Symphony for the dike

Orchestrating a soundscape ecology for a city park at the Delflandsedijk in Maassluis, the Netherlands



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MSc. Landscape Architecture

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Forward

This work is a graduation project developed in the lab “Design of Urban Fabrics”, within the “Flowscapes” studio, for my Master’s degree in Architecture and the Built Environment, track Landscape Architecture, at TUDelft. The project focused on landscape architecture (Flowscapes) within the urban environment (Design of Urban Fabrics). Soundscape and soundscape ecology were the approaches used to design the project for a city park, aiming to create public places that promote health and well-being, as well as robust and resilient landscapes.





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Figure 1 - The Delflandsedijk, Maassluis.
Source: De author, 2024.

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Ana Paula Duarte de Oliveira Post

Abstract

The Delflandsedijk is one of the most important dikes in the Netherlands, protecting the Delta's residents from constant flooding. In Maassluis it runs parallel to the river Het Scheur and is located less than 450 meters from a pleasant boulevard, where many people walk or bike daily. It is the boundary of *Het Balkon*, a recent functional neighbourhood of Maassluis, whose residents are mainly kids and people between 35-50 years old.

Walking along the Delflandsedijk is a disturbing and lonely experience. There are very few people over there. Merged into the urban landscape of Maassluis, it performs as a utilitarian element, emitting safety notes (not perceived by people) in a non-orchestrated urban landscape, with a very poor environment, where sounds are reflected and reverberated since it is a flat area, with very few absorption surfaces and elements. It is an underused and non-vegetated public space, muted for social interaction opportunities. There are no "sounds of life" such as conversations, laughs, screams or cries. Sounds of birds, insects or other non-human lives are insignificant and there are moments of almost silence. The systematic sounds of the metro and its gate alarms are very intense and combined with vehicle traffic, especially during rush hours, mask any other sounds.

This research values the utilitarian character of the Delflandsedijk and other Dutch dikes, highlighting their richer urban landscape and a great public space for people, where multiple uses and functions can occur. It can become a robust and resilient landscape by connecting local fragmented green structures (enriching biodiversity) while promoting well-being, health and social interactions.

To achieve that, landscape architecture was defined and understood phenomenologically, with a human-centered perspective that allows people to relate to it and find meaning in it. This particular landscape was investigated and understood as such, using our sensory capacities to extract and collect information to find answers to the posed problem.

Through the lenses of Soundscape ecology, a "Catalogue of soundscape design" was developed to show design possibilities within this theoretical approach, which is an important contribution to landscape architecture studies, since there are scarce references for this topic.

Furthermore, a practical application of the soundscape designs from the catalogue was implemented through a landscape project for a city park on the Delflandsedijk in Maassluis.

Soundscape ecology is confirmed as essential for urban design, as it effectively addresses the complexity of the human-environment relationship. Natural environments have the potential to provide psychological restoration for people and living organisms and soundscape is being proved to be a great asset in this regard.

Resilient and robust landscapes can be built using a soundscape approach and as a result, we can create great places for people to live, work, sport, enjoy nature, recreate, play, eat, rest or simply listen to the sounds that are there.

Keywords: Landscape architecture; soundscape; soundscape ecology; sensory perception; healthy public spaces; city park.

1 Introduction

Like an orchestra, every element (“instrument”) in the urban context is important and complementary, but they need to be tuned and encompassed.

The Delflandsedijk is one of the most important dikes in the Netherlands. After so many years of struggling with flooding and intense landscape dynamics, this dike brought safety to the residents of the River Maas delta. Like many other Dutch dikes, it is a public space conventionally covered with grass, and seasonal flowers, merged into the urban landscape, performing as a utilitarian element, underused as a public space, with low landscape qualities and lacking social interactions. Could this scenario be changed? Certainly. The Delflandsedijk could offer much more as a public place and contribute to a more resilient urban landscape by transforming it into a City Park.

To develop this City Park project this research required intensive fieldwork. The posed problem and research questions were defined after initial visits to the area and a structured methodology was established for this research (Chapter 1).

A theoretical framework was necessary for this scientific work and is built on Chapter 2. It provides an overview of dikes, crucial for understanding these remarkable landscape elements that form an intricate network throughout the Netherlands, with special attention to the Delflandsedijk. In addition, a core understanding of Landscape Architecture was analyzed. The phenomenological approach, essential in Landscape Architecture, emphasizes experiencing landscapes as key for the design process (Swaffield, 2001; Landezine, 2023; Green Cities Europe, 2023; Schutz, 2017; Cerwen, 2017; Schafer, 1970). By perceiving a landscape, we have a better understanding of it and can design something more closely related to it, more realistic (The Cultural Landscape Foundation, 2013).

This perception triggers all our sensory capacities to think, define, describe, and create memories with the momentaneous experience (De Wit, 2023). This phenomenology approach was essential throughout this research to understand and qualify the study area, because accurate information is gathered during experiential moments (Schafer, 1977), with special regard to sounds, the core sensorial element of this work.

The Delflandsedijk is a public space, underused and unattractive for social interactions, and has the potential to change this reality. Public spaces only become places if there are people in them. To understand, explain and inform how important the dynamics and interactions that could happen in such areas are, this research was enriched with the reflections of Whyte (1980), Lynch (1965) and Harteveld (2021).

Sound is the main sensorial element in this research. As mentioned by Juhani Pallasmaa (2011), sounds are the only sense that allows a broader experience of a place.
We live in a world full of sounds but daily, almost nobody distinguishes them anymore, unless they somehow cause some disturbances, which directly affect people's health negatively (Muhar & Brown, 2004, Aletta, 2018; Layton, 2018; Mookiah, 2022; Schutz, 2017). The sounds are being avoided. People are shutting themselves into a kind of "acoustic bubble" with their high-tech headsets, avoiding social interactions. By doing that, people are not perceiving the world and are missing the opportunity to use their sensorial capacity for rich experiences of all kinds. This research also emphasizes that sound experiences can contribute to health restoration, such as reducing stress and anxiety.

There are many sounds on the Delflandsedijk and they need to be discovered and experienced (Swaffield, 2001; De Wit, 2018). For that, it was essential to delve into the Soundscape theory, projects, concepts, and definitions, passing through the basic understanding of simple acoustic principles, such as the propagation of sounds (Schafer, 1977; Farina, 2022; Krause,1987; Pijanowsky, 2011; Trouax, 2007; Cerwen, 2017; Schutz, 2017).

Chapter 3 presents the site for the City park, with references to the historical past, analysis of the landscape regarding its uses, dynamics, potentialities and opportunities, having sounds as background.

As mentioned earlier, this research required intense fieldwork, which can be seen in Chapter 4.

The theoretical framework revealed that while scholars have presented many dense studies about Soundscape, they lack practical methods of how to visualize and inform sounds through design. This raised a need to complement this research with a "Catalogue for Soundscape Design" as a soundscape design application (Chapter 5), in which common landscape elements were defined and scaled according to their sound propagation capacity, and arranged in design compositions, showing different auditory experiences, and different Soundscapes.

Using the "Catalogue of Soundscape Design", the project for a city park on the Delflandsedijk was developed under the lenses of Soundscape ecology, with a higher-quality urban landscape, providing multiple uses (regarding spaces and seasonality) and functions (considering residents' questionnaire responses), while improving the overall landscape structure, where the sounds of people, birds, insects, wind, rain, water, gravel, leaves, falling branches and even of cars, planes and metro are welcome (Chapter 6).

The research findings were very clear and objective, despite the phenomenology guidance: by creating new sonic environments, we can create landscapes that can not only inform sounds, but offer high spatial qualities, which improves human health, biodiversity and resilience, and better use of a place (Chapter 7).

Maassluis, the Netherlands

Figure 2
Douane house, Maassluis.



Source: By the author, 2023.



Province of Zuid Holland



Maassluis



Study area

Maps - by the author.

Fascination

“Are we safe living here?

- Yes, Ana, we are! We live on a dike.”

My fascination with dikes did not begin with this dialogue between my husband and I, when we moved to Maassluis from Brazil. It had already begun since I first knew about dikes in the Netherlands, which happened to be during high school, also in Brazil.

Dikes always intrigued me for the simple fact that around one-third of The Netherlands is below sea level and built on the water. How amazing isn’t this?

Another fact that captivates me is related to my background as an architect. I like to observe people and understand how they interact with places, for which purposes and uses. Cities would not exist without people. Urban spaces are shaped by people and I like to know how this happens.

Figure 3 - People on street in Maassluis.

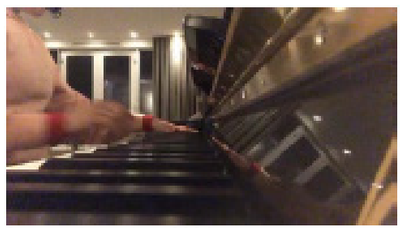


Source: De author, 2024.

The stories, history and hidden information are of great interest to me. There are “hidden gems” hidden behind the pragmatic information that are sometimes the most valuable asset for a project. I like to investigate that and this gives me a sense of belonging to the place I am working with.

Music is always present in my life. Good music (no specific style), good sounds, good rhythm. Sounds have this magic of "playing" with feelings, emotions, and I am very susceptible to that. I have played a musical instrument (piano) since a young age and have realized that the moment in time decides if the song I will play is calm, melancholic or super joyful. I also have my "dynamics", like the landscape! There are moments when I just want silence. There are moments when I want loud chords. But, there is always some music in my day. This is nothing more, nothing less than phenomenology.

Figure 4 - Me, playing piano.

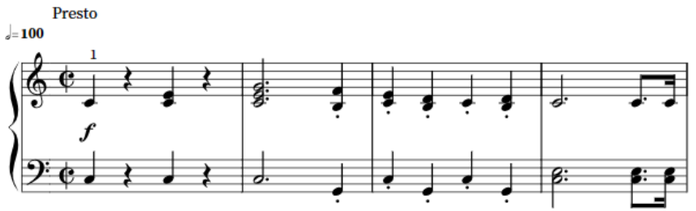


Source: De author, 2024.

Now, for the graduation project, I mixed these personal fascinations to place an “honour” for one dike. I felt devoted to the dike that allows me, my family and thousands of people to live on the Dutch delta. It is my appreciation for it and comes with lots of joy and hope, as we are facing difficult moments regarding the future safety and liveability of this and all the countries in the world.

I can do that by making a “Symphony for the dike”, for the Delflandsedijk!

Figure 5 - *Random musical notation*.



Source: De author, 2024.





Figure 6 - Neighborhood *Het Balkon* on the Delflandsedijk, Maassluis.
Source: De author, 2024.

We need to discover *the sounds that are there...*

We need to perceive *the sounds that are there…*

We need to distinguish *the sounds that are there...*

We need to listen *to the symphonies that are played every day there…*

"Everyday by the dike"

During 8 months, pictures were taken from the same place at Delflandsedijk, at different moments of the day. From the end of Summer till beginning of Spring.

Everyday by the dike



Problem statement

In Landscape Architecture, the phenomenological approach is essential to investigate and understand a place, using our sensorial capacities to extract and collect information. The posed problem of this research project is a result of a collection of experiences at the location, with a focus on sounds.

The Delflandsedijk in Maassluis is parallel to the river Scheur (how river Maas is named in this part of the delta) and is located less than 450 meters from its nice boulevard, where many people walk or bike daily. It is obvious to imagine that these same people have to pass through this dike at some point, and somewhat, interact with it. However, this does not happen.

This dike is a borderline of *Het Balkon*, a recent functional neighbourhood of Maassluis, whose residents are mainly kids and people between 35-50 years old. A neighbourhood with this profile is normally very vivid and a huge area of grass (the dike) seems to be the perfect place for kids to play and run freely, but instead, it is mostly used by dog owners to walk their pets, in different moments of the day.

Walking along the Delflandsedijk is a disturbing and lonely experience. There is always few people over there. There are no “sounds of life” such as conversations, laughs, screams or cries. Not even the dogs bark. Sounds of birds, insects or other natural non-human life are not expressive, and there are moments of near silence. The proximity to the river and a small forest (*Sterrenbos*) brings flocks of birds and ducks over the area, but they never stay on the dike.

The systematic sounds of the metro and its gates’ alarm are very intense and combined with the traffic of vehicles, especially during rush hours, mask any other sounds. The airplanes that fly to and from Rotterdam Airport can be heard with no difficulty because they have low altitudes when passing over the area.

In summary, the Delflandsedijk has a very poor environment, where sounds are reflected and reverberated since it is a flat area, with very few absorption surfaces and elements. It is an underused and under-vegetated public space, muted for social interaction opportunities. Merged into the urban landscape of Maassluis, it performs as a utilitarian element, emitting safety notes (not perceived by people) in a not-orchestrated urban landscape.

The Delflandsedijk, as well as many other Dutch dikes, has the potential to offer higher urban landscape quality, such as promoting social interactions and well-being while improving the use of public space, as well as increasing biodiversity. Recent researchers are finally considering dikes as the new contributors to climate adaptation, since the engineered utilitarian character is not solving many important topics, such as climate adaptation. One of the most important issues is to understand the landscape dynamics through time and work with the sounds inherent to them.
It is time to look at the dikes not only as an object/ machine but as a place where multiple uses and functions can happen, such as living, working, sporting, enjoying nature, recreating, playing, eating, resting or simply **listening to its sounds**.

Figure 7 - Delflandsedijk, Maassluis.
Source: De author, 2023 and 2024.

“Enjoy the silence...”



Figure 8 - Spots at the Delflandsedijk, Maassluis West.
Source: The author, 2023.

Research question

The research question aims to answer how the landscape potentialities of Delflandsedijk within Maassluis can be used in the design of a city park, using Soundscape ecology, a phenomenological scientific approach, to improve the liveability of a place, promoting well-being, social interactions, and bringing more biodiversity.

How can the landscape potentialities of the Delflandsedijk in Maassluis be transformed into a vibrant and quality urban landscape as a city park, using soundscape ecology as a design approach?

Sub reserach questions

Some especific investigations must be done to help answering the main research question. For that, sub-research questions were formulated:

- How is the urban landscape of Delflandsedijk being used nowadays and what are its potentialities?

- What are the sounds of the Delflandsedijk?

- Can these sounds promote social interactions and well-being of the people, and contribute to biodiversity?

- How can soundscape ecology design be relevant to the design of the park and contribute to future climate adaptive design/solutions??

Research scope

Research question

Sub research questions

- How is the urban landscape of Delflandsedijk being used nowadays and what are its potentialities?
- What are the sounds of the Delflandsedijk?
- Can these sounds promote social interactions and well-being of the people, and contribute to biodiversity?
- How can soundscape ecology design be relevant to the design of the park and contribute to future climate adaptive design/solutions??

Theoretical framework

- Field work and site analysis
- Field work
- Catalogue
- The design of the park

Relevance of the research

Scientific Relevance

Dikes are seen as the landscape of the future and this graduation project supports this scientific approach which is embraced by prominent research centers in the Netherlands (Future Dikes | Radboud Universiteit; Climate-proof coastal protection with “living dikes”). Working with the Delflandsedijk provided an opportunity to contribute to this scientific approach, extending its application to regional and national scales.

A phenomenological approach is being defended by many scholars, as an accurate way to understand and work with landscapes holistically (De Wit, 2023; De Wit, 2018; Mookiah, 2022; Swaffield, 2001). This research contributed to this approach, by applying it to site analysis, to the “Catalogue for Soundscape Design” and the project for the city park.

Soundscape is also a relatively recent scientific approach that is not commonly used in the daily practice of landscape architecture offices. Few urban landscape projects implemented worldwide have implemented this theory. In this graduation project, I demonstrated that the environment should offer good soundscapes for the landscapes. New methods for developing landscape architecture projects are needed to address contemporary challenges. Soundscape ecology is bridging the gap between objective way of thinking (precise measures) and phenomenological thinking (holistic approach) (Mookiah, 2022; Landezine, 2023; Pallaasma, 2011).

Social relevance

The social relevance of this research is directly connected to people’s health and well-being. Sounds affect the health of living organisms and can make public and private places inhospitable (Mookiah, 2022). This research will emphasize the importance of managing our sonic environment, especially in public spaces, to promote a better quality of life for people.

Sounds have a profound impact on people’s health and can trigger stress, and anxiety, but also restore their cognitive resources. (Herranz-Pascual, K. in : Mookiah, 2022)
The project also addresses a significant topic for the city of Maassluis: social interaction among its residents. A city park can promote these social interactions, especially in the study area: a public space that offers few opportunities for those social encounters. (Whyte, W,1980; Harteveld, 2021; Layton, 2018).

Professional relevance

The graduation project synthesizes everything learned during the Master’s, combined with previous experiences. The theoretical framework incorporated insights of important researchers such as Shaffer (1977), Swaffield (1998), De Wit (2018), Cerwen (2003), and Pijanowsky (2001), who believe soundscape can transform our way of working with landscapes. This belief is particularly relevant when considering the complex human-environment relationship. The sensorial and experiential aspects provided by the landscapes are rich assets that should be used at the beginning of any project.

Professionally, I am convinced that this phenomenological approach is crucial to developing any landscape project. Like any non-usual asset, it takes time to be fully absorbed by the professionals.

This research is significant in this context because it also offers a “Catalogue of Soundscape Design” for those interested on start working with soundscape. The Catalogue can be used anywhere and just needs to be adapted to the local situation.

We hope this approach will soon become part of daily discussions at landscape architecture offices.

Methodology

Research Methods

A mixed-methods approach was used to build the work, combining both qualitative and quantitative methods to approach the research questions.

The theoretical framework was built with a literature review of essential topics constituted as fundamental basis to answer the research question and sub-research questions.

Understanding the Dikes
The posed problem indicated a short literature review to understand the dikes and their importance as an utilitarian element in the Dutch landscape, focusing at the Delflandsedijk in Maassluis. Its contextualization enforces a dike as an element which can contribute as a great structure for public uses and climate adaptation solutions.

Phenomenological approach for Landscape Architecture
This pragmatic exploration about the dikes, one of the main elements in the Dutch landscape will lead to the phenomenological approach to understand the landscape. There is a need to look differently at the landscapes, to find solutions that are more realistic and with great chances for success, based on perceptions and sensorial analysis. Landscapes are composed for living organisms, for people, who need to have a close interaction with it. This is not a matter of numerical measurements since they do not deliver holistic values. A phenomenological approach such as Soundscape and Soundscape ecology can contribute much more for the design of our landscapes.

Understanding Public Spaces
This research will explore the Delflandsedijk as a landscape element within the urban fabric, a public space. For that, it is crucial to understand it as such. How people use them? How people walk throughout them? Looking at its dynamics and human interactions and relations, which transforms public spaces into places, the aim is to show the need of offering healthy places to public, enhancing well-being besides the “raw” utilitarian aspect of them. As part of the urban landscape, public spaces must be in balance and Soundscape can offer that.

Understanding Soundscape
As the main approach of this research, Soundscape will be addressed to as a crucial phenomenological way to be used in the landscape architecture projects. The literature review covers the most prominent scientific studies used in the ocntemporary understanding of this topic, with emphasis on **Soundscape Ecology**, which will be used on the Field work analysis, as well as in the Catalogue and City park designs.

Understanding sounds
The approach is fundamented on the basic acoustic definitions of sounds and its propagation ways, which supports further analysis in this research. Implications with health and well being will be discussed to enforce the social aspect of sounds.

Designing with Soundscapes
Case studies will be presented to support the Soundscape theory for the landscape designs.

Analytical methods

Inductive and deductive analysis were used for critical reflections an application on the design process.
Local and regional legislations (municipal planning, visions, rules and regulations), advises from *Hoogheemraadschap van Delfland* were used for the site analysis. This way, the project is aligned with the legal requirements.

Research techniques: Field work and site analysis

Field work
The field work was the ground base to establish the problem statement and define the research questions. The prior experience of this particular landscape was done through different methods.
- Photographing: visual documentation of the physical characteristics of the area and the landscape essence.
- Sketching: representation and interpretation of the site, including a urban analysis of the various elements that are present and relevant for the research.
- Mapping sensorial experiences with sounds, using the “Getting lost” approach from Paul Auster (in: xxxx). A non- biased walk through the area enable the identification of sounds that were present.
- Sound recordings: audio recordings from the sonic environment of Delflandsedijk were captured and helped on the identification of its qualities and patterns.
-Ethnography: inspired by the theory of Amos Rapoport (Rapoport, 1990), pictures of the dike were taken every day, in different hours, to analyse the changes performed on the landscape when considering both fixed and non-fixed elements.

