U-form, the L-form, and the O-form. The letters explain how the surrounding buildings enclose the outdoor space and suggest a more open character (the U-form) or a more closed character (the O-form). Within these general forms, there are some sub-categories (the page right), which suggest more diversity within this publicness.

The orientation: to the inside

What makes the inward-oriented space different from a typical urban block is the orientation towards the inside. It is important to have access to this inward space in order to experience its soundscape. This access is visible through doors of homes, entrances of garages, and private gardens that transform gradually into collective gardens. Because of this, the urban blocks that solely include private gardens are not taken into account in this chapter.



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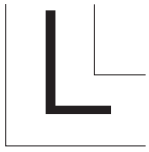
The O-form
Mainly used for semi-public and private courtyards (Author, 2022)



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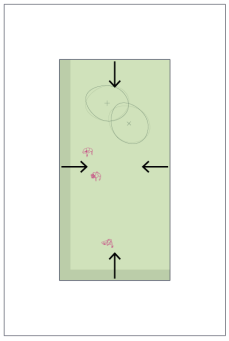
The L-form
Mainly used for semi-public expedition streets and collective gardens (Author, 2022)



45

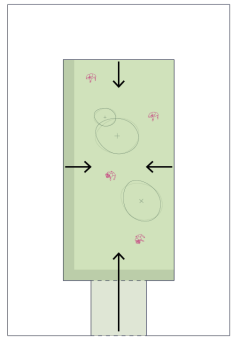
The U-form
Mainly used for public collective gardens and pocket parks (Author, 2022)

O



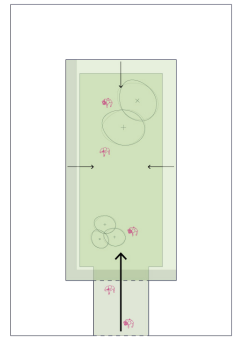
Urban form: Closed building block
Access: Access through homes to collective garden
Publicness: Private
Sound direction: Stays inside, blocks outside

O



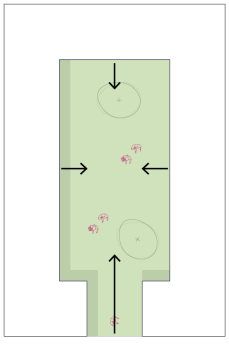
Urban form: Closed building block
Access: Access by passage and through homes to collective garden
Publicness: Private
Sound direction: Stays inside, blocks outside

O



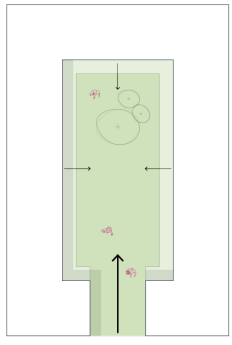
Urban form: Closed building block
Access: Access by passage and by private gardens to collective garden
Publicness: Private
Sound direction: Stays inside, blocks outside

U or L



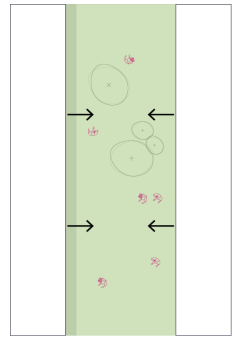
Urban form: Building block with open entrance
Access: Access by main entrance and through homes to collective garden
Publicness: Semi-public
Sound direction: Exchange via entrance

U or L



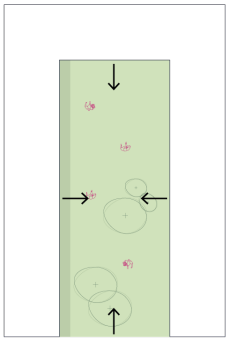
Urban form: Building block with open entrance
Access: Access by passage and by private gardens to collective garden
Publicness: Semi-public
Sound direction: Exchange via entrance

L



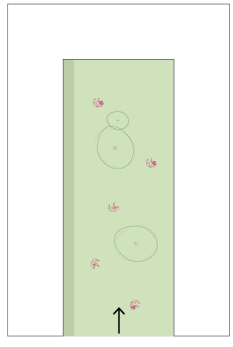
Urban form: Inward-oriented building rows
Access: Access through building to collective garden
Publicness: Public
Sound direction: Exchange via open sides

U



Urban form: U-shaped building block
Access: Access by main entrance and through homes to collective garden
Publicness: Semi-public
Sound direction: Exchange via entrance

U



Urban form: U-shaped building block
Access: Access by main entrance to collective garden
Publicness: Public
Sound direction: Exchange via entrance

46

An overview of the differences between inward-oriented forms (Author, 2022)

Position and publicness: substructures and semi-publicness

The publicness of the inward-oriented space and position have a strong relationship. The typical inward space is part of the substructure of the urban structure, which means that, in most cases, the space is not only hidden by its surrounding buildings but also the context of the structure. However, there are also some exceptions, such as Paley Park in New York and the Lijnbaan Ensemble in Rotterdam. In these cases, the position next to a main street and a central area in the city creates a high contrast in soundscapes and suggests bigger transitions in publicness within the inward-oriented space itself. Looking at the urban form, these inward spaces mainly have a U-form. Because of the open side, this form also points out a more public character as well. O-forms and L-forms can also be located across the main structure, however imply, because of the more nuanced entrance a more private character, whereby the soundcontrast can be experienced in the moment you entre the inward space. Other inward-oriented spaces that are positioned within the substructure, create a more gradual contrast in the soundtransition and have a more collective character. In this way, it becomes a possibility to experiment with the publicness in relation to the position within the urban network.

Relation to sound

However, the hidden identity, the inward-oriented space, seems to be quite famous. Examples are the 1. Superblocks of Barcelona (Superblocks restrict traffic to the surrounding of 9 building blocks, wherein an island of slow-traffic streets arises), 2. the Baugenossenschaft in Germany (Whereby the buildings create an ensemble with a collective garden) and the 3. Dutch Courtyard.(a semi-public communal garden surrounded by housing). What they have in common is, next to their inward orientation, sound. The spaces have the ability to block mechanical sounds (eliminate traffic) with their urban form and focus on natural sounds (the gardens). This happens within the building block. This explains why the urban form changes the soundscape the soundscape within, without changing the soundscape from outside, whereby the natural atmosphere seems to play a main role in creating a calm atmosphere. Looking at the misbalance between vibrance and silence in the case of Rotterdam, and many other urban areas, these inward-oriented blocks can have great potential.

4.1 | Hidden spaces in Rotterdam

Content of this chapter
(1) Opportunities for calmness
(2) The calm structure is locked

Opportunities for calmness

In the case of Rotterdam, I want to highlight 2 types of inward-oriented spaces; the courtyards and the expedition streets. However, these spaces differ a lot in position and function. These two types both have the potential to become calm soundscapes.

Courtyards and expedition streets

The courtyard, as I explained in the previous paragraph, forms a semi-public green space accessible by the surrounding buildings and/or a main entrance. These yards are spread over the whole plan area and show a network of inner spaces with existing (collective) gardens or potential (collective) gardens.

The expedition streets form the loading and unloading space for shops, restaurants, and other public functions. These streets are located at the back of main corridors and are empty most of the day. These streets, in contrast to the courtyards, function as the substructure that can connect the inner spaces and are, due to their position and urban form, an inward-orientated space as well.

In the following pages, I visualized where these spaces are and how they look. This gives an overview of the existing inward-oriented spaces and potential calm soundscapes. There-after, I will introduce the urban escapes and territories of silence, which are categories of the inward-oriented spaces based on their position in the soundscape. Together, this gives a first insight into the potential calm urban landscape.

A quick calculation

Total square meter of Expedition streets (16.569 m2) + total square meters of courtyards (136576 m2) = an inward-oriented structure of 153.145 m2 that could be possible calm soundscapes.

This equals 22 soccer fields* and 32 Rotterdam Central Stations**

* Based on a soccer field of 6770 m^2

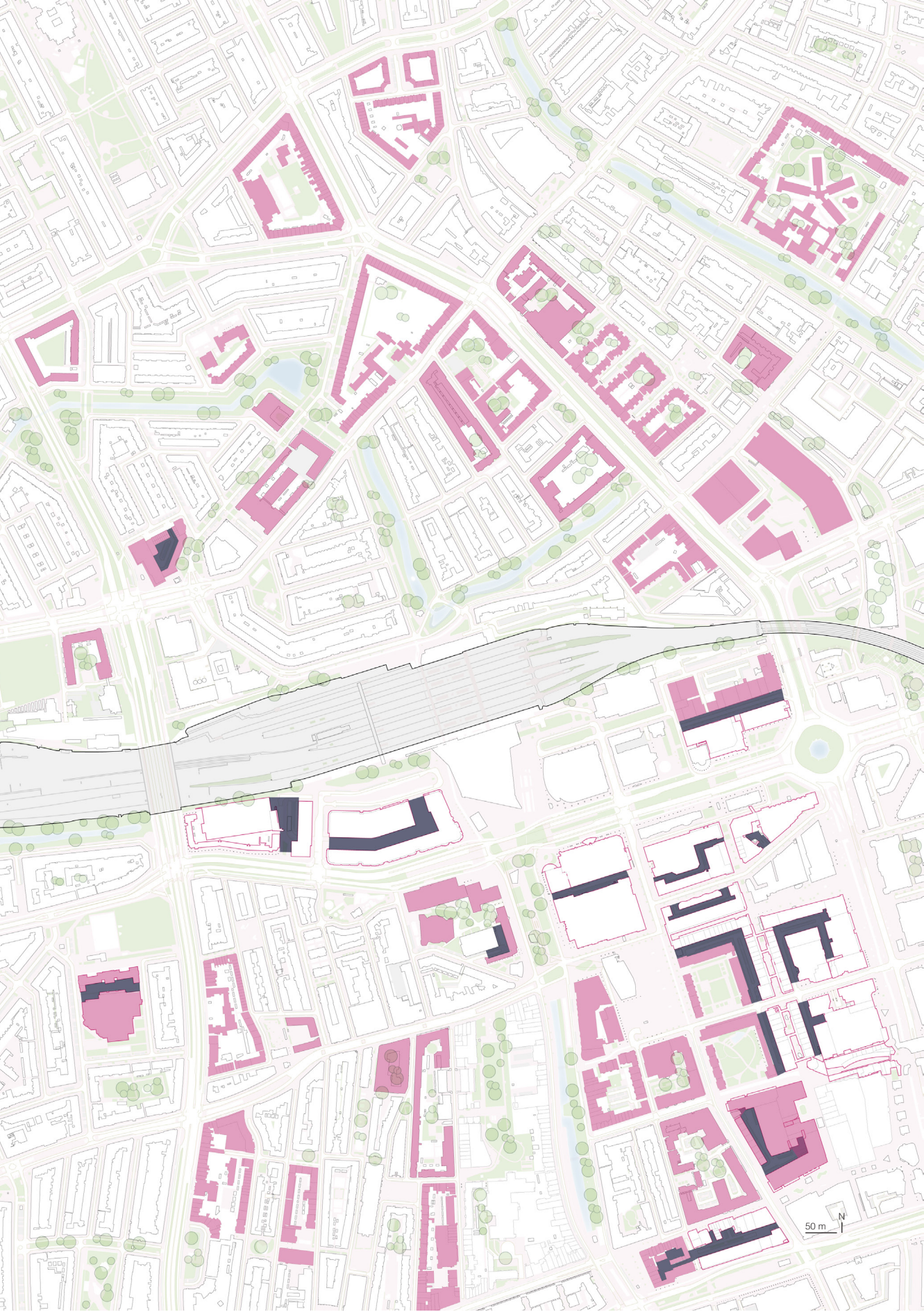
**The floor space of Rotterdam Central Station is 4.700 m^2 (Author, 2022)

Do you want to see the overview of the size and publicness per inward-oriented space, take a look at the appendix.

47

An overview of the current inward-oriented space: the courtyards, expedition streets and communal gardens (Author, 2022)

- Courtyards
- Expedition streets
- Buildings surrounding the expedition street


50 m
N

The calm structure is locked

The study of inward-oriented spaces provides us with useful information about their sound, their location within the urban landscape, and the amount of space that could become or is already a tranquil soundscape. This demonstrates that Rotterdam's missing calm structure is already physically present in its soundscape. Why, though, does it seem that the spaces to retreat are still missing? And why does the actual psychological benefit remain absent?

Access

Looking back at the visited building blocks in the analysis, we got the answer. The communal garden, as shown in the Schepenstraat, functions as a retreat for residents living in the buildings that enclose the inner space itself. Furthermore, the residents of the Spoorsingel block do not have a common area, yet a difference in sounds can be heard. When you look at these cases, you'll see that they all have one common factor: access. Zooming out, we see that the Schepenstraat and Spoorsingel are no exceptions. As a result, we can conclude that the urban environment currently includes a calm urban structure. However, access is limited to a small group of citizens, so the psychological component and space to retreat as well.

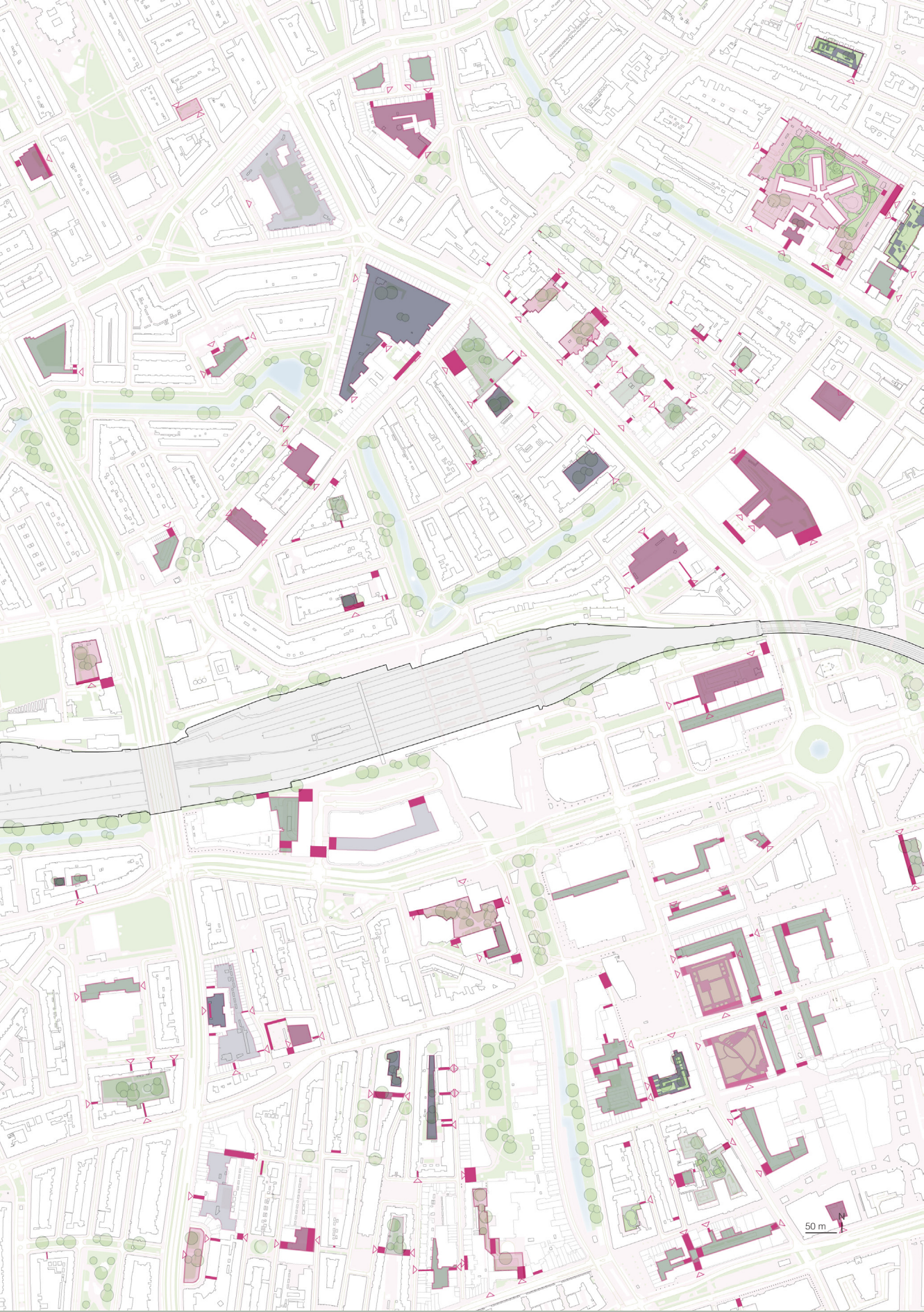
48

The access, publicness and transitions of the inward-oriented spaces (Author, 2022)

Access
Transition

Current calm soundscape
Public inner space
Semi-public inner space
Private inner space (only accessible by residents living in the surrounding block)

Potential calm soundscape
Public inner space
Semi-public inner space
Private inner space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Handbook exercise

1 | Define the inward-oriented spaces

Define the courtyards, expedition streets and other semi-public inner scapes. These spaces are the physical basis for the calm soundscape.

2 | Define the accessibility

The access gives an indication if people can retreat to and visit the actual inward-oriented calm soundscape

3 | Increase the amount of inward-oriented spaces

Look for spaces that could be possible calm soundscapes and these to the map; together the future spaces to retreat arise.

4.2 | Conclusion

Urban escapes and territories of silence

Creating a balance between vibrance and silence, therefore, is not about changing the urban structure but changing the transitions and developing connections from one to the other. This can be implemented in a variety of ways, depending on the function of the block, its position in the urban landscape, and the form of the block itself.

Here, I'd like to focus on two categories: 1. urban escapes: inward-oriented spaces that are part of a louder structure and should be accessible to everyone (Rotterdam City Center), and 2. territories of silence, which are embedded in residential areas and provide a semi-public and collective purpose (Rotterdam North). Both categories contribute to accessibility, while the approach includes a variety of auditory accents and interventions. In this way, the approach to creating a calming soundscape is flexible while emphasizing the challenges that need to be tackled.

In the appendix, you can find how to approach the design of the transitions towards and from the urban escapes and territories of silence.

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Concluding table inward-oriented spaces (Author, 2022)

In the following pages, you can see some examples of existing courtyards and expedition streets.

1. Private courtyard Gaffelstraat p.150-151
2. Semi-public courtyard Tuin van Noord p.152-153
3. Diverse expedition streets in the city center p. 154-157

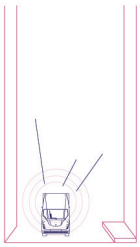
The inward-oriented urban form

Expedition streets

Courtyards

Courtyards

Communal gardens within building blocks



Expedition street



Courtyard



Enclosed community garden



Collective garden

Urban function and access

1 | Public commercial scapes

2 | Semi public community scapes within commercial district

3 | Semi public community scapes within residential areas

4 | Semi public to private community scapes within residential areas

Urban position of the calm soundscape

Urban escapes

A louder structure should always have a calm escape to retreat

Territories of silence

A calm soundscape within a territory of silence should always have a gradual transition to another calm soundscape

Rotterdam city center

Rotterdam Noord






REGEN
WATER




LAATS 19 T/M 40




PULL&BEAR
SKVR



Handbook exercise

1 | Draw entrances

Now you have an overview of the possible inward-oriented space, define their transitions.

2 | Zoom out

There-after it is needed to zoom out. Are these space part of a louder structure or part of a network or patchwork of calm soundscapes? Your analysis help with defining this.

3 | Look for high or low contrast

An inner space in a louder environment asks for more contrasts than an inward-oriented space part of the territory of silence. Look at the appendix for the transition tools and the patterns about contrast and continuation.

Part 5 | Design approach

The new soundscape

Answered subquestions

(DS-01) How can these areas be transformed as a place to retreat?
(DS-02) How do these spaces establish a network of inner soundscapes?

Content of this chapter

Layers of a new song
5.1 Vision
5.2 Strategy

Layers of the new song

Creating the urban symphony requires a combination of scales, sound interventions, and variations in sound atmospheres. In this chapter, we combine the gained knowledge, findings and ways to design with sound to illustrate the strategy towards the new soundscape of Rotterdam.

A multi-layered strategy

I will explain this by using the three scale-levels of the sound spectrum; the district, the island, and the block. Firstly, the vision for the surrounding area of Rotterdam Central Station will be shown. This vision illustrates the spaces of intervention and the general steps that should be taken to create a network of calm soundscapes.

Thereafter, I will zoom in at two locations; the Lijnbaan ensemble in the city center (block-level) and the whisperroutes in Noord (island-level). These locations show a dichotomy in the soundscape itself and, thereby, a contrasting approach towards creating a tranquil atmosphere. Hereby, the Lijnbaan Ensemble shows a calm soundscape embedded in a louder soundisland, while the whisperroutes show how calm soundscapes can become a silent substructure. Both zoom-in locations explain how we can implement the vision for the whole area.

Therefore, I will use the ear-perspective, for the two approaches. This scale explains how different interventions (at all scale levels) change the perception of sound. Hereby, personas and poems show several current and future narratives and link back to the psychological well-being that the story of this handbook started with.

Together, by working with different scales and approaches, this results in an overview of the calm soundscape through Rotterdam and a gradient from vibrance to silence that can be linked back to the pattern language.

5.1 | Vision

(1) Rotterdam Central Environment
(2) Spaces of intervention
(3) Vision

Rotterdam Central Environment

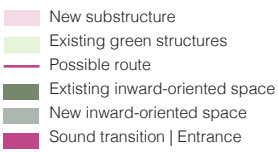
We start on the scale of the district: Rotterdam Central Environment. When working on this scale, I want to underline the value of understanding the context of the inward-oriented space as well as the network in which it is embedded. The calm alternative sound network is a network in itself, but continuously interacts with its louder, surrounding structure. As a result, this approach focuses on constructing a calm structure next to the current vibrant structure, rather than changing the vibrance into a tranquil atmosphere. Hereby, the perception of the soundscape is thus given an alternative. In this way, the goal is to find a balance in Rotterdam between vibrance and silence.

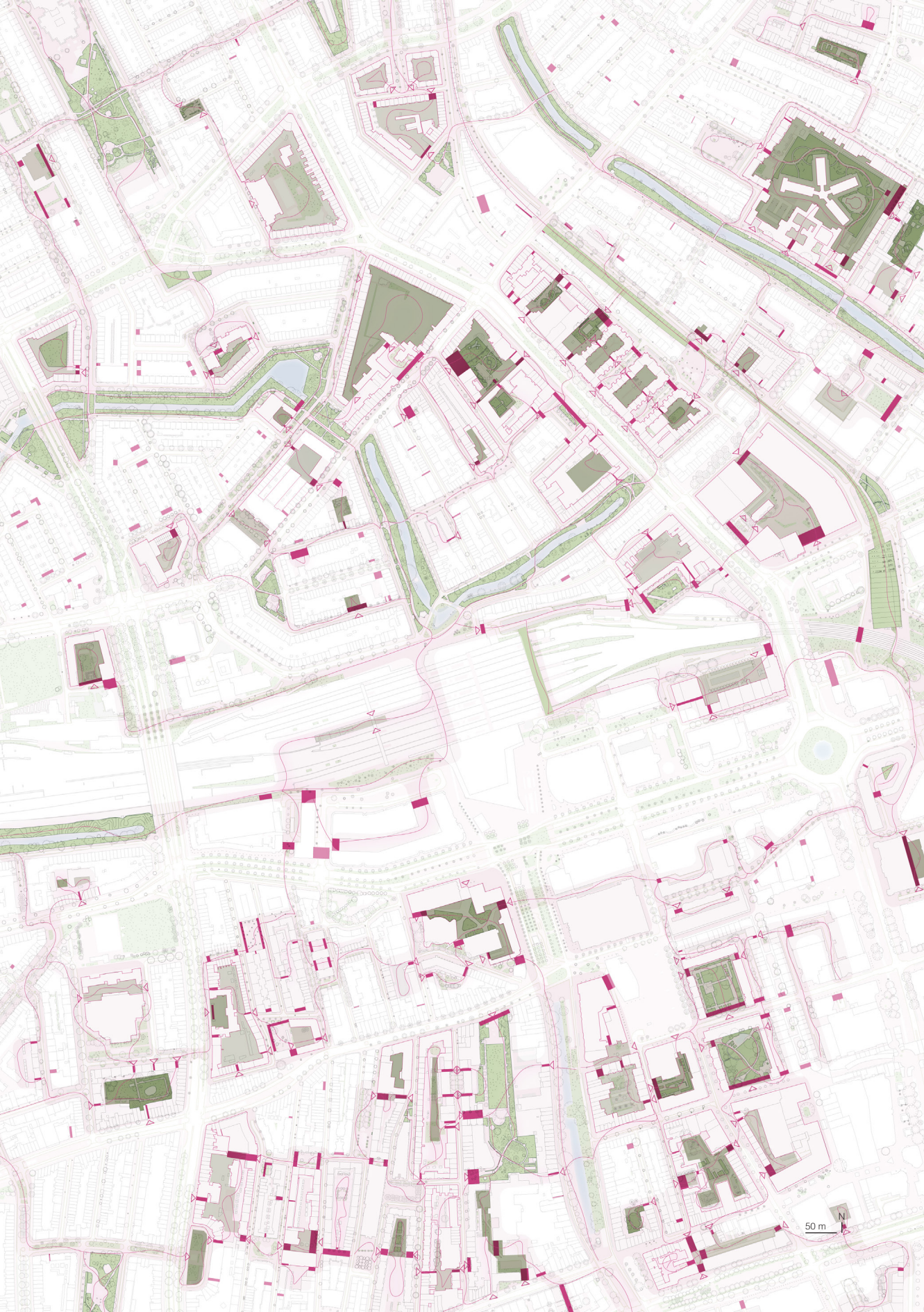
Taking the alternative road

First of all, I will explain how the inward-oriented space, the calm semi-public place, is part of the sequence from vibrance to silence. In the city center of Rotterdam, these were mainly the expedition streets; in the North, these were mainly the alleys, gates and inner parking terrains. The combination of these creates a calm substructure that provides a network of places to retreat, recharge, and experience the variation of sound. This is shown in the diagram and in the image on the following page.