Methodology

Site Analysis

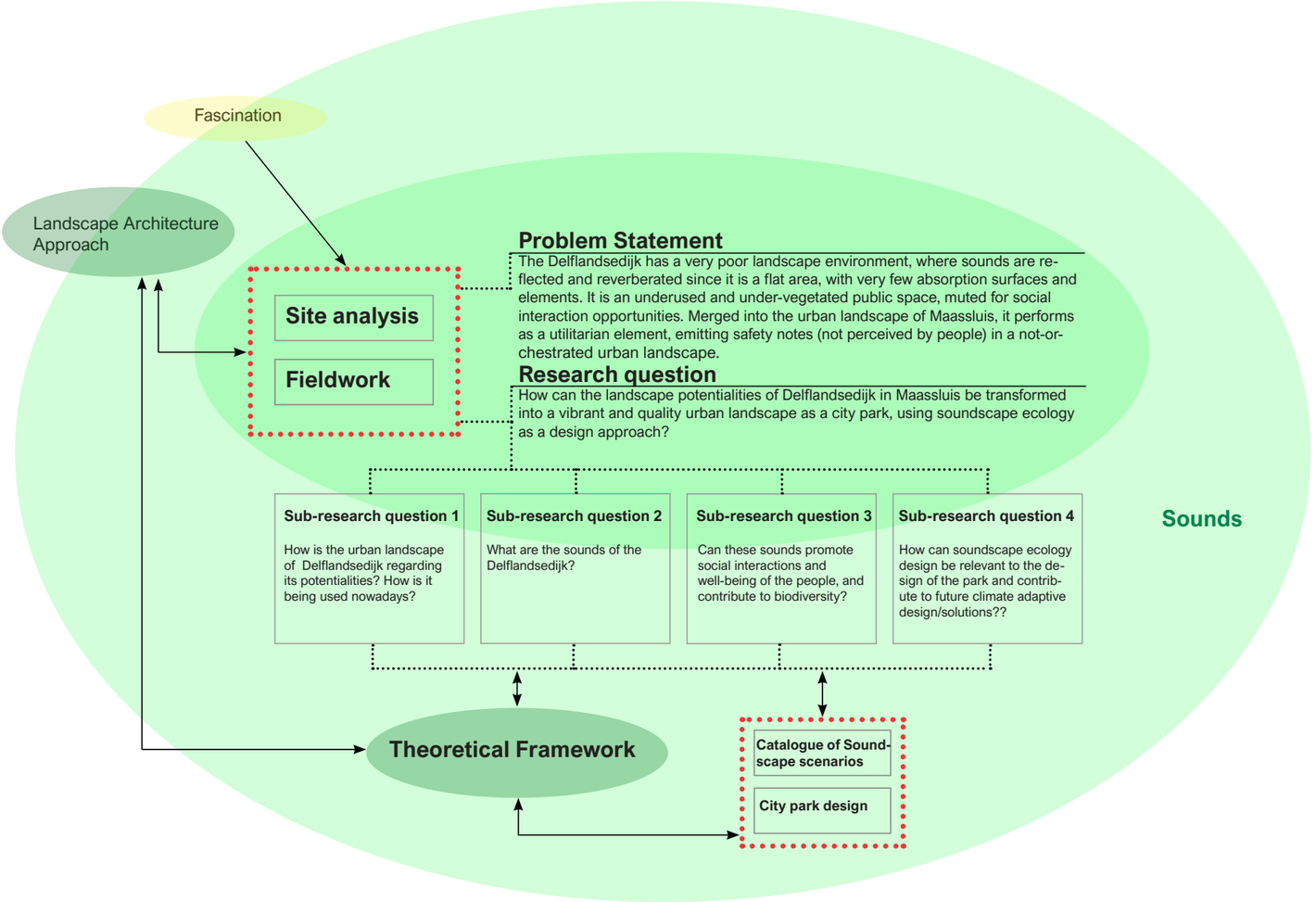
The site analysis brought a deep understanding of the history, physical and social context.
-Biography of the place (‘sounds in history’): the main historical moments of Maassluis were analyzed under the lenses of Soundscape, contextualizing the development of the city, which includes the Delflandsedijk, pictured through sounds that were remarkable for each moment in time.
-Photographing: visual documentation was elaborated in terms of spatial images of the site, highlighting the elements which are significant for the city.
-Sketching: representation and interpretation of the qualities and elements of the site.
-Mapping the landscape through time was important to comprehend the site structure; urban elements; green and blue structures; soil; sound disturbances
-“Soundwalk scoring”: based on Saskia de Wit’s method of “Walking and scoring”(in: Machado e Moura et al., 2023), routes were defined within the site for recording the sounds. The recordings were captured at the moment there was a change on the way (empty plot, high building, parking, change in the topography). Each recording lasted 1 minute and was made using a cell phone, at 1,10m high.

Research techniques: Design

Catalogue: **Research by design**
Based on the theoretical framework, a catalogue of Soundscape scenarios was designed, showing the possibilities of a phenomenological interpretation through the design and can be applied in different landscape architecture projects.

City Park: Design by research
- Resident’s opinions survey: through a simple online survey residents exposed their opinions and preferences/ wishes regarding types of places, sounds and furniture for the future Delflandsedijk park. This survey is very important to be considered during the design process.
- Sketching scenarios: , various scenarios were sketched, using the design principles. Representation was carried out in various ways: hand drawings, digital drawings, and physical models.
- Project development: using the information gathered during Fieldwork and site analysis, and the knowledge acquired with the theoretical framework, a project for the city park was developed, using the scenarios from the Catalogue to exemplify their practical application.

Methodology



2 Theoretical framework

Understanding dikes

Dikes are utilitarian elements on the landscape for flooding defense. In the Netherlands, they guarantee the safety of the country and the millions of lives of its inhabitants.

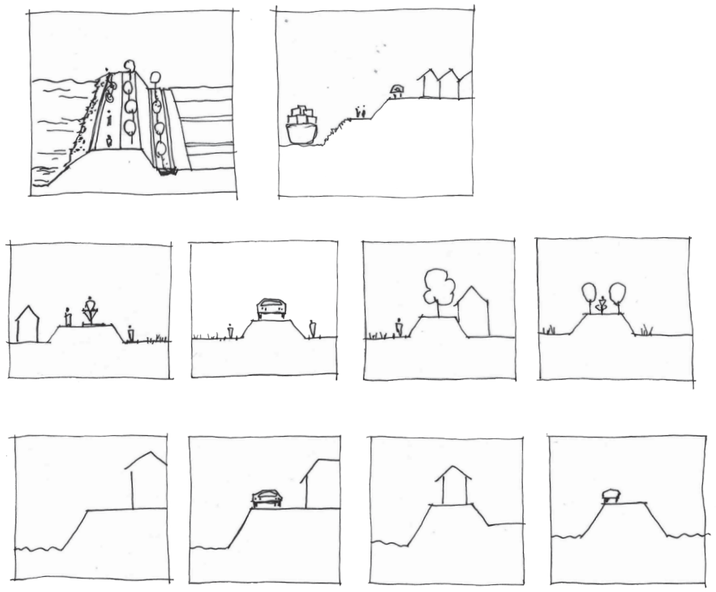
Since earlier times floodings were constant and due to landscape dynamics, the land had faced terrible disasters that cost many lives. The Dutch people discovered since then how to protect themselves against flooding threats and the dikes were used as defense elements.

In the Netherlands, the dikes are constantly being monitored, to receive the correct and necessary maintenance when needed. Sometimes adjustments must be made according to the analysis of the actual condition. These adjustments vary from enforcement, raising or enlarging. Each situation requires a different procedure.

The network of dikes in the Netherlands is a kind of skeleton to assure safety in different landscapes. This is composed of the following types: sea dikes; river dikes; polder dikes; lake dikes; canal dikes; water defense line dikes and dams/storm surge barriers (Pleijster & Van der Veeken, 2014).

Basically, the defences can be divided into 3 types:
- Primary flood defences: keep the water at bay
- Non-primary flood defences: “regional flood defences”
- Non-flood defence: they do not play a role in flooding defence (Pleijster & Van der Veeken, 2014).

Dikes perform as a certain identity for the Netherlands and are considered a historical-cultural element of the Dutch heritage. The reasons are obvious. However, the dikes are so merged into the built environment that people do not see them at first sight. This merger is causing the identity loss of such an essential element of the Dutch culture.



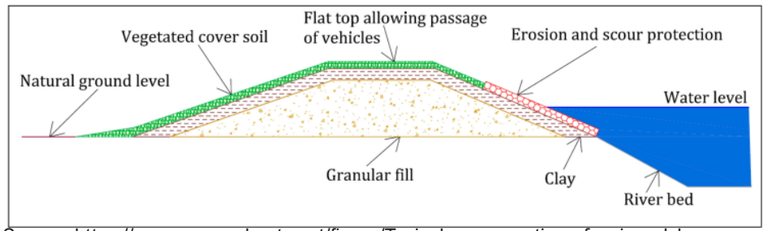
Dijk ; DYCK, DYC, DIIC, DICK, DIKE
DICCUS, DICUS, DIKA, DICHE,
DICCARE- FROM THE LATIN “TO DIG”
(in: “Dutch Dikes”, Lola Landscape Architects, 2014)

Understanding dikes

There are 3 types of dikes: sea dikes, river dikes and polder dikes. They have similarities and differences regarding profiles.

Figure 40 shows a typical cross-section of a river dike. As a built element, it is under physical forces, which can be permanent, variable or subject to other factors. Figures 10 e 11 shows the *Schieland Hoge Zeedijk*, a polder dike which was built in the 13th century to protect Maasland polder and goes all the way to Gouda. In Maasslu-is it is particularly important because defined its sovereignity as a municipality.

Figure 9
Typical cross-section of a river dike.



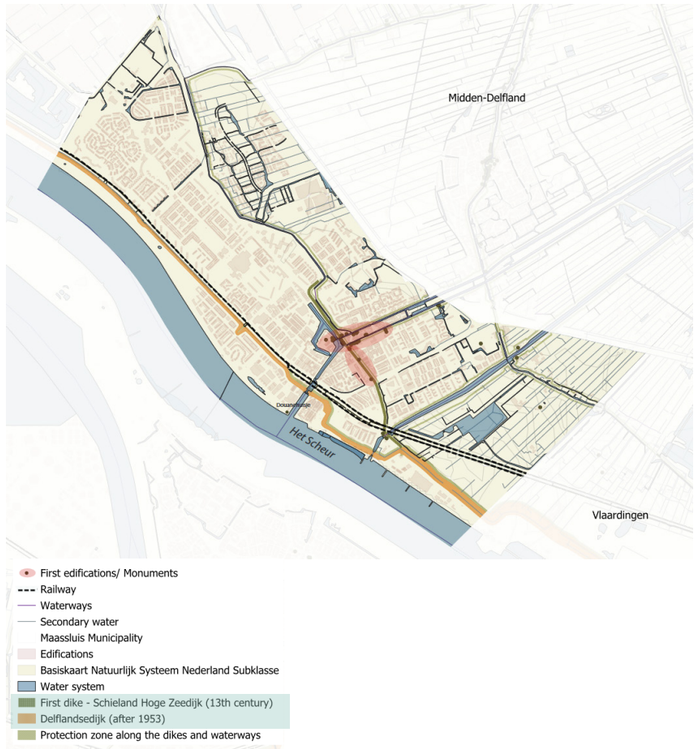
Source: https://www.researchgate.net/figure/Typical-cross-section-of-a-river-dyke_fig1_350902652

Figure 10
Schieland Hoge Zeedijk- Maassluis



Source: De author.

Figure 11
Essential elements on the early development of Maassluis



Source: De author.

The ambitious engineering national project “Delta Works” was developed in the Netherlands to guaranteed the safety of the delta residents. This project started in 1971 and was concluded in 1977 with the Delflandsedijk and the sluice “Maeslandkering” (Fig. 13, 14 and 17).

Figure 12

Delta Works Project, The Netherlands.

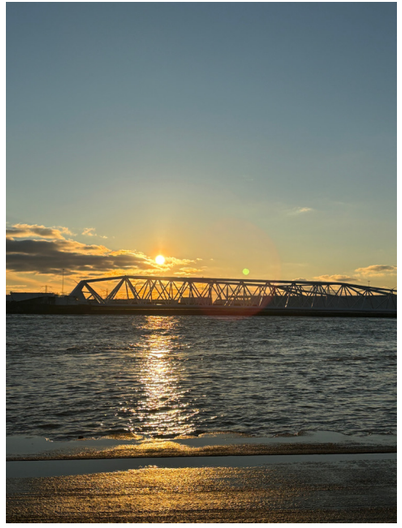


Source: RAAF and Atelier de Lyon, n.d.
https://www.raaaf.nl/en/projects/1005_deltawerk_m1611

Understanding dikes

After many years of natural processes such as river floodings and tidal dynamics, the river front was finally safe to receive occupation, which happened very fast. A small area near the entrance of the old harbour was reclaimed and a contention of the riverbank with a robust stone structure was built to avoid future tidal activity inland (Fig.14 and 15). These were the final elements to allow Maassluis continue to grow.

Figure 13
Maaslandkering.



Source: Author, 2024.

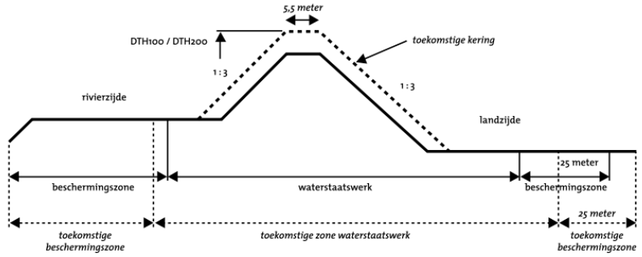
Figure 14
River waterfront with stone contention.



Source: Author, 2024.

The occupation of the riverfront had to follow strict regulations from the Delfland Waterboard. The developers of the new housing neighborhoods at the “Nieuwe Waterweg” had to raise the whole site to approximately 6 meters above sea level (NAP). This condition prepared the dike as it should be 100 years from now, not demanding future enlargements or raising. (https://www.hhdelfland.nl/over-ons/regelgeving/beleidsregels/) See figure 16 below.

Figure 15
Dike zoning



Source: *Hoogheemraadschap van Delfland , 2020.*

Figure 16
Delflandsedijk raised to 6 meters high.



Source: https://hvm.collectiebank.nl/

Figure 17
Maeslandkering closed for the annual tests, October 2023.
Source: De author, 2023.



Understanding dikes

Althought the dikes were treated as essential utilitarian elements, due to a need of finding solutions to mitigate climate change, researches are looking at the dikes in a different way.

As a Dutch heritage, it performs as an element which guarantees the safety of life in the country. However, it is a fertile base for increasing biodiversity, enhancing ecosystems, promote social interactions with a better and diversified use.

Landscape architecture offices are working with new approaches for using the dikes as future climate adaptation element. They work differently but with the same target: finding solutions for climate adaptation, having the dike as a main character.

These new ways of looking at such a institutionalized element enforce and creates strong base for this research, since shows that there is a change in mentality and a need to think about soutions that can add value to the utilitarian identity of the dikes.

Dikes are the landscape of the future!

Dutch landscape architecture offices like Felixx, H+N+S and Palmbout are researching solutions involving a better use of the dikes (including rescuing the old ones) to smooth the landscape for the future. The example below is from Felixx Architects and they proposed to revitalized the old dike in Dordrecht, bringing new usages while contributing for climate adaptation.

Figure 18
"The dikes are the new climate adaptive living environment." Felixx Landscape Architects



Source: www.felixx.nl

Understanding dikes

Figure 19
"The dikes are the new climate adaptive living environment."



Source: https://www.ru.nl/onderzoek/onderzoeksprojecten/future-dikes

The Radbout and Wageningen universities are developing a projec called “Future dikes”, requested by the *Waterschap Riviereland* and financed by Heeremschap, to look for solutions to strengthen the dikes with rich-grass revetment, instead of using costly enlargements of raisings. They are researching diverse species of grass and flowers on real small built dikes, whose roots make the structure of a dike more strong, avoiding erosion, especially after long periods of drought (which is already happening in the Netherlands).

Positive results are encouraging the ecologists to defend this innovative way of looking at the dikes, since it is restoring biodiversity and connecting different ecosystems.

The dikes can no longer be only utilitarian elements in the landscape and this research is enhancing them as new climate adaptive living environment. (ru.nl) https://www.wur.nl/nl/Onderzoek-Resultaten/Onderzoeksinstituten/Environmental-Research/show-wenr/Future-Dikes-sterke-en-soortenrijke-grasbekleding.htm

Dikes need to be re-engineered. The contemporary framework of finding solutions for climate adaptation has pointed out that raising the dikes will not solve the problem of sea level rise. It is needed a more sustainable approach, considering the dynamics of the landscape as a primary factor to be observed.

This is what the "Living Dikes project" is aiming. In this project they see the dike as a structure that "enhance nature development, provide very effective carbon storage and encourage recreation."

The dikes are no longer only seen as a utilitarian element and their extensive network can bring more values (special social ones) and qualities to the landscape where it belongs.

Figure 20
"The dikes are the new climate adaptive living environment."



https://www.tudelft.nl/en/2023/tbm/climate-proof-coastal-protection-with-living-dikes

Phenomenological approach of Landscape Architecture

In a recent lecture to landscape architecture students, Professor Saskia de Wit defined landscape as a moment perceived by a person and somehow, registered through photography, drawing or painting. This definition strongly emphasizes the phenomenological character of landscape, in which perception is key (De Wit, 2023).

In the same direction, Ian McHarg has proposed in his “Design with Nature” that man is the only “conscious creature who can perceive and express” (Swaffield, 2001, p.173). In line with the sustainable concerns raised in the years 60s and ‘70s, when the world faced a fast urbanization and industrialisation period, he proposed to not separate nature from non-nature environments and treat both as unique bodies, which could offer many possibilities for harmonious landscape architecture design.

Landscape architecture has numerous definitions. It is an exceptional multidisciplinary science, in which the phenomenological approach plays an important role, invoking experiences, subjective points of view, sensory experiences and a large variety of meanings it intrinsically brings with it.
Among the texts compiled by Simon Swaffield (Swaffield, 2001), “The Language of Landscape” by Ann Whiston Spirn has presented a metaphor with language to define landscape architecture, which can easily reach a variety of public. As a language, landscapes also have patterns of shape, structure, formation, and function and were the first human texts to inform people about many issues. This simple way of addressing such a complex topic is very much appreciated, for the fact that knowledge should reach everybody, not only a privileged scientific community. Besides, it is beautiful and poetic.

Landscape architecture has the honourable task of working with and within landscapes, understanding and designing the best integrative use of it, not only for humans and their creations but also for all living creatures. However, we cannot leave the responsibility of keeping this world equalised and in balance only for the landscape architects (Landezine, 2023). We are all part of it and only for that, we are all responsible for it. In this sense, a sustainable world should be “designed” somehow by everyone who inhabits it.

Landscape Architects have the “power” and knowledge to transform landscapes, and they must aim for the best solution, not a perfect one since nobody can affirm whether a landscape project would work or not.

Perception and scientific knowledge should be together in landscape architecture. Georges Descombes has a very good real example of this while developing the project in the river L’ Aire, France (Figure 19). The project was successful (according to him “up to now!”) because they carried out a deep reading on the landscape and had a clear understanding of it. However, he and his team were not sure if the project would work, even with scientific knowledge behind it. They gave it a try and the landscape architecture intervention/ transformation occurred, harmoniously and successfully (Green Cities Europe, 2023).



Figure 21
Georges Descombes in his project for the river L'Air.

Source: Karla Hiraldo Voleau (BAK), www.world-architects.com

Phenomenological approach of Landscape Architecture

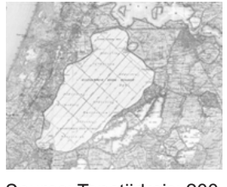
Landscape transformation

Every day, everywhere in the world, people are using, working, living, and bringing benefits or causing damage to the landscapes (no matter the age, culture, socioeconomic conditions, or beliefs). According to Ann Whiston Spirn, there is not even a remote place on Earth where human activity has not caused any kind of impact (Swaffield, 2001). We should be conscious of developing and transforming our landscapes in such a way that we look for maximization of its potentialities and mitigation of its problems.

The landscape is dynamic, with or without human interventions. When we humans make interventions in the landscape is to make it suitable for our needs, in a determined moment, not judging here if they are good or bad.

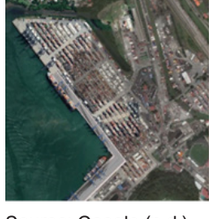
Society is as dynamic as the landscape and that is why there is a constant need for changing, modifying, and adapting. For instance, the Dutch made the polders to create safe living conditions for the people (Fig. 22). Many hectares of landscapes were modified to meet Dutch needs. Another example that can be presented is the reclamation of areas to allocate housing, industrial parks, and infrastructure to make cities work better as it happened in Balboa Village, Panama, during the construction of the Panama Canal (Fig. 23).

Figure 22.
The Haarlemmermeer polder, North Holland Province, 1867.



Source: Topotijdreis: 200 Jaar Topografische Kaarten, n.d.

Figure 23.
Balboa Village, Panama.



Source: Google (n.d.).

We create places to “accommodate our creations”. We were given the capacity and intelligence for that, but for many years there was an uncontrolled and unbalanced way of managing these.

Because we began very late to consider sustainability as essential, many transformations brought depleted landscapes around the world, despite the strong earlier alerts raised by Rachel Carson (1962) and later on, with the United Nations’ members agreement in the so-called “Brundtland Report” (United Nations, 1987).

However, landscape architects continue to worry about the ongoing transformations. In 1984, Anne Whiston-Spirn discussed in “The Granite Garden” (Swaffield, 2001) how the city was put aside the nature. She also reflects on how the modern world has put the city against nature and nature against the city. It is clear that the development of modern society brought pollution to the cities, contamination of water sources, the devastation of natural vegetation, scarcity of raw materials, an increase in energy demand and overall, a risk for the landscape’s sustainability.

In this sense, Peter Jacobs is very assertive when he mentioned that “landscape design will have to contribute to the need to build landscapes that are equitable- equitable in the way the living resources of the landscape are used and distributed (…), equitable with providing opportunities for those generations that will follow our own.”(Swaffield, 2001, p.120). He also enforces that “we must account for our individual and collective need to develop a sense of belonging to and within the landscape” (Swaffield, 2001, p.121). The sense of belonging has a highly positive impact on landscape transformations. It makes things work (well).

This aspect is also mentioned as essential by Alan Ruff, who affirms the importance of a landscape designer being a “catalyst and adviser, rather than an all-knowing professional” (Swaffield, 2001, p.177). Landscape architects need to get closer to the place and people, avoiding outcomes that do not correspond to reality and do not get people involved. As mentioned by Olin (The Cultural Landscape Foundation, 2013), beautifully rendered images or collages digitally fabricated most of the time do not correspond to reality.

Transformations on the landscape are grounded on scientific knowledge but a significant part of the design process should embrace phenomenological approaches. They connect real-world experiences to real people, fostering a more intense interaction with the landscapes, which triggers a sense of belonging and responsibility within the world.

Understanding Public Spaces, Public Places

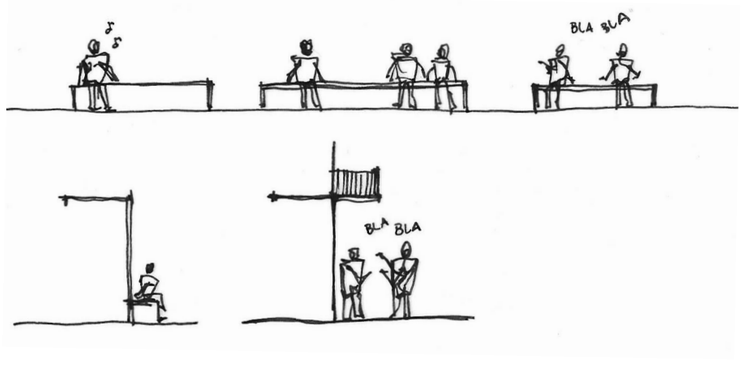
Within the urban fabric, spaces are defined, shaped, limited and structured, mixed between public and private.
What makes a space become a place? A space becomes a place if there are people in there. People interact, use, change, move around, pass by or fill a space, but by performing any kind of action, they transform a space into a place. Memories can be built, changes in personal behavior can happen, and choices and preferences can be made. When a place is “formed”, there is a mix of physical and phenomenological actions that only happens in the presence of people.
Urban parks are good examples of places. There is no control over what kind of interactions can be done by people over there; it is highly dependent on people’s behavior.

William H. Whyte (1980) says that urban parks are elements that stimulate people’s interaction with the city. According to him,

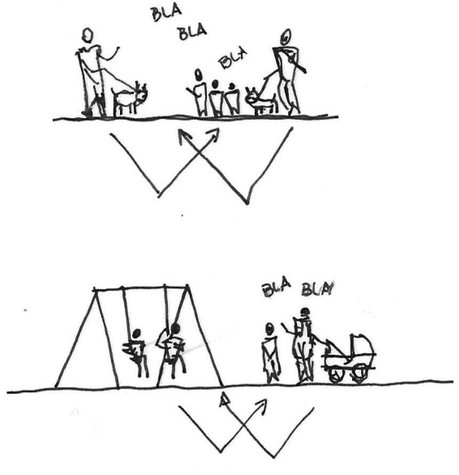
“The park stimulates impulse use. Many people will do a double take as they pass by, pause, move a few steps, and then, with a slight acceleration, go on up the steps. Children do it more vigorously, the very young ones usually pointing at the park and tugging at their mothers to go in, many of the older ones breaking into a run just as they approach the steps, then skipping a step or two.”(Whyte, 1980).

Transforming a space into a place is a difficult task, which can fail or succeed. The design itself cannot guarantee anything. However, if the design reflects the basic actions of people, such as what attracts them to a certain place, why they use this way and not the other, or how can a place gather people, are some of the questions that we designers should ask. These questions should be addressed considering the context of where a public space will be transformed into a public place. The context is essential to respond to the questions.

In a public space, many elements can bring people together. For instance, a simple bench can become a place for unexpected encounters. A bench can perform many possibilities of social interactions, which the design cannot assure, only allow.



Other structures also offer opportunities to socially connect people in public spaces and even become affective spots, which is called triangulation, approached by William H. Whyte (1980) while addressing the social life in public places. For instance, a dog owner walks with his friendly pet and meets kids on the way, who are accompanied by one of the parents and a dog. The situation in a public space creates momentum (social dynamics), in which a friendly and unassuming conversation takes place. Edges, stairs, piers, playgrounds, trees, and lakes are some public spaces susceptible to this.



Understanding Public Spaces, Public Places

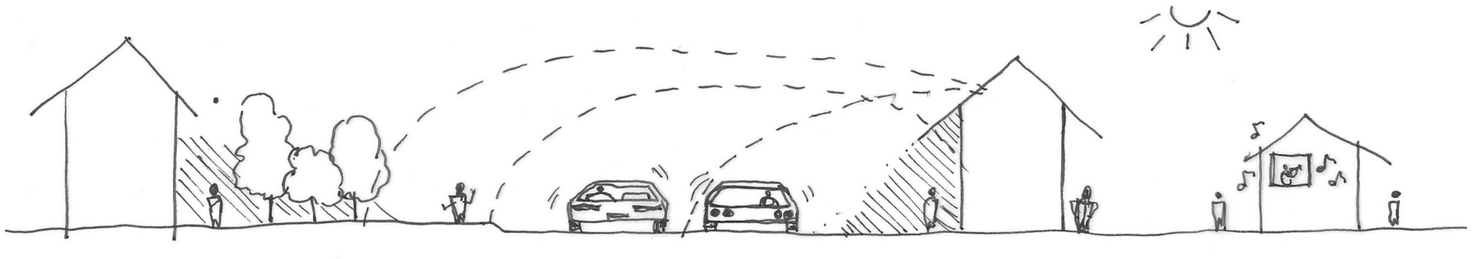


Especial events, not exactly planned but placed spontaneously in public spaces can also gather people. As observed by Whyte:

“Then there’s music, known to enchant the brain and influence our emotions in profound ways:
Musicians and entertainers draw people together [but] it is not the excellence of the act that is important. It is the fact that it is there that bonds people, and sometimes a really bad act will work even better than a good one.”(Whyte, 1980).

How do people move around the public place?

This question is very relevant for this research because while designing a park, we should make sure that people can move in expected ways but also in unexpected ones. Some people walk the same route every day. Some vary it. People are different and cannot be biased 100% through the design because the way they move is connected to a variety of personal preferences, which vary according the psychological conditions or practical needs: the fast way to get there; the pleasant path; the safest route; the sunny side; the shadow side; the silent street, the protected sidewalk when it is raining.



Understanding Public Spaces, Public Places

What do people see when walk?

In the urban fabric, people move around and while moving, they see a world of scenes, which also vary from person to person. While walking in routes defined spontaneously or based on a necessity, some connections with these scenes are bonded and mental images are built. This is called the imageability of a place. As a consequence, people can build memories with these images and use them as references and landmarks, to remember a funny history, etc. This is called legibility.

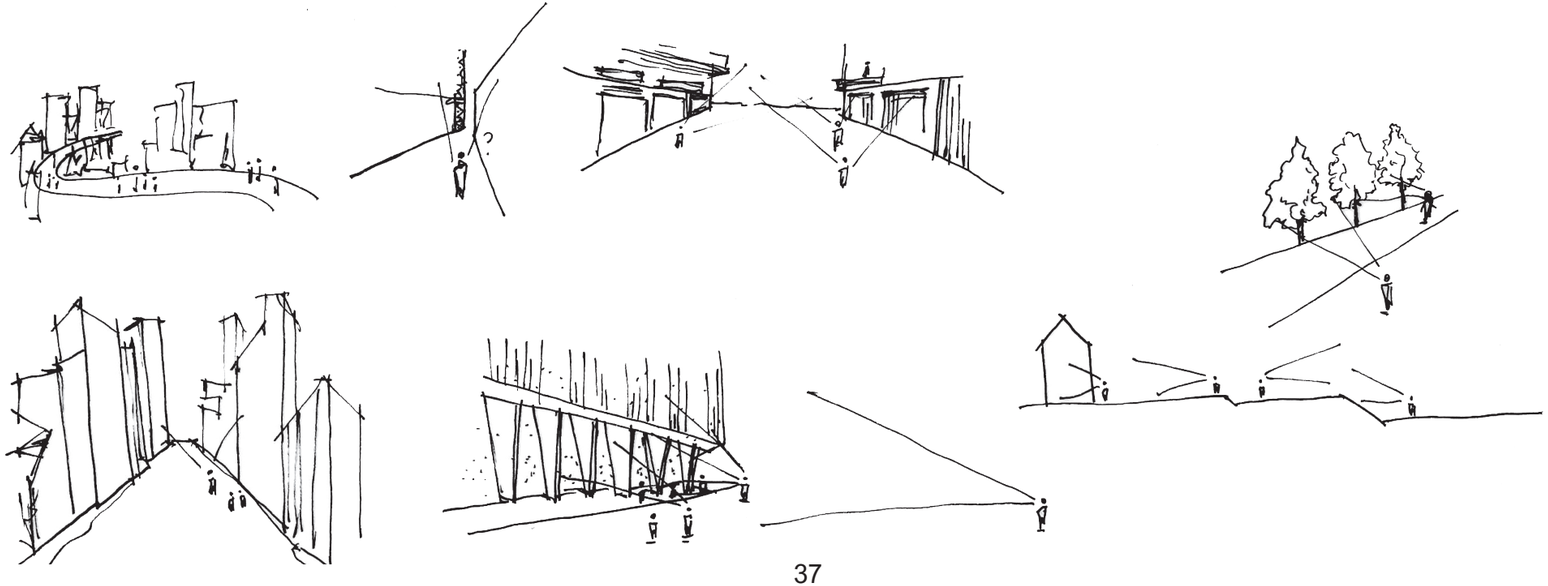
These images and memories are made on the street view level. Many elements in the city cannot be verified on the street view level due to the scale.

Therefore, they are not legible and mere elements with no significant importance for a city, but they are there (Harteveld, 2001).

The importance of a street view level goes beyond the scale. If people can build memories with a place or element within it, a sense of belonging is established.

This is very relevant within a public space because it involves care, attention and a sense of responsibility with this place. From a pedestrian perspective, to have a sense of belonging means somehow safety. If the place is legible, which can happen with the presence of landmarks - paths, edges, buildings, a tree, a garden-, a person immediately has a way finding and a sense of belonging (Lynch, 1965).

Place is a shelter, and protection, where people's experience built meaning, memories and stories (De Wit, 2018).



Understanding Public Spaces, Public Places

Public spaces are used, owned and known. They are responsible for uncountable encounters and social interactions. Observing public life, there are many ways they use, own and know the places. Sometimes one edge is enough to promote unexpected social interactions/ encounters. People gather, walk and get oriented in public places to find comfort and safety.
“People appropriate public space as their private place!”(Harteveld, 2001).

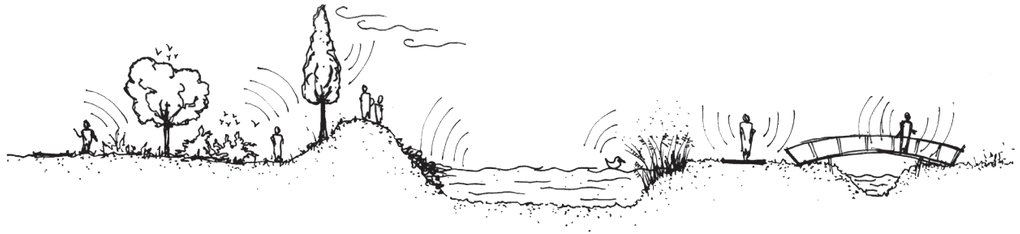
People remember different things from a certain place, which can be very specific since is a very subjective matter. There are types of perception: cognitive, affective, interpretative and evaluative. Normally, a first experience within a place is different from a second one. However, this can be biased and not represent the true individual experience. The experiences can be easily influenced by media, social media, which alters the real individual perception. The true experience of a place should be neutral. In any case, “spaces provide the context for a place” (Harteveld, 2001) and “when people feel familiar with a place, they also feel comfortable with it”.

What do people hear while they move?
The perception of the receiver depends on the position an distance of he/she, regarding the sources of sounds.

Of course, sounds are modified by diffraction, reverberation, and absorption.
In public spaces, there are many sonotopes. The acoustic niches are part of it. Experiencing public spaces let people know where these niches are.
During a walk, people build memories or mental images, which are called Imageability.

Part of these mental images are filled with sounds: “the sounds of cars on that crossing intersection”; the sounds of birds on that street; the sound of wind on that building corner, etc. All these elements work as Soundmarks, as proposed by Murray Schafer (Schafer, 1977).





When people walk through a city park, many way findings can be found through sounds. These landsmarks/ soundmarks are important and part of experiencing public spaces.
It is important to acknowledge the legibility of a place regarding its elements.

People are different. They remember different elements of a place. They also remember specific things in specific times (which is very subjective!) (Harteveld, 2001). These experiences are variable when happened for the second time. Can be totally different from the first. If the experience is pleasant, it is more likely to happen again.

The most important question is regarding when space becomes place. Space needs people to become a place. When there are people, there are experiences with the space, perceptions and the physical attributes are mixed with the sensory attributes.

Understanding Public Spaces, Public Places

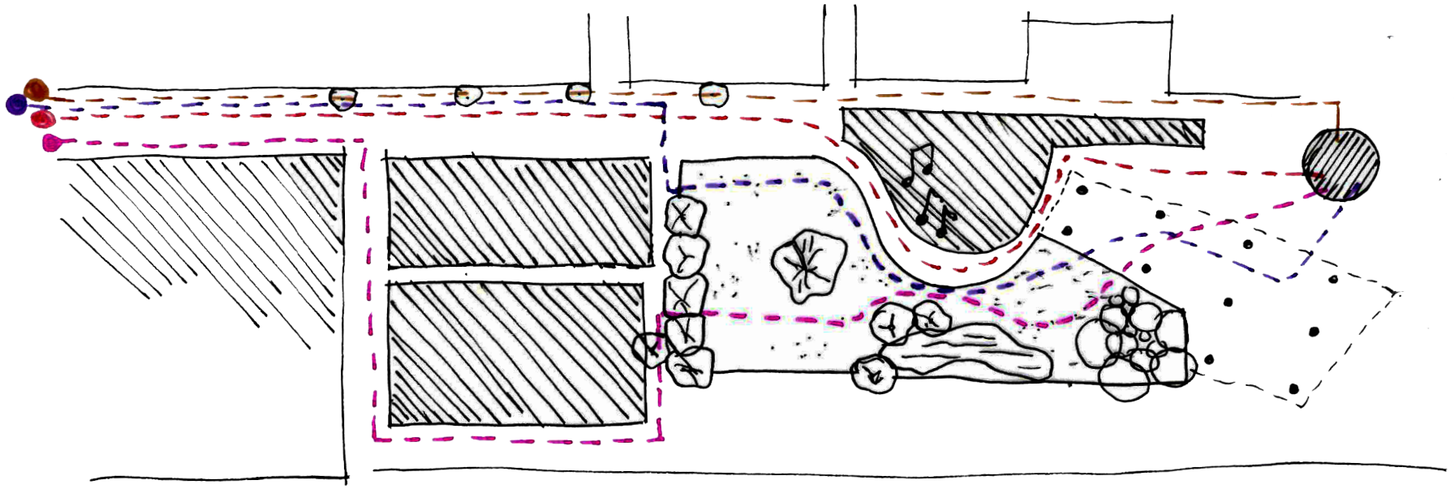
William H. Whyte (1980) observed how people move around in the city, on a street eye level, how they gather, walk, get oriented.

Isolating the sensorial perceptions and considering the various sonotopes of public spaces, it is difficult to preview what kind of behaviour people will have. However, some are obvious and common because they are closely related to the health condition of any human being.

Any person would feel completely uncomfortable within places where sounds are louder than 50dB. The number one complaint lies over traffic.
Human well-being's core concept is related to the human need to orient oneself in a place and identify with the surroundings. This is *Genius Loci* according to Norberg-Schulz (in: De Wit, 2018).

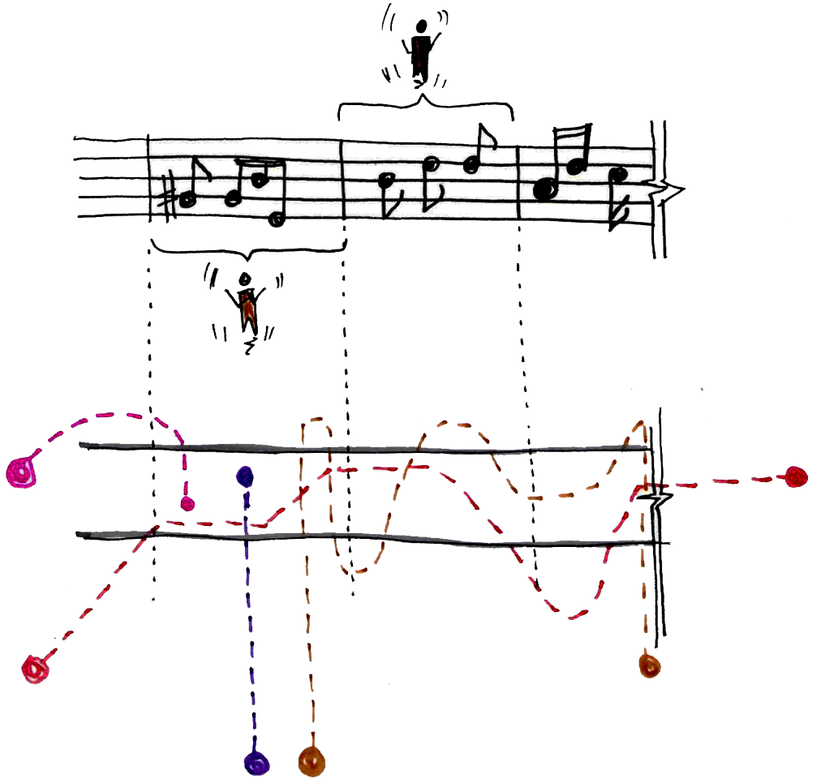
As our asset in this work, sound can perform as an element of decision for walking a route: "Let's walk this way because there is less traffic sounds"; "let's take that street because there is always a person playing music in one of the houses".

In the following example, four different people walk different routes to achieve the same destination. Since sound can be an element of the decision, as landscape architects we should not control the route people make but suggest.



Source: By the author

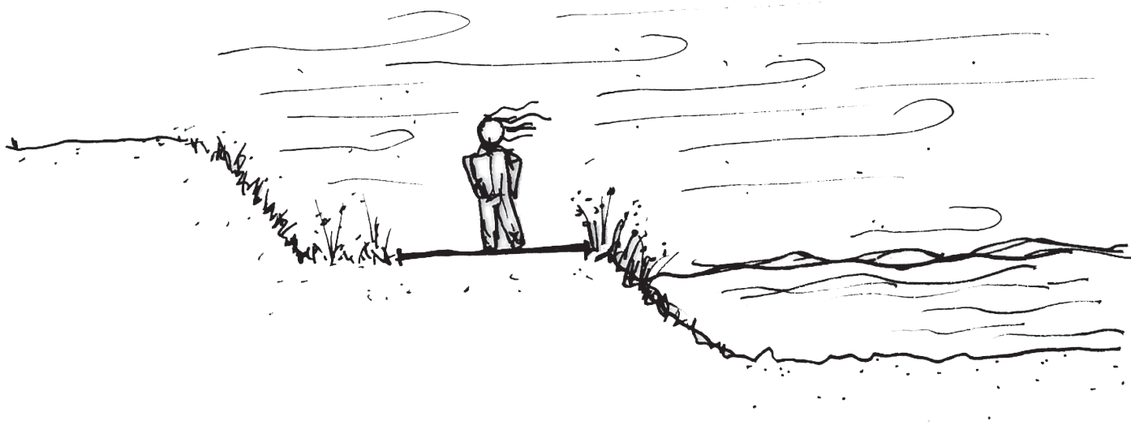
Understanding Public Spaces, Public Places



People connect to places according to their needs and preferences. Preferences are time-mood-needs conditioned. Comparing this to music, the same song can be enjoyed by people in different ways. One prefers the beginning; another prefers the middle; the other one loves one accord and keeps playing it over and over again. The song is the route and each individual makes different decisions to walk this way or the other.

The decision for experiencing sounds is due to each person. Some loves to hide from the wind; others love to sense the harshness of it.