50

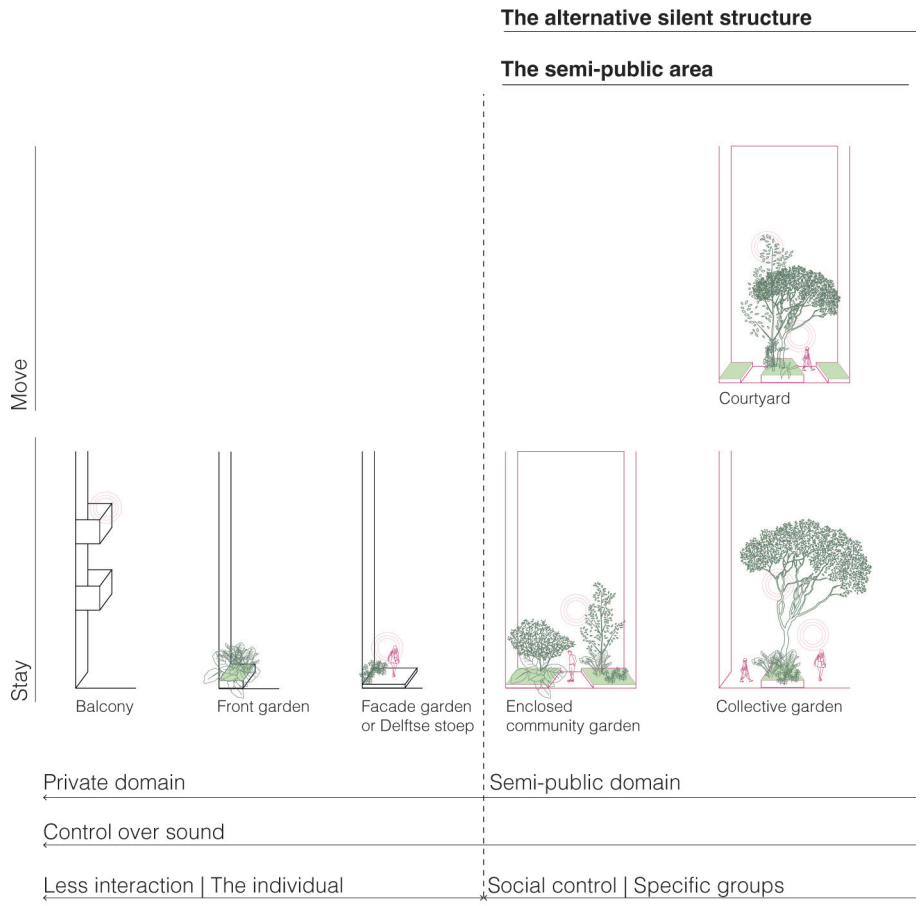
The moments of transition, the semi-public inward-oriented spaces and the calm structure (Author, 2022)




50 m
N

Spaces of intervention

The alternative silent structure combines the semi-public area and the sound transition zones. At the diagram there is visible how this alternative structure is part of the gradience between vibrance and silence. Besides, it becomes clear that the courtyards and collective gardens form the scape to retreat and the alleys and expedition streets the structure towards these spaces.

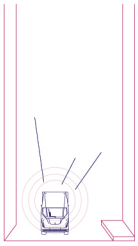


51 Diagram of the gradience between public and private. The silent substructure is highlighted in pink and form the spaces of intervention. (Author, 2022)

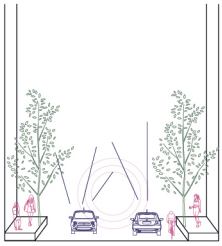
Soundtransitionzone



Alley



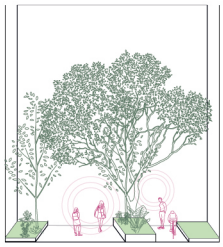
Expedition street



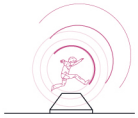
Residential street



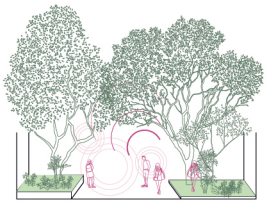
Main street



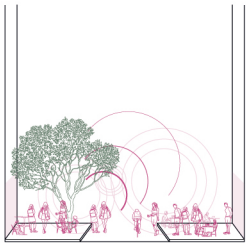
Enclosed pocket park



Playground



Public park



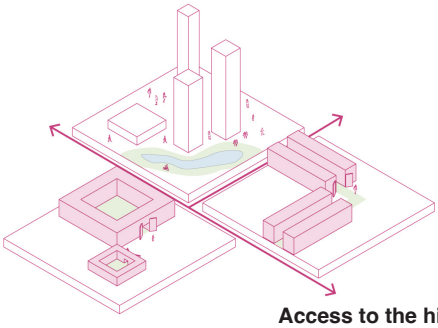
Main street with
public functions

Public domain

No control over sound

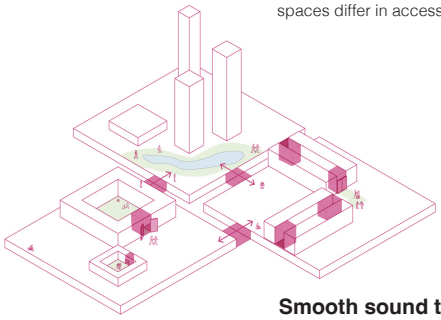
Interaction in anonimity | The crowd

The vision



Access to the hidden spots

The new calm soundscapes and highlighted existing calm soundscapes will arise within the existing urban structure. The courtyards function as a network of places to retreat, while the expedition streets facilitate the sub-structure towards these collective spaces. Hereby, the spaces do not scream for attention but are readable and audible in a subtle way. Based on the context of the inner space and the time of the day, the spaces differ in access.



Smooth sound transitions

From the analysis, we can conclude that transitions in the urban structure and from one soundscape to another soundscape play an essential role in the perception of sound. The transitions that lead to collective inner spaces are addressed so that the sound transition is experienced as pleasant. The level of contrast, the function of the transition, and the materialization will be taken into account.



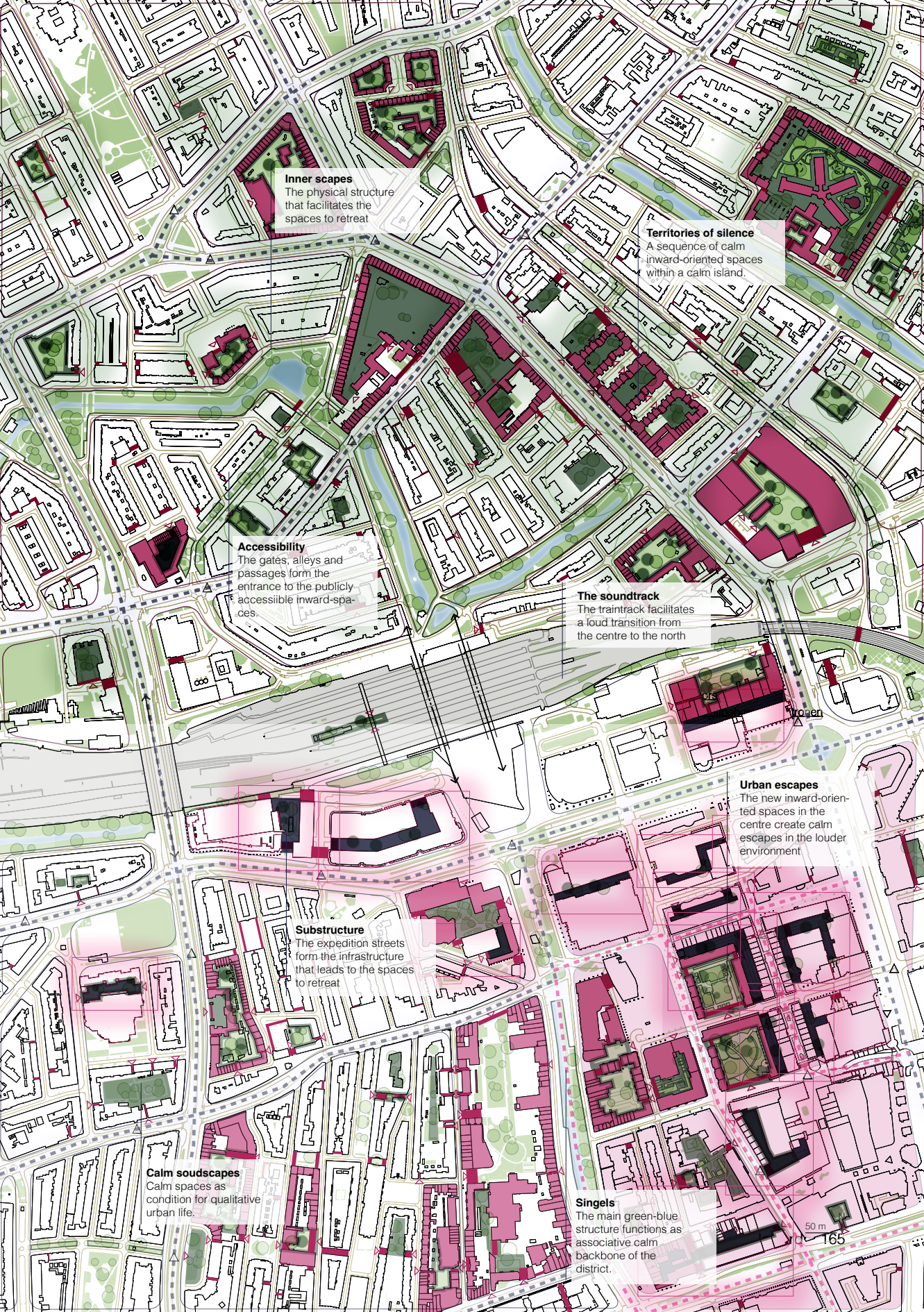
Play with perception

The perception of the inward-oriented spaces and their sound transitions must be physically possible and readable but also welcoming and pleasant. Therefore, vegetation, expectation, and variety in sound elements are used to improve the mental state and welcoming identity of the hidden spaces.

52

Different scales (Author, 2022)
1. The whisperroute in Noord and
2. the tranquil soundscape in Rotterdam city center as part of the vision for the district

- Traintrack
- Crossovers traintrack
- Existing green structures
- Extisting inward-oriented space
- New inward-oriented space
- Courtyards
- Expedition streets
- Buildings surrounding the expedition street
- Sound transition
- Entrance
- Territories of silence
- Urban escapes
- Sounding islands
- Main roads in between the islands
- Main pedestrian roads


Inner scapes
The physical structure that facilitates the spaces to retreat
Territories of silence
A sequence of calm inward-oriented spaces within a calm island.
Accessibility
The gates, alleys and passages form the entrance to the publicly accessiible inward-spaces.
The soundtrack
The traintrack facilitates a loud transition from the centre to the north
Urban escapes
The new inward-oriented spaces in the centre create calm escapes in the louder environment
Substructure
The expedition streets form the infrastructure that leads to the spaces to retreat
Calm soudscapes
Calm spaces as condition for qualitative urban life.
Singels
The main green-blue structure functions as associative calm backbone of the district.
50 m

Handbook exercise
1 | Make a vision
Consider the key sound interventions you have to tackle in order to creat calm soundscapes and position them in a map.

2 | Choose the areas of intervention
These are the inward-oriented spaces, but also the transitions towards it.

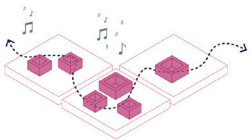
3 | Make sure the Pattern Language is connected to this vision
For the case of Rotterdam, variation, expectation and contrast were the key pattern sets on the district level. For other locations, this depends on the intended goal and context.

5.2 | Strategy

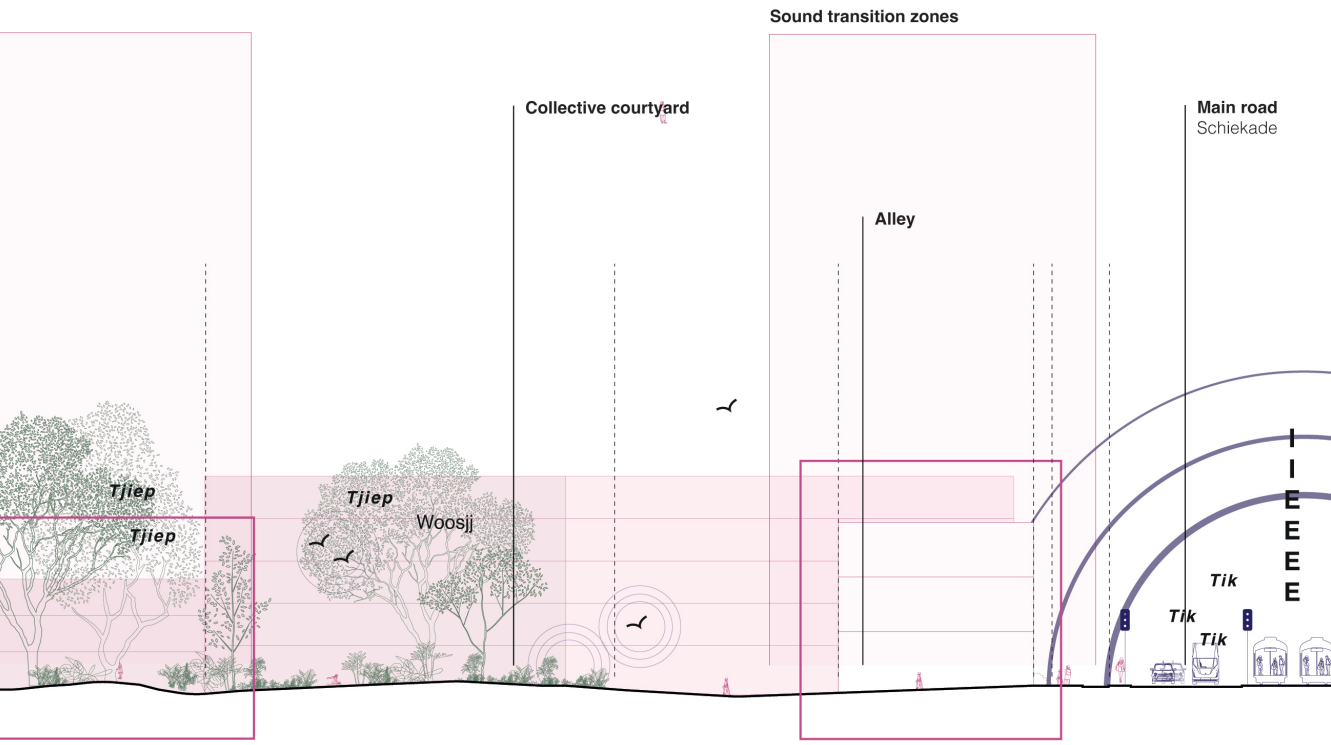
(1) The whisperroutes of North
(2) Urban escapes in the city center

The whisperroutes of Noord

The strategy of the Whisperroutes in Noord shows how the current inward-oriented space can become part of the calm subnetwork. Gates, alleys and passages play a main role in this strategy; they facilate the transition between calm soundscape and vibrant island. These design elements form a route, not from A to B, but by emphasizing hidden areas in a subtle way.



From page 172 to179, several entrances and their collective space are photographed.



Rotterdam Noord
Calm and chaotic atmosphere

Design aims

Access to the hidden spots

It is undesirable to attract sounds at times residents want to rest in their own homes, therefore the spaces can be locked at certain times. Furthermore, a variation in publicness over time allows for route variety.

Smooth sound transition

Because of the network of calm spaces, it is possible to create gradual transitions.

Play with perception

Vegetation and expectation are most important elements to play with perception.

Context

Role in the Urban symphony of Rotterdam

The territories of silence highlight the existing calm atmosphere of the northern part of Rotterdam. The whisperroutes of North show an example how the transition from vibrant to silence works and can be designed for the rest of the northern area.

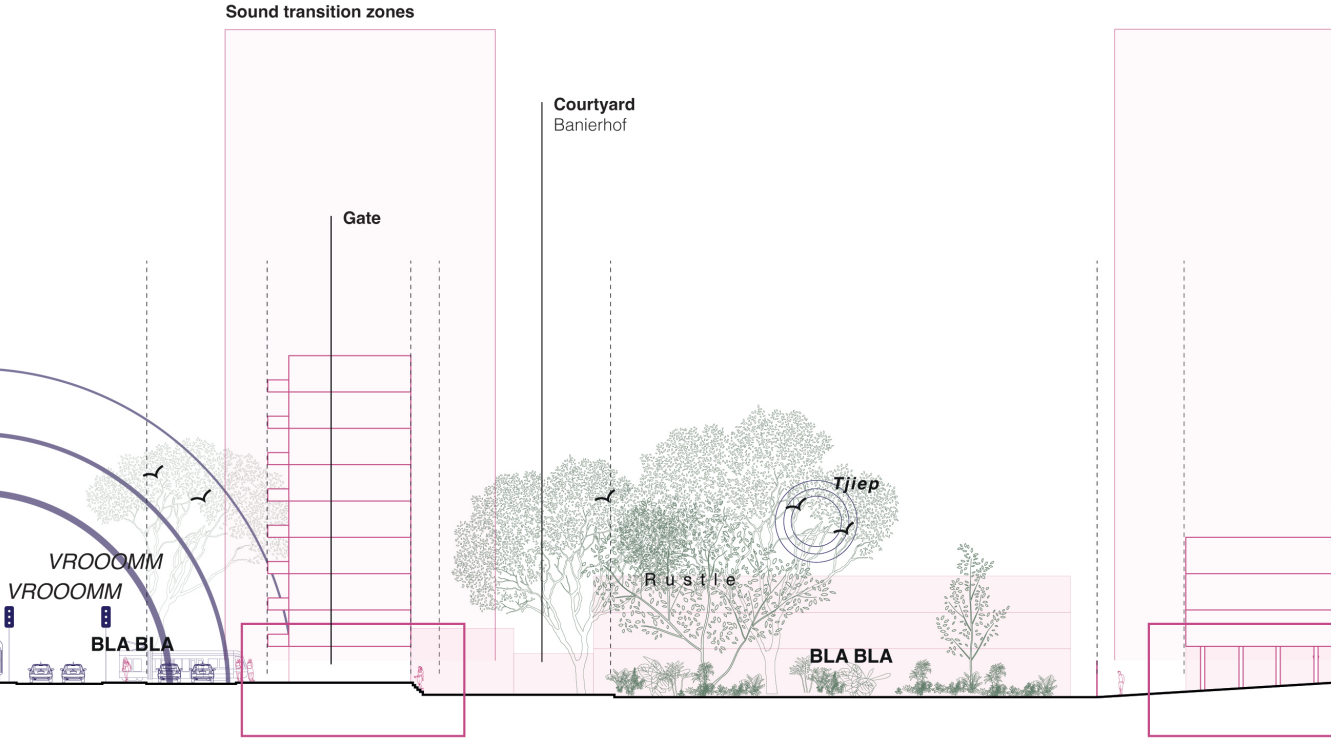
Key notes

Functional identity: Residential environment

Connections: Gates and alleys

Scale

Island-level



53

Strategy Noord (Author, 2022)


Banierhof
18 1/M 32 B




50-54




THEATER
't Kapelletje



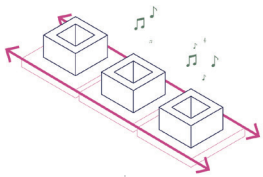


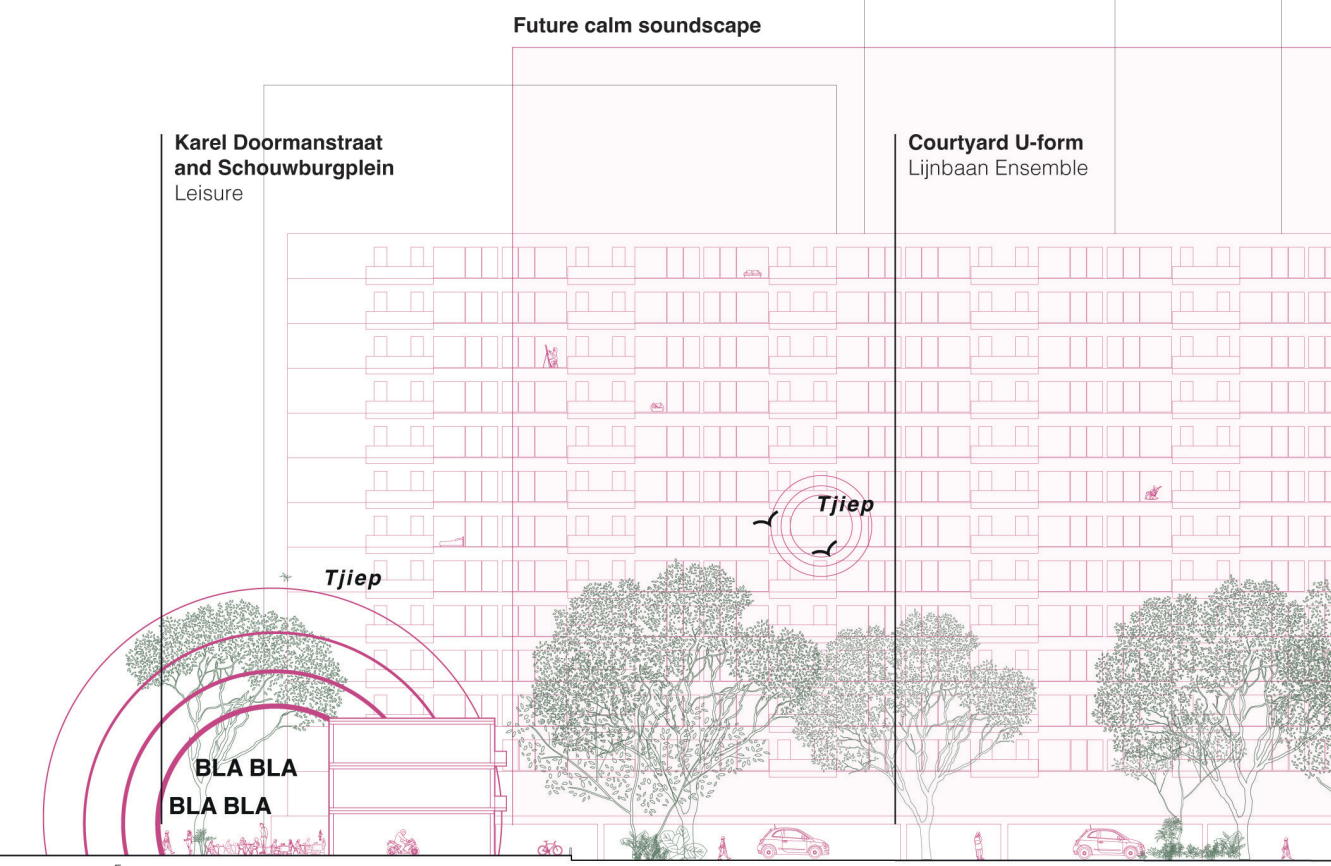


The urban escapes of the city center

The urban escapes in the city center are designed as calm soundscapes within the vibrant sound island. Hereby, I worked with the existing substructure of the expedition streets that connect the (missing) calm soundscapes. The Lijnbaan Ensemble, in between the Schouwburgplein and the Lijnbaan, shows an example how the vision can be implemented.

From page 182 to187, the context of the ensemble, the expedition street towards the ensemble and the ensemble itself are photographed.





Rotterdam city center
Lifely and chaotic atmosphere

Design aims

Access to the hidden spots
The spaces can be visited at every moment.

Smooth sound transition
Due to the loud environment, the transition towards the urban escapes has a high contrast.

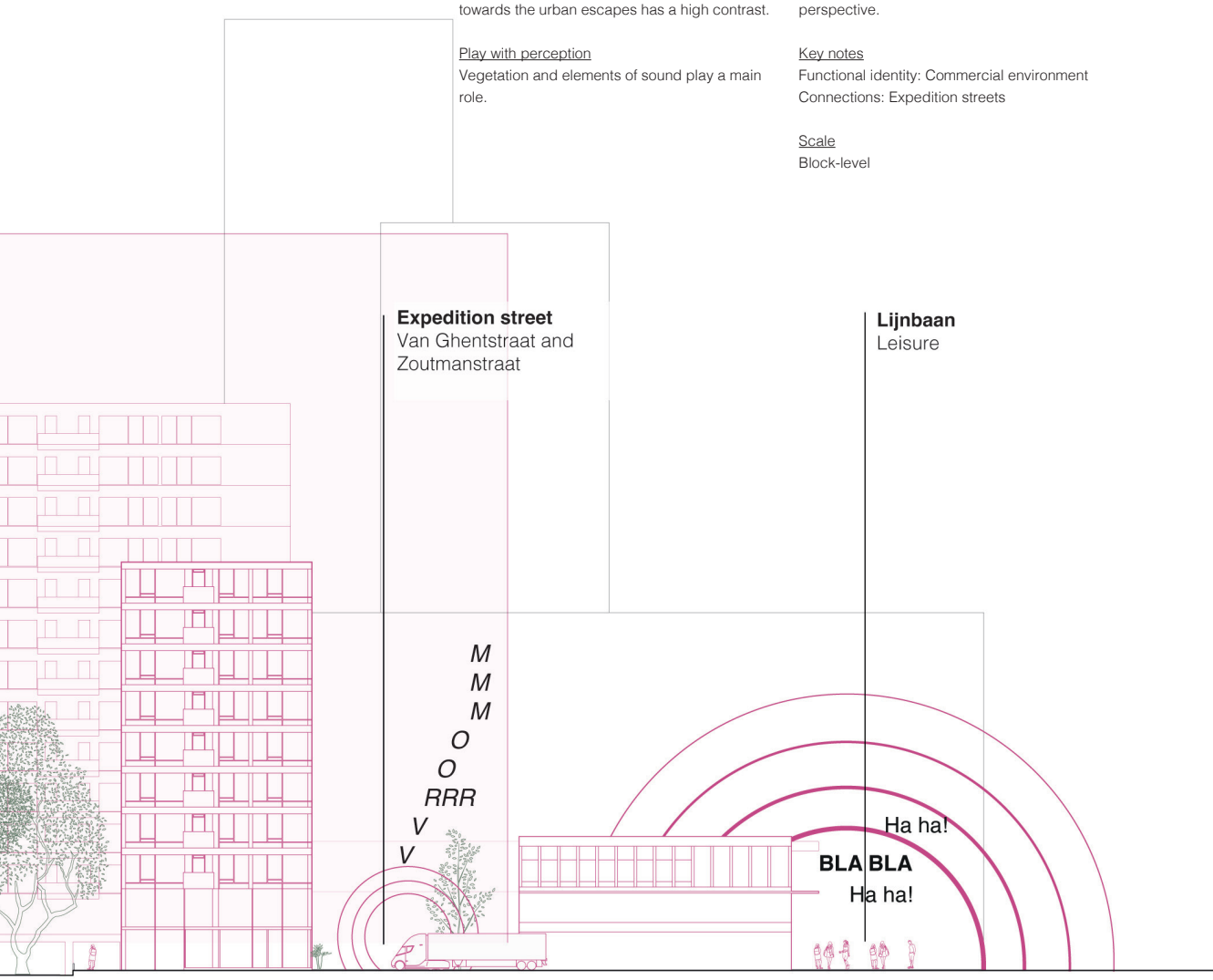
Play with perception
Vegetation and elements of sound play a main role.

Context

Role in the Urban symphony of Rotterdam
The urban escapes show how creating calm spaces can be implemented in very contrasting (lifely and chaotic) atmospheres. The Lijnbaan Ensemble is an example of an utopian sound perspective.

Key notes
Functional identity: Commercial environment
Connections: Expedition streets

Scale
Block-level



54

Strategy City Center (Author, 2022)


Foot Locker


PME LEGEND
CAST IRON
VANGUARD
SKECHERS
OPENING 2022
PME LEGEND






190



Handbook exercise
1 | Work with a clear strategy
The strategy is based on your conclusions. Make sure the strategy for the design location fits into the overal vision and relates to the goal of creating calm soundscapes in order to retreat.

Part 6 | Design

Whisperroutes and urban escapes

Answered subquestions

(DS-01) How can these areas be transformed as a place to retreat?
(DS-02) How do these spaces establish a network of inner soundscapes?

Content of this chapter

6.1 Rotterdam North and her whisperroutes
6.2 The Lijnbaan Ensemble as urban escape
6.3 The power of hidden space

Rotterdam North and her Whisperroutes

The northern area of Rotterdam Central Station contains a high concentration of inward-oriented spaces. Because of the spatial configuration, these spaces function as hidden territories, which, on the one hand, can be seen as a quality. The buildings block the sounds of the surrounding main roads, such as the Schiekade and the Walenburgerweg, which create calm and peaceful spaces on the inside. On the other hand, this quality also has a downside; the spaces are hard to find, unaccessible, unsafe, or underused. Therefore, the acoustic quality on the inside isn't hearable on the outside, thereby creating an absence of awareness. To tackle this, the strategy is to design a whisperroute that focuses on the transitions from the vibrance to the silence and emphasizes the hidden quality of Noord.

Morgen gaan de deuren open
Van de hekken op slot

Om snachts de stilte te bewaren

waar ik hem overdag opzoek.

echo

echo

Hier druissst de echo door openingen

Waar ieder ander omkeren zon.

Ze fluistert tussen [het stadsorkest aan de Schiekade,

nieuwe coupletten en

verborgen parels in].

Het doe weg me

Door slapende achterpaden.

Zoveel stappen en ze zijn

allemaal van mij.

Zelden waren (pauzemomenten)

ZO LUID AANWEZIG

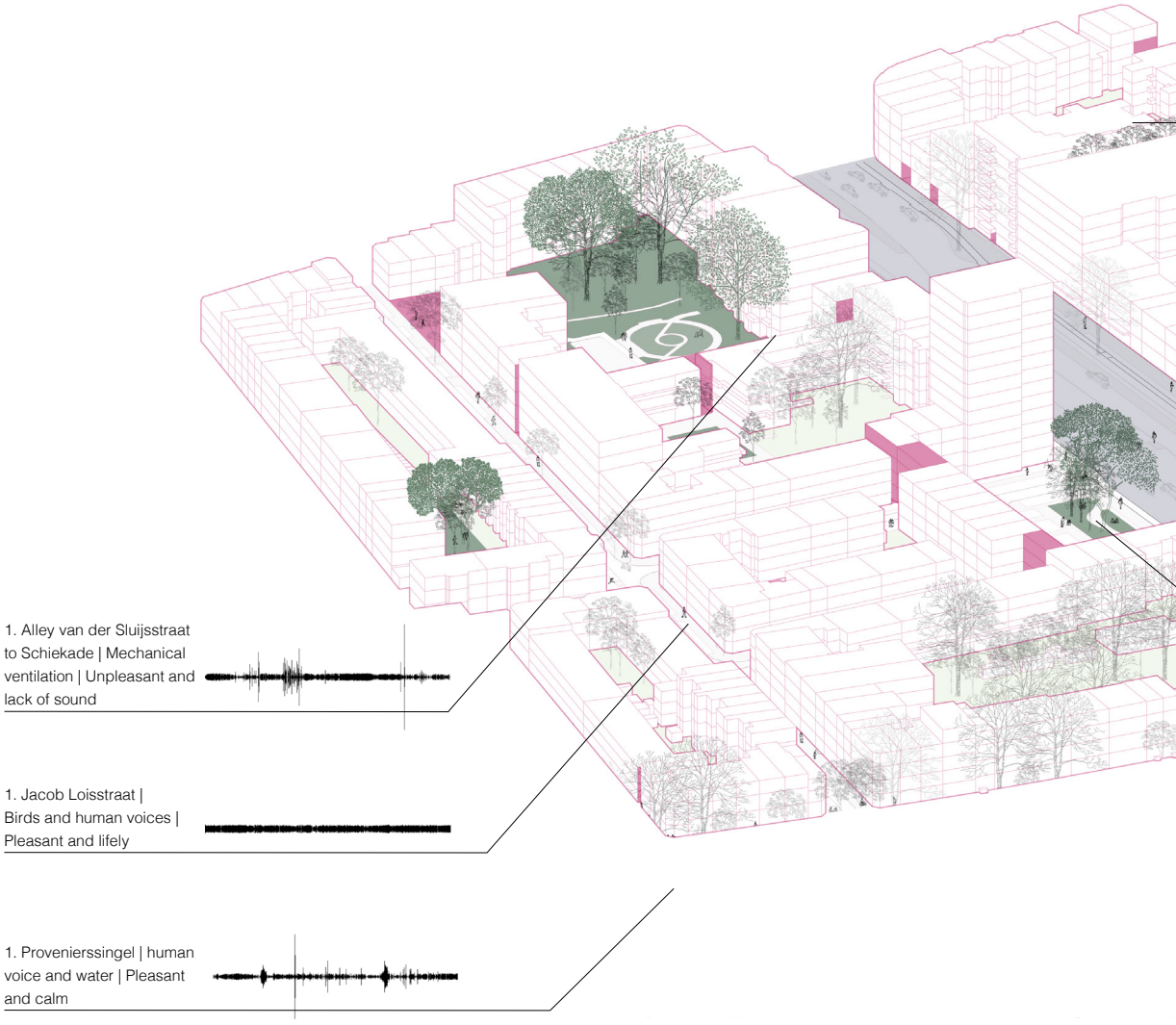
Ze volgen elkaar als route

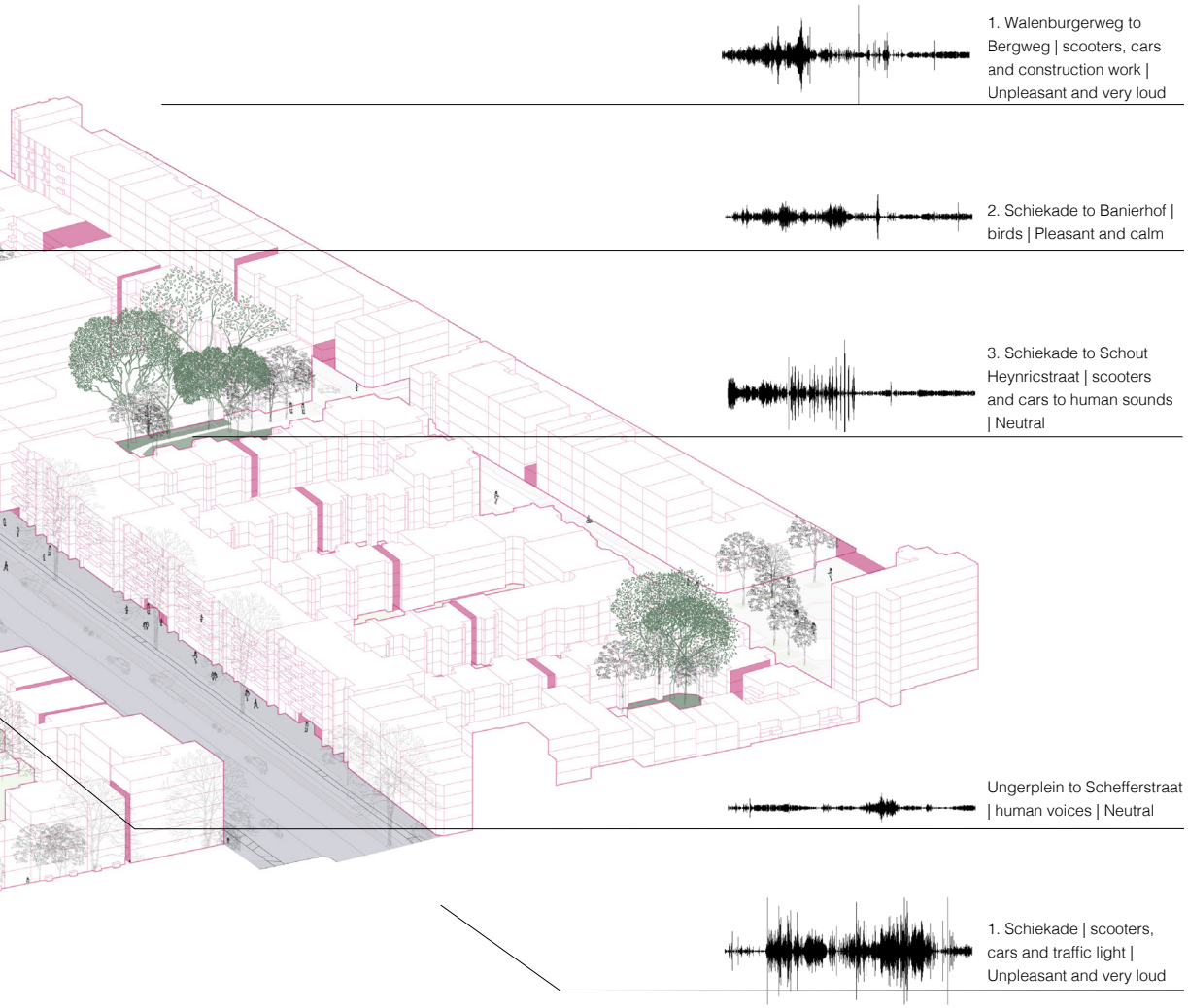
Bouwrij

na

Bouwrij.

Current situation





55

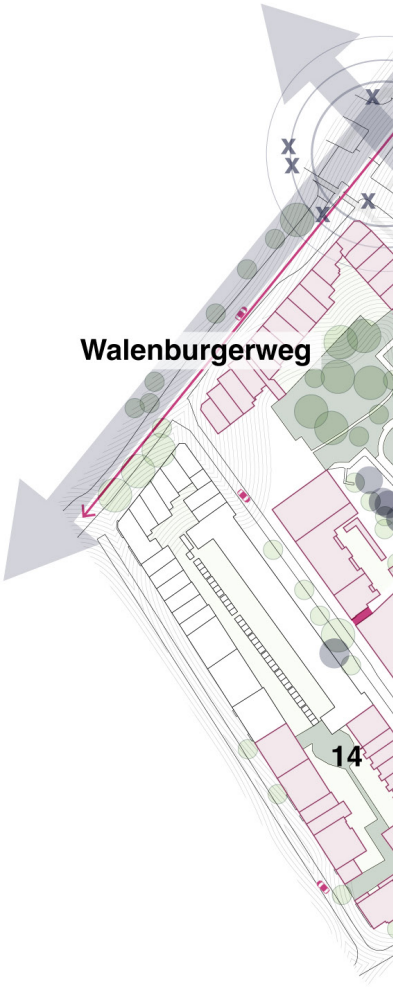
The current situation of the Courtyards of Noord (Author, 2022)

Schiekade
Courtyards
Gates, alleys and parking lots

Inward islands

On the map on the right, all inward-oriented spaces of the northern area are mapped. This area is large enough to explain potential networks and spatial linkages while being small enough to illustrate how this could lead to a route.

However, at this moment, the inner spaces seem to be a patchwork of calm atmospheres instead of a connected substructure. To explain this, I will explain the publicness of the spaces, the sound transitions and the links between them..



01 | Schiekade car court
Function: Car park
Dominant sound: Mechanical
Access: Limited, via driveway

02 | Banierhof
Function: Public courtyard
Dominant sound: Nature
Access: Open, via alley and gate

03 | Banierstraat car court
Function: Car park
Dominant sound: Mechanical
Access: Limited, via alley and gate

04 | Schout Heynricstraat
Function: Court and playground
Dominant sound: Human
Access: Open, via street and alley

05 | Alley Schout Heynricstraat and Paap Dirckstraat
Function: Pedestrian connection and playground
Dominant sound: Human
Access: Open, via alleys

06 | Paap Dirckstraat
Function: Pedestrian street
Dominant sound: Human
Access: Open, via alley

07 | De Banier
Function:Collective garden
Dominant sound: Nature
Access: Limited, via alleys

08 | Meester Marrestraat
Function: Pedestrian street
Dominant sound: Human
Access: Open, via alley

09 | Meester Marrestraat and Vrouw-Jannestraat
Function: Collective garden
Dominant sound: Human and nature
Access: Limited, via alleys and gate

10 | Van der Sluyscourtyardt 1
Function: Car park, playground and collective garden
Dominant sound: Nature
Access: Limited, via parking gates

11 | Van der Sluyscourtyard 2
Function: Collective garden
Dominant sound: Nature
Access: Limited, via homes and gate

12 | Ungerplein
Function: Collective garden and parking area
Dominant sound: Mechanical
Access: Open, via streets

13 | Provenierscourtyard
Function: Collective garden
Dominant sound: Nature
Access: Closed, via private gardens

14 | Onze tuin
Function: Collective alley
Dominant sound: Nature and human
Access: Limited, via gate and private gardens

15 | Jacob Loisstraat
Function: Playground
Dominant sound: Human
Access: Open, via streets



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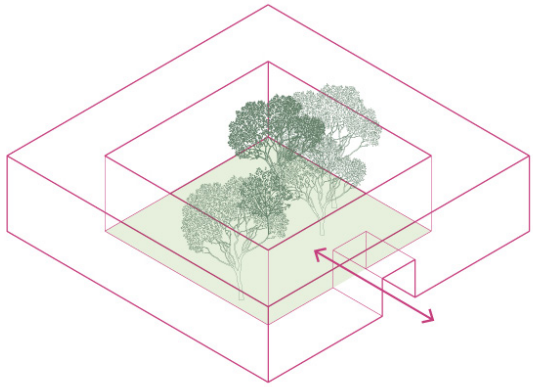
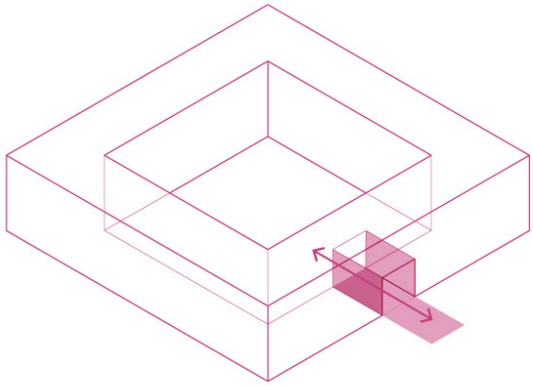
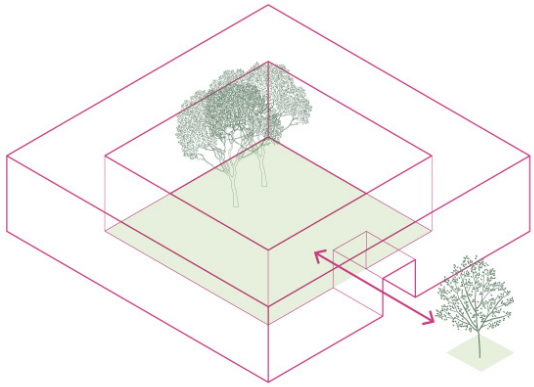
Soundscape of the Schiekade area (Author, 2022).







Approach

Based on the analysis (integrated in the appendix), I decided to take the moments of (sound) transition as the leading element for design. These elements are the entrances of the existing inward-oriented calm atmospheres and play a crucial role in the perception of sound and in the feeling of safety. The gates, alleys, and inward-oriented parking spaces will be redesigned to create a welcoming and gradual transition from public to private and from lively to calm. This will be done in the following three steps.

Step 1	**Draw attention** Use the gates and parking terrains as the physical connection towards the inward-oriented space.
Step 2	**Variety in material** Emphasize sound transition and routing by changing the material or continuing the material.
Step 3	**Seeing green** Improve the perception of space and sound by adding vegetation and making this visible. (Seeing) vegetation increases sounds of nature and the association of a positive perception.

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The strategy for Noord (Author, 2022)

This approach is based on the analysis about the current conditions of noord. The analysis about the publicness of the spaces and the social safety can be found in the appendix.

The new entrances of silence

On the map on the right, you can see the whisperroute of Noord. The intended route is not a straight line from A to B, but instead a concentration of epiphanies. By this, I mean that the value of inward-oriented spaces is realized the moment you hear (or see) them, without needing to take a certain route. The quiet quality can be maintained in this manner. To explain this, I will zoom in to three locations: 1. The gates that form the entrance to the Banierhof, 2. The parking lot that functions as transitions from the Walenburgerweg to the courtyard and 3. the alleys that connect the collective garden in between the Vrouw Jannestraat to Meester Marrestraat.

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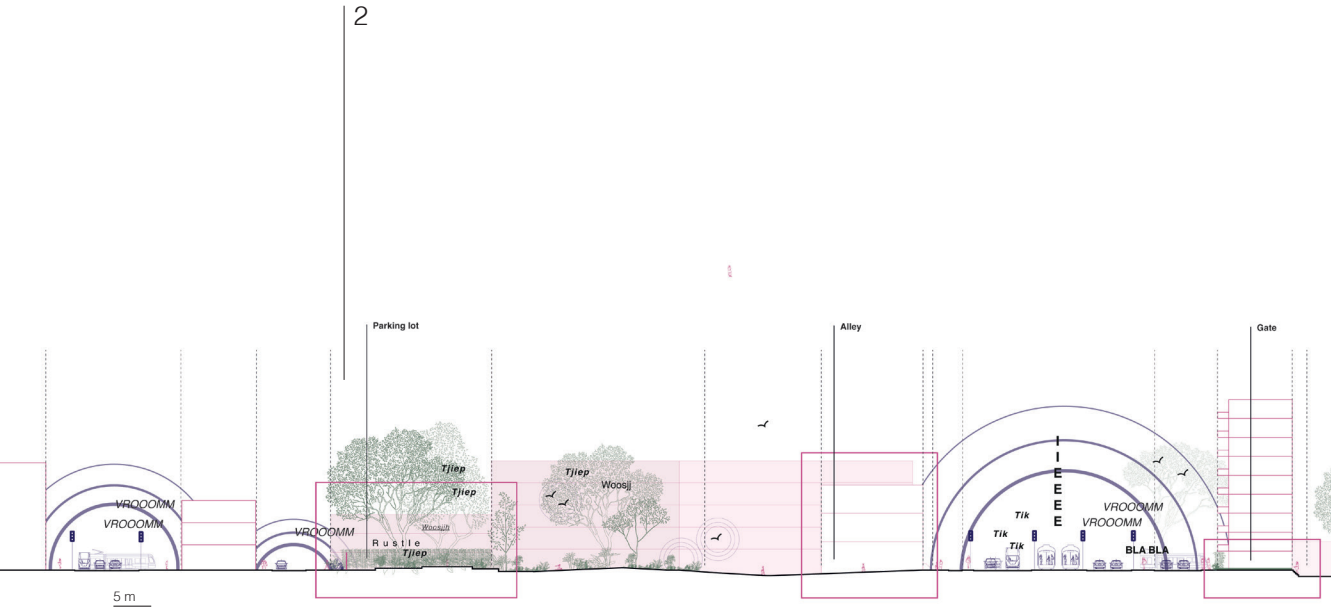
Zoom-in locations final design Noord (Author, 2022)

59

Section of the new entrances in Noord (Author, 2022)



The gate I
Entrance to
Banierhof

The parking lot I
Entrance to
collective garden

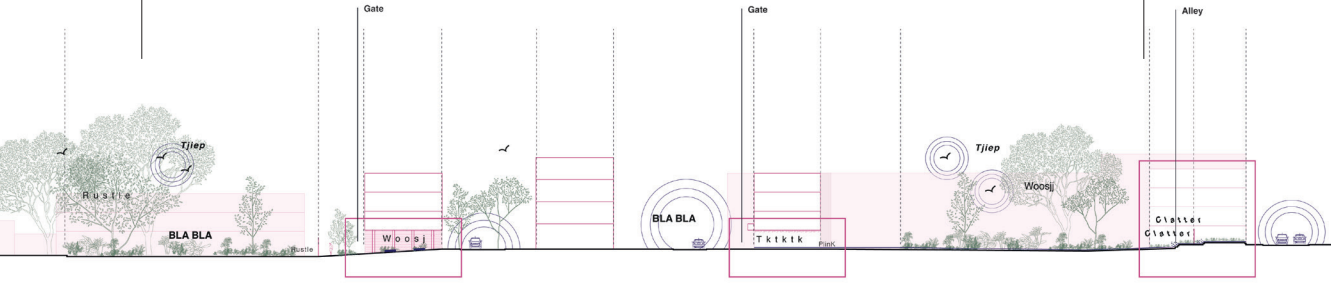
The alley I
Entrance to
collective garden

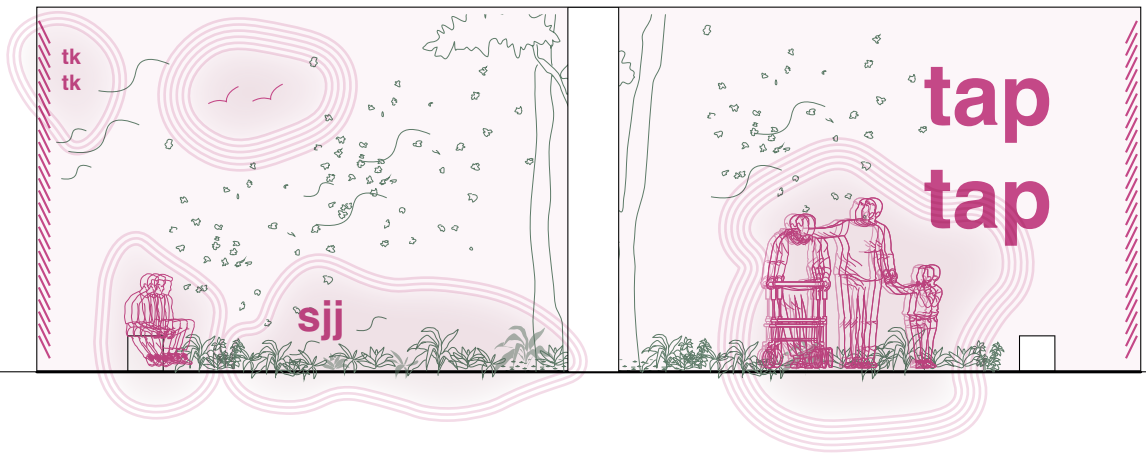
30 m

N

1

3





60

New entrance Banierstraat to Banierhof
(Author, 2022)



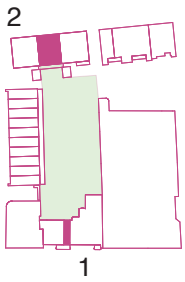
61

New entrance Schiekade to Banierhof
(Author, 2022)

1 m

1 | Transition through the gate

The gates from the Schiekade and the Banierstraat function as the entrances to the Banierhof, a semi-public courtyard that provides access to 10 houses.



1 | The entrance from the Schiekade to the Banierhof is a small gate through a building of 9 stories. Because of the loudness of the Schiekade, the mechanical sounds will remain dominant. Association with calm sounds is therefore leading.

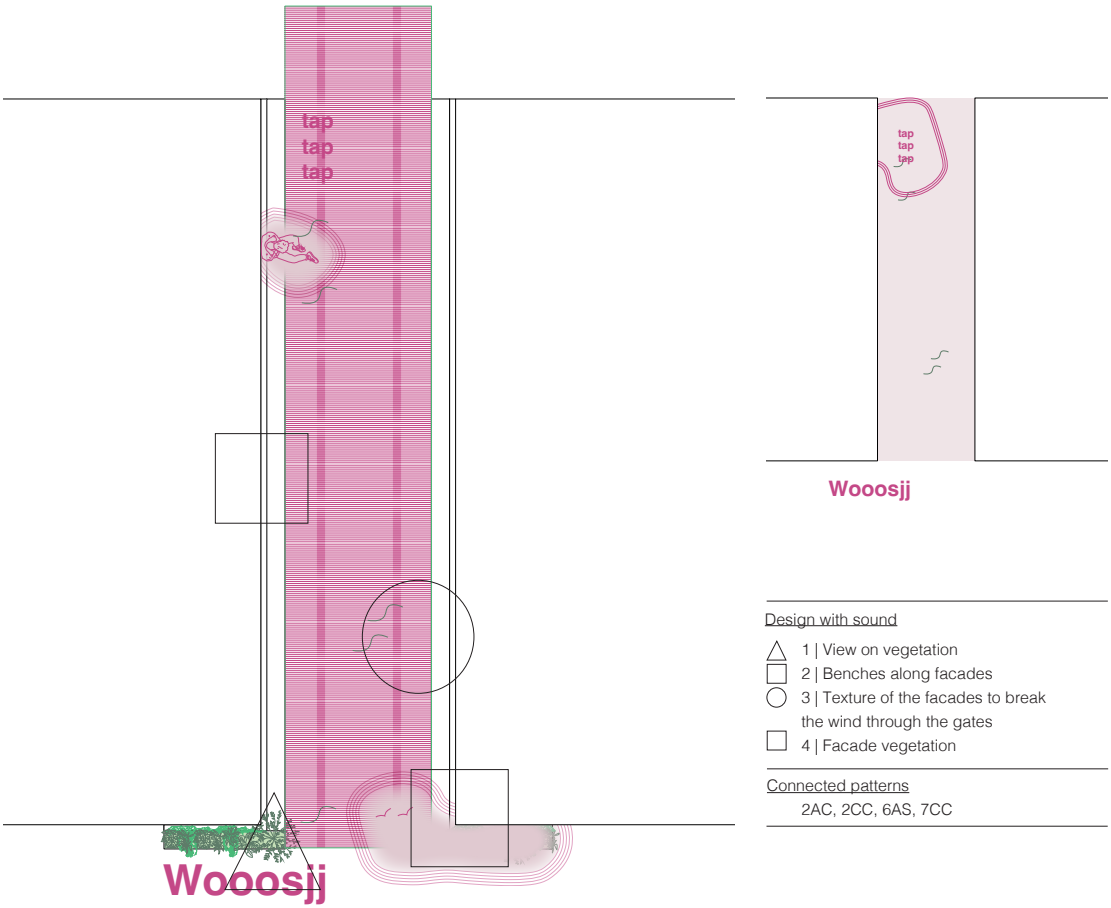
2 | The other entrance offers more opportunities to design with sound; the gate is wider and the building has 4 stories. The wider and lower volume increase the reach of the sounds of nature. In this way, vegetation is part of the transition, and the wind is used as a sound generator.