Preferences are individual, so are the senses. As can be seeing on the example below, some people feel very comfortable walking along the water in windy days. Others do not get out of the house. The individual well-being is a response of our senses to different external manifestations of the environment. It is phenomenological. It implies experiencing a place and respond to it in a positive or negative way.



Understanding Public Spaces, Public Places

We believe that our public spaces are being designed to promote these social interactions but in fact, it is happening the opposite.

As mentioned before, spaces need people to become places. But if there are no interactions of the people with this space and with other people, we still do not have a place. Social interactions have proved to be an important element for human health and there are many scientific studies about this. Those interactions only happen when people are open to making them happen.

After the COVID-19 pandemic (2020-2022), people began to evaluate many issues that before had no meaning and importance in their lives. The sound of the cities was one of them. Suddenly, with the lockdowns, our urban environments were emanating different sounds everywhere. Biological and Geological sounds overlapped the Anthropological (especially the technological) ones, which were almost nulled. And surprisingly, people were enjoying this “new world of sounds”, which was there all the time.

Everybody began to search for natural environments such as parks or green structures, which were less dangerous to be contaminated since were open areas. These places were “escape zones” to release the pressure of being confined within our houses. Even though many people could not leave their houses, they discovered a different soundscape through their windows, which instinctively brought the notion of what could be a healthier environment to live in.

From empty streets that usually have crowds and chaotic traffic to small green spaces confined between buildings (where a sense of clean air was somehow present), people experienced public spaces in an almost “artificial” way, because that was not the real life but an imposed one, that revealed the “bright side” of where we live, work and recreate. Public spaces (not places, because people could not go out of their houses) showed their potential and values, as well their weakenesses.

After the pandemic, people returned to their routines and the public places could be enjoyable again. However, new senses, new sounds, new experiences brought a conscious of their meaning. Everything that was not part of our daily life was attractive and wanted.

Our cities are struggling to offer healthy and enjoyable public spaces to the population. Therefore, whatever solution is bringing to the table, it involves well being. during Covid lockdown, different experiences with public spaces were noticeable and sounds were perhaps the most prominent ones. The sounds in the cities changed. The unwanted sounds became almost silent, giving the floor to wanted ones that were masked before. A new acoustic environment was revealed, with notes that were never clearly heard before. Can we bring these sounds back?

Figure 24.
A deer crossing the street in Nara, Japan during the lockdown.



Source: Jae C Hong/AP, 2020. https://www.theguardian.com/world/gallery/2020/apr/22/animals-roaming-streets-coronavirus-lockdown-photos.

Understanding Soundscape

“We need to make people see again things that we are used to, in a different way. People have to experience and have special moments with nature: touching water, smelling leaves, ***listening to the sounds****.”*
(Georges Desmonds, “Green cities lectures”, TUDelft, October, 2023)



Figure 25
“Bringing nature back”

Source: https://youtu.be/l3m0BtOclvQ

Understanding Soundscape

As a multidisciplinary field, people from different backgrounds are looking at different ways to make our landscapes more liveable. When R. Murray Schafer started his World Soundscape Project in 1977 (Truax, 2007; Schutz, 2017; Cerwen, 2017), he defended the sustainability of our landscape by asking everybody to listen to the world, which was also a claim of Rachel Carson ten years earlier with her “Silent Spring” (Carson, 1962). In the same line, as mentioned by Gunnar Cerwen, Southworth started a phenomenological exploratory field to emphasize how essential is to perceive our landscapes through their sounds (Cerwen, 2017). This new approach – Soundscape - brought new ways of understanding the landscape and its complexity and was spread to the world mainly through *The World Soundscape Project* led by R. Murray Shafer (Truax, 2007). Nowadays, derived theories of Soundscape complement each other, such as Acoustic Ecology, Landscape Ecology and Soundscape Ecology.

Acoustic Ecology concentrates on studies of natural sounds as a matter of knowing about species and their ecosystems (Farina, 2022; Schutz, 2017).

John Tyler discusses his belief in Landscape Ecology, as a way to find harmony in the world. Climate change, decrease of biodiversity, health threats, and food shortage, are some of the problems that need to be tackled now and everywhere (Swaffield, 2001; Landezine, 2023).

Instead of aiming at the management of disturbances (noises), Soundscape Ecology for instance looks for harmonic ways to combine the biophonic, geophonic, and anthrophonic sounds to create “desirable acoustic environments”. **The way they interact with each other is what and how our world is defined** (Schutz, 2017; Farina, 2022; Cerwen, 2017).

As a relatively recent approach, triggered by important names in Landscape Architecture such as Ann Whiston-Spirn and Ian McHarg, Soundscape emphasizes that sounds are as important as other sensorial experiences, mainly because they directly affect the individual perception of a determined space (phenomenological approach). Schutz argues that the spatiality of landscapes is significantly influenced by all types of sounds (Schutz, 2017).

No matter the approach being used to define, understand, and read the landscapes, the most important is that it should be useful somehow for the landscape architects to create sustainable, desirable, and liveable places.

According to Nadine Schutz (p.147, 2017), “Sounds play a significant role in the formation of a landscape spatiality. It is phenomenological. Therefore, sound is an important asset for landscape experiences.”

“It is no longer sufficient to design environments that satisfy the eyes alone (Southworth, 1969)”.

Understanding Soundscape



In this research project, the sound is the main sensorial element.

We live in a world full of sounds but daily, almost nobody distinguishes them anymore, unless they somehow cause some disturbances. It is a fact that in our complex urban environments what we hear is mostly unwanted sounds, which we can refer to as a “noise landscape”. This is why the environmental sounds are being avoided. People are shutting themselves into a kind of “acoustic bubble” with their high-tech headsets. By doing that, they are not perceiving the world and are missing the opportunity to use their sensorial capacity to have rich experiences of all kinds, such as social interactions. If we block one of our senses, the experience and connection with a place fail.

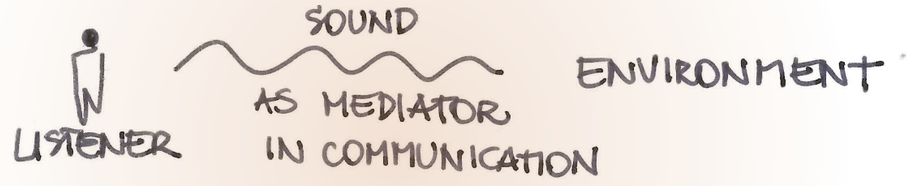
For the purpose of this research, noise will be called unwanted sounds, which will be explained on the theoretical basis further on.

Sounds are a very important matter within urban areas. Unconsciously, people tend to associate city centers with high concentration of sounds, mostly, unwanted sounds such as vehicles, metro, train, planes, people talking loud (to overlap the background sounds!).

Lately, this scenario is being found everywhere. The constant growth of traffic due to not efficient public transportation (people look for comfort and reliability of their private cars) is transforming calm areas in sources of loud and mixed sounds, which turns our world into an unhealthy place.

Understanding Soundscape

Figure 26
Soundwalk



Source: By the author

The use of sounds as a mediator in communication with the environment, as stated by Murray Schafer and Truax in the 70s, brought back an ancient concept already used by Greeks to build their amphitheaters. The perfect acoustic ambiance was “built” observing and, respecting and using the landscape qualities and values.

Schafer had a very clear definition of this relationship between sound and the environment and tried to show the world that if we measure the auditory qualities of a place, we can make it better, just like the Greeks did. This is what he called “spatial auditory awareness”(Schafer, 1977). For that, he defined three sound classes:

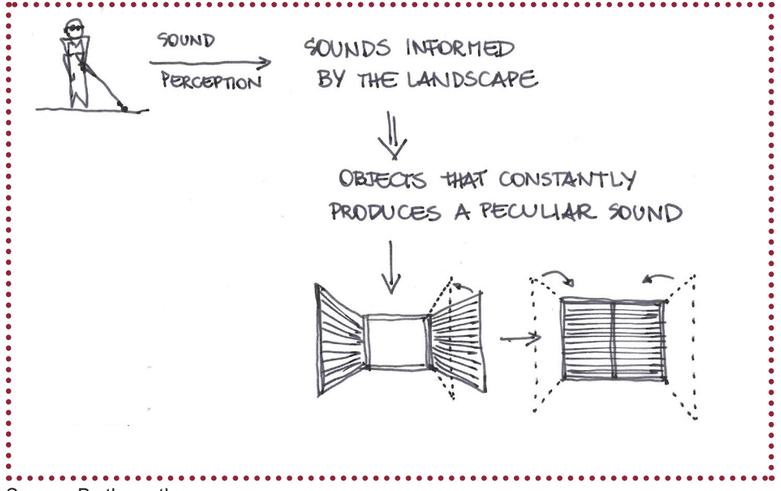
1. Sound marks (culturally significant) – temple bells, town square clocks
2. Keynote sounds - continuously operated within a site and form a background
3. Sound signals (generated through electro-acoustic means – traffic, air conditioning.

These classes mix with each other within the environment and one can mask the other.

The main idea of Schafer was to explore the perception of the sounds within a determined environment, or place. Not only accurate measurements should be used to analyze a place, but overall, a phenomenological approach- perception. In this sense,

Soundscape was an appropriated name for this experimental work, which became scientific shortly after.

Figure 27
Blindscape



Source: By the author

Figure 28
Soundwalk- individual perception of sounds are different



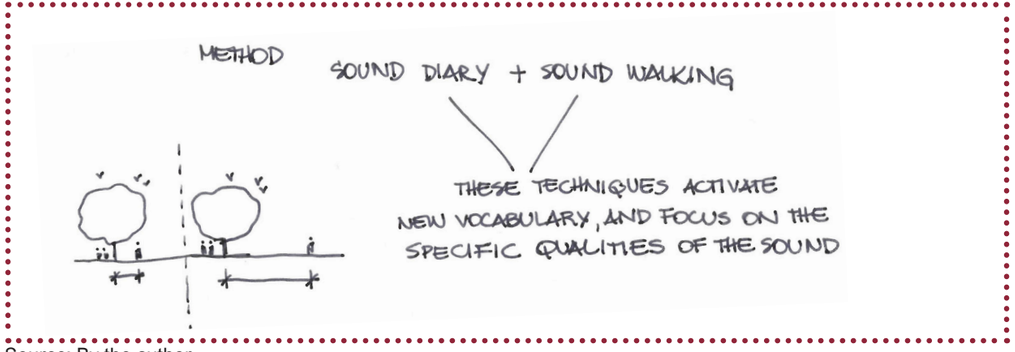
Source: By the author

Schafer defended an interdisciplinary inquiry since there are many sources of sounds in the world. One of his experiments with the group “World Soundscape Project” was called “Blindscape” (Fig.27). He wanted to show how can a landscape be informed by the acoustic for the visually impaired people. This experiment focused on the perception of the sounds using natural listening, to identify the specific types and qualities of a determined place of determined objects. According to him, there is no need of accurated equipment to measure sounds because the natural listening is the real experience and can activate a new vocabulary on us.

We are guided by certain sounds and built awareness. For instance, sounds can provides us information about size and form of spaces, just by listening to its reflection.

The World's Soundscape Project lead by Schafer was a pilot project that raised the importance of listening to our world. During a world trip, his group and himself documented their experiences in big cities of Europe, using a sound diary and a sound walking method. They made notes about the Soundscape of each place based on individual experiences while walking around the cities.
Important reflections from this project influenced many other scientific researchers further on.

Figure 29
Soundwalk- the distance of the receiver from the sound source changes the perception.



Source: By the author



Figure 30
The World Soundscape Project "European Sound Diary"
Source: Schafer, R.M, 1977.

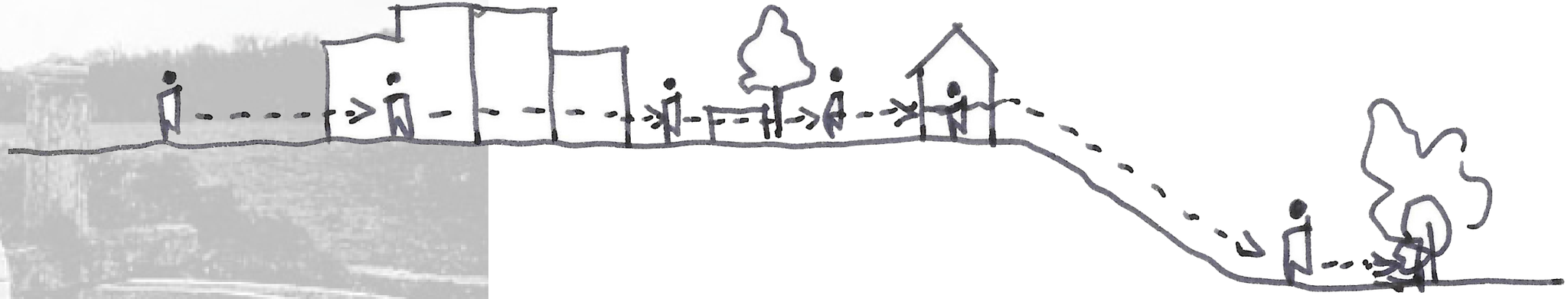


Figure 30
Soundwalk

Source: By the author

Understanding Soundscape

Perception is essential to understanding the landscape and getting connected to it and its characteristics, elements, and composition.

The Greeks used the Genius Loci to understand a place before any intervention. According to Norberg-Schutz (De Wit, 1997), *Genius Loci* is “a core concept for the human well-being, related to the human need to orient oneself in a place and to identify with the surroundings”.

It is part of our “behaviour” within a landscape and most of us just do not realize that.

Bernard Lassus also has a similar opinion when says that “as soon we perceive landscape with all our senses, we have a sense of place”(De Wit, 1997). A place has a physical, spatial and psychological component. A place that offers shelter, and protection, is a vehicle for imagination, where people’s experiences build meanings, memories and stories (Norberg Schutz in De Wit, 2017). When we experience a place, "our sensory capacity is stimulated and personal feelings come up mixed with many other elements. A range of senses is crucial for the complete appreciation of the outdoor environment" (Turner, 1996).

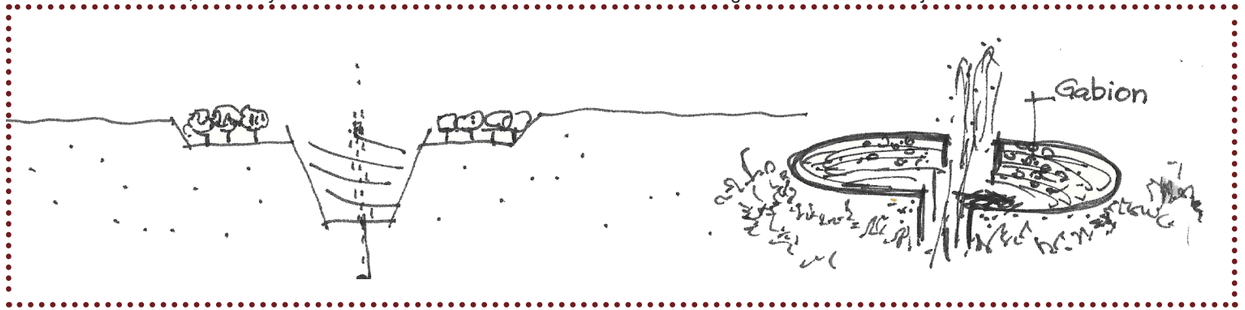
Anne Whiston-Spirn also remarks on the relevance of sounds as not ephemeral during landscape experience (Swaffield, 2001). Sounds which are not familiar in the home environment are considered to be interesting”(Kageyama, 1993: in Hedfors, 2003). (Fig. 31 and 32)

Figure 31
Sea organ in Zadar, Croatia, by Nikola Basic.



Source: https://youtubemusicsucks.com/sea-organ-of-zadar-croatia-unique-musical-instruments/

Figure 32
Wasserkrater Garden, Germany. Hard materials inside the "krater" enhance the strong sounds of the water jet.



Source: By the author (adapted from De Wit, 1997)

Understanding Soundscape

The psichological component within a landscape experience is essential for this work. Our aim is that people can interact with the landscape and use their auditory capacity to enhance this experience, emphasizing the phenomenological character of soundscape. Therefore, this cannot be measured using sound meter. For instance, any sound over 50 db is considered as disturbant. Traffic reaches this value and up, being unhealthy for people. However, this value is easily surpassed in a pub environment for example and is pleasant for everyone who is present. This kind of places bring people together and release the stress of daily life, let smiles go freely on faces, as well as other positive feelings. Does sound meter capture this? (Axelsson in Aletta, 2018; Layton, 2018)

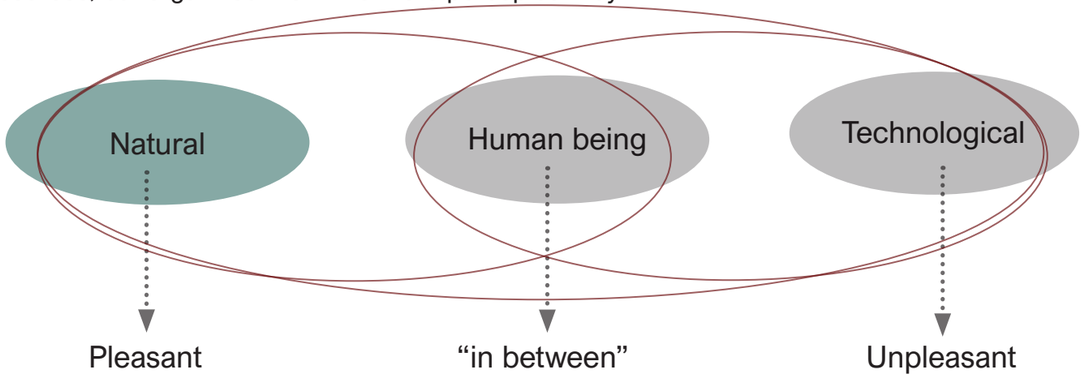
Considering that Soundscape experiences are closely connected to well being, it is important to reflect about these experiences in terms of subjectivity and emotional responses. Different individuals have distinct interpretation over the same acoustic environment. This is mostly explained by individual preferences, mood, life experiences and culture. The same goes for the emotional response over a certain place. People tend to associate sounds to memories, feelings, personal experiences involving happiness or sadness, joyfulness or desappointment, for instance. (Axelsson in Aletta, 2018)

Simple examples can be explored to illustrate these situations. Old people have joy on sitting around playground areas, because they bring back memories, emotions and that fresh spirit and joy typically from kids transcend into energy for living. However, there are elders that cannot stand the soundscape of a playground; too loud for them. It can also happen that a person sitting next to a waterfall do not stay too long there. With the time, the pleasant sound becomes unpleasant not because of its volume, but because it turns out to be monotonous. As humans, we need some dynamics.

Reflecting on Soundscape within an urban environment, it is crucial to seriously consider these facts while designing urban landscapes. They must be used by everyone. Therefore, understanding that the sonic environment can interfere directly in personal well being, to comprehend what could be the unwanted and wanted sounds for a place for a diverse public can make the design of an urban landscape more inclusive and engaged, not to say a success. Again, approaching the soundscape in a phenomenological way.

Soundscape aims to make our living environment more pleasant and healthier, with more wanted sounds. However, the way sounds are heard differ from person to person, since listening is a sensorial individual experience. Gunner (2010) explains this perception as a phenomenological process. There is a recent understanding of sounds not as a mathematical measured asset but experiential. As mentioned earlier, Schafer, Southworth, Schutz also affirmed that numeric values for sounds, such as decibels, can inform only about disturbances.