62

The new transitions (Author, 2022)

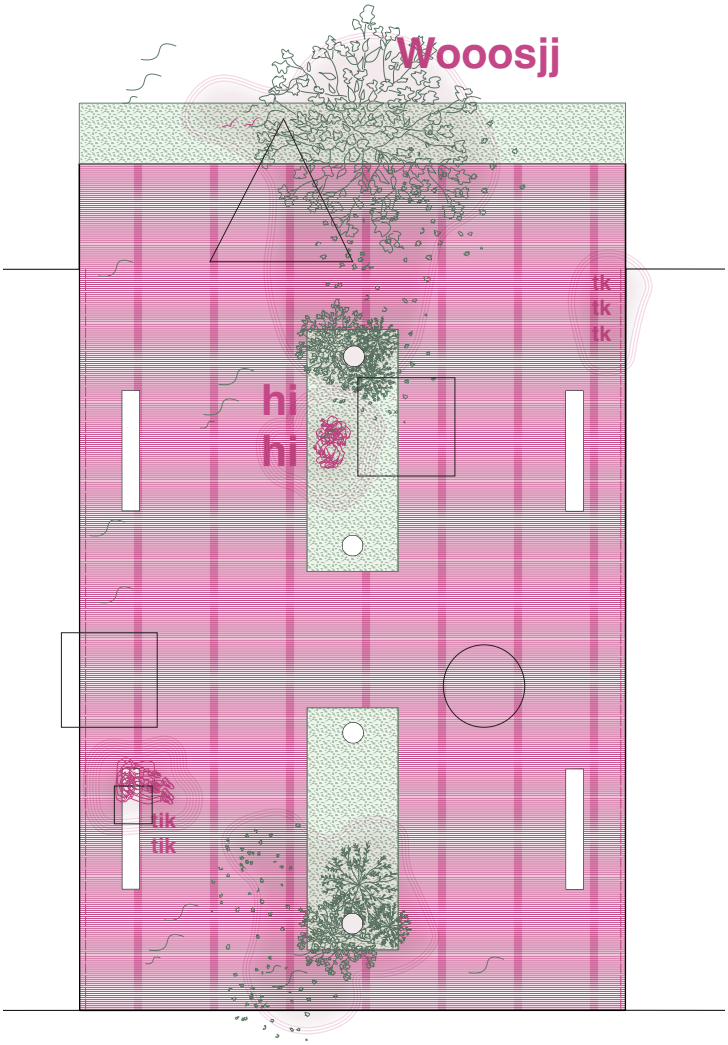
1.1 | Schiekade to Banierhof

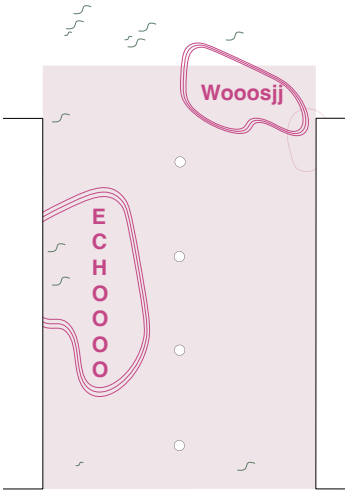


63

Before and after redesigning the gate
Location: From Schiekade to Banierhof
(Author, 2022)

1.2 | Banierstraat to Banierhof





Design with sound

- 1 | View on vegetation
- 2 | Benches
- 3 | Concrete floor
- 4 | Moving facade art
- 5 | Vegetation to attrack sounds of nature

Connected patterns

2AC, 2CC, 6AS, 7CC, 7BP

1 m

64

Before and after redesigning the gate
Location: From Banierstraat to Banierhof
(Author, 2022)



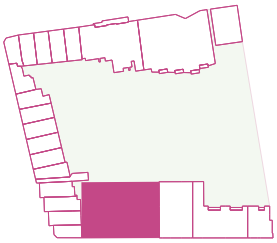
65

New entrance van der Sluysstraat to the courtyard (Author, 2022)

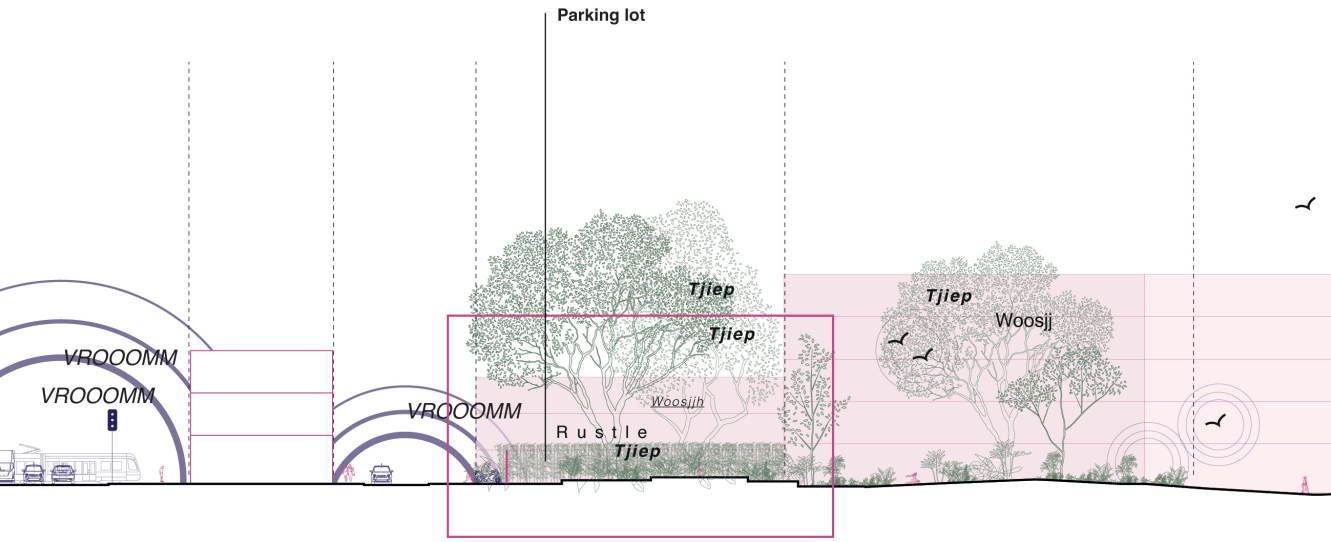
1 m

2 | Transition through the parking lot

The parking lot from van der Sluysstraat/Walenbrugerweg functions as the main entrance to the courtyard. At this moment, people have to cross at least 3 fences to enter this area. With the redesign, there is removed a small part of the parking lot that increases the reach of sounds of nature towards the street and replaces the fences by one clear entrance.



1

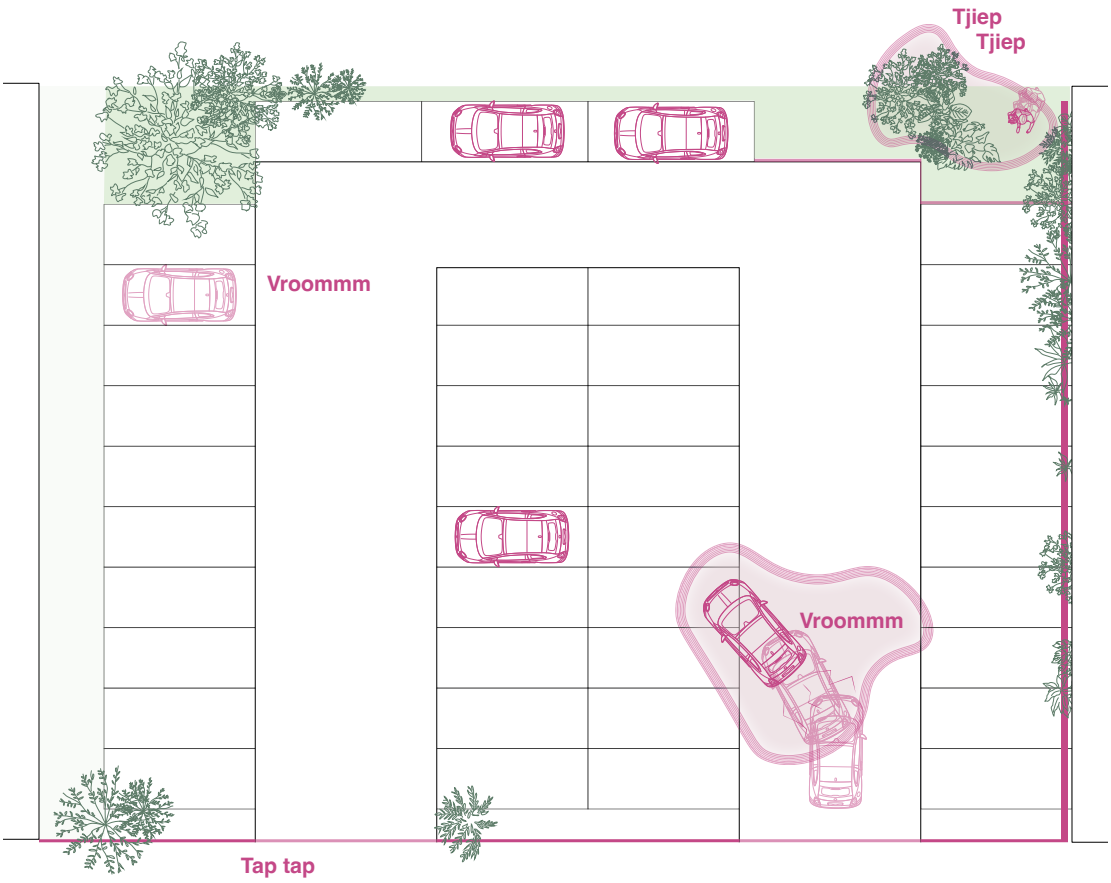


5 m

66

The new transition (Author, 2022)

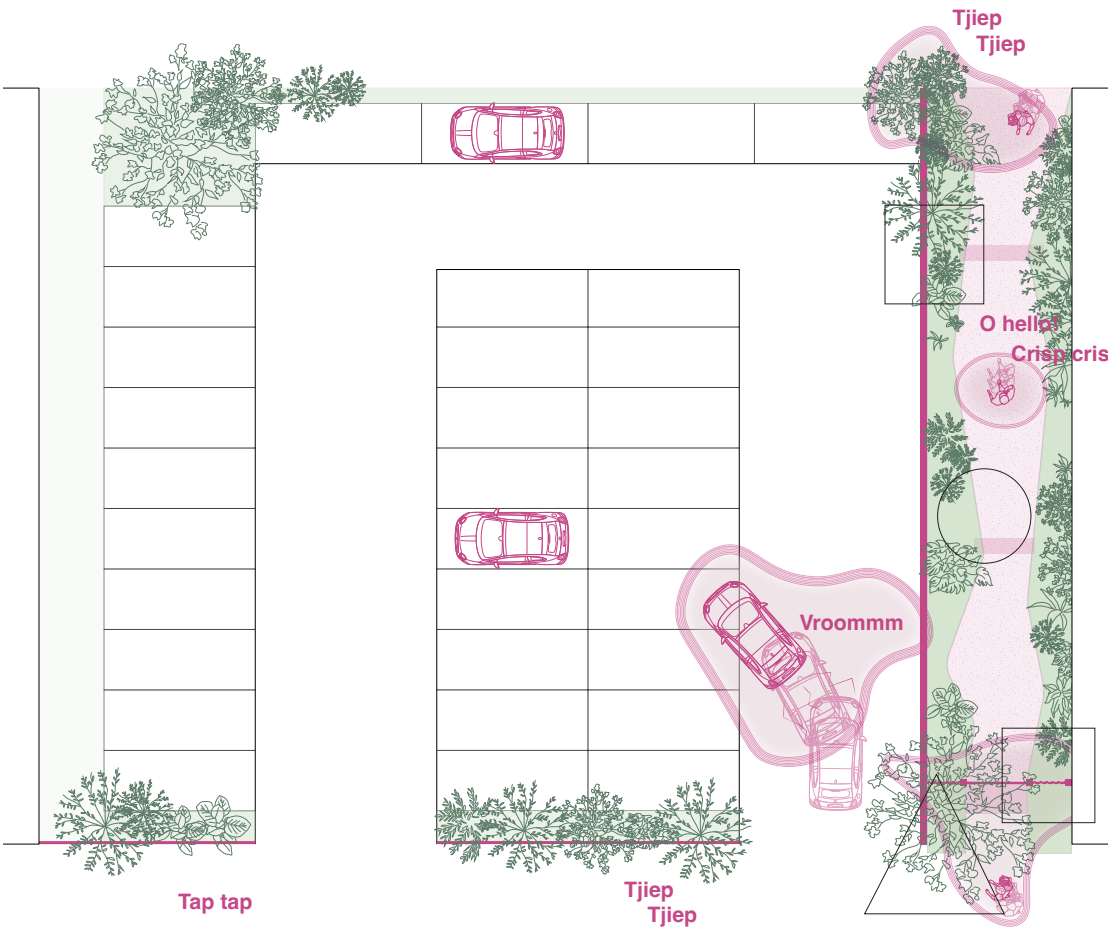
2 | Van der Sluysstraat to courtyard



67

Before redesigning the lot
Location: From van der Sluysstraat to collective garden
(Author, 2022)

1 m



Design with sound

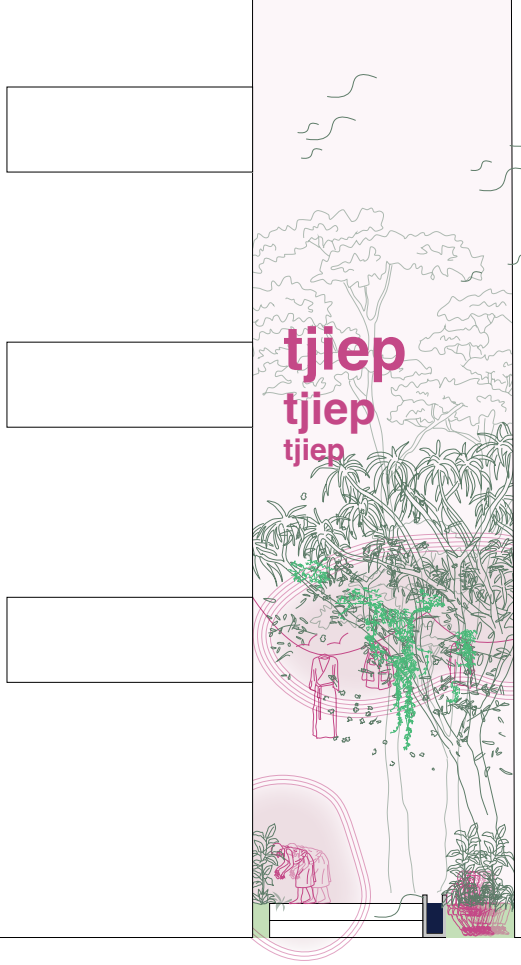
- 1 | Adding a fence
- 2 | Adding a gravel pathway in stead of parking space
- 3 | Extending the vegetation
- 4 | Visible vegetation

Connected patterns

1BC, 1CC, 3AP, 6AS

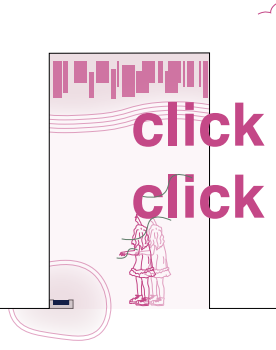
68

After redesigning the lot
Location: From van der Sluysstraat to collective garden
(Author, 2022)



69

The new entrance from the Vrouw Jannestraat to the collective garden (Author, 2022)



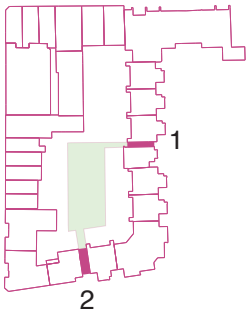
70

The new entrance from the Meester Marrestraat to the collective garden (Author, 2022)

1 m

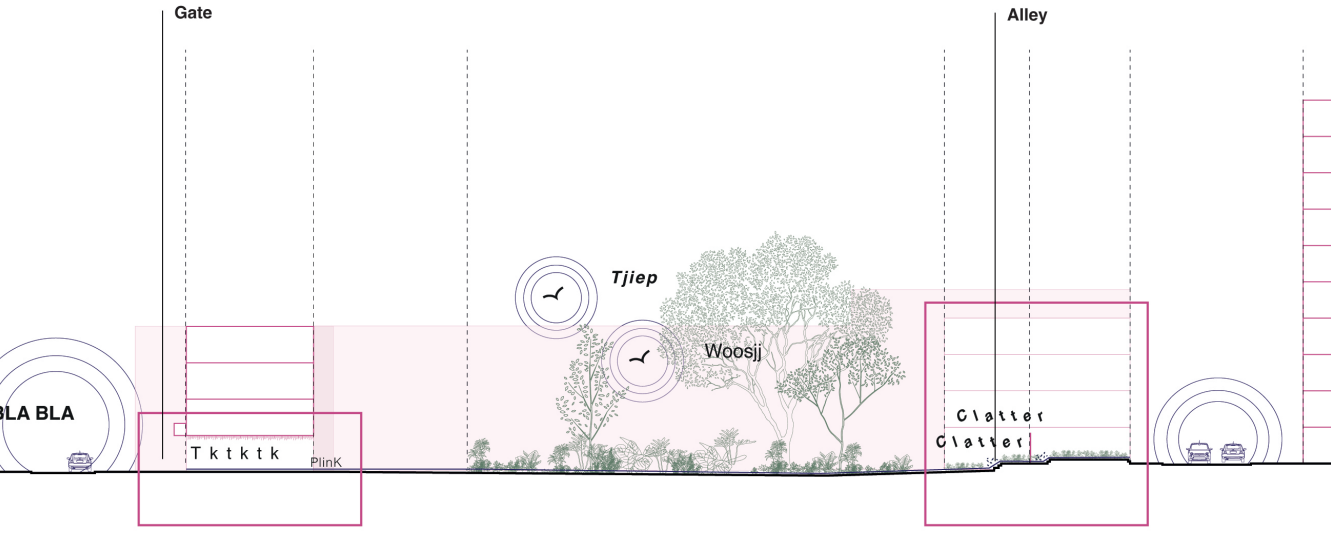
3 | Transition through the alley

The alleys from the Vrouw Jannestraat to Meester Marrestraat are connected by the collective garden in between. This collective garden, adjacent to private gardens, functions as the most private calm soundscape in this design approach.



1 | The Meester Marrestraat is a dead-end street in the urban structure and is mainly used by residents. The access can be closed off and is very small; therefore, the soundtransition mainly focuses on the pavement and the texture of the facade.

2 | The second entrance, the Vrouw Jannestraat, is slightly broader and contains height differences. In that way, it is hard to see the vegetation of the collective zone. This is improved by extending the vegetation and the implementation of height earlier in the transition.

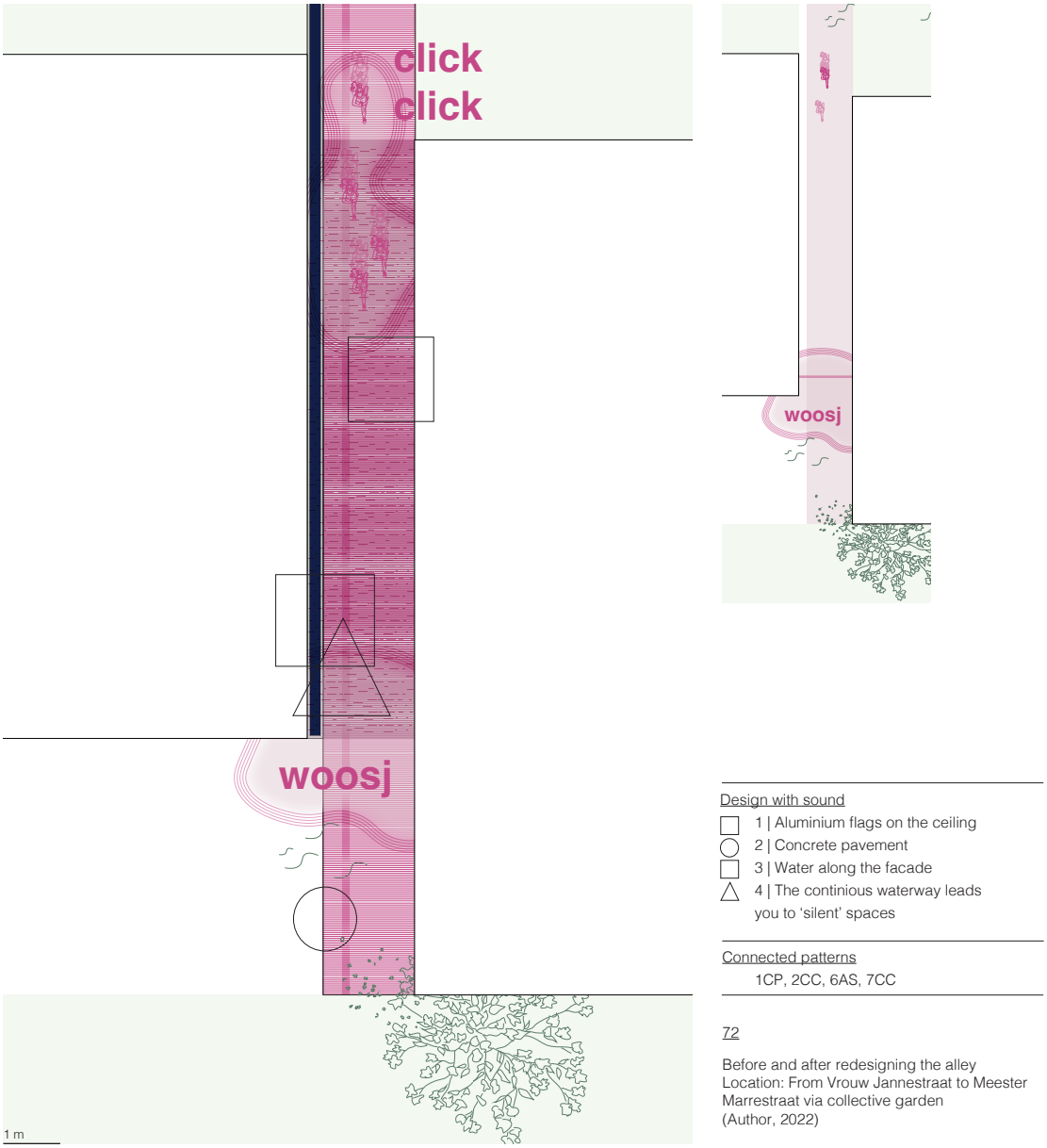


5 m

71

The new transitions (Author, 2022)

3.1 | Meester Marrestraat to collective garden



Design with sound

- 1 | Aluminium flags on the ceiling
- 2 | Concrete pavement
- 3 | Water along the facade
- 4 | The continious waterway leads you to 'silent' spaces

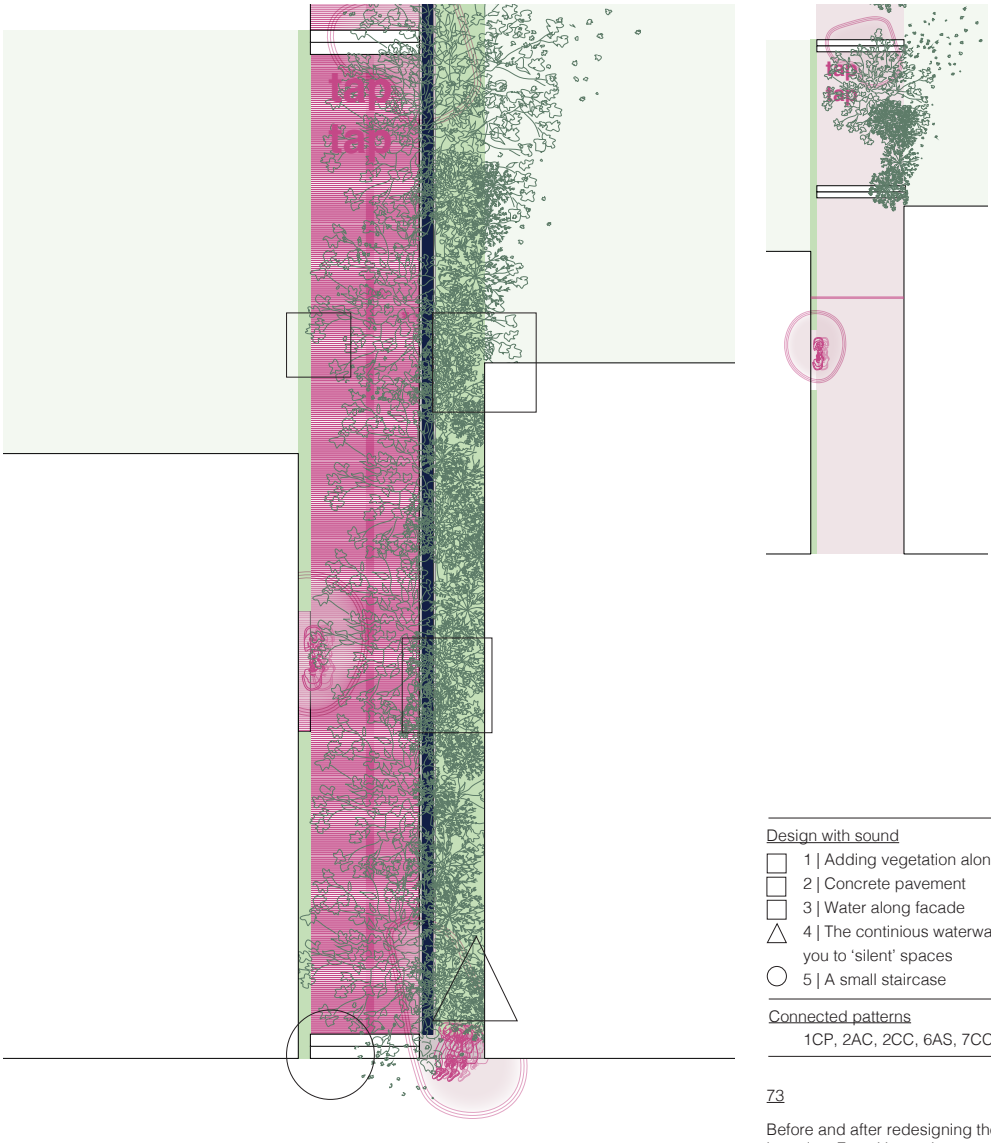
Connected patterns

1CP, 2CC, 6AS, 7CC

72

Before and after redesigning the alley
Location: From Vrouw Jannestraat to Meester Marrestraat via collective garden
(Author, 2022)

3.1 | Vrouw Jannestraat to collective garden



1 m

Design with sound

- 1 | Adding vegetation along facade
- 2 | Concrete pavement
- 3 | Water along facade
- 4 | The continious waterway leads you to 'silent' spaces
- 5 | A small staircase

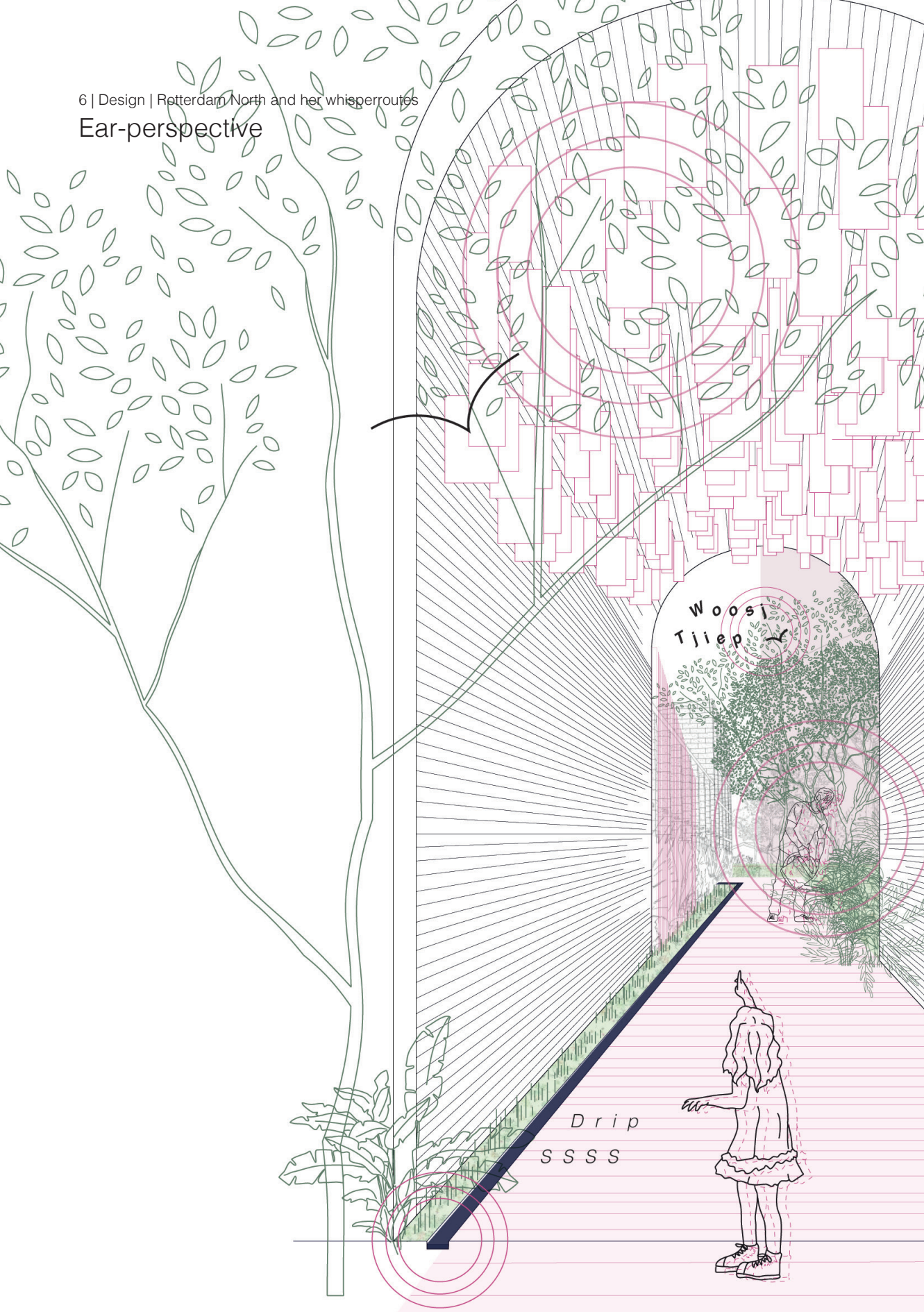
Connected patterns

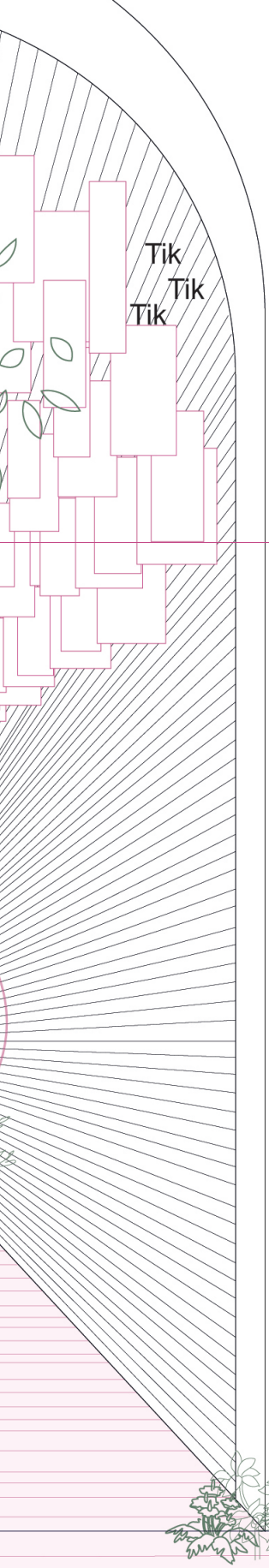
1CP, 2AC, 2CC, 6AS, 7CC

73

Before and after redesigning the alley
Location: From Vrouw Jannestraat to Meester Marrestraat via collective garden
(Author, 2022)

Ear-perspective





Louise Kuijper
38 years old

Visits: Not on purpose
Duration: Varies
Sound perception note: Louise does not have a specific sound recommendation.

The soundscape perception narrative:
'Oh hello! What a coincidence to meet you here. I was just walking with my dog. We like exploring all parts of the city and today I was feeling like walking through the city center. It is so beautiful to see the sun rizing and the city waking up. Here you can observe the changing dynamics very well; the noise just changes from place to place. Sometimes, I see my friend from highschool, Theo, at this place. He still plays the same music, however my dog has more interests in George; his bark is recognizable from far far away. See you somewhere around! Louise'

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Ear-perspective Meester Marrestraat to collective garden (Author, 2022)

The Lijnbaan Ensemble as urban escape

The Lijnbaan ensemble consists of a courtyard of 63 by 88 meters surrounded by multiple buildings. These buildings, differing in height (3, 10, and 14 stories), function as apartments in the luwth of the vibrant shopping street “The Lijnbaan”. The ensemble, designed by architects van den Broek and Bakema, is a known example of the ‘New urban Rotterdam’, a movement that arose after the Second World War. Looking at the spatial configuration, you can see these building blocks as repetitive and rhythmic compositions in the city.

06.00 uur: De ochtendgroep dekt de L
A
D
I
N
G

Achteruit in haar Gepiep
Gepiep

Lade open, deur open
Deur dicht, lade dicht.

Vooruit *en gasssssss*
De vracht blijft achter in
zoem
m
m
mende ventilatoren
en een dichtgeslagen deuren-spel.

Deur open, deur dicht.

Ik kan uren kijken naar het vertrekken
uit vertrekken
maar het duurt maar een kwartier.

De laatste maakt gehaaste passen
Ze gaan op in de AANSTORMENDE MASSA
van dagjesmensen. *Tegendraads flaneren ze in bochtjes*
wapperen met gordijnen van winkelhokjes,
Rinkelen met toonbanken, koffiekopjes,
over(koop)goten met
~~deelscooter~~ -toeters en
~~fiets~~ -bellen.

Als een op hol geslagen
fanfare die verdwijnt
in de spetters van Schouwburgplein
of haar fonteinen.

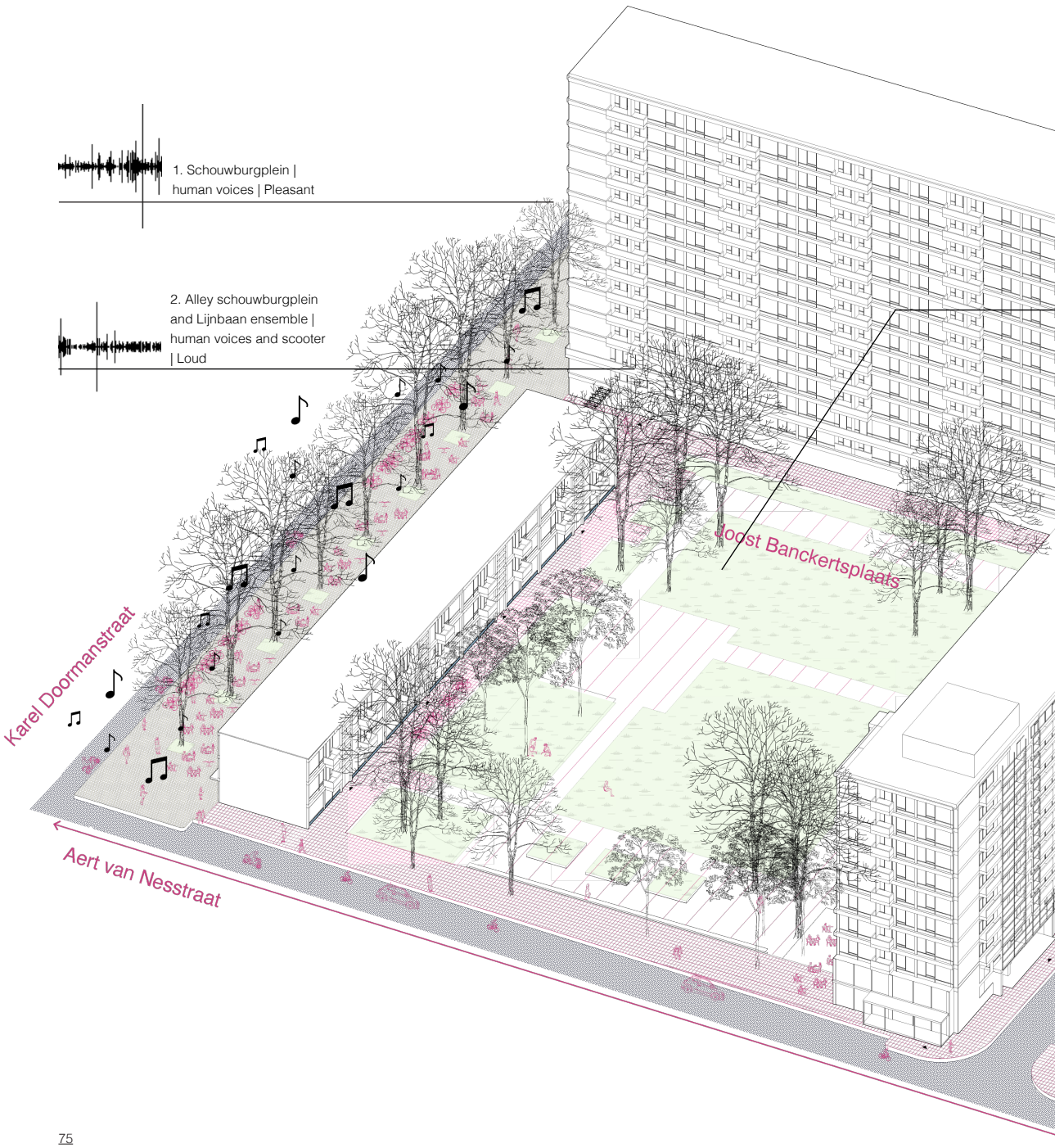
[Daartussen] hoor ik enkel wind door

Bomen, bomen, hoge bomen.

Ze reizen als ontmoetingsplek
voor honden met baasjes,
of jongens met sigaretten.

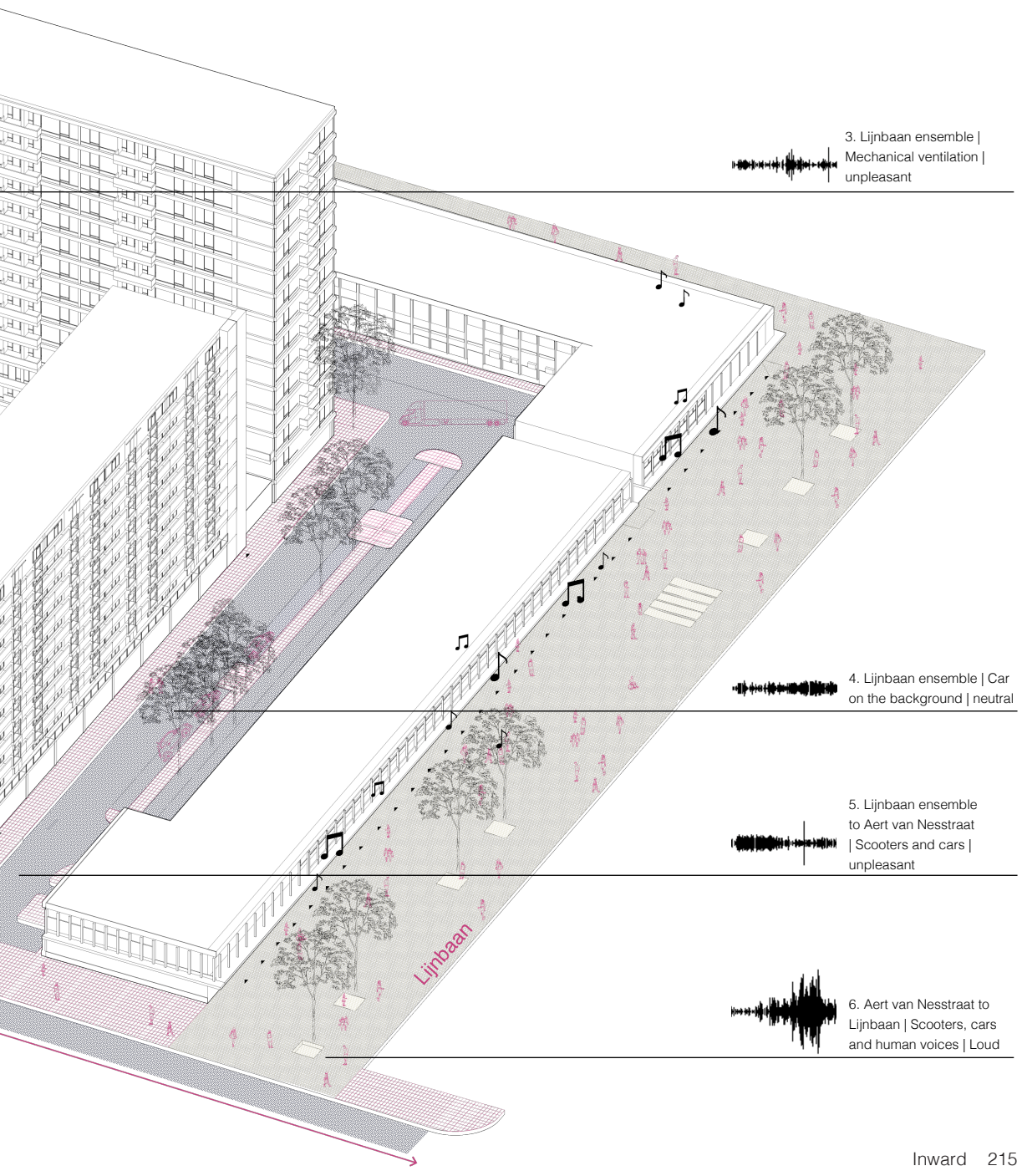
pfffffff
Ze lijken beide uitgelaten.

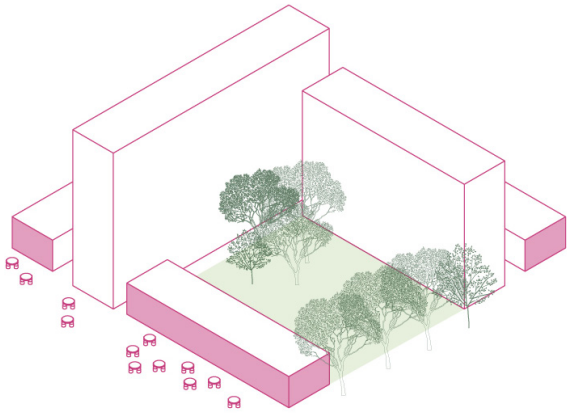
Current situation

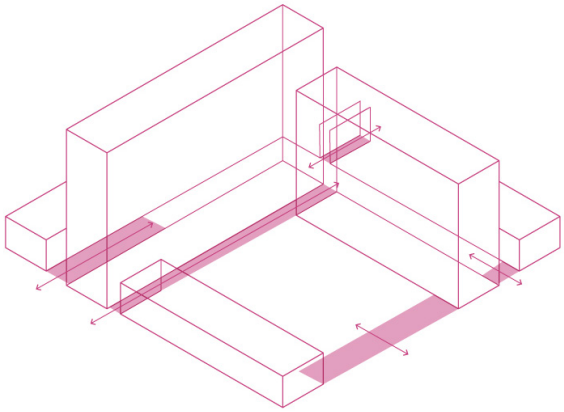


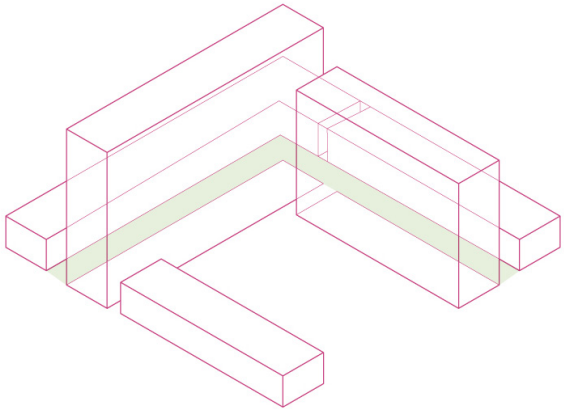
75

The current situation of the Lijnbaan Ensemble
(Author, 2022)


3. Lijnbaan ensemble | Mechanical ventilation | unpleasant
4. Lijnbaan ensemble | Car on the background | neutral
5. Lijnbaan ensemble to Aert van Nesstraat | Scooters and cars | unpleasant
6. Aert van Nesstraat to Lijnbaan | Scooters, cars and human voices | Loud
Lijnbaan







Approach

To design the calm soundscape as an urban escape, we should be aware that the current auditive landscape plays a key role in the lifely landscape and is needed to be maintained. Therefore, the focus lies on contrasting transitions in order to design this calm soundscape. With this in mind, the following aspects are considered the main approaches for the design of the new soundscape.

Step 1 **Current qualities**
Keep existing trees as much as possible and add diversity with new trees. Besides, the functions of the ensemble and the surrounding buildings are maintained. These functions play an important role in the lively atmosphere of the city center.

Step 2 **Connecting atmospheres**
Create connections between sound islands and functional networks. In this way, the (sound) transitions from one atmosphere to the other can be improved.

Step 3 **Sounding dualities**
Use the expedition street as a sub-structure to create a calm network in the city center of Rotterdam.

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Approach diagrams (Author, 2022)

Interested in the design variants and the narratives that belong to this approach? You can find them in the appendix.

The new soundscape

The new calm soundscape is built up by a set of soundelements that create two things: A. the transition from the louder environment to the ensemble and B. the transition between several spaces to retreat within the ensemble.

A. Entrance sound element

1 | The waterwall
The waterwall overrules the sounds of the Schouwburgplein and Karel Doormanstraat. When entering the expedition street, the waterwall is heard immediately and decreases in sound gradually.

2 | The passage
The passage is the gate-through from the Karel Doormanstraat to the expeditionstreet. Because of the detailed roof, the sounds are clustered within the passage and create an echo. In addition, the roof is used as a green garden in order to minimize the reflecting sounds and add a reverberating effect.

6 | The pavillion
The holes in the facade and entrance are the sounding go-throughs. Because the street contains mechanical sounds, these sounds become background sounds in the pavillion. Because of the roof and walls, the direction of the sound is blocked. This creates a humming effect.

8 | The expedition gate
The gate forms the separation between the Aert van Nesstraat and the expedition street. This street can be entered by slow-traffic and destination traffic as well as trucks to supply the shops and residential traffic. This creates a low volume of mechanical sounds, limited by the green environment behind the gate.

B. The space to retreat

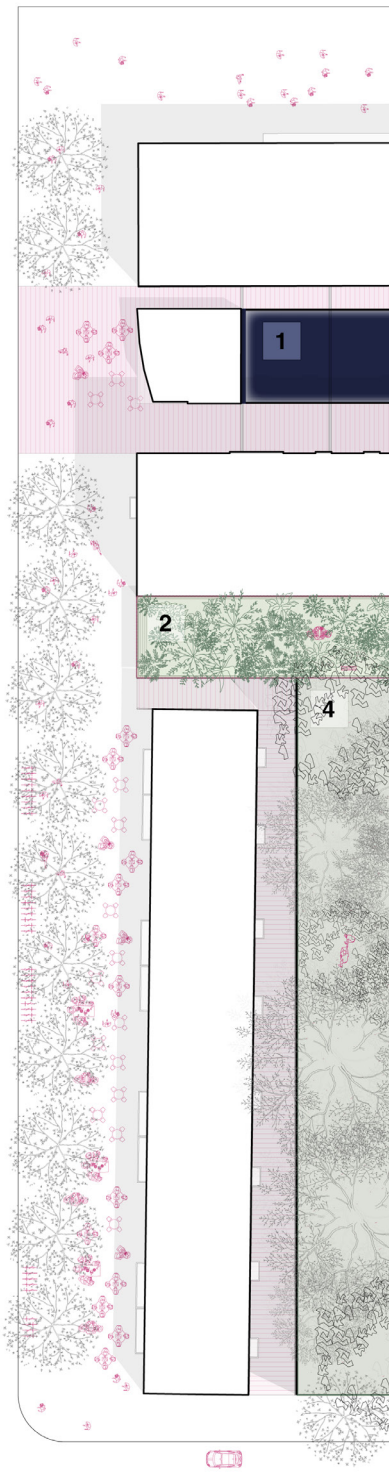
3 | The watersquare
The small waterfountains play a rhythmic sound on top of a tile pathway. This creates a clattery sound on the pavement and is exacerbated when people walk on it. In the evening, these fountains stop in order to get a more peaceful sounding landscape.

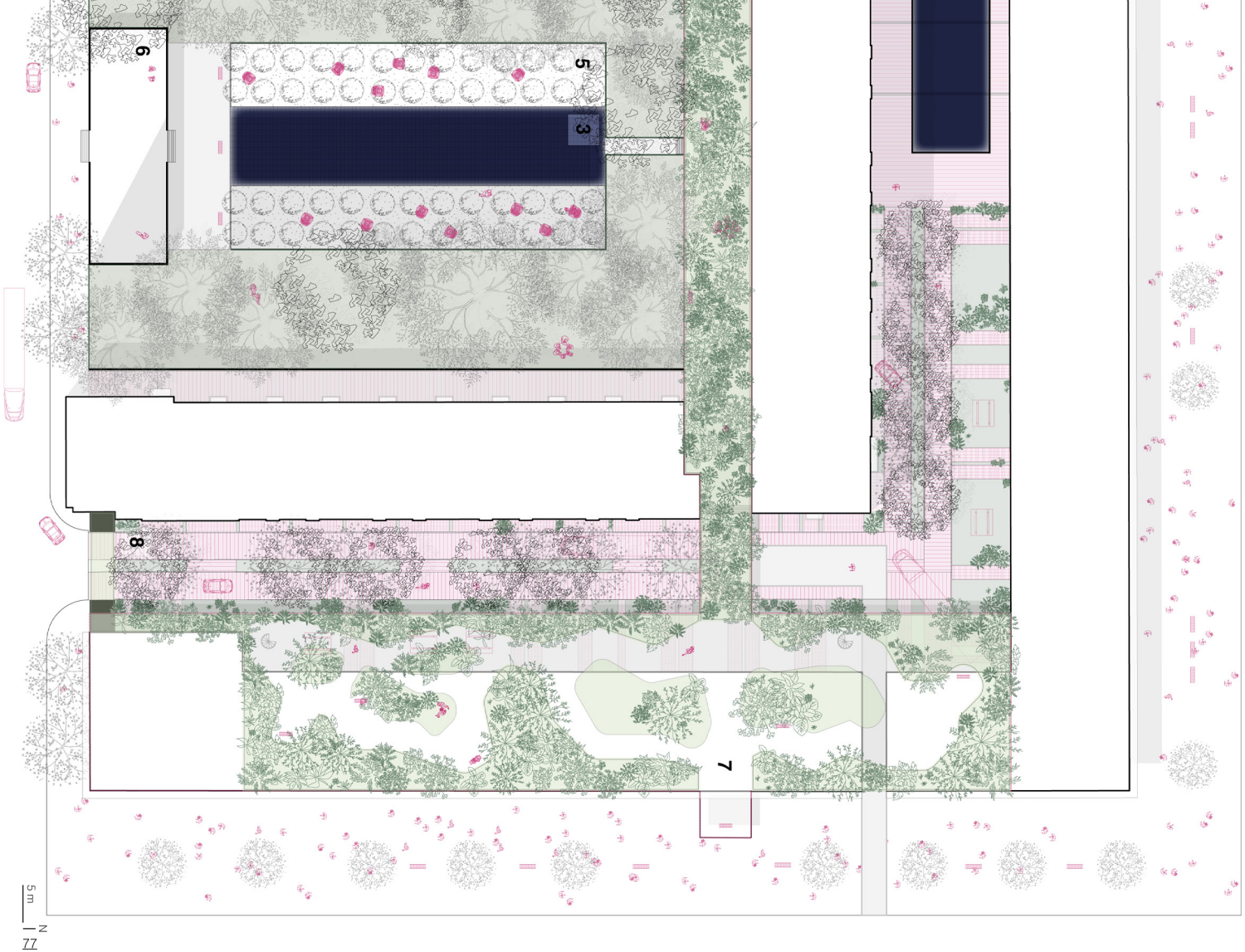
4 | The forest
The forest is a combination of existing trees and newly planted trees. These trees form a tall and dense area, which blocks the surrounding sounds at different height levels. In that way, the residents living upstairs hear fewer sounds from the watersquare and street.