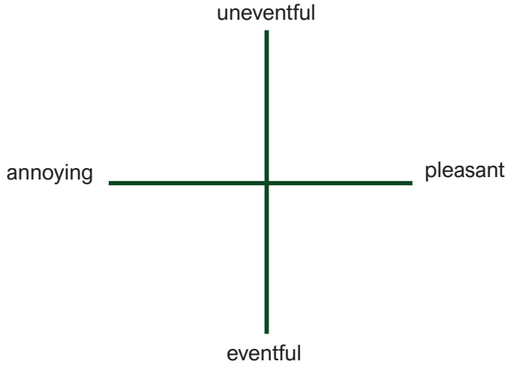
In this sense, sounds need to be addressed as a phenomenological element and Axelsson et al. (in: Gunner, 2010) began to analyze sounds considering them as pleasant and unpleasant. this is how people refers to when asked about a determined sound. Based on that, he did not deny the main sound sources, but organized them in a more perceptual way:



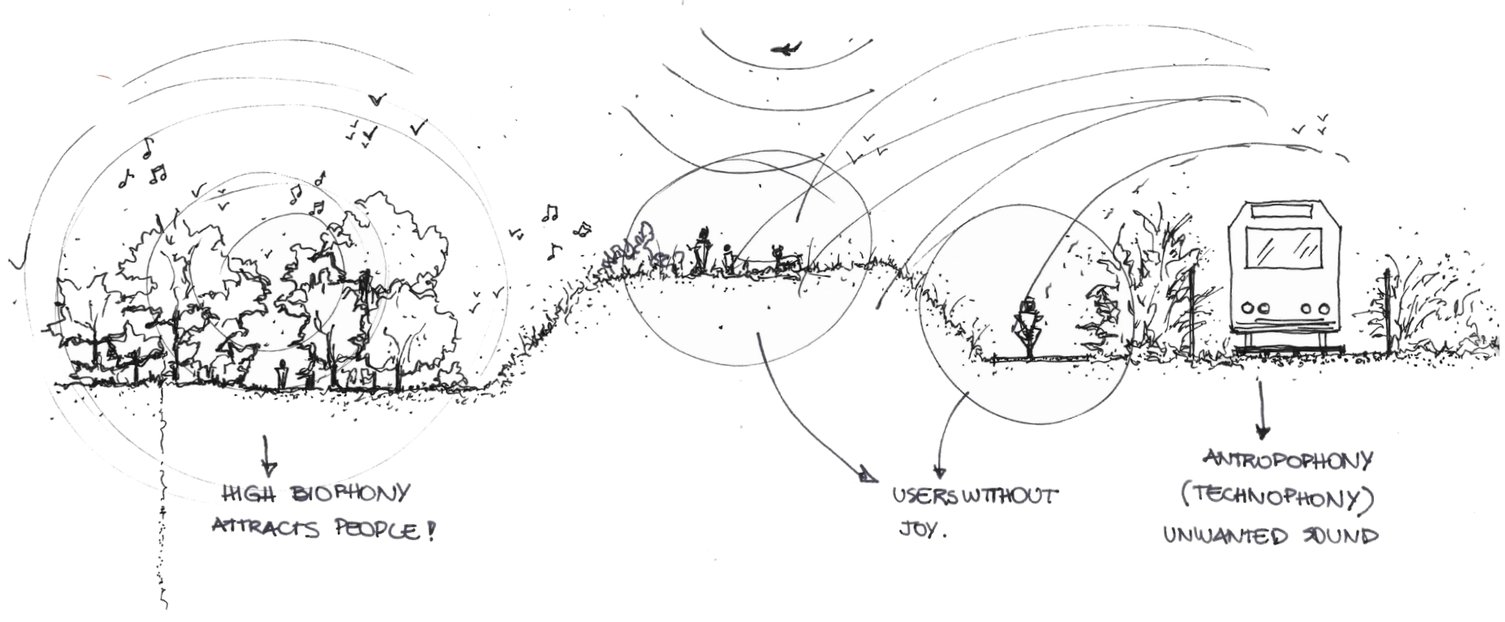
These sounds are never isolated, but combined.
Each one of them has a distinct perception and "graduation". There are moments when one masks the other and the volume of each differ from person to person.

Axelsson et al (in: Aletta et al, 2018), developed a method based on perception using simple variables that represents the overall experience of people within a soundscape, as shown below:

Figure 33
Axelsson's model for soundscape individual perception



Source: Interpreted and adapted by the author.



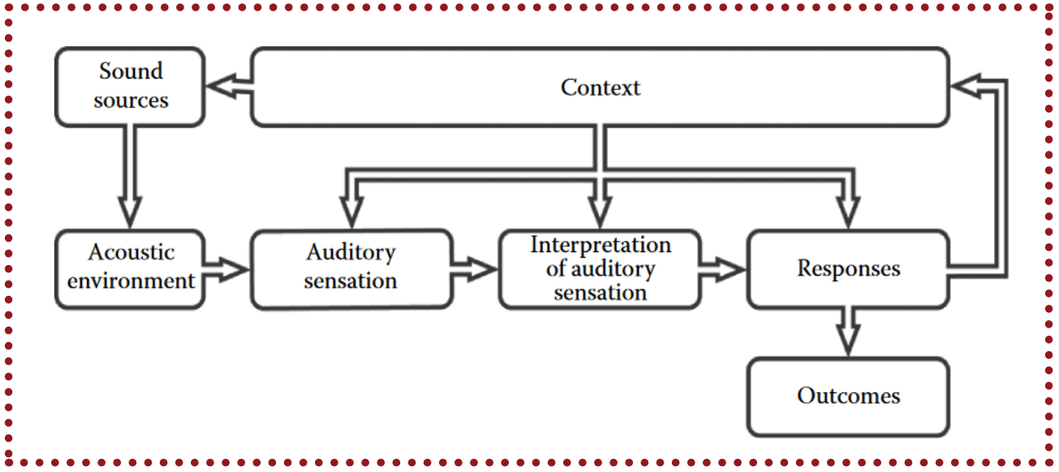
This simple scheme represents the experiences people have with the soundscape: it can be pleasant and calm, but agitated and pleasant; or annoying when is calm or annoying because is to agitated.

This method is also exploratory, since there is not a prior scientific study about the subject. We will use it to develop our design, since people will be helping with their perception for the study area.

Understanding Sounds

Sounds is intrinsic related to our health. They can be nutritious (wanted) or toxic (unwanted) as an outcome from a certain acoustic experience. No matter the sources, the context and the exposure time combined with our personal psichological conditions at a determined moment will determine our resposnses while experiencing an acoustic environment. The scheme below shows these relations:

Figure 34
Sound sources and our interpretation



Source: Kang & Schulte-Fortkamp, 2016.

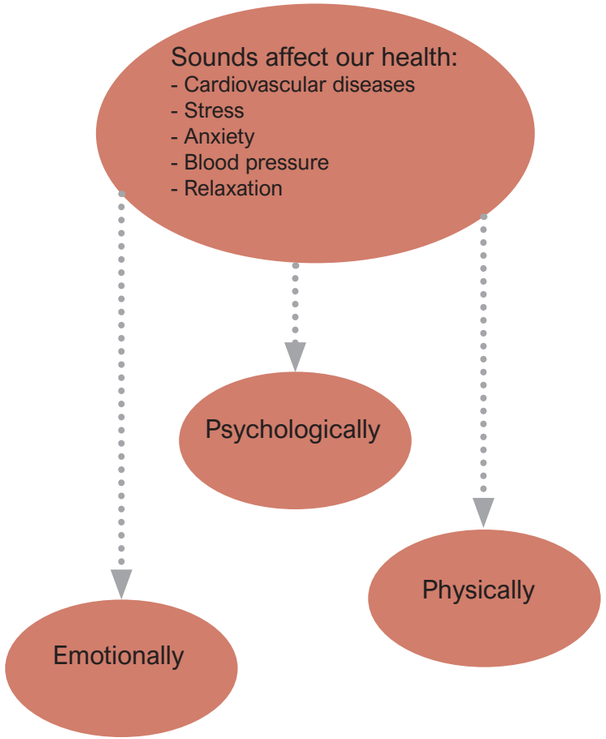
Figure 35
Experiencing the landscape



Source: By the author, 2024.

Understanding Sounds

Figure 36
Axelsson's model for soundscape individual perception



Source: By the author.

In this sense, it is assertive to affirm that sounds are an essential component of our well-being. As we are exposed to them, our responses will vary, depending on our capacity to relate to them emotionally, psychologically and physically (fig. 36).

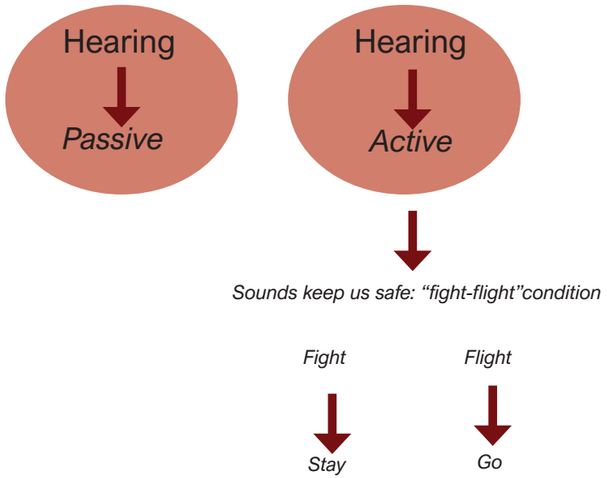
For instance, sounds can bring memories back and create new ones, altering our emotions positively or negatively. They can also be both a source and treatment for stress, as well as a provider of physical energy to develop a range of activities.

When people are asked about preferred sounds, normally they mention bird's sounds. Birds singing is a signal that everything is balanced. Absence of that means that something is wrong (https://www.ted.com/talks/julian_treasure_the_4_ways_sound_affects_us?utm_campaign=tedspread&utm_medium=referral&utm_source=tedcomshare).

Not only humans are affected by sounds. Animals are susceptible to them as well. In places where the dominant sound sources are from humans or their creations, animals hide or simply avoid determined areas, because they understand them as threatful. Even domesticated animals can experience significant stress from certain sounds, leading to cardiovascular issues, anxiety or an increase in blood pressure.

The hearing is a passive response while the listening is an active one, which means that we instantly build the "fight-flight" condition. It was said before that sounds keep us aware of the space where we are experiencing. This awareness brings safety. When we listen to a sound, we are exposed to basically two types of situations: stay (fight) or go (flight). This explains two conditions connected to a moment of decision: passive and active. We can choose to stay (fight) or go (flight) when we hear the sound of a car approaching the intersection. The sound helps us judge how safe each choice would be (Fig. 37).

Figure 37
Axelsson's model for soundscape individual perception



Source: Adapted by the author from Layton, 2018.

Understanding Sounds

Recently, scientific studies have connected sounds to two essential assets of human life: health and natural biodiversity.

This field of research is getting attention because when tackling health issues, sounds are addressed instantly as **noise nuisances** and therefore, treated as such. The majority of the scientific researches for our urban landscapes are concentrated in reduction of **noise** to increase health on our population. It is a need but there are inumerous solutions already implemented with success, following protocols, legislations and regulations.

What about the other sounds that are not noise, that do not disturb us? Few researchers noticed that these “good” sounds not only promote human health but also enhance it through the biodiverse natural environment.

The connection between health and soundscape is direct: the most wanted sounds for people are usually concentrated in a natural environment, preferably with high biodiversity. Why that? Why people look for nature when they want to rest, relax, clear their mind?

The human being is part of nature and it is normal to understand a connection. Humans use nature sounds in artificial way to develop activities related to relaxation, espirituality, mind peace.

A quick search on the internet only with the term “Soundscape” offers inumerous options of nature sounds recorded in various locations in the world.

The sounds of nature are balanced and never exagerated. This makes it so wanted and never related to noise. In the minute a human being interferes in any natural ecosystem, there is a change in the equilibrium of sources and “noise” can appear.

As landscape architects, we are challenged to design landscapes in which everything has a balance. That is when soundscape has a crucial participation/ influence. If there is a sound source with too much presence, the environment can become unpleasant.

Especially considering the urban landscapes, this plays a essential role, transforming public spaces into avoided areas or where everybody wants to be.

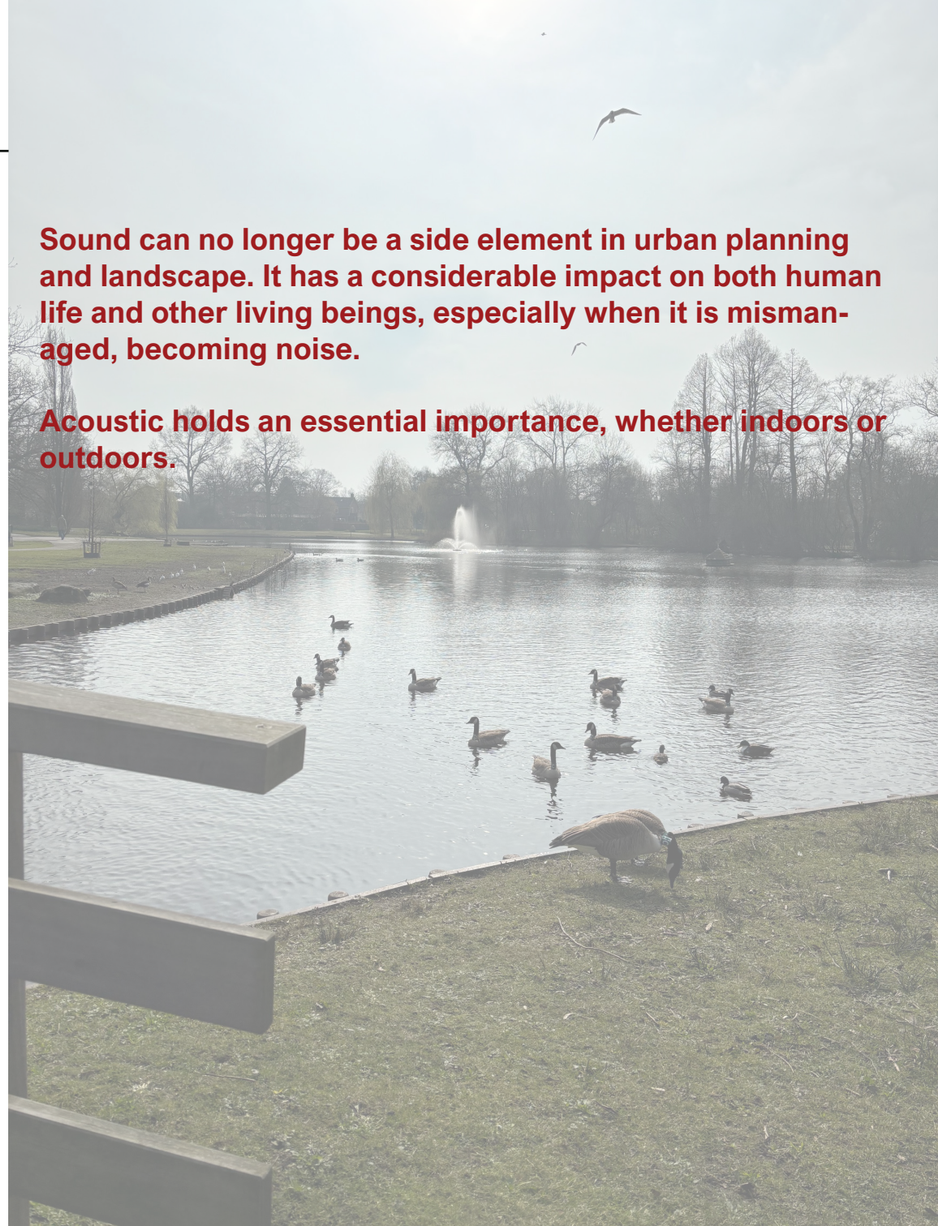


Figure 38
City park in Haren, The Netherlands.
Source: By the author, 2024.

SOUND

“Sound is defined as a mechanical vibration transmitted through an elastic medium. It travels long distances in the air, penetrating vegetation and water layers and maintaining some parts of the associated information. It propagates in the air at 331 m/s at 0 grau Celsius and five times faster (1484 m/s) in water. Sound is modified by diffraction, reverberation, and absorbent effects, and its perceived quality depends on the position and distance a receiver is located compared with the position of sources.”

This technical definition by Almo Farina (2022) gives us an introduction to one of the most interesting sensorial capacities that living organisms have: the hearing.

Understanding Sounds

Although this research focused on sounds with a phenomenological approach, it is very relevant to cover some technical terms, which will be briefly explained as follows. They will help on a full comprehension of the topic.

The first term is **Amplitude**, which states how loud a sound is and it is measured in decibels (dB). A human with normal hearing capacity can hear sounds from 0 dB onwards. However, the amplitude is related to the exposure time. The higher the amplitude, the lower should be the exposure. For instance, **when exposed to values at 120 dB for 15 minutes, humans have hearing loss.** That is why in many workspaces ear protection is mandatory. Surprinsigly, hearing loss is considered as a “silent disability”. Everyone is susceptible to it and should measure their hearing capacity regularly.

The table below (Fig. 39), elaborated by the World Health Organization (www.who.nl) gives an idea of amplitude intensity for common types of sounds.

Figure 39
Sound intensities

Sound intensity in decibels	Example of type of sound at the specified intensity
10dB	Normal breathing
30dB	Soft whispering
40dB	Library
60dB	Normal conversation
80dB	Doorbell
85dB	Heavy traffic (inside car)
90dB	Shouted conversation
95dB	Motorcycle
100dB	Hair dryer
105dB	Car horn at 5 meters
110dB	Shouting in the ear
120dB	Standing near a siren
130dB	Jackhammer
140dB	Airplane taking off
150dB	Firecrackers

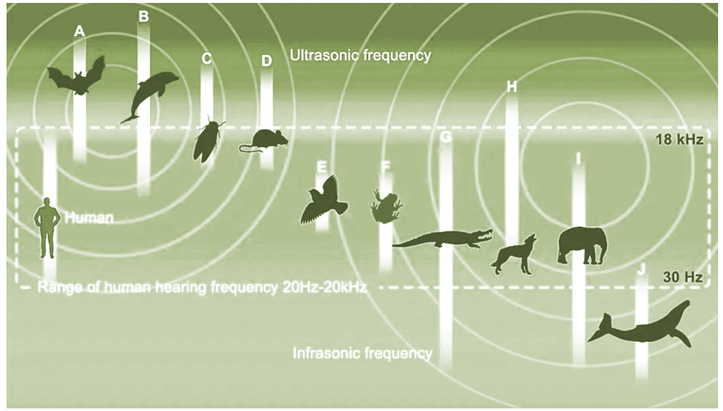
Source: https://www.who.int/news-room/questions-and-answers/item/deafness-and-hearing-loss-safe-listening

Another term is **Frequency**, measured in Hertz (Hz), which is a number of undulated pulses over a given time - cycles/sec (Farina, 2022). Farina (2022) describes that frequency is categorized in relation to human’s ability of perceiving sounds, which can be seen as follows:

Audible sounds to humans: 20 to 20,000 hertz.

Audible sounds for different species of animals:
- Infrasounds: <20 to 0.001 hertz.
- Ultrasounds: from 20,000 Hz to several gigahertz.

Figure 40
Sound frequency for humans and some animal species

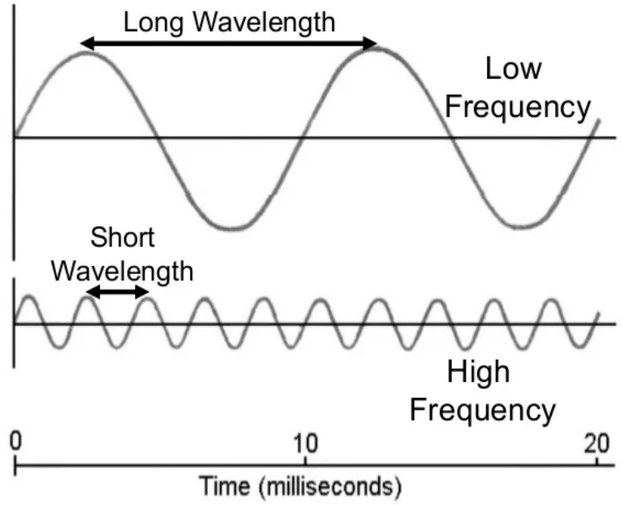


A. Bat	2kHz - 120kHz	**F.** Frog & Toad	50Hz - 4kHz
B. Dolphin	75Hz - 150kHz	**G.** Crocodile	16Hz - 18kHz
C. Insect	10kHz - 80kHz	**H.** Dog	64Hz - 44kHz
D. Rat	900Hz - 79kHz	**I.** Elephant	17Hz - 10.5kHz
E. Bird	1kHz - 4kHz	**J.** Blue whale	14Hz - 36Hz

Source: www.earhealth.co.nz

Waves are related to the frequency and in practical meaning shows if the sounds has a low or high frequency. Long wavelengh means low frequency and short wavelengh, high frequency. For example, acute sounds have low frequency, therefore, long waves.

Figure 41
Sound waves



Source: https://www.slideshare.net/aalleyne/changes-in-waveproperties

Understanding Sounds

The sounds are produced (sources), perceived because of its propagation, which can be measured. Sounds travels very fast and it is very dependent on the environment conditions and its materials' constitution, but also on the temperature.

For example, at a temperature of 20o. Celsius, sounds travels with the following speed:

- Steel: 5,8 km / sec
- Wood: 3,96 km /sec
- Water: 1,43 km/ sec
- Air: 0,34 km/ sec

Interesting to remark that in places where the temperature are very low (below 0o. Celsius) and covered with snow, certain sounds are not audible.

Sounds work as a vector and its propagation is a combination of diffusers and absorbers. These characteristics are variable and a good combination of them makes the sounds more natural. The acoustic qualities of materials and spaces are key for a good appreciation (Hedfors, 20xx).

In Acoustics, this balance is used overal to make interiors more pleasant to live, work, do sports, and other activities. In the landscape, the challenge is to make use of the absorbers and diffusers in a way that people can perceive as pleasant.

Topography plays a crucial role in the landscape, since it works as a diffuser and absorber.

A simple example of an egg tray (used by some people on the walls to absorb sounds !) can show how a not flat surface is efficient to control the propagation of a sound.

Flat surfaces such as Delflandsedijk, do not have differences in the topography and the grass surface does not absorbs all the sounds, especially the unwanted sounds. This makes the soundscape of this place not very pleasant, because all the sounds are unbalanced.

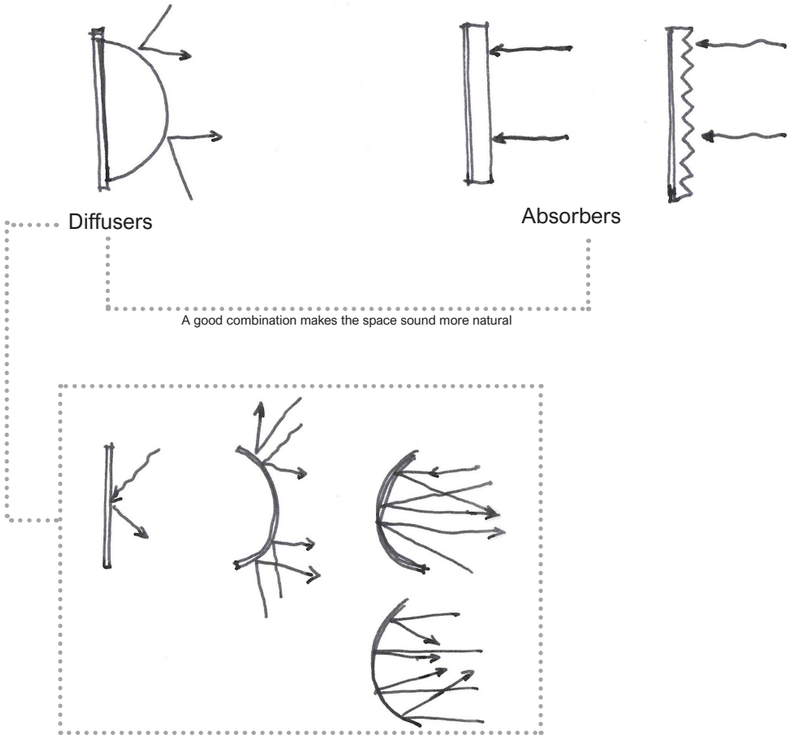
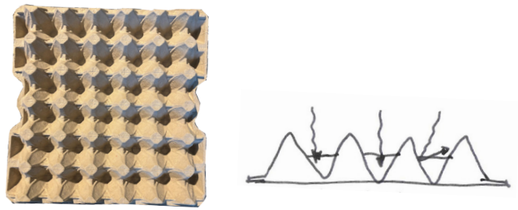


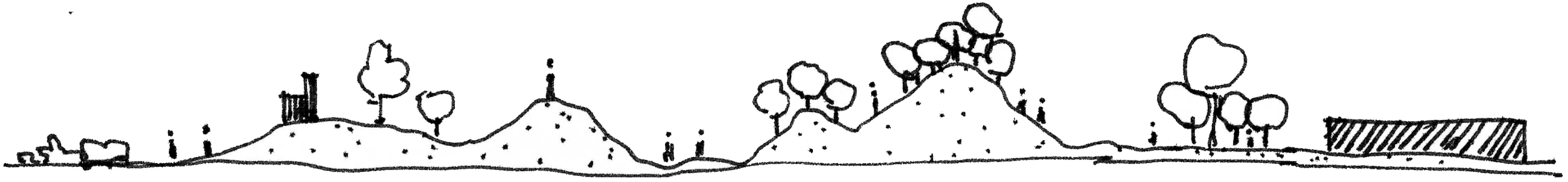
Figure 42.
Egg tray.



Source: By the author, 2023.

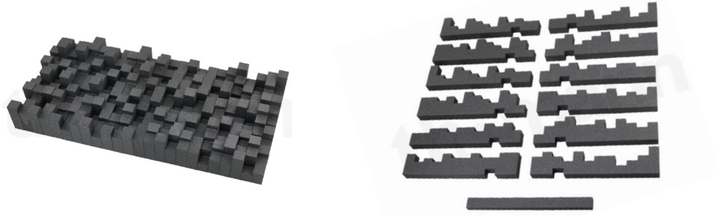
Understanding Sounds

Soundscape should be considered from the beginning of the design process. It can reduce the impact of harsh and aggressive sounds. Not only topography, but also the gradients of elements that can diffuse or absorb sounds are very efficient for a good sonic environment.



The gradient of the vegetation is very important for soundscape. It performs as a diffuser or absorption element, as a kind of “vegetation topography”. It is comparable to acoustic panels used in Architecture (Fig. 43).

Figure 43
Acoustic pannels.



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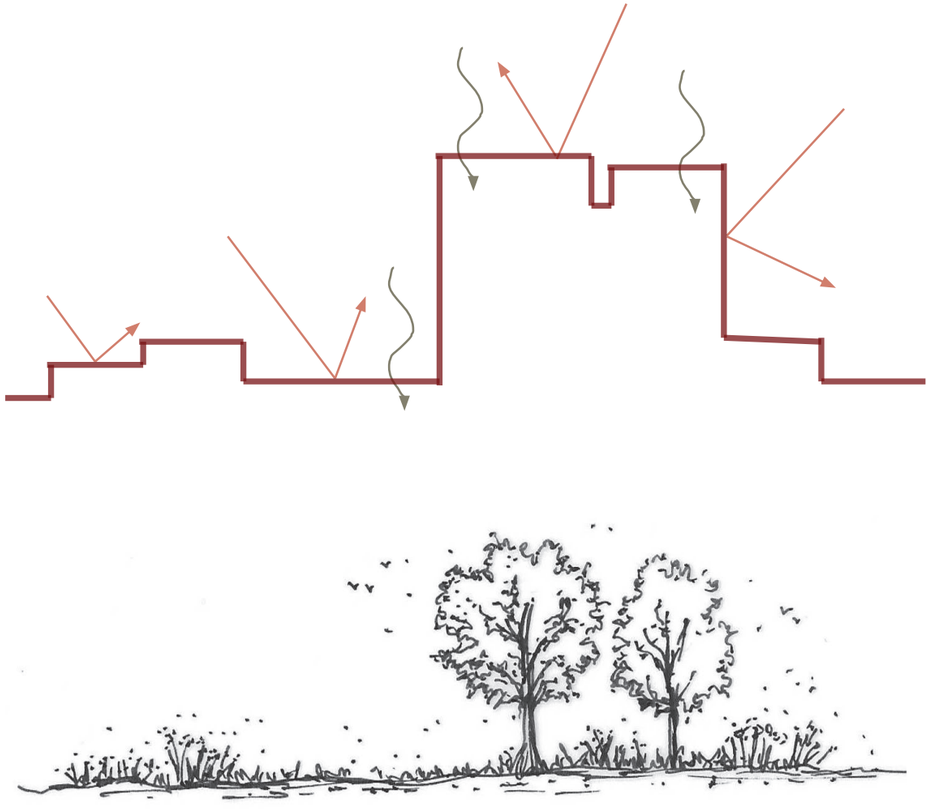
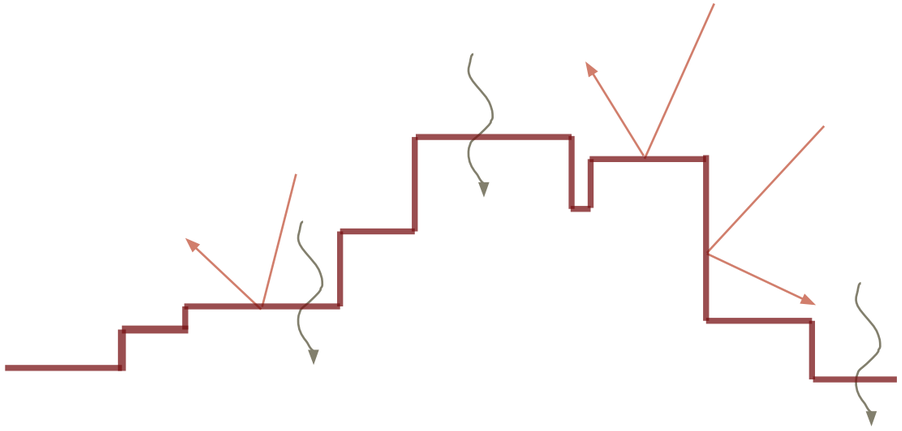
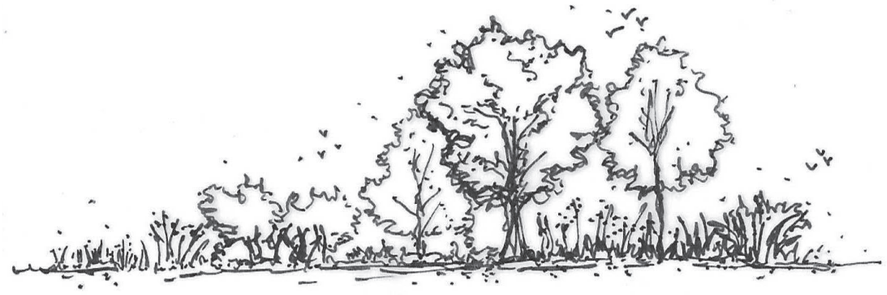
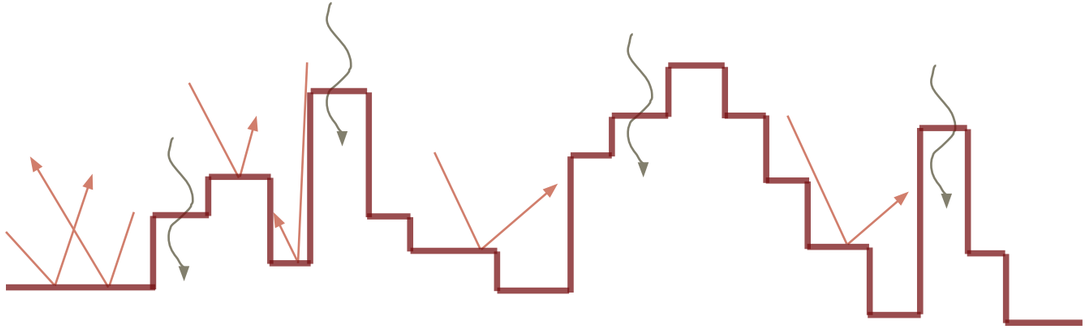


Understanding Sounds









Understanding Soundscape ecology

Ecoacoustics
Interdisciplinary science that investigates natural and antropogenic sounds and their relationship with the environment over populations, communities, landscapes.

Acoustic Ecology
Concentrates on studies of natural sounds as a matter of knowing about species and their ecosystems (Farina, 2022; Schutz, 2017).

Landscape Ecology
A way to find harmony in the world, according to John Turner. Climate change, decrease of biodiversity, health threats, and food shortage, are some of the problems that need to be tackled now and everywhere (Swaffield, 2001; Landezine, 2023).

Soundscape ecology
Look for harmonic ways to combine the biophonic, geophonic, and anthrophonic sounds to create **“desirable acoustic environments”.** The way they interact with each other is what and how our world is defined (Schutz, 2017; Farina, 2022; Cerwen, 2017).

Understanding Soundscape ecology

The urban landscape is composed by single or multiple sources of sounds that are perceived by people in many ways. The acoustic environment of a place is not always in balance, which means that some sonotopes have more evidence than others, which vary with seasons, time and climate. In order to understand, classify and evaluate these sonotopes, Almo Farina (2022) clearly defined the three main sources of sounds that exist in our environemnt: biological, geological and antropological. The last one has a sub-category addressed as technological.

Although these sound sources are complexly arranged in any landscape, they are easily understood as follows:

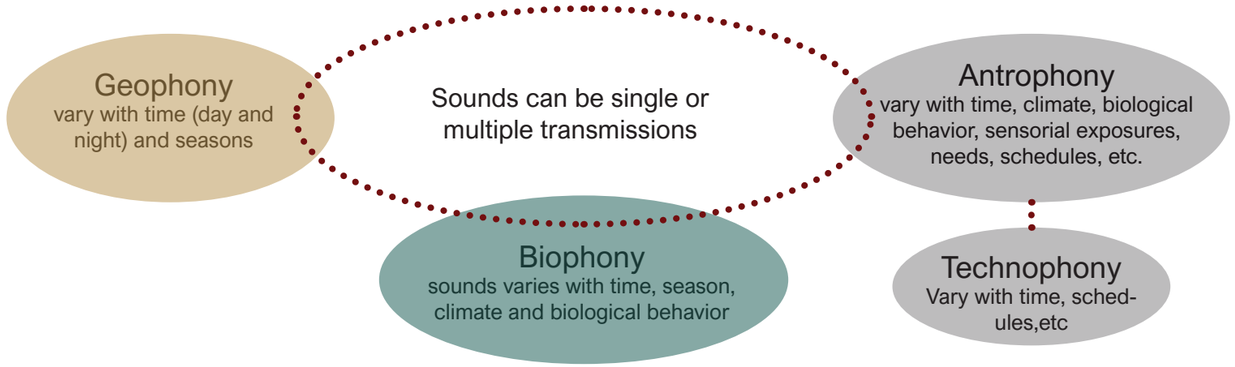
- Biological sounds - Biophony: Sounds emitted by living organisms, excluding humans.

- Geological sounds - Geophony: Non-biological sounds such as water, rain, wind, thunder, earthquake.

- Antropological sounds - Antrophony: Human sounds.

*** Technological sounds - Technophony**: derived from antrophony, are sounds emitted by human's creations, such as musical instruments, vehicles, engines, equipments. (Krause, 1987).

Figure 44
Variation in sounds



Source: By the author.

“Soundscape is how the Geophony, Biophony, Antrophony and technophony are distributed and emanated across the landscape, collectively. It is highly variable in time and space because of the overlapping and reciprocally masking process that emerges from the relationship from these 4 groups.” (Farina, 2022, p.88).

Understanding Soundscape ecology

Soundscape ecology is highly dependent on seasonal changes. Nature can balance the sonotopes througout the seasons, but the human interference unbalance it.



Spring

Summer

Fall

Winter

Understanding Soundscape ecology

Soundscape involves a complex arrangement of all sources of sounds in our environment.

The existent world has passed by inumerous events, receiving human or natural interferences. For each process, the environment responds in a certain way. The Soundscape is very sensitive "tool" to understand these modifications.

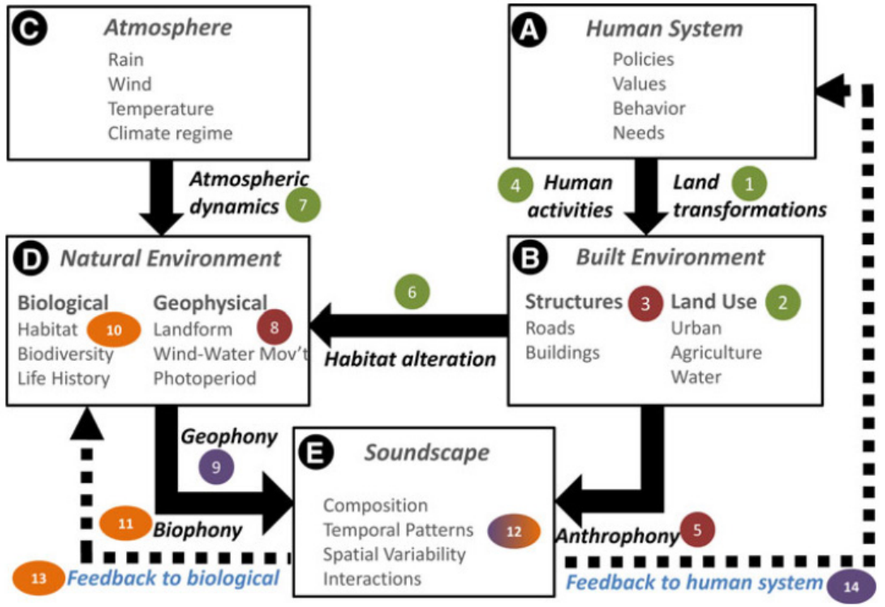
In the moment humans perform interferences on the natural environment such as land transformations, the habitats and the ecosystems are altered.

*"**Soundscape ecology** requires several approaches and competencies for its transdisciplinary character where its goal may be focused:*

– Analysis of spatiotemporal acoustic patterns borne by the interaction between geophonic, biophonic, and anthrophonic sonic components.
– Analysis of the relationship between patterns and processes of the landscape and patterns and processes of the soundscape.
– Conservation of soundscapes as important components of the landscape.
– Short- and long-term monitoring of ecosystem dynamics". (Farina, 2014)

This is the framework of Soundscape Ecology, defined by Pijanowsky (2022).
The followed conceptual scheme shows how the processes happened in the environment regarding Soundscape.

Figure 45
Soundscape Ecology theoretical framework

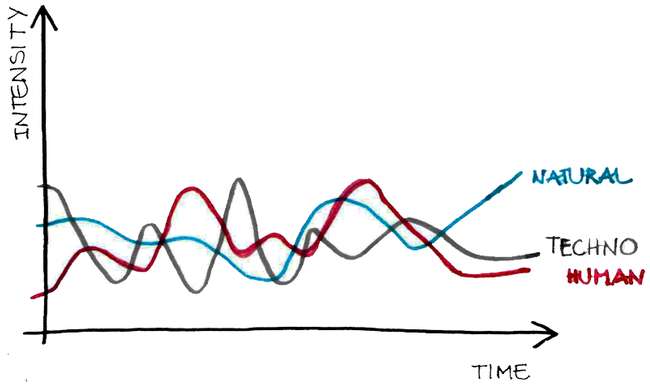


Source: Pijanowsky, 2022.

Soundscapes represent the heritage of our planet's acoustic biodiversity, and reflect Earth's natural assemblage of organisms—soundscapes are natural resources (Pijanowski et al., 2011a)

Understanding Soundscape ecology

Figure 46
Sound sources combination



Source: Adapted by the author from Gunner (2010).

Our world is living without balance among the sound sources and this is a factor of concern.

The biodiversity has dropped down drastically in our cities and Soundscape is showing this through high levels of antropogenic/technological sounds; an unbalanced soundscape.

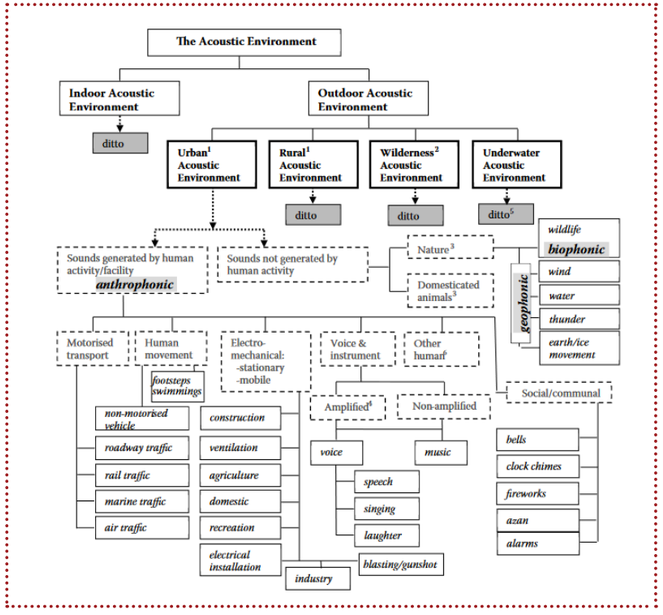
Our urban landscapes are not offering wanted sounds and people are simply chosing to not listening to our cities anymore. Unwanted sounds defines what is commonly understood as *Noise.*

Environmental noise: objective approach
Soundscape: subjective approach

Looking at our landscapes, there is an intrinsic relationship with the composition of its sounds, which create “unique acoustical patterns across a variety of spatial and temporal scales”, defined as **Soundscape Ecology** (Pijanowski et al., 2011). Its emphasis is on the socio-ecological systems approach.

Understanding Soundscape ecology

Figure 47
The acoustic environment - Sources of sound



Source: Kang & Schulte-Fortkamp, 2016.

Figure 48
Urban acoustic environment - Valkenberg Park, Breda, NL.



Source: The author, 2024.

Figure 49
Rural acoustic environment - Hoek van Holland, NL.



Source: The author, 2022.

Figure 50
Wilderness acoustic environment - Foz do Iguazu, Brazil.



Source: The author, 2017.

Figure 51
Underwater acoustic environment - Seal amond algaes.



Source: Kyle McBurnie.Kyle McBurnie https://pin.it/8eifl0Zy9

Understanding Soundscape ecology

Figure 52
Cicade



Source: https://nypost.com/wp-content/uploads/sites/2/2020/05/cicadas.jpg?resize=878,585&quality=75&strip=all

Soundscape is a scientific approach and requires a holistic understanding. For instance, scientific studies found that soundscapes can offer valuable insights into ecosystems and their dynamics and certain biological groups can be identified through their sounds. In Brazil is very common to hear frogs at marsh areas, specially at night. If they are not heard, something is wrong. Another example, also from Brazil, is the loud sounds of cicadas during the Spring. The sound can reach 120 dB and inform the mating time of these insects. An overpopulation of cicadas can become very uncomfortable and inform an unbalanced environment.