5 | The urban park
The urban park is located in between the forest and watersquare and functions, in sound as well, as a transition zone. When people use the gravel (to walk or to move the chairs), a sound is created. The small trees are a reference to sounds, but they do not block sound.

7 | The rooftop garden
The rooftop garden is situated on top of the Lijnbaan building and functions, partly, as a canopy over the expedition street. This garden is publicly accessible by two stairs and contains a dense green environment, with one exception: the 'soundspot' above the Lijnbaan.

Sounds of nature
Mechanical sounds
Human sounds
Pines and plane trees
Dense vegetation
Grass
Water
Bricks
Concrete
Gravel
Stone





Groundplan Lijnbaanensemble
(Author, 2022)

Soundmarks | A. The space to retreat

01 | The waterwall
Sound: Clattering water
Impact: Overruling
Level of contrast: High
Material: Water, smooth pavement

Design with sound
- ◯ 1 | Blocking sound from Schouwburgpein
- □ 2 | Adding sounds of water
- △ 3 | Water associate with calmness

Connected patterns
1AC, 3CP, 4AC, 4CP

02 | The passage
Sound: Humming echo
Impact: Reflecting
Level of contrast: Low
Material: Concrete pavement and low dense plants on the roof

Design with sound
- ◯ 1 | Blocking sound from surrounding spaces
- ◯ 2 | Emphasizing the direction of sound

Connected patterns
1CP, 5AC, 6CC

06 | The pavillion
Sound: Humming echo
Impact: Overruling
Level of contrast: Medium
Material: Bricks | Block pattern with shifting holes in it.

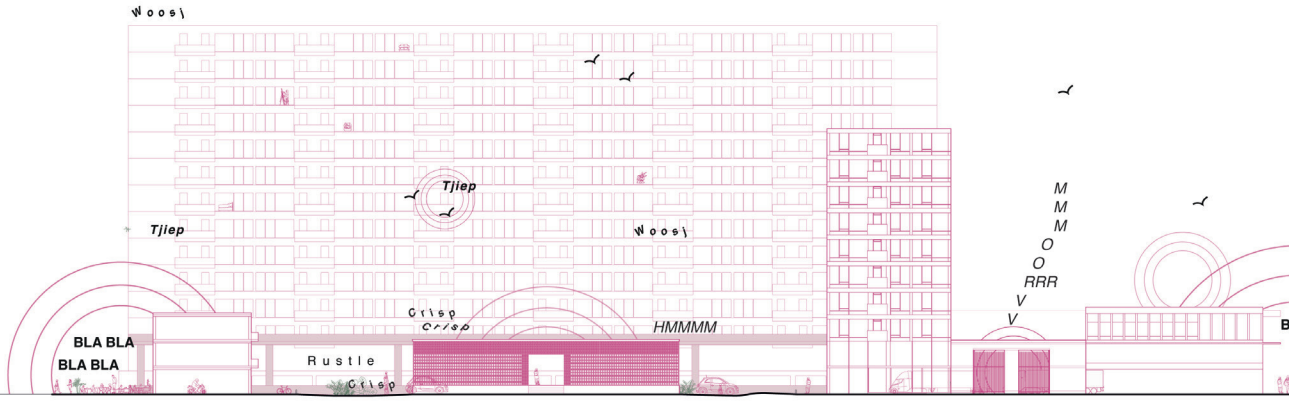
Design with sound
- ◯ 1 | Blocking sound by its building volume
- ◯ 2 | Emphasizing echo

Connected patterns
4BP, 6CC, 7AS

08 | The expedition gate
Sound: No sound
Impact: Demping, blocking
Level of contrast: High
Material: Steel and bricks

Design with sound
- ◯ 1 | Blocking sound by its fence and wall
- □ 2 | Adding sound by opening the fence

Connected patterns
1AC, 2CC, 4CS



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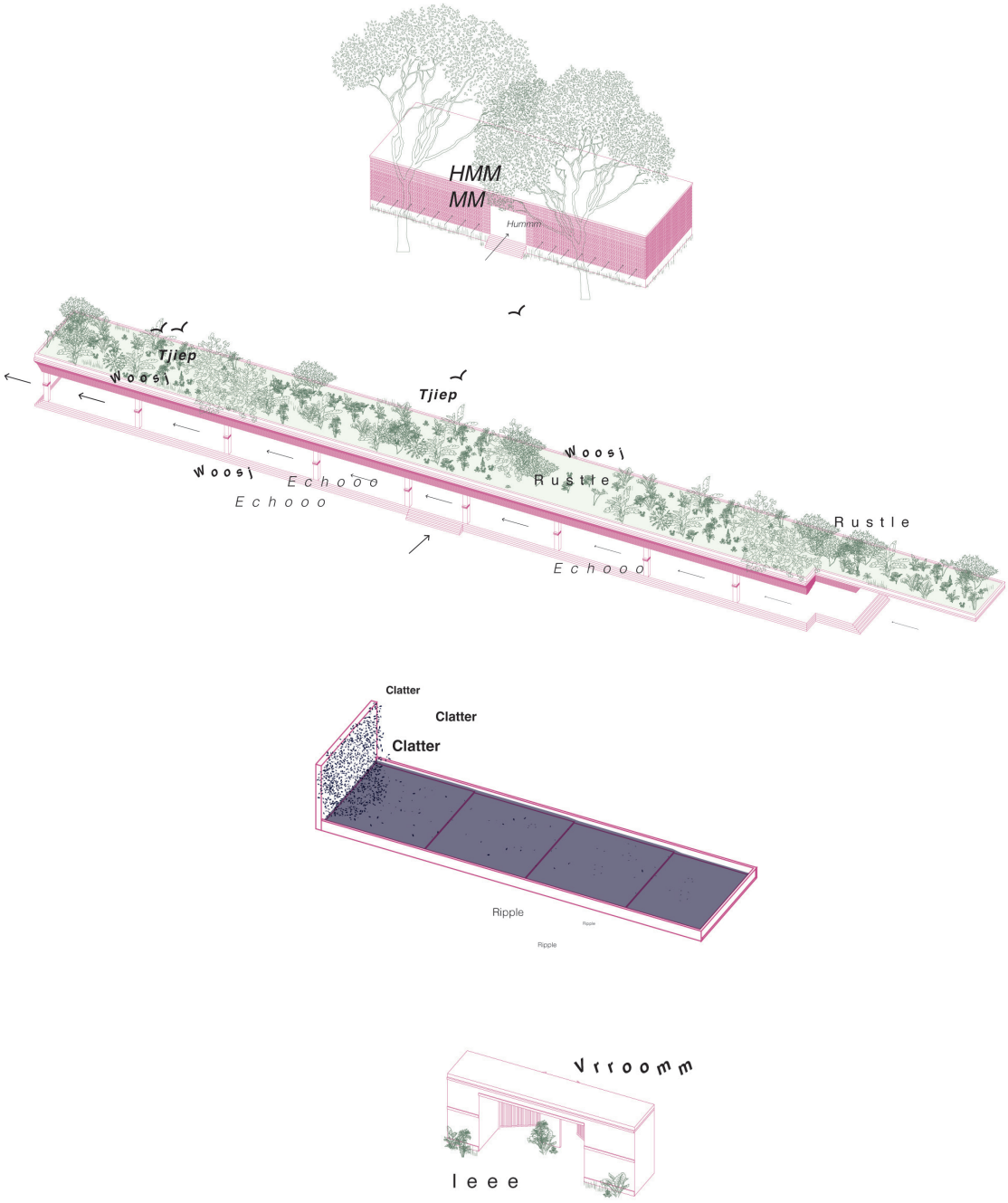
Entrance elements (Author, 2022)



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Entrance elements (Author, 2022)

Soundmarks | B. Other sound transitions

03 | The watersquare
Sound: Sound of calm water
Impact: Stimulating
Level of contrast: High
Material: Water sprinklers, tile.

Design with sound
- □ 1 | Adding sounds of water by sprinklers
- △ 2 | Emphasizing material by walking on the wet surface

Connected patterns
1CC, 3BP, 7AS, 7BP

04 | The forest
Sound: Foggy
Impact: Demping, absorbing
Level of contrast: Low
Material: Dense tall trees: pine trees and plane trees

Design with sound
- ○ 1 | Blocking sound by height of the trees
- □ 2 | Adding sounds by attracking animals
- △ 3 | Assocation of calmness

Connected patterns
5AC, 6AS, 7CC

05 | The urban park
Sound: Crackling
Impact:Reverberation
Level of contrast: High
Material: Gravel, vegetation and small trees

Design with sound
- □ 1 | Creating sound by gravel
- □ 2 | Creating sound by moving chairs
- △ 3 | Association of control by using chairs

Connected patterns
4BP, 5AC, 6AS

07 | The rooftop garden
Sound: Sounds of nature
Impact: Reverberation
Level of contrast: High
Material: Wooden chips, concrete and diverse low to high vegetation

Design with sound
- ○ 1 | Blocking sound by vegetation
- □ 2 | Adding sound animals
- △ 3 | Emphasizing sound (seating point)

Connected patterns
1AC, 2AC, 6BC, 7BP



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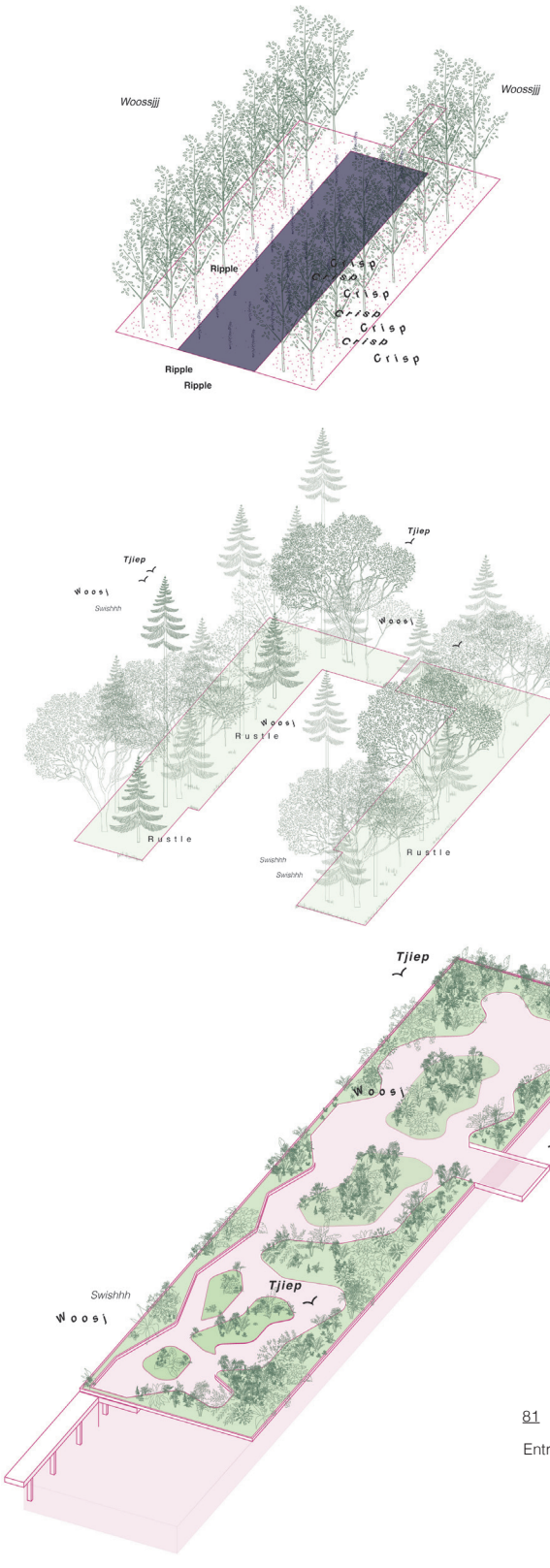
Entrance elements (Author, 2022)



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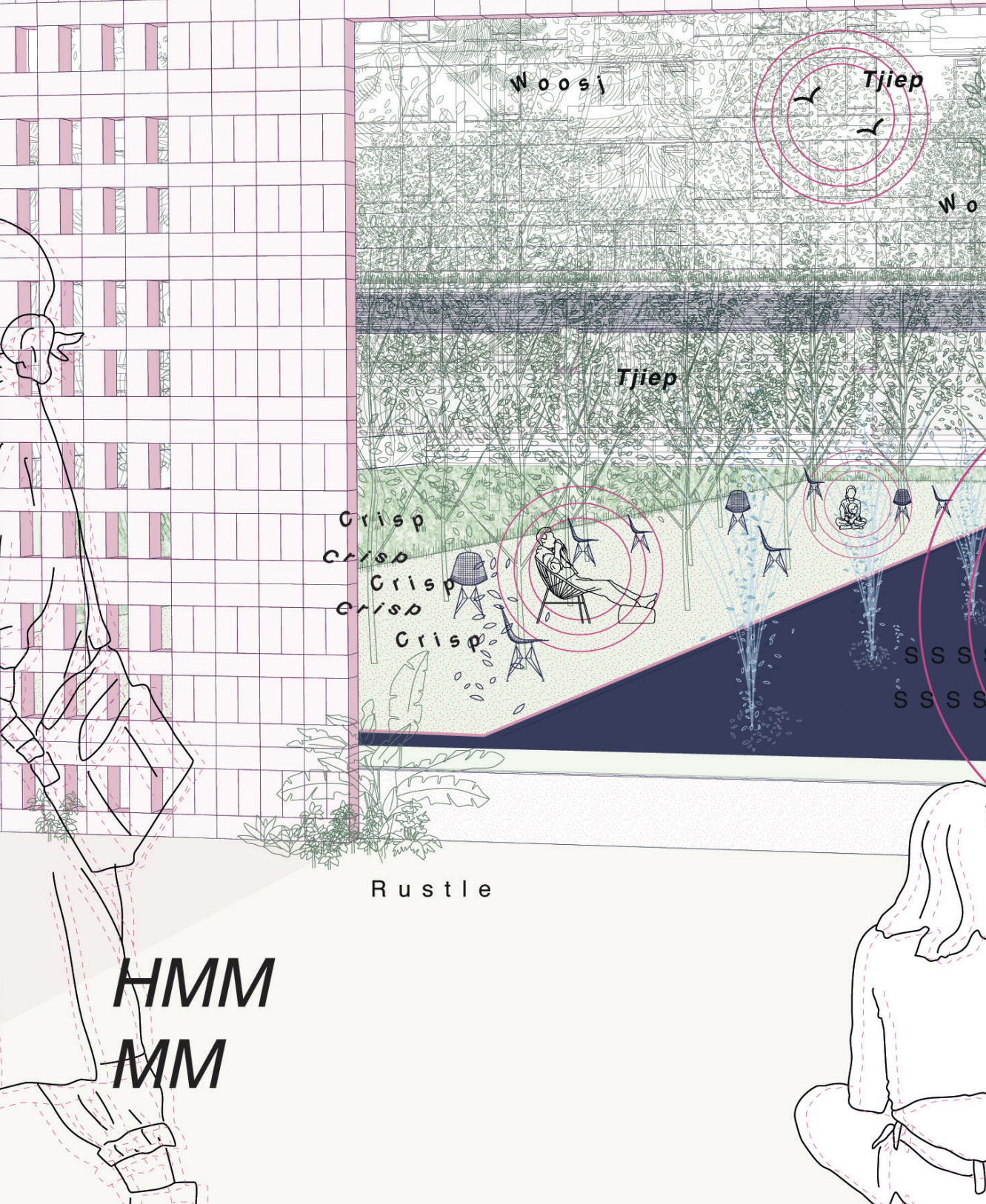
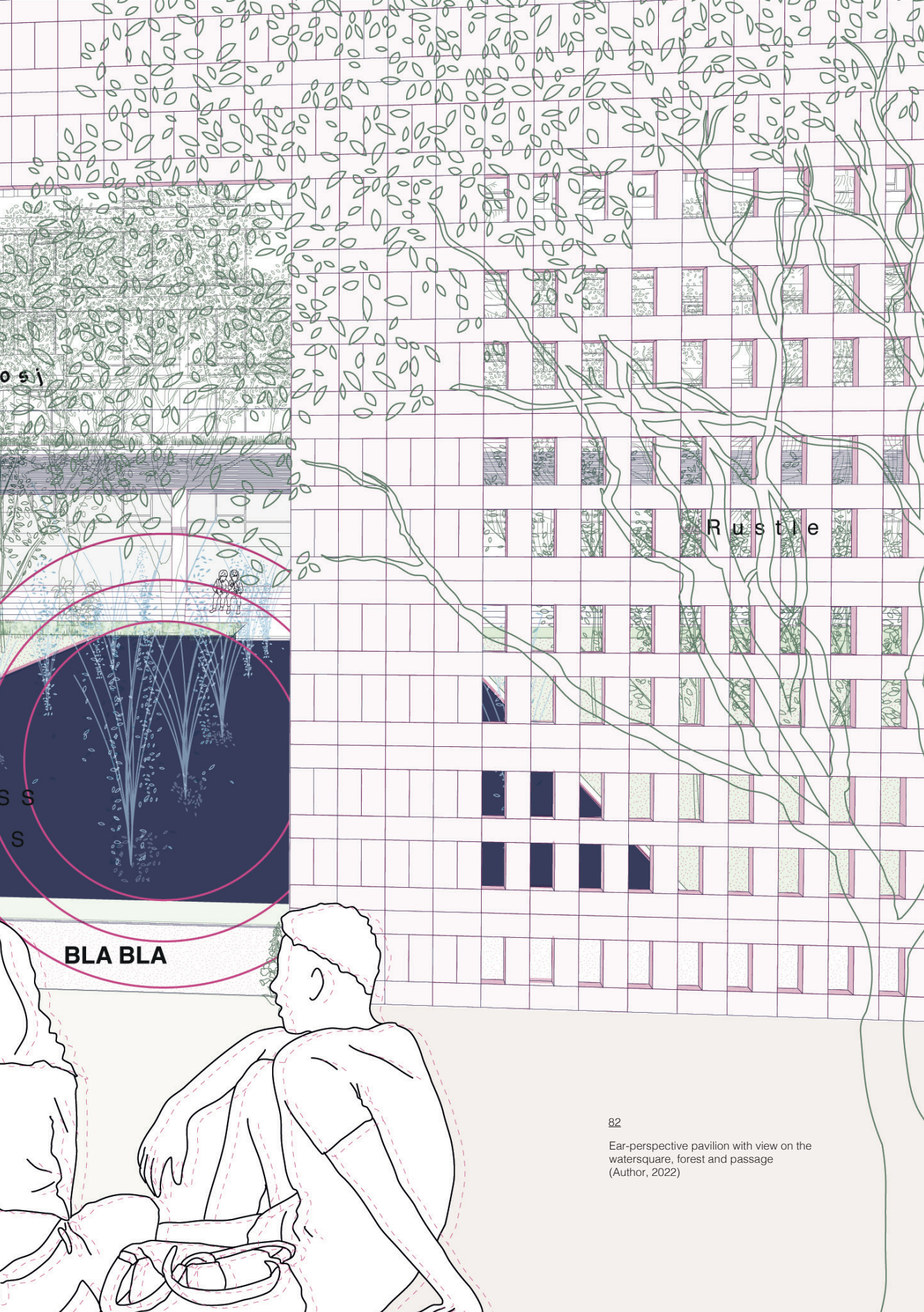
Entrance elements (Author, 2022)

Ear-perspective





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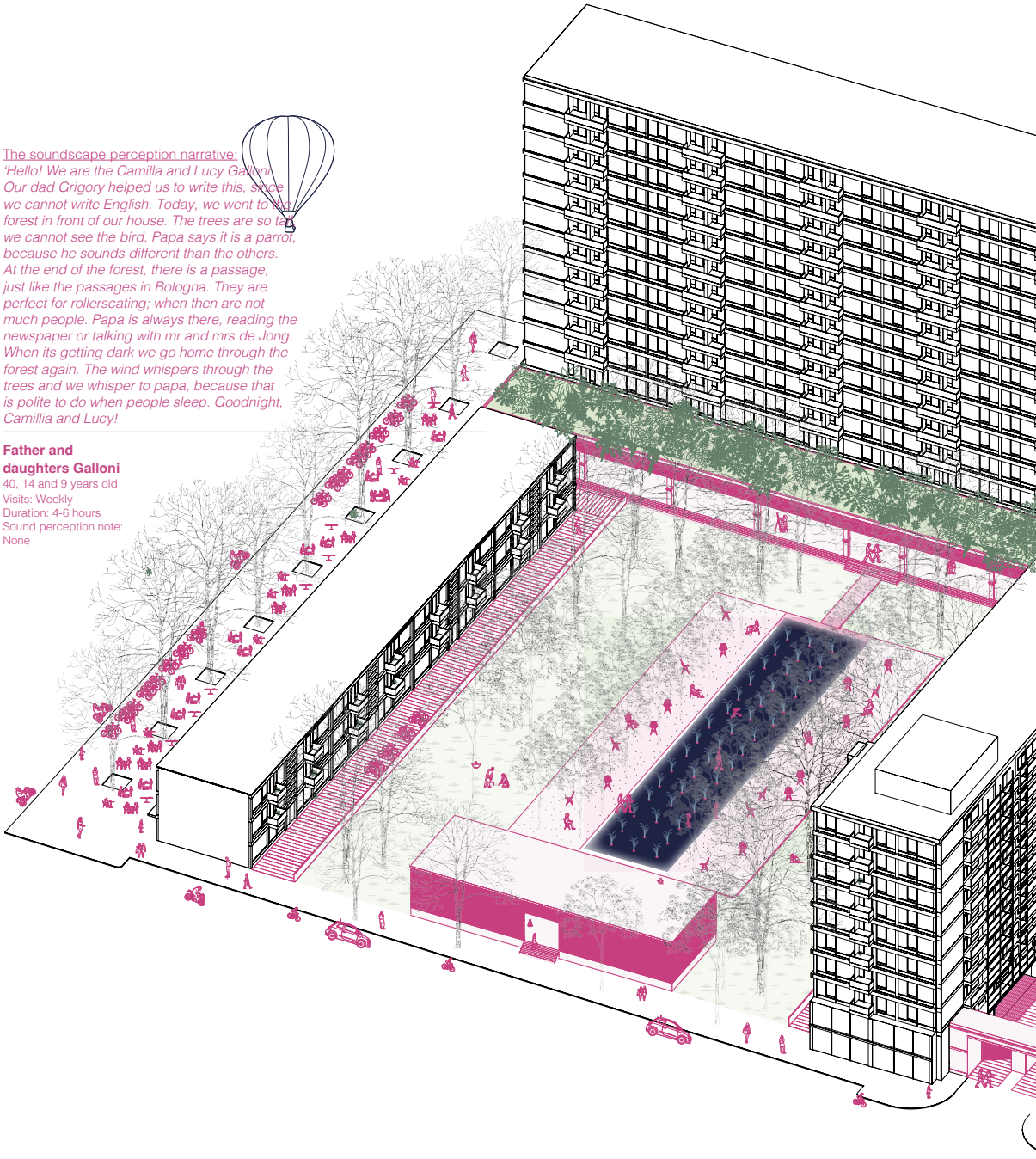
Ear-perspective pavilion with view on the watersquare, forest and passage
(Author, 2022)

Perceiving the new soundscape



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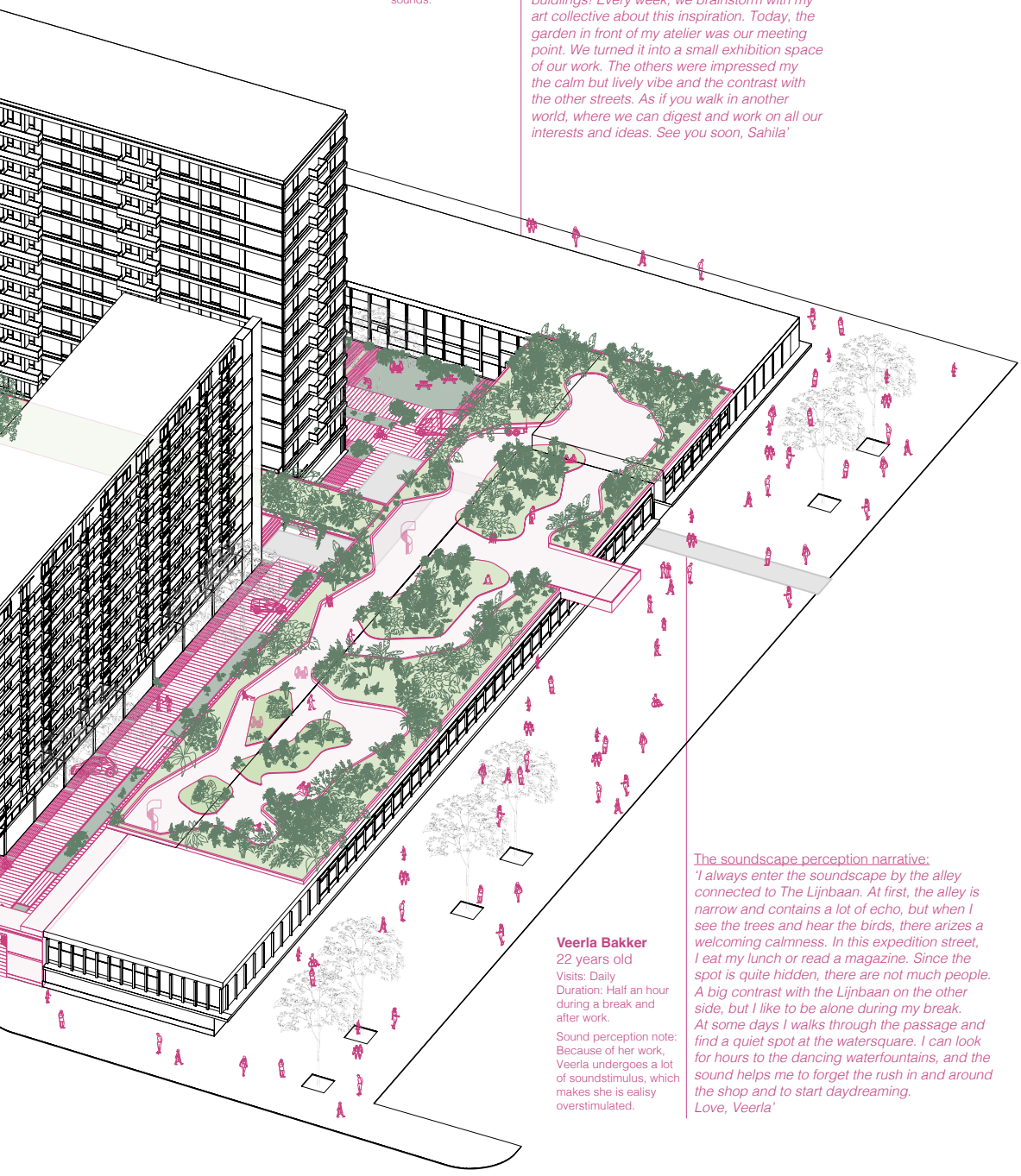
The new soundscape of the Lijnbaan Ensemble
(Author, 2022)

Sahila Demir
29 years old

Visits: In the weekends
Duration: Depends on her creative mood (1-8 hours)
Sound perception note: Sahila cannot work efficient without sounds.