Additionally, sound plays a crucial role in animal behaviour, since some species are able to recognize threats through sound cues. For example, some birds adjust their singing volume in the presence of others to avoid having their sounds masked. (https://doi.org/10.1016/j.ufug.2022.127555)

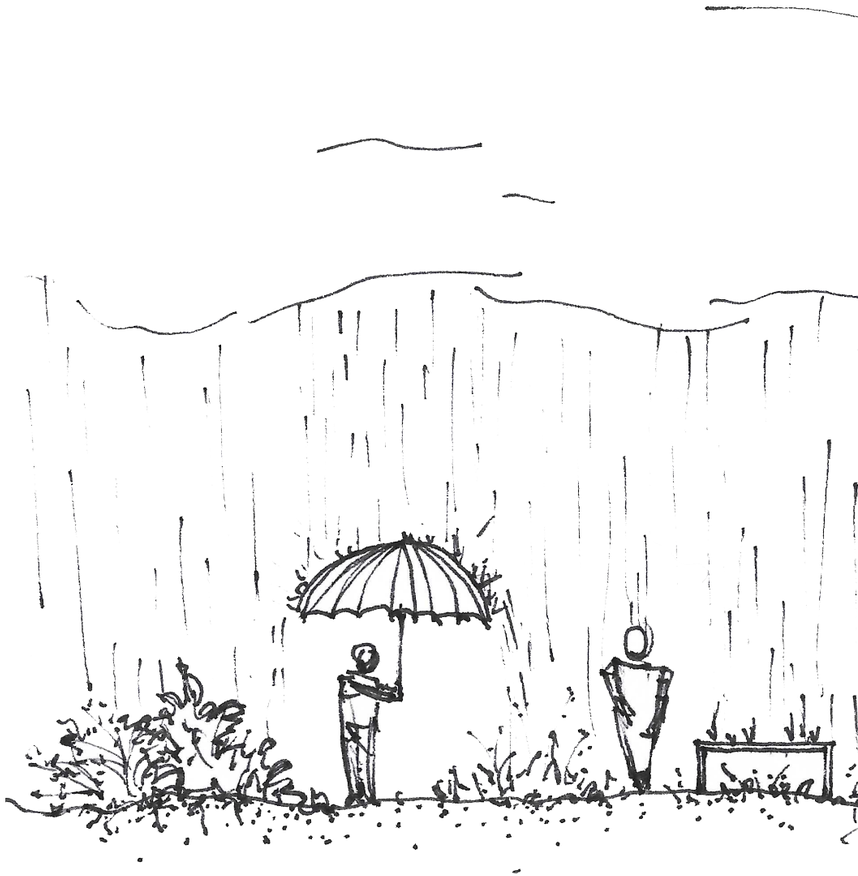
Designing with Soundscape

Designing with Soundscape is perhaps part of most Architecture projects. The Acoustics is already precisely researched and principles, values, materials, equipments are tested and used by the architects.

In Urban Design/ planning, Soundscape performs as a tool to assure quality to the places, also based on measurements, legislations, regulations and parameters within a city limit. Therefore, Soundscape is connected to the management of nuisances or disturbances - noise pollution.

In the field of Landscape Architecture, Soundscape is not commonly seen. There are many projects which use this approach but also correcting the disturbances, most of the time using sonic elements to mask the sonic environment. There are few examples in the world which really uses the Design to address Soundscape. It sounds like when the Universal Design principles were first introduced in urbanism and Architecture, to make our places more inclusive for disable people after the Second World war.
In a way, we are facing some similar situation, since we are just living a post-pandemic moment and being healthy became one of the most important assets in life.

Designing landscapes with Soundscape is therefore a relatively unusual approach, which in our beliefs, will change within a short period of time, since based on the reflections stated in this research, is a natural way to offer a better urban environmental quality to people and all living organisms.





“Vision isolates, while sound incorporates.”

(Juhani Pallasmaa, 2011)

Designing with Soundscape

How can soundscape be addressed in the landscape? Hedfors (2012) suggested that we use the elements that are present in the landscape to make pleasant acoustic environments.

The majority of the Soundscape projects used artificial elements to create acoustic scenarios, by using sound amplifiers to reproduce birds singing, water, underground low-frequency sounds or even music to create sonic ambiences. In fact, this is an introduction of a not local soundscape to a landscape.

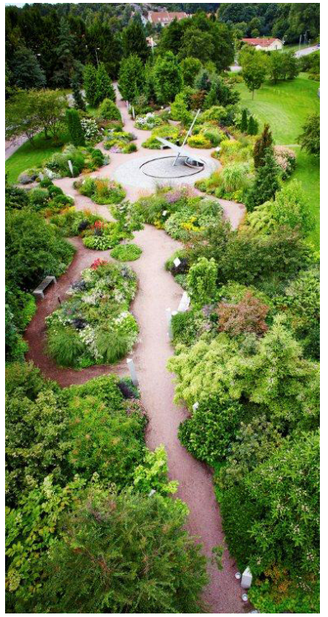
Every place has a particular soundscape and it can be reproduced, as Schafer, Nadine Schutz and Bernie Krouse did and still do. They record incredible sounds from natural landscapes and transform them into music. These compositions are being used by many people to re-establish a connection with nature, at the same time releasing stress and reducing heart rates. It is like bringing the landscape to our private home. Not necessarily we need to be in the landscape.

Figure 53
Nauener Platz, Berlin. Speakers are placed on some designed elements in the park.



Source: https://acoustics.org/2ansa1-soundscape-will-tune-an-acoustic-environment-through-peoples-mind-brigitte-schulte-fortkamp/

Figure 54
Vardens Park, Gothenburg, Sweden. Speakers with sensors are placed along the walkways and reproduces sounds of the sea.



Source: https://poseidon.goteborg.se/om-oss/vara-grona-gardar/vardens-park/

Figure 55
Solbjerg Plads, Copenhagen (SLA ARchitects, 2005). Speakers are placed everywhere, even underground, to amplify the sounds.



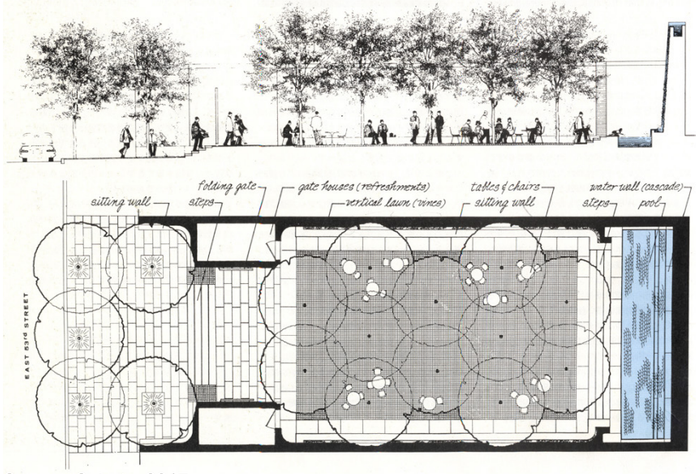
Source: https://dac.dk/viden/arkitektur/frederiksbergs-nye-pladser/

Designing with Soundscape

Understanding that our sonic environments are composed of low and high-frequency values, commonly called *lo-fi* and *hi-fi* is crucial. Schutz (2017) explains that “the *hi-fi* soundscape is one in which discrete sounds can be heard clearly because of the low ambient noise level.” The countryside has what Schutz called “single sounds events”, which are church bells, croaking frogs or many other insects, for example. These sounds are easily distinguished and for those who live in the area they can become “uncomfortable” just because they seems to have a more sensitive hearing capacity. However, the opposite happens in our cities, where the sounds are mixed, loud and not distinguishable. It is expected that people cannot specify or recognize the sound sources, missing an important moment to connect themselves to a place.

A very interesting example of this is Paley Park in New York (Fig.56 and 57). A sonic environment was created in an enclosed space, where a synesthetic experience is the highlight. A waterfall located at the back of the place masks the sound of local traffic as you walk towards it. Water is a natural element and any person feels connected to it because it symbolizes the possibility of life. In this sense, the visual effect of this element merges with the harsh sound from the waterfall. The sound is almost deafening, and aggressive, but somehow, disconnects people from the city and transports them to a natural (in fact, artificial) sonic environment.

Figure 56
Paley Park, New York - section and plan view.



Source: Schutz, 2017.

Figure 57
Paley Park, New York.



Source: https://upload.wikimedia.org/wikipedia/commons/4/41/Paley_Park_jeh.jpg

Designing with Soundscape

Following the idea of Hedfors (2012), sounds can be addressed in the landscape through its elements and there is no need for artificial equipment. This is the approach that this research is defending and which makes Soundscape fullfill all the theory that has already been discussed in this work.

In this sense, iconic places such as the Greek theatres or the fountains of the Renaissance Villa D'Este, Tivoli (Italy), bring truly the Soundscape that people will enjoy experiencing. The greek theater of Dionysos Eleuthereus in Athens was built with the most pure interpretation of the Genius Loci, perhaps instigating the phenomenological character of the landscape. The shape evoques the respect to the topography at the same time that solves the acoustics and the spatiallity of it. Perfect geometry that articulates with the vizualization of the stage and the sounds emanated from there, without echoing (Fig. 58).

The breathtaking fountains of the Renaissance Villa D'Este, Tivoli (Italy) takes the visitors thoughout an immersive experience, where the water sound is certainly the main component of this enclosed landscape, masking other natural sound sources (Fig. 59).

We can say that it fits the model proposed by Axelsson (Gunnar, 2012) for individual perception: it goes from pleasant to annoying, but it is a composition of sounds made with natural elements: water and plants built in a cascade.

Figure 58
Theatre of Dyonisos Eleuthereus, Athens.



https://www.worldhistory.org/uploads/images/3763.jpg?v=1713261243

Figure 59
Villa d' Este, Tivoli, Italy. This Renassaince master piece garden is composed with magnificent water jets, stones, and plants. The aisle offers an interesting experience of sounds while walking through.

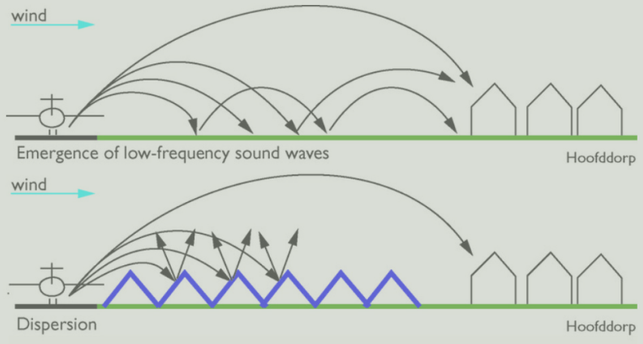


Source: https://www.italyguides.it/it/lazio/tivoli/le-foto-di-tivoli

Designing with Soundscape

One of the most interesting examples of designing with Soundscape was made by a Dutch landscape ARchitecture office H+S+N.
The project was comissioned to find a solution for the sonic enviornment which would be created with the expansion of Schipol Airport, near Amsterdam.
A meticoulous study of acoustics and the local topography, brought up an assertive solution for the residents of the area. The sound barriers were built to disperse the unpleasant and constant sound of the aircrafts and perform as new and attractive landscape elements (Fig. 60 and 61).

Figure 60
Scheme of sound dispersion using landscape elements.



Source: https://www.hnsland.nl/projecten/landartpark-buitenschot/

Figure 61
Park Buitenschot, Schipol. Designing with topography was the solution for aircraft sounds absorption.



Source: https://www.hnsland.nl/projecten/landartpark-buitenschot/

Designing with Soundscape

An interesting soundscape project in San Francisco, california, uses water jets to mask the sounds of buses. The fountain is located on the roof of the bus departure hall and are also triggered by their movements, whose frequency is connected to the water flow, that can be lower or higher.

As a public space where many people passes by daily, the sounds of the water jets attract even more.

The solution was simple but with a very complicated execution, since the water jets are connected to sensors that are activated with the flow of the buses on the floor below.

The fact is that Soundscape was a solution to create quality to an urban environment, previously with a boring and unwanted condition regarding to its sonic environment.

Figure 62
Transbay Transit Center - “Bus fountain”



Source: https://californiawaters.com/portfolio/projects/water-features-fountains/salesforce-transit-center/

Designing with Soundscape

The projects which were designed with soundscape are successful examples of inclusion and respect towards people's needs, health and quality of life. As a dramatic experience such as the fountains of Villa D'Este or a short diving moment into a water world, people can add some positive load of pleasantness into their lives. While listening to pleasant sounds, we can connect to our senses and they transform somehow our behavior.

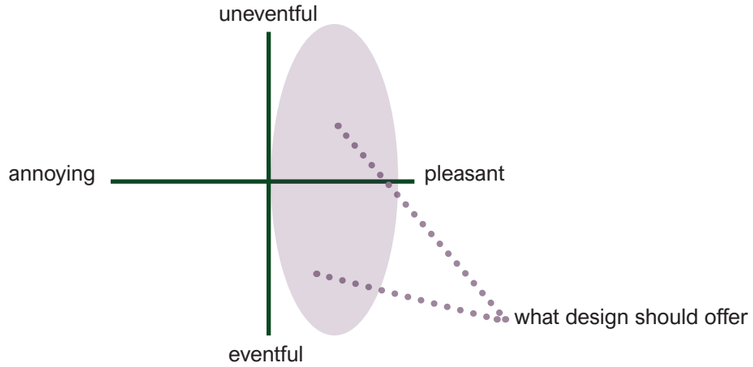
Axelsson noticed that and created a model to analyze these senses in a simple, as it should be (Fig. 63). People do not spend hours understanding their senses and just respond to them as how they feel: pleasant or unpleasant, according to the especific environment in which they are submitted, considering their sonic interesses at the moment.

"A person listens and perceives sounds according to its sonic interests.
Acoustic goals:

- Current and foreseen purpose of the place
- The uses
- The activities
- The variations in time (along the day, week,)
- Local culture and history (Brambilla and Maffei, 2010; Muhar, 2004)

This is also a motivation to design with what is available in the landscape. Some projects made use of artificial sounds to create soundscapes. This research is emphasizing the use of natural sonic possibilities to bring quality and values to the landscape, which is more coherent with all the aspects already presented in this work.

Figure 63
Axelsson's model for soundscape individual perception



Source: Adapted by the author.



Figure 64.
Pleasant vegetated area by River *Het Schuur*, Maassluis.
Source: Adapted by the author, 2023.

When we are calm and relaxed, we can connect easily to each other. On the opposite way, in an acute situation, we have an aggressive reflection.


FURIE
MAASSLUIS

3 Site Analysis



Figure 65
Oud Haven, Maassluis

Source: By the author, 2024.

Maassluis is proud of being the first waterfront city in the Netherlands. It has participated in almost all important moments of the country's history, which can be seen through the historical layers of this city which has a very rich past. Its strategic location, as the main entrance of Rotterdam Port, brought wealth and development. Not only that, but the fact that it is located between the river and the polder offers different types of landscapes, which makes Maassluis a very unique and beautiful place.

One of the distinct values of the city is the fact that it shows clearly that it would not exist if there were no human interventions on the landscape. As we say that humans have to create places to perpetuate their existence, we can directly inform the origins of Maassluis.

As still under the jurisdiction of Maasland, Maassluis had a prosperous fishery economic activity as the main income source for its residents.

The constant river floodings that washed out the old port and the polders of Maasland, were contained by the construction of the *Schielandse Hoge Dijk*. This structure, which goes all the way to Gouda, allowed Maassluis to finally establish its first settlements and get its independence from Maasland.

The village has developed over time, still having fishery activity and navigation (transportation of goods) as the economic core, with residents somewhat connected and dependent on that. An interesting example is the "Grote Kerk" (main church), which was built with special fishery taxes and its interior shows the pride of the people through sculptures and paintings illustrating boats and fish. Sounds of prosperity merged with sounds of religion and people.

In general lines, the history of Maassluis had various sounds, from unwanted, such as wars, floodings, and fires, to wanted ones, like economic prosperity, development and social interactions. Strong sounds that show a vibrant and dynamic place.

Sounds of History

Unwanted ——————————————————————— **Wanted**

Figure 66
Sounds of History, Maassluis

WAR















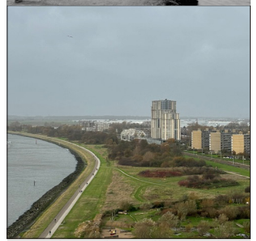
Source: https://hvm.collectiebank.nl/

LANDSCAPE DYNAMICS









Source: https://hvm.collectiebank.nl/

TRAGEDY







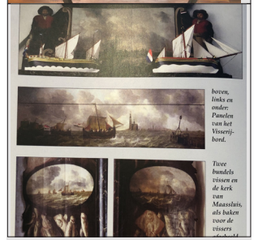


Source: https://hvm.collectiebank.nl/

RELIGION





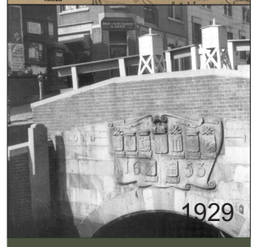



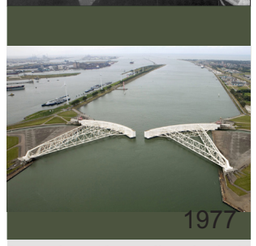
Source: https://hvm.collectiebank.nl/

SAFETY





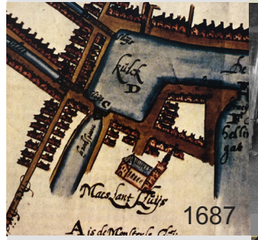




Source: https://hvm.collectiebank.nl/

PROSPERITY













Source: https://hvm.collectiebank.nl/

PEOPLE

















Source: https://hvm.collectiebank.nl/

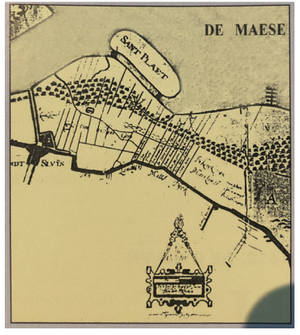
Land use x Landscape dynamics

The landscape of the area of study had significant transformations, natural dynamics and also man-made interventions.
Important to highlight that a lot of sand and clay were brought into the urban structure during many years, due to the river floodings. At the entrance of the port, a sand bank (Figure 67) was washed way as one of the radical changes that happened.

Since earlier times the establishment of a community in Maassluis was dependent on the landscape dynamics. The village was developed between the river and the the polder, after the construction of the Schielandse Hoge Zeedijk and sluices to keep the area safe. The first settlements were seen near the dijk and along the old “haven”(port).

The prosper and intense fishery activity brought richness to the town and diversification of commerce and services. After the Second World War, a rapid development change the urban fabric, bringing expansion with a modernist configuration for the town.

Figure 67
Sand bank (*SantPlaet*) near the port entrance



Source: https://hvm.collectiebank.nl/

The flooding of 1953 caused many damages, since the barriers (lower dikes) located next to the river were not enough to contain the water, showing the vulnerability of these areas. Floodings continue to happen in small scale, till the effective solution brought by the national project Deltaworks. The construction of the Delflandsedijk(1977)and the inauguration of Maasslandkering (1997), changed the scenario of the waterfront, with a reclamation of small area near the port entrance.

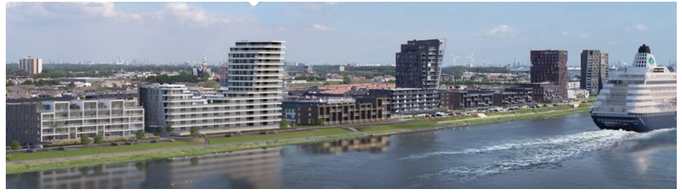
Figure 68
Waterfront of Maassluis only with “bedrijven terrein”



Source: Gemeente Maassluis.

This events allowed the developers to take advantage of a special piece of land, that could never be used due to constant river tidal threats. This priviledge location with a beautiful waterfront received a neighbourhood, Het Balkon, built with the conventional modernist functionalist structure. Due to spatial limitation, this neighborhood is on its last phase now, which will be concluded with the construction of a multifamiliar vertical building, “De Baken”.

Figure 69
Het Balkon and its waterfront buildings



Source: https://hvm.collectiebank.nl/

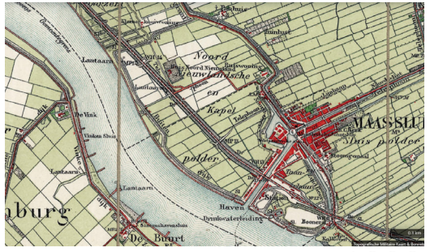
Land use x Landscape dynamics


1633


1815


1850


1908


1939


1953


1986


1993


1995


1997


1998


2022

Deltaworks/ Maeslandkering

Figure 70
Sand bank (*SantPlaet*) near the port entrance

Source: https://www.topotijdreis.nl

Green/ Blue structures

In this map is very clear the concentration of big green structures outside the limits of Maassluis. The highlighted area shows the Delflandsedijk not connected to any robust green structure.

On the other hand, the water network is very intricated and connected with other, as the majority of the area is constituted by polders.

There is a need to improve the green network in order to create continuous corridors. This will bring more biodiversity and also more resilience.



Figure 71
Green and Water network in Midden Delfland

Source: By the author, 2023.