The soundscape perception narrative:
'Hi there, Sahila here! Welcome in my atelier! This garden seems to be a hidden spot in the city, while I still can hear the crowd at the Karel Doormanstraat and Lijnbaan. I like these background voices and I am always wondering what they are talking about. These spaces are full of inspirational elements, people and buidlings! Every week, we brainstorm with my art collective about this inspiration. Today, the garden in front of my atelier was our meeting point. We turned it into a small exhibition space of our work. The others were impressed my the calm but lively vibe and the contrast with the other streets. As if you walk in another world, where we can digest and work on all our interests and ideas. See you soon, Sahila'



Veerla Bakker
22 years old

Visits: Daily
Duration: Half an hour during a break and after work.

Sound perception note: Because of her work, Veerla undergoes a lot of soundstimulus, which makes she is ealisy overstimulated.

The soundscape perception narrative:
'I always enter the soundscape by the alley connected to The Lijnbaan. At first, the alley is narrow and contains a lot of echo, but when I see the trees and hear the birds, there arizes a welcoming calmness. In this expedition street, I eat my lunch or read a magazine. Since the spot is quite hidden, there are not much people. A big contrast with the Lijnbaan on the other side, but I like to be alone during my break. At some days I walks through the passage and find a quiet spot at the watersquare. I can look for hours to the dancing waterfountains, and the sound helps me to forget the rush in and around the shop and to start daydreaming.
Love, Veerla'

The power of the hidden space

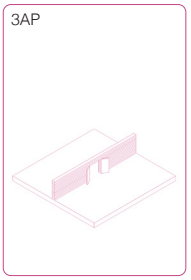
The calm soundscapes and the (sound) transition towards these spaces are explained in the previous design. But what is the role if we look back at the scale of Rotterdam? And how can we approach these interventions in a generic way? Therefore, I come back to the Pattern Language. Firstly, I used this language to form a base to design with; now, I will use the same language to reflect back.

Whisperroutes of Noord

The whisperroutes of Noord function as a territory of silence within the auditory landscape of Rotterdam. In this design, the gates, alleys, and parking lots formed the sound transitions. The smallness of these elements seemed to have a great impact on the use and access of the inner spaces. Looking at the aims, the variety in the urban landscape was dominant, whereby the patterns of contrast, continuity, variation, and expectation, automatically, became higher in the hierarchy. Hereby, the pattern 3AP 'Active Noise Control' was leading, which is about control over sound and publicness of spaces.

The broader picture shows that Rotterdam has a lot of courtyards in the Noord that could be territories of silence. It would be beneficial to use these pattern sets when start designing with these spaces.

Route 2: Whisperroutes in North

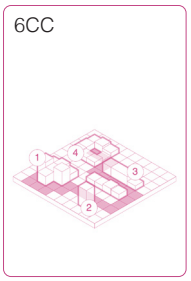


The Lijnbaan Ensemble

The Lijnbaan Ensemble is an example of an urban escape within a louder soundscape. The transitions in this design were higher in contrast, had a more intervening character, and were connected to the substructure of the expedition streets. Because the louder environment contains a chaotic and lifely atmosphere, the aim was to attract natural sounds. Here, the pattern sets of variation, expectation, control, and exposure were taken as main patterns. The leading pattern here was 6CC 'Track 6/18', which focuses on the exposure of space and sequences of sound.

Looking at the possibilities for urban escapes, the expedition streets show a lot of potential. These physical elements and the 4 pattern sets are the first steps to increasing the calm soundscape for the whole city center.

Route 3: Silent escapes in the shopping centre



The two strategies demonstrate contrasting approaches to achieving a calm soundscape in the auditory landscape; however, they complement each other and highlight the diversity of the districts. In the following routemap, you can see how you can use this strategy to explore the silence in Rotterdam.

Contrast Continuity Variation Expectation Control Exposure Distance Time

Territories of silence

Variety in the urban landscape | Transitions and access

Reducing mechanical sounds | Use and perception of space

Urban escapes

Attracting natural sounds | Healing effect of sound

Explore the silence

Explore the silence of Rotterdam! Start your route from the Central station of Rotterdam and walk up to the north or the south. There are different perceptionroutes you can use to find your way... or use your ears and find the way yourself. Have a nice retreat.

- Route 1: Exploring contrast
  Note: This route contains loud areas as well
  Duration: +- 180 minutes
- Route 2: Whisperroutes in North
  Note: Some gardens are temporary closed, check them online before visiting.
  Duration: +- 60 minutes
- Route 3: Silent escapes in the shopping centre
  Note: Sometimes the expedition streets are used for the supply of the shops; mainly in the morning and evening. Stay calm, this won't take long.
  Duration: +- 80 minutes

Singels & streets
- (1) Statensingel
- (2) Spoorsingel
- (3) Provenierssingel
- (4) Noordsingel
- (5) Gardens of the Schepenstraat
- (6) Luchtsingel
- (7) Hofbogen
- (8) Westersingel

Green squares & parks
- 1 Noorderhavenkade
- 2 Insulindeplein
- 3 Baljuwplein
- 4 Zuster Hennekeplein
- 5 Urban agriculture Zomerhofstraat
- 6 Essenburgpark
- 7 Diergaardesingel
- 8 Achter park Speelplaats
- 9 Wijktuin Oude Westen
- 10 Branco van Dantzigpark

Collective gardens & courtyards
- [1] De Eendracht
- [2] Van Maanenbad
- [3] Stadskwekerij de Kas
- [4] Waelheul
- [5] Ungertuin
- [6] Heultuin
- [7] Banierhof
- [8] Oogst met mij mee
- [9] Groen en bloeituin
- [10] Centraal wonen de Banier
- [11] Tuin van Noord
- [12] Rembrandt Kinderhof
- [13] Binnentuin hofdijk
- [14] Stadhuis
- [15] Lijnbaan ensemble
- [16] Jan Evertsenplaats
- [17] Tom Mandershof
- [18] Karel Doormanhof
- [19] Jacobustuin
- [20] Tussentuin het Oude Westen
- [21] De Bajonet
- [22] Onze tuin
- [23] Spoortuin

Restaurants with a garden
- Garden of Bird
- Teds
- Boudewijn
- Floor

All routes contain a sign that describes the sounds of the soundscape. They are also written in braille!

[15] Lijnbaan Ensemble

Hi! You found the hidden space! This soundscape functions as urban escape from the vibrant shopping area. Pay attention to the water elements, variety in trees and canopies; they will guide your ears!

Sound elements
1 | Water wall
2 | Passage
3 | Rooftop garden
4 | Gate
5 | Forest
6 | Water fountains
7 | Gravel square
8 | Pavilion

Access
24/7
Please be quiet after 10 pm, thankyou

Function
Urban escape





84 The routes of the calm substructure (Author, 2022)

Handbook exercise

1 | Design a calm soundscape or a transition towards a calm soundscape

Make a design, on a specific scale, that improves the substructure towards the existing calm soundscape or creates a calm soundscape in itself. Make sure this design fits to an urban escape or territory of silence and work with the aims for the calm soundscape and ways to design with sound.

2 | Reflect back on the Pattern Language

Take the language to reflect on the key interventions made during the design. This emphasizes the dominant aspects in relation to perception.

3 | Position your design in the bigger picture

Define the role of your calm soundscape at district level. This makes clear what the potential extension of the design could be and what influence the space can have for perpection of sound.

Need help? Write poems or a narrative from the perspective of a persona. This helps to position yourself in the role of the person that experiences the space.

Part 7 | Future projection

It sounds like a dream

(1) The what -if scenario

The song of tomorrow

The narrative of this handbook focuses on improving psychological well-being based on the current sound perception. However, looking back at the Omgevingsvisie of Rotterdam, we can expect higher densities, changing lifestyles, and changing mobilities that imply some changes in the future soundscape. Therefore, I will explain a future projection of these trends and their influence on the soundscape in order to improve psychological well-being in the long term.

In this chapter we reflect back on the current visions for Rotterdam and take the Omgevingsvisie as the leading document. I turned the aspects of the Omgevingsvisie into a what-if scenario, to predict the consequences for the future soundscape. In the following scenarios, the 'what if' is based on 3 pillars of the Omgevingsvisie; the healthy city, the productive city, and the compact city. Hereby, I focused on the impact of sound and the psychological component of it.

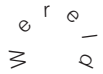
The assumed scenarios are translated into three key aspects that should be considered to improve the soundscapes and thereby increase psychological well-being. As a result, these interventions are linked to the pattern language.

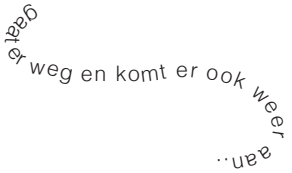
CS. A poem by Jules Deelder.

Translation:
Central station.
Centred in Rotterdam, Stands Rotterdam
Central stration. The whole world goes away,
And will arrive as well. Stations are like
harbours, For the wandering soul. The
beginning of there, The end of here.



staat
ROTTERDAM CENTRAAL
Heel de





STATIONS



Begin van het daar en

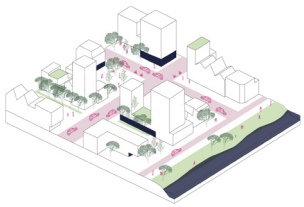
eind

van het hier.
(J.A. Deelder)

The volumes rise?

What is the scenario? The densification and urbanization reaches a new record. The high-rise buildings replace the urban blocks, foreseeing new citizens' homes. As a result, rising volumes reduce the amount of inward-oriented spaces, putting more pressure on the city's current calm atmospheres and increasing the amount of crowds spread throughout the city.

Psychological benefit
Reducing stress



If the city will be densified, make sure:
1 | The new high-rise buildings create an ensemble
2 | There is per building at least one silent capsules within the urban fabric.
3 | New parking spaces are integrated in the buildings and not on street level

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The compact city
A schematic visualization of the interventions for the compact city, based on sound. The upper image shows the before image, the big 3d shows the future scenario.

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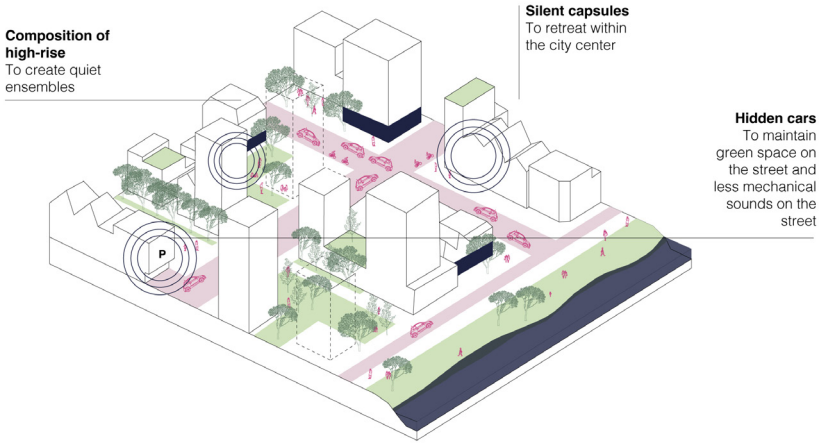
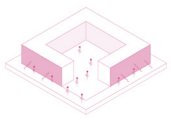
Designing with sound for the compact city. From top to bottom: Creating ensembles of high-rise, adding silent capsules and implementing garages.

Composition, capsules and cars

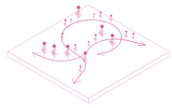


1BP
The sounding barrier



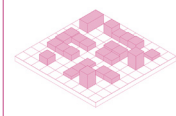
Contrast and urban form

4AC
The soundwave



Continuity and movement

5AP
Urban conductors



Variation and composition

1 Compositioning high-rise:
The new ensemble
Compose high-rise buildings in such way that they make a court in between. In that way, the inward-oriented typology gets a twist, suitable for higher densities.

2 Silent capsules:
Small contrasting spots
Silent capsules are little silent spaces within a louder area. Work with high contrasts to give the maximum effect of retreat.

3 Hidden cars:
Volume in, Silence out
Implementing cars in garages at the outhern parts of the structure gives distance to mechanical sounds and increases the amount of space on ground level to become a calm scape.

The office is at home?

What is the scenario?
More and more people are not dependent on an office and are working from home. This creates flexibility and decreases traffic, but also leads to the need for a quieter environment. How do you keep focused when you live near a school, next to a train station, or a neighbor that tries to play the violin? And thereby, how do you get inspired if you hear the same sounds every day?



Psychological benefit
Improving focus

If the city works from home, make sure:
1 | The public space contains green structures connected to inward-oriented spaces to get inspired and to take a break
2 | All buildings have a view on green or are nearby green.
3 | Lively functions are positioned strategic and form a contrasting sound transition.

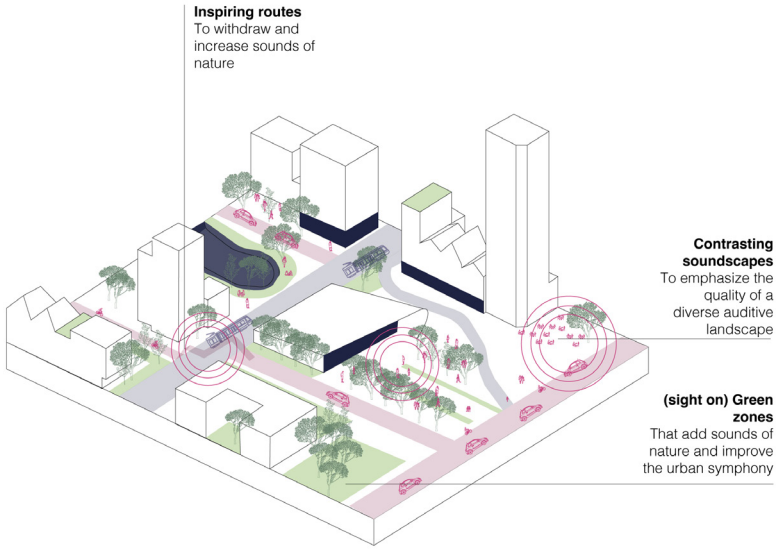
87

The productive city
A schematic visualization of the interventions for the productive city, based on sound. The upper image shows the before image, the big 3d shows the future scenario.

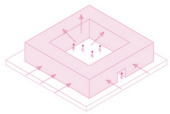
88

Designing with sound for the productive city. From top to bottom: Inspiring routes, green views and contrasting atmospheres

Creativity, concentration and contrasts

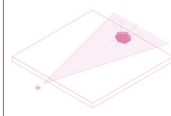


7AS
Noise-canceling



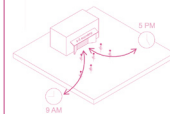
Distance and distraction

7CC
See the silence



Distance and sight

8AP
(Anti-)climax



Time and function

1 Design an inspiring route for during the break

Inspiring routes generate inspiration, which has positive effects on the productivity of the work and adds a nice break to the day.

2 Create zones that create natural sounds and green views to improve focus

Green zones and natural sounds have a positive effect on people their productivity and lead to more positive feelings.

3 Implement contrasting atmospheres for free moments

The senses want some extra stimuli at the end ot the working day. Therefore add strategic functions close by home that generate more lifely sounds.

We let the city sleep?

What is the scenario? Imagine, you live in the most beautiful city of the world*. It has everything; sunny terraces, parks, great public transport and even your own balcony. The tram continues all night but doesn't grind anymore. The club stays inside and the trucks whisper silently to prepare full stores for tomorrow. The bird wakes you up, fresh, and makes you doubt: is this the utopian soundscape we live in? Or was it just a dream?

* Rotterdam

Psychological benefit
Improving sleep



If the city lives in a dream, make sure:
1 | New pavement is silent, in order to reduce sounds.
2 | Louder functions are not positioned in residential areas or are limited to a certain time.
3 | The inward-oriented spaces are locked during evenings and night, to preserve the sleeping quality.

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The healthy city
A schematic visualization of the interventions for the healthy city, based on sound. The upper image shows the before image, the big 3d shows the future scenario.

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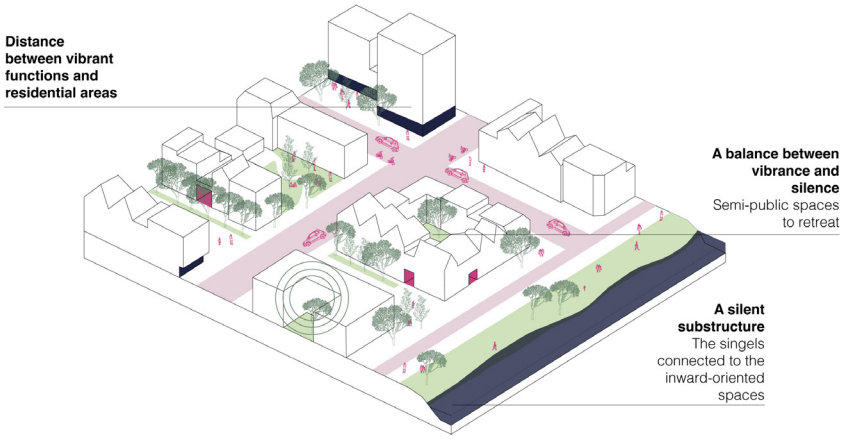
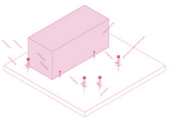
Designing with sound for the healthy city. From top to bottom: Inspiring routes, green views and contrasting atmospheres

Pavement, party's and publicness



1CP
Tap-dancing



Contrast and materialization

3AP
Active Noice Control

Control and publicness

8CC
Daily Dose

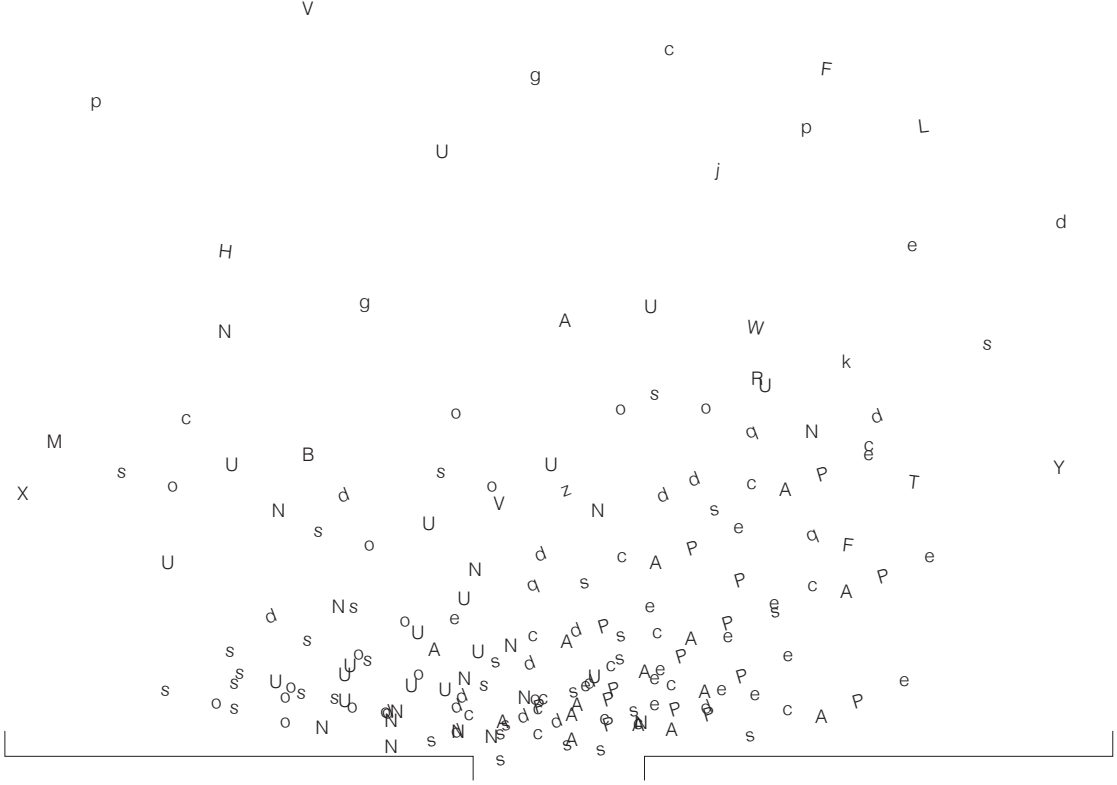


Time and daily life

1 Use silent materials for main roads,as silent asphalt.
Implementing silent pavement can improve the quality of sleep. Hereby, the actual amount of sound (decibel) decreases and the type of sound (mechanical) becomes less dominant.

2 Seperate louder public functions from residential blocks
Creating distance between high sounding functions and low sounding functions can the decrease the amount of sound that reaches the bedroom.

3 Work with areas that are not always accessible or suggest a more private atmosphere
Next to spatial configuration, the publicness can help in creating distance to louder sounds.



The soundscape

Part 8 | Conclusion

Urban symphonies

(1) Conclusion
(2) Discussion and recommendations
(3) Reflection
(4) Literature

Conclusion

By making this handbook, I worked towards answering the main research question; “In what way does the urban design of calm, inner soundscapes contribute to the psychological well-being of citizens, focusing on the area surrounding Rotterdam Central Station?” In this conclusion, the main question arises: did I answer the main question? I will explain the answer by zooming in into the main research aims related to this question; a. finding balance, b. turning the consequences of urbanization into opportunities, and c. decreasing the gap between psychology and urban design.

Recap

Main research question
In what way does the urban design of calm, inner soundscapes contribute to the psychological well-being of citizens, focusing on the area surrounding Rotterdam Central Station?

Aims
(A) Finding balance in the composition and gradience of chaos and silence.

(B) Turning the consequences of urbanization into opportunities for changing living environments.

(C) Decrease the gap between psychology and urban design, focussing on sound. And thereby improve the psychological well-being by urban design.

Opportunities for the urban landscape
The research started with, on the one hand, an analysis of the theoretical part, mainly related to the psychological research of sound perception, and a case-study in Rotterdam, related to the role of sound in the spatial context. In particular, the sound perception map, based on interviews, fieldwork and the contrasts between the north (Rotterdam North) and the city center (Rotterdam City Center), were important components. Moreover, the soundscape is not only a collection of static and moving sounds but, in the first place, the experience of sounds that create a certain perception. Together, this emphasizes that there is no one-fits-all solution but rather a combination of different strategies with the same goal. On the one hand, the substructure lacks quality (Noord), and on the other hand, the spaces to withdraw itself seem to be missing (city center). At the same time, the analysis of the urban landscape shows that within the current urban structure, there is potential to find that balance between vibrance and silence. Here, transitions play a crucial role.

Interlinking psychology and urban design
In the pattern language, I started by using correlations between psychology and urban design. It is a valuable way to find relations between theory and spatial interventions without stating specific site and scale-specific interventions. In the first place, the pattern language offers an overview of interrationships and the scope of this research. Later on, you can see how the patterns also play a role in the other parts of the handbook. The patterns of the themes of control, contrast, and exposure appeared to be particularly important for the Rotterdam case study. These patterns are used to design routes and contribute to multiple scales in the experience of the acoustic

landscape. The whisperroutes, urban escapes, and the route that connects north and south strongly show this relationship.
However, the patterns alone are insufficient to determine sound perception. For the actual perception, and the interlinkage of urban design and psychological well-being focussing on the sensations of sound, we have to zoom to the scale of interaction; the ear-perspective.

This perspective, heard from the person itself (and in this case, the personas), stands closest to experience, which makes it easier to position ourselves in it. It tells you which sounds play a dominant role, which sounds are visible (and invisible), and what relationship or interaction you have with these sounds. All these factors influence the perception of sound. And although the ear-perspective is the smallest urban scale, it does contain the best bundle of information; a personal soundperception of the scape without losing the bigger picture.

Balance between silence and vibrance

In order to experience the balance between vibrance and silence, I went back to this bigger picture; the scale of the soundscape, the neighborhood, and the district. The soundscape as a space explains the transitions between several elements of the space. These can be contrasting, but all focus on creating a calm space. The neighborhood and the district, however, show more focus on transitions between different soundscapes. In this case, the sequences of publicness and diversity of sounds are important components. Hereby, the goal was to improve the routes towards calm spaces. Therefore, I should emphasize that the vibrance of Rotterdam should be approached as a quality; an absence of opposites would decrease the value of the acoustic landscape. In that way, in this handbook, the inward-oriented calm spaces are a solution to creating a balance between silence and vibrance, not an approach to decreasing the vibrant city. This calls for careful and strategic interventions that include both sides of the sounding sequence.

To come back to the main question, I would like to state the following: The soundscape, seen as an inward-oriented space, forms a place to withdraw and recover. It offers a calm atmosphere that, at this moment, is missing or not accessible enough in Rotterdam. The contribution to psychological well-being focuses on creating alternatives (diversity) and the quality of sound. I interpret the quality of sound as the translation of the theoretical research and the more stabile contribution; human and mainly natural sounds play a main role in our well-being and offer a quality that always leads to an

improvement in sound perception and, thereby, psychological well-being. As a consequence, approached in a spatial way, green spaces within the substructure (as the inward-oriented space) have a major impact on how people feel.

Secondly, offering alternatives comes from the perception of the environment as an interaction between the person and her context. The consequences of the acoustic context on psychological well-being cannot be grasped in theory, but address a more practical approach. People need the choice to visit a vibrant space or to (spontaneously) seek a silent space. Therefore, the decision that is made is not only based on spatial options, but also on the mental state itself, which changes over time itself. Therefore, offering an alternative reaches not only a broader group of people, but also a broader timespan to digest the urban landscape, wherein the route plays an important role.
Together, the contribution towards psychological well-being is, spatially, formed by the addition of spaces to retreat, a better transition between silence and vibrance, and the implementation of theoretical research.

‘Studying the environment without listening to it is like studying film with the sound turned off’

(Bernie Krause, 2022)

Discussion & recommendations

In this discussion, I would like to pay attention to the four topics, including the strategy used throughout the process and the scope of this handbook. This is because it clarifies some limitations and offers suggestions about the stated conclusions, the validity of the handbook, and possible next steps.

Recommendations
Quality of sound
(1) Work with association of sound

Physical connections
(2) Connect the perception of sound to spatial themes
(3) Make sound part of other strategies
(4) Reduce noise

Psychological connections
(5) Extend the Pattern Language
(6) Design with the (other) senses

The narrative of an urbanist
(7) Improve the visualisation of sound

Quality of sound

Throughout the process, it became clear that the association with sound tells a lot about its quality and perception. This seems to outweigh the actual measurable data, as calculated in decibels. Giving bold conclusions on the quality of the urban soundscape is difficult since perception is based on individual circumstances and characteristics; it's impossible to provide quantitative data on perception, which limits the handbook's validity. However, including various types of people, conditions, and times in the research provides useful information as well as some general perceptions regarding sound experience. Here, the association of (positive) sounds seems to be a more general factor; sounds of nature (vegetation, water, animals) are perceived as more desirable, even if they are loud. This implies that, on the one hand, sound association research should be conducted, and on the other hand, sound association can be used as a starting point in sound design.

(1) Work with association of sound

Physical connections

This brings me to the second point I would like to make: socio-spatial themes. Sound perception appears to be strongly linked to socio-spatial factors such as social safety and a sense of belonging. These themes are part of the design in this handbook, but they play a minor role in the analysis. Further research into the connection between sound and these themes would be beneficial in order to develop more solid conclusions.

(2) Connect the perception of sound to spatial themes

Because spatial strategies and vision are increasingly focusing on social impact, I believe it is better to include sound in all of these strategies rather than focus on sound as a separate strategy. Sound is considered as a separate subject in this handbook, with the emphasis that sound has a significant impact on our daily lives; the symphony of sounds affects how we feel. This creates a utopian soundscape that encourages us to look (and

hear) at our surroundings in a different way. However, changing the city entirely based on the perception of sounds is (economically) unfeasible. As a result, it would be preferable to incorporate sound into other topics.
(3) Make sound part of other strategies

Additionally, while this guidebook focuses mostly on increasing qualitative sounds, decreasing negatively perceived sounds should also be a part of the strategy. In this handbook, it was intentionally decided to shift from "reducing noise" to "attracking quality" as a more positive approach. First, there are already articles and spatial interventions that explain how to reduce noise; second, these strategies do not, in my opinion, fully include perception and psychological well-being. On the other hand, connecting these two strategies could tell us a lot about how spatial interventions can improve the soundscape.
(4) Reduce noise.

Psychological connections
I would recommend using the pattern language to improve the approach and make designing with sound an aspect of urban strategies. Currently, the pattern language provides a basis of concepts and components that connect psychological well-being to sound design. This language can be expanded in order to create a stronger link to spatial concepts.
(5) Extend the Pattern Language

Furthermore, connecting the pattern language to the other senses would be valuable, since this would provide a holistic approach to designing with the senses and its implications for psychological well-being. Furthermore, connecting the senses gives insights into conflicting or strengthened perceptions.
(6) Design with the (other) senses

The narrative of an urbanist
Finally, I would like to emphasize the importance of this manual in the role of the urban designer. The urban designer is focused on visual communication. While it was hard to find techniques to do so, I tried to take a first step into visualizing sounds in this handbook. It requires transforming one sense into the other. As a result, I recommend two last things: enhancing ways to represent sound and/or not being limited to the sense of sound in (urban) design.
(7) Improve the visualisation of sound

Reflection

During the graduation process, we take a look inside. The personal process is examined in addition to the development of the narrative and the results. To describe this, the reflection is divided into two sections: 1. the overall perspective and resilience during the graduating year; and 2. the components of developing a relevant thesis. The first part of this focuses on the process, while the second part focuses on the product.

Part 1: The process

In this reflection, I would like to begin with a general statement about the process. This graduation project is much broader than all other courses done during the bachelor and master programs. As a result, the steps of design, research, and analysis each take longer, emphasizing that this graduation is a collaborative and iterative process. I enjoy moving between the various components of the graduation, but I also find it difficult. This comes from the sense that nothing is accomplished until the very last moment, implying a lack of progress. It's difficult for me to consider a component "completed" and thereby limit the scope of the project. After p2, I decided to make my assignments smaller in order to 'complete' smaller parts, as well as to work with daily to-do lists rather than weekly lists. This helped me to make a better estimation of how long a task would take.

Overview: Understanding of the how and why of the project

Designing with sound

To begin, I want to state that sound visualization requires a sense translation. This translation is a challenge that needs me to think differently about presenting. On the one hand, this makes the project more creative and provides a better knowledge of the importance of sound in urban planning. On the other hand, translating sound to vision takes a lot of time and is sometimes inadequate. Throughout this quest, I attempted to look beyond sound waves and diagrams because these images do not communicate the perception of a specific sound or the soundscape as a whole. To address this, I used personas and poetry; these methods and forms of describing a sound or a soundscape provide more depth in the underlying perception.

In addition, I intended to analyze various types of sound expressions. For example, a novel (Ruw by Marie Kessels) has been written from the perspective of a blind person. The way sound is described makes it highly visual without providing an actual image. As an additional method, playing sound fragments or links to fragments can serve as an alternative or supplement to the visuals in order to experience the perception for yourself. This adds to the storyline, even though I feel the search for transferring perceptions will continue after the project is completed.

Designing with multiple scale-levels

Sound can be heard at all scale levels. The city describes the character of sound in its whole, while the street or green space that people visit also gives an idea of the city's soundscape. This means that sound is not dependent on a specific scale and cannot be seen (heard) as a standalone object, but can instead be interpreted as a symphony of tones. Furthermore, the fact that sound is intangible contributes to its scale-independence. However, working with different scales will also help in finding the symbiosis between the sound elements of a city on the one hand and the composition of an urban song on the other.

In the project, multiple scale levels are used: the urban district (the surrounding area of Rotterdam Central Station), the network of inward-oriented soundscapes on a neighborhood scale (Provenierswijk and Agniesebuurt), the soundscapes (the Lijnbaanensemble), and the sound transition elements (gates and alleys). The urban district shapes the context of sound; the networks create a silent sound wave within a louder structure; the soundscape shows the variety of sound-identities; and the elements give an indication of the transition moments of sounds in between different soundscapes.

Working with different scales requires various levels of detail, aspects, and focus, indicating that sound perception is not just a combination of multiple scales but also implies a difference in usage and user; the context of space is crucial in the symphony of sounds.

To return to my first point in the graduation process, I found it difficult to grasp the scope of sounds. I began on the district scale, but suddenly learned that it was too big. Zooming in on a (semi) public space showed me how sounds interact with one another and how to play with this. This helped me improve the narrative of the storyline and return to the larger scale. However, all sounds finally cluster on a single scale level: in between the ears. This is where the storyline should land.

Sound and presenting

The five presentation times throughout the graduating year require the integration of sound. I did not add sound to the first presentation, but it became very audible due to the construction workers over the two sessions. Because of these sounds, the presentations were interrupted for a short period of time, particularly during the afternoon session. This made me realize that sound has a significant impact on how people function and

react, and in this case, in a negative way.
For the second presentation, I intended to expand on this experience by demonstrating the difference between the hindrance of background noise and the absence of it. During the introduction part of the presentation, I played one of the recordings I made during a field trip. This was a recording of the Schieblok's surrounding area, which had a lot of traffic, passages, expedition streets, height differences, and an inward-oriented block. All of these physical factors affect the perception of sound and emphasize the consequences it can have. And even though I purposely played this recording, it was a relief for me when it/the recording ended.

For the third presentation, I brought ''soundboxes''. These boxes were filled with various urban materials that produce diverse sounds when shaken. I wanted to underline the significance of material diversity and how they could sound together in this way. Furthermore, I wanted to establish an interaction between sound and the user to emphasize not only the diversity of sound but also the user's control over it. The boxes were a first step in this search, but they turned out to be more of a sound awareness gadget than a symphony of the urban soundscape.

It is important to consider alternative ways of presenting sound for the following presentations. As a result, it should concentrate on the good qualities of sound, as the first two presentations focused on the negative. Sound can be very fascinating and facilitate the experience of a location. To illustrate, good qualities can be the sounds of birds or the wind blowing through the trees.

Resilience: The ability to change and improve the project
Transferring feedback
After Presentation 2, the key feedback was to: 1. Begin with design; 2. Do not limit the project to static elements, but also include dynamic elements; and 3. Focus on the soundscape as a whole (not only the elements). I completely agree with this feedback. Until the second presentation, the project was mainly a combination of primary material and theoretical research. As a result, the topic was clear to me, but the connection to the location was weak.

1. By starting with the design and afterwards shifting to larger scales, it was easier to connect theory to design. Furthermore, the design outcomes not only brought me back to new tasks for the analysis but also drew additional conclusions that are useful for the storyline. The Lijnbaan ensemble and the courtyards of Noord have many similarities, but they also assume a different approach and design conclusion (in scale and interventions), which contributes to the district-scale narrative. I struggled a lot with the in-between scale (the courtyards of Noord), because the network of places should not be a straight line from A to B. As a consequence, I looked for elements to work with that connect on a larger scale and link to various sound islands. This helped me realize that the quiet route is a hidden network that can be used as a spontaneous route rather than

a straight or clear route. The major goal at this phase is to 1. convert these new findings into a comprehensible and clear analysis, and 2. ear-perspectives that illustrate the smallest scale of sound perception.

2. Second, the design supported me in understanding the dynamic qualities of sound. I altered the storyline and content of the analysis to include the moving sounds as well and thereby made these sounds an intrinsic part of the design for the design part. Furthermore, based on this feedback, the method clearly demonstrates that designing is an iterative process.

3. Lastly, I attempted to approach these elements as a whole soundscape. I was able to experiment with integrating various components and sound interventions into the design. The transition zones from one soundscape to the next play a larger role than I expected, but they can also establish a link across different scale levels.

The key input after the third presentation was about developing a narrative between the scales while still relating back to the research. As a result, it was suggested that the report be approached as a handbook that shows how to design with sound, as well as how the narrative of Rotterdam may be translated to a more generic strategy. The Pattern Language formed a major aspect in this, making it easier to identify overlapping findings at different size levels.

Learning from my own work
However, I believe it is too early to answer what I learnt from my own project; nevertheless, there are some subjects that indicate the learning process. First, I'd want to address the arising battle between visualizing and hearing. As I previously stated, it is difficult to visualize sound, but it is also a welcome opportunity to explore the edges of what Urbanism is about (or to state that this should be part of the core of the design field). Aside from visualizing, using poems to express the perception of sound helped me describe the ambiance of soundscapes.

Thereby, I enjoy writing poetry that helps you consider the message you want to communicate. I had no idea there was a connection between urbanism and poetry at first, but it seems to have a link in perception. Finally, I'd like to make a critical point (to myself) during the graduating process. I have a habit of starting a lot of products and never finishing them. As a result, I lose focus on what I'm doing and struggle to keep on track. This is why I believe the handbook lacks certain conclusions, illustrations, and texts that I started with. In recent months, I've been focusing on improving my working approach, which I believe will benefit the project's end result.

Part 2: Aspects
Aspect 1: The relationship between research and design
During my bachelor and master's, I have always been interested in the combination of psychology (research) and urbanism (design). The way

urbanists design places can affect the way people feel, experience, and behave.
My fascination with this graduation research started with the courtyard. In the courtyard, people feel a sense of belonging; a place of home. I like the places for the 'community' because it touches the individual and the crowd. Diving into this typology, I realized that there were many more inward-oriented scapes that share this community function. It became a set of inward spaces where I wanted to design further in the process. The buildings function as walls without closing off from the surroundings. They are places to retreat; places to rest in order to re-energize and return to the vibrant life.

This touches on my second reason: noise. The psychological well-being of citizens is getting worse because of noise pollution. The noisy city keeps us awake, distracts us, and overstimulates our senses. Hereby, I come back to inward-oriented spaces. The walled open spaces are small enough to be incorporated into the urban fabric but large enough to create mental space and isolate one from overstimulating sounds.
During this graduation, I wanted to dive into the concept of the "soundscape" that came across. With the soundscape, the design of spaces focuses on the sense of sound and the perception of it. As a result, I could connect psychological well-being to noise, and thus to urban design and psychology.

Aspect 2: The relationship between the graduation project, the studio topic, the master track and the master program

This master's thesis combines the fields of urban design and psychology by designing places to retreat for citizens. The studio "Urban Fabrics" is mainly focused on design and integrates spatial and social factors.
The design of places to retreat suits the theme of the studio "at home", since "places to retreat" and the inward-oriented typology I will use are strongly related to "spaces of belonging". The perception of sound can be connected to both, which suggests the bigger picture related to the field of architecture and the built environment. Stating the ongoing urbanization with higher densities, growing mobilities, and 24-hour economies in a future scenario, the realistic consequence involves an increasing number of people and traffic, and thereby a continuous exposure to sound. Without changing the policies of urban planners and strategies of urban designers, noise pollution will affect the liveability of citizens more and more. This suggests an imbalance and necessitates a design solution; the conditions for developing the vibrant city have a negative impact on the development of the soft city, despite the fact that both concepts aim to increase the citizen's liveability. This handbook proposes a new approach to the future landscape, wherein both concepts improve the psychological well-being of the citizens together.

Aspect 3: An elaboration on the research methods and approach chosen, in relation to the graduation studio methodical line of inquiry, reflecting on the scientific relevance of the work

The methodological focus of this graduating studio is on working through

scales, research by design, and integrating theory into design. I believe my handbook fits these methodological approaches because I am using and connecting several scale levels; trying to combine psychological research with urban design interventions; and using various research by design methods. The pattern language is a method that I used in the studio and in my project because it helped me achieve an overview of the scope and relate perception to space. As a result, I was able to evaluate the story in a range of methods, which will strengthen it. Also, the concept of “at home” is very suitable. The inward-oriented typology are places where (most people) feel “at home”, and I believe I felt “at home” within this studio.

Aspect 4: An elaboration on the relation between the graduation project and the wider social, professional and scientific framework, touching upon the transferability of the project results

Societal relevance

Many cities around the world are polluted by noise. Noise perception affects all citizens’ daily lives and thus affects more than just sensitive groups. In order to maintain or improve the liveability of the city, these areas have to rethink their strategies in order to decrease or solve the noise pollution. Especially with the growing urbanization and densification, designing with sound becomes more and more important.

This handbook could serve as an example of how to work with different soundscapes and different scale levels, focusing on the aural landscape. It addresses the positive approach towards a diverse sounding atmosphere instead of reducing noise in general. Furthermore, the study addresses the role of urban design in relation to its psychological effects. This emphasizes the effects of urban design and increases awareness of the connection between the physical and psychological spheres.

Scientific relevance

Inward connects two fields of research: the urban design field and the psychological field. The connectivity addresses the socio-spatial gap, resulting in a lack of knowledge transition between the two fields. The psychological field lacks spatial outcomes, the urban design field is unaware of its psychological effects. In that way, this handbook aims to decrease this gap focusing on (the perception of) sound as the connecting topic. This approach gives insight into what urban design elements and sound components can be implemented (physically) as guidelines in order to create a liveable city in the future, looking at human well-being (psychological).
These tools are based on a specific location, however shows general relations between the two fields. Therefore, it sets a basis for further research between the relationships between psychology and urban design, which results in new, sense-oriented approaches in urban design and more spatial research about psychological effects.

Professional relevance

This project mostly focuses on the Urban Studies group within the

Department of Urbanism. Therefore, more socially oriented fields of architecture and landscape architecture are touched upon. It states the subjective relevance of design within a sense context point of view, starting from the individual.
In this way, the focus shifts from the sight perspective to other senses, even though visualization is the most important communicative tool for a designer. As a consequence, the role of the urban designer is repositioned. Due to the broadness of all senses, sound was taken as the main sense of research.

Aspect 5: The ethical issues and dilemmas encountered during the research, design and applications of the results in practice
Ethical considerations
Noise pollution is a subject related to the right to have silence. Hereby, silence is taken as a beneficial factor for all people and is not limited to blind people and sound-sensitive people. The project aims to design with a variety of soundscapes, distributed over a sequence of spaces, in order to achieve a balance between vibrance and silence. As a result, everyone should be able to retreat within their daily environment. The auditory design is closely related to the spaces for the community. The city of Rotterdam has a lack of “places of belonging”, which goes hand in hand with the perception of sound and the gradient of soundscapes. In this way, the report mentions spatial justice (the right to have silence) not as a research discussion, but as a starting statement.

Ik heb de kilometers naar Delft
niet geteld,
maar wel geluisterd.
1000 vogels en een boot.
Roeiers op de achtergrond of
ingehaald door
het peloton.
De trappers ratelen
voortwaarts
richting de Espressobar.
Ze kraait motivatie en het
onderste uit de
melkkan.
Ik heb hem
leeggeschraapt
en uitgelikt,
gekanteld
en tegen de muur aan
gehouden.
Mijn oor er tegenaan
gedrukt
om op geluid
te vertrouwen.
Ik hoorde een lange adem en
blote tanden, een ruimte
vol verbetering.
Ruisende computers,
lieve woorden,
een trein met
lichte hapering.
Ze zet de toon, geeft een stem,
voor de woorden die ik zoek.
Fonetisch beleef ik steeds opnieuw,
dit jaar als
een luisterboek.

Literature

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Sound suggestions

The following list contains suggestions to perceive the soundscape yourself, formed by a collection of video's, recordings, excersizes and readings.

In case you want to hear more...

Stilte van de Wereld | Podcast
Podcast about the sound of crowded places during pandemic.

Coda (Child Of Deaf Adults)
Film about a hearing girl that wants to be singer within a deaf family.

Soundsnap
A database of daily life sound recordings

Epidemicsound
Another database of daily life sound recordings

Architectuur door andere ogen | Martijn Jordans, Bastiaan van de Kraats, Marij van den Wildenberg | 2014
Eposodes of sounds in different spaces including comments about the sounds by blind people.

The Wikisinger | Touché Videoproduktion
The sound of buildings as acoustic environment for a song: https://vimeo.com/132408379

Why Architects Need to Use their Ears | Julian Treasure
TED Talk about designing for the ears by sound expert Julian Treasure

Sanctuaries of Silence | Adam Loften & Emmanuel Vaughan-Lee
A documentairy about the sounds of places and the poetics of silence: https://emergencemagazine.org/feature/sanctuaries-of-silence/

The Ecology of Perception | David Abram | 2022
A podcast episode with cultural ecologist and philosopher David Abram where they discuss the power of ecology to human perception.

Harel Asafs
A funny way to understand how frequencies work. On this instagram page, the extremes of the frequencies in songs are enlarged.

In mijn hoofd | De klank van blind zijn | Podcast
A podcast of Anke van Meer about the sounds of daily-circumstances, feelings and deseases. In this episode, Alexander, a blind person, is interviewed.

In case you want to experience sound yourself...

Verborgentuinen.nl
A website that collects inward-oriented spaces and gives information about these spaces.

Close your eyes and listen
An exercise you can always do

The spoon | Alexander Petrounine
Testing a metallic spoon on different materials in different sites gives an indication about the rhythm of sound. Due to its material and shape, an interaction with the surrouding is facilitated. In case you need an example: https://www.tudelft.nl/index.php?id=45168

Urban umbrella's
A rainy day gives the change to block your sight and experience the sounds of your surrounding. This is one of the few moments everyone experiences the need to focus more on the ear-perspective in order to keep moving.

Material boxes
Put different materials in a box and shake them. On this way, you can hear how materials in the city can sound on its own, or together.

MuZIEum | Museum | Nijmegen
An eye-opening perspective how to experience sound and/or the absence of vision. Plan a tour to get the full experience.

Nederlands instituut van beeld en geluid | Museum | Den Haag and Hilversum
A museum about the experience of different media types. Sound play a key role in this experience.

Overhear conversations
Hear the conversations of people passing by. The conversations tell a lot about their state of well-being, their experience of the space and their behavior. Maybe it changes your sound perception as well.

Improvisatietheater in het donker | Oogziekenhuis Rotterdam | Theater
A performance in the dark, which addresses the focus on the other senses

In case you want to read more...

The soundscape (Our sonic environment and the tuning of the world) | Schafer R. M. | 1994
The soundscape bible in literature.

Machinekamers | Like Bijlsma, Hedwig van der Linden | 2020
A research about the transformation of expedition streets in the city center of Rotterdam.

Architectuur door andere ogen | Martijn Jordans, Bastiaan van de Kraats, Marij van den Wildenberg | 2014
A book about sound in architecture as continuation of the eposodes of 'Architectuur door andere ogen'.

Ruw | Marie Kessels | 2009
A novel written by the perspective of a blind main character, giving understanding how people move through urban space by the sense of hearing.

Hidden landscapes | Saskia de Wit | 2018
A book about gardens within the metropolitan landscape that show how small scale interventions and spaces can have major

impact on the experience of space.

The sound of Architecture | Angeliki Sioli, Elisavet Kiourtsoglou | 2022
A book about the acoustic atmospheres and its relation to architecture. This book gives information about sound in architecture, but also methods to design with it.

Handboek voor Hofjes | Stipo | 2015
A study about finding a modern collective typology of living and a bundle of current collective courtyards in The Netherlands

The eyes of the skin | Juhani Pallasmaa | 2008
A book about how the senses are related to architecture and what the task for architects is how to incorporate these senses in design.

Atmospheres | Peter Zumthor | 2020
A book written about 'reading' a space according to their atmosphere. In this book, there is explained the importance of emotion, mood and senses in architecture and urban design. Go to the website to listen to the audiobook: https://archive.org/details/peter-zumthor-atmospheres/page/23/mode/2up?view=theater

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Blind expert

Marianne Huijben
Blind expert

Ernie van Wissen
Blind expert

The residents and companies
Liliane Geerling
Citizen of the planlocation

Marie Claire Gellings
Citizen of the planlocation

Open Kaart
Architectural firm focusing on designing with people

Zee de Heer
Interview participant

Fenna Regenboog and roommates
Interview participant

Merel de Leeuw den Bouter and roommates
Interview participant

Kelly Schoenmaker
Interview participant

Joost Smeets
Interview participant

Karlou Westerbeek
Interview participant

The superior experts
Machiel van Dorst
1st mentor, unlimited inspirational quotes and human behavior expert

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2nd mentor, wordlist lover and landscape design expert

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Race-bike partner and workation companion

Joelle Hermans
Workation companion

Juliette Brouwer
Workation companion

Paula Nooteboom
Urban Fabrics sparringpartner

Valentin Zech
Interview participant

The unconditional support

Mama
Lay-out advice

Papa
Mentioning he is proud

Marleen
Greatest sister

Huub
Greatest brother

Loes de Jong
Spellingcheck and sweet words

Charlotte van Strien
To get some fresh air

Kimberly van Vliet
Mental support

Koen Kroes
Critical questions

Camiel van der Heijden
For the sun

Anouk Melis
Builts an urban oases herself

Espressobar Sterk
And especially the woman that gave me coffee in the morning

The other great urbanists

Jin-ah Duijghuisen
Urban metabolism sparringpartner, coffeesupporter and neighbor

Noa te Duits
Pattern language expert and neighbor

Jan Eggink
Mental support and hugs

Marloes Willemsen
For always making me laugh

Raven van der Steen
Inspiration and sparkles

The common interest group

Hibbe Amema
Architecture student and atmosphere sparringpartner

Noor Boreel
Architecture student and sound sparringpartner

Laura Koot
Graduated Industrial designing focussing on blind people

The sound experts

Inge Duijghuisen
Expert Robert Coppes Stichting

Ruth Doeve
Communication contact VISIO Expertisecentre for blind people

Nathalie Verhulst
Blind expert

wil.

Die - onder
en aan de zon
voeten
zich aan mijn
De hoge torens strijken

Wil.

Of waar ik vandaan
MOET
Naar waar ik zijn
Loop ik
Stap- voets

vermijden.
niet meer wil

die ik
mag zijn
Totdat de reuring weer de reuring
Te kunnen spreiden

VLEUGELS

genoeg om onze
zingen de ruimte vol
De vogels
die ik niet zetten hoef.
verdeeld zich in stapjes
de achterplaats,
Het achterpad,

of elkaar spontaan ontmoeten.
Omdat de rust de reuring vindt
Maar koos het met genoegen
Had hier hoeven zijn
Niemand hier

Inward
The silence is within