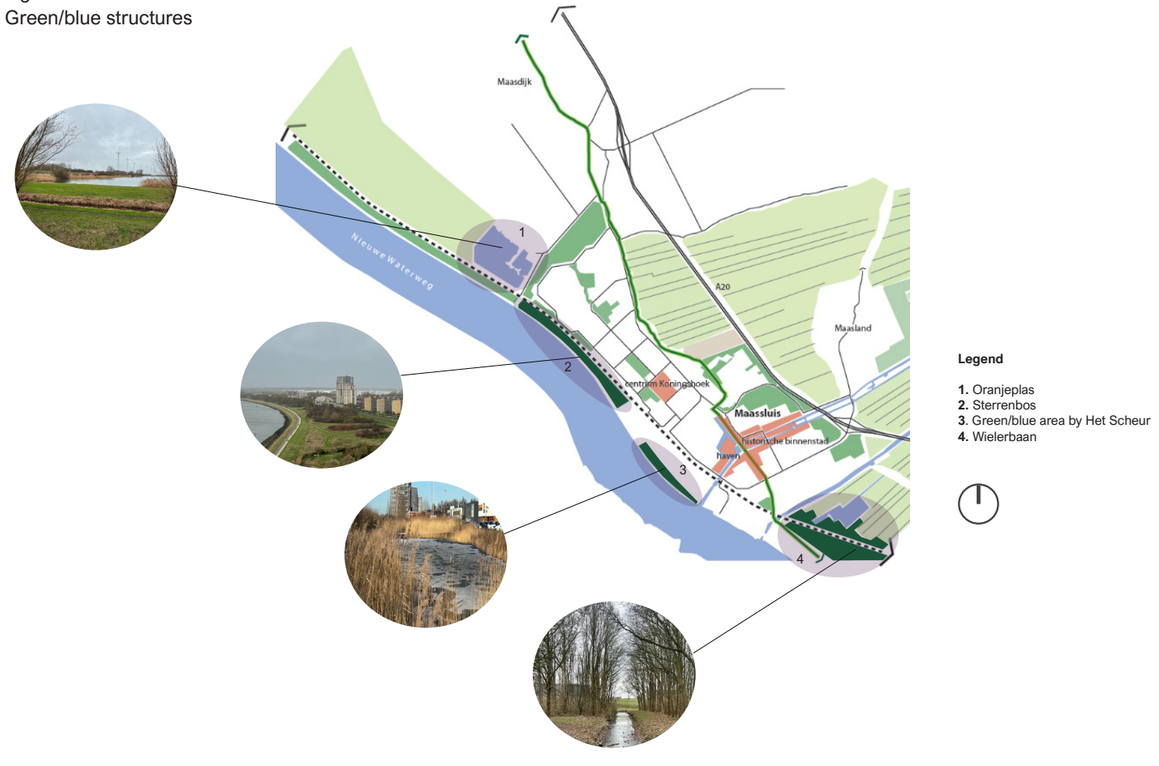
Landscape potentialities

The green structures of Maassluis are fragmented within the urban fabric, while the more robust, with high and mature trees are located on the municipal borders.
In terms of quality landscape, there is significant potential for enhancement, particularly concerning the diversity of species. In many areas of the city, the green is simply “green” because of the grass revetment.

The vision for Maassluis emphasizes this fact and recognizes interventions to revert it. The local government intends to improve the resilience of the city and also adopt solutions towards climate adaptation.

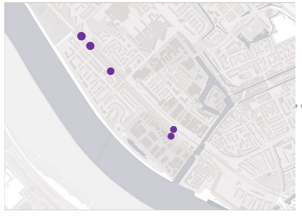
The study area is one of these poor-quality green structures. Due to general rules and regulations for planting on dikes, only grass and a few seasonal flowers were allowed (see *Waterschapsverordening Delfland | Lokale wet- en regelgeving and Beleidsregels – Delfland*), both include the Delflandsedijk. The reason for those regulations is to first guarantee the safety of the dikes. For instance, trees can cause severe damage to the structure of a dike with their roots and when they fall because of wind storms.

Figure 72
Green/blue structures

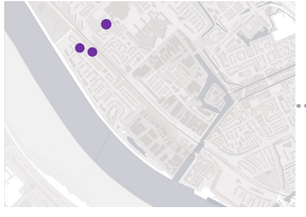


Source: https://www.maassluis.nl, modified by the author, 2024.

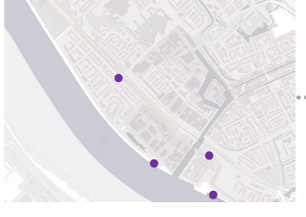
Landscape potentialities



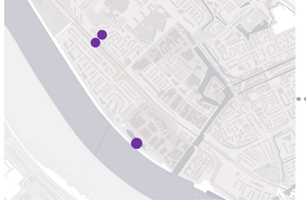
The landscape qualities differ throughout the area. The analysis are happening during Fall and Winter seasons, therefore, there are many interesting spots with layers of water, which is a very important element to be explored in the project. Water brings different possibilities of sounds and can be used in creative manners.



Few species of trees are very commen, with a grass revetment or small size schrubs. The landscape can have a diversification of the planting.



Vast areas with grass revetment on the polder contrast with dune vegetation on the river-front, where stones gently receive some small species of plants in the interspersed gaps. Some shrubs are also present in some parts of the dike. More diversity in plants is indeed needed.



Another observation is a concentration of birds in an specific place, not exactly on the dijk, but near it. It can be connected with the project of the park, creating a corridor for bird flocks.
The presence of natural green-blue patch near the dike is also an important element to be connected to the park, with the same corridor concept described before. Besides, this particular patch can have more space for water storage, infiltration, since on the past, the water surface used to be bigger than it is now.
This area next to the dike and metro track is a potential place for a tree planting, maybe a tine forest.









Figure 73
Scenes of Maassluis.

Source: By the author, 2023.

Opportunities

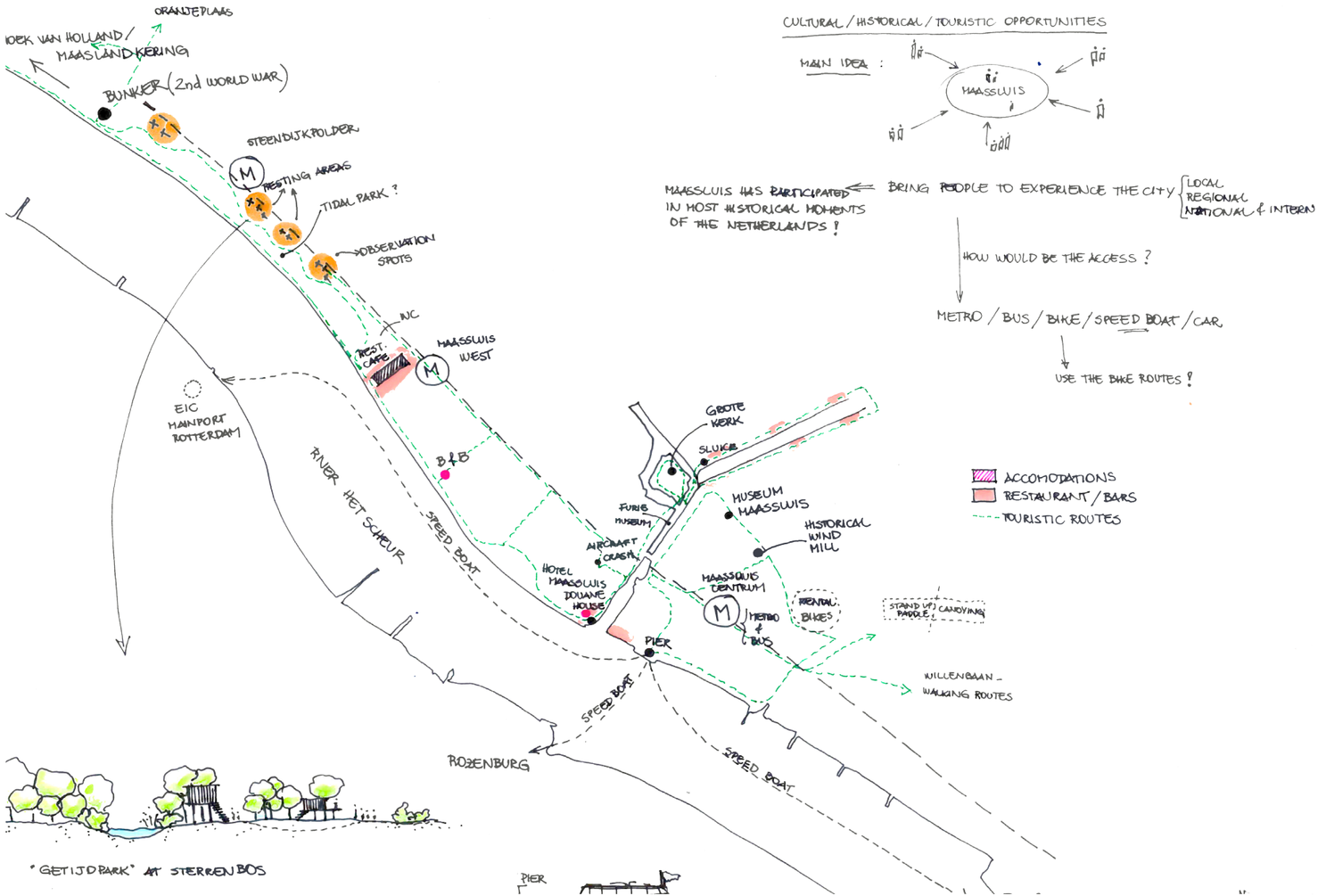
Maassluis has many opportunities for further cultural and leisure developments. Its rich and remarkable historical past can be easily connected to the green structures, attracting people for various activities, being therefore the biggest potential of the city. The residents are very opened to social interactions, exemplified by the constant activities promoted by diverse associations, such as historical walking tours, boat museums and boat trips with the old vessels, “ontmoeten maand”(a whole month with social activites to bring people together), ecological walkings.

Historical museums, and uplifts such as the old sluices, bunker, church, windmills, Douane house, old harbour, and Second World War spots, are some of the local attractions.

The boulevard Willem Alexander by the the river Het Scheur is an “anchor” structure for walking, running and biking. Walking and bike formal routes already exist bringing sounds of entertainment to the city. This river front area is connected to a small park, Sterrenbos, which has potential to become a tidal park.

Access to Maassluis is very easy utilizing public transportation or private cars. However, there is an opportunity to strengthen tourism by creating access with speed boats, connecting Maassluis-Rotterdam-Rozenburg (the new tunnel will remove the ferry that for years made the connection with Maassluis).

Sounds of people are welcome and the Delflandsedijk is a place where this can happen, bringing culture, leisure and sport together.



Unwanted sounds map

Completing the site analysis, the pragmatic values for the sounds in the city are represented through the noise map of Maassluis, available in public government sources.

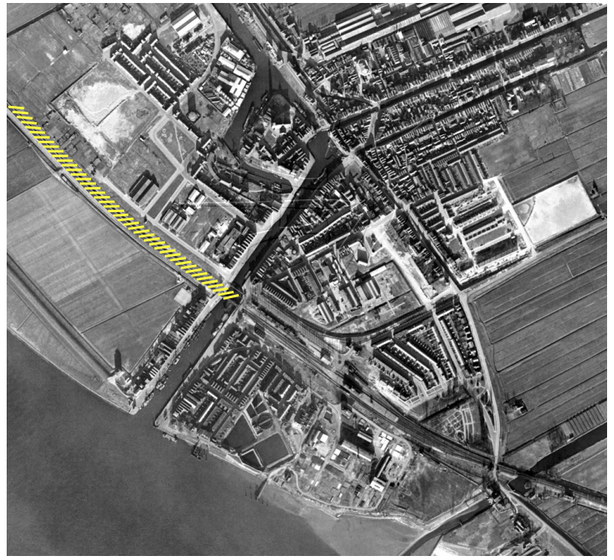
The Maassluis mapping for “geluid”- noise (our unwanted sounds) shows that more than half of the study area is situated on harmful and high-rated values. This is due to the intense traffic on the street along the metro track and the metro itself - the Industrieweg. It is an arterial connection within Maassluis, built before the 1950s, along the area destined for companies and industries and parallel to the Delflandsedijk.

Figure 74
Unwanted sound (Noise) map for the study area



Source: https://www.maassluis.nl

Figure 75
Aerial view of Maassluis, with Industrieweg highlighted,1950s.



Source: adapted by the author from https://hvm.collectiebank.nl/beeldbank/files/alle-archieven5/fto42/A6369.jpg

4 Fieldwork

Fieldwork is the core of this research project. It has begun before the definition of the problem statement and research question. To be more precise, the fieldwork began at the moment the first personal experience happened with and on the Delflandsedijk. The fascination for this element just triggered an spontaneous daily observation of the area, which later on, happened to be the research study area.

As a scientific research, before any definition of problem statement, research question or methods, another fieldwork took place. This time the aim was to observe and experience the study area focusing on sounds. As a common person just using the area, some notes and sketches were done, exactly how R. Murray Shafer did while visiting the cities in Europe with his “World Soundscape Project” (the sound walk method). This choice allowed a more receptive way for what the landscape could offer. It was an assertive decision since there were no predefined expectations.

After this moment, the fieldwork followed a more structured scientific exploration and different methods were used to collect data from the area.

A combination of intuitive and analytical data gave the research a more rich documentation of the area. The approach reflects a commitment with gathering data that are realistic and useful, using subjective engagement and objective inquiry. For a public space, this is essential and could also confirm the efficiency of different scientific methods adopted, as stated on the Methods.

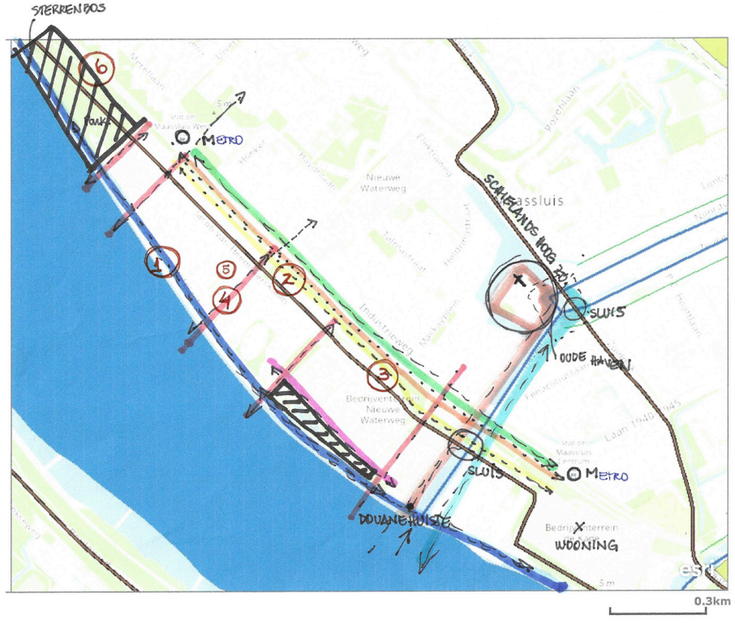
Figure 76
The emblematic “Furie”.



Source: https://hvm.collectiebank.nl

Fieldwork

Figure 77
First sound walk.



1 **By the river**
ships
planes
people
bikes
scooters
leaves
water
insects
birds
ducks
wind

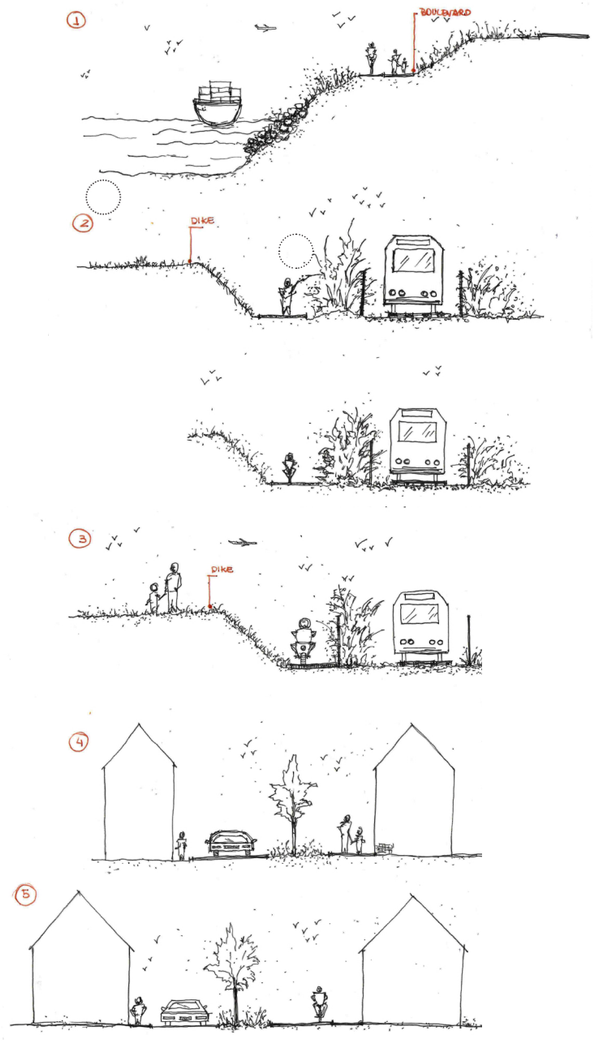
2 **Along metro line (low part)**
planes
kids
bikes
scooters
leaves
metro (every 10 min)
insects
birds

3 **Along metro line (on the dike)**
ships
planes
people
birds
wind
metro (every 10 min)

4 /5 **Inside streets**
ships
planes
people
bikes
cars
leaves
birds
wind

6 **Sterrenbos**
ships
planes
leaves
insects
birds
gravel
wind

Source: By the author, 2023.



Sound walk



The Sound walk method proposed by *The World Soundscape Project* (Schafer, 1977) was an important way for knowing and documenting the soundscape of the study area.

The sounds vary throughout the area. Aircrafts are heard because of the proximity to Rotterdam Airport. Ships navigate the river all day long and the sounds are more intense by the riverfront, flowing through the transversal streets towards the Delflandsedijk, losing intensity.

The human sounds are not too prominent, since people were spread throughout the area walking (alone, in pairs, with dogs), cycling, and running.

During the walk, birds were present but not consistently. They could be heard close to trees and where the green was more dense, such as by Sterrenbos. Due to the season (Autumn), many species were not naturally present. Besides that, no other animals were heard, for instance, insects.

Despite all these sounds, the metro was a fixed sound every 10 minutes that invaded the whole area, with low or high intensity, but always present.

Figure 78
Sound walk output.

Source: By the author, 2023.

Spatial analysis

Spatial analysis was another relevant method to understand the study area and its context better.

The routes were previously defined considering the main accesses to the Delflandsedijk nowadays.

Some historical elements were spotted, such as the post with the higher water levels from the river Het Schuur, the Grote Kerk, and the main asset of the city: the harbour.

An important remark during this analysis: is the absence of people.



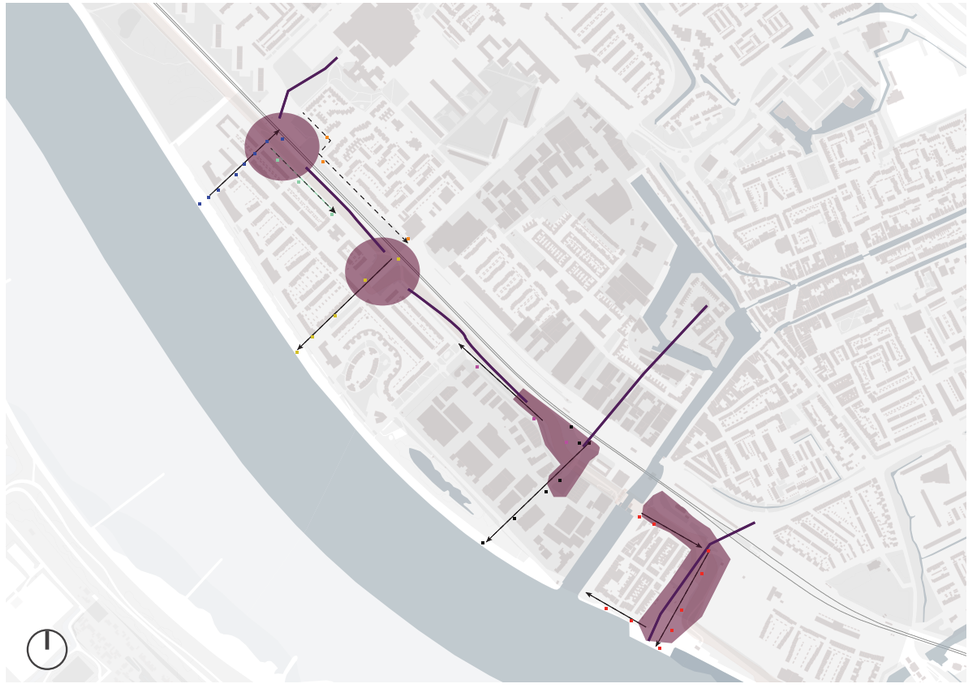
Pictures highlighted with this rectangle are important elements for the city.

Figure 79
Spatial analysis of the Delflandsedijk.

Source: By the author, 2023.

Walking & scoring

Figure 80
Map with routes and recording stop points.



Source: By the author, 2023.

This method from Saskia de Wit suited very well this research. It made possible the visualization of the experiences in the fieldwork.

For this research, four routes were chosen based on the future urban redevelopment approved planning for Maassluis. The intention was to connect these zones to the future city park, creating a real integration within the urban fabric (Fig.80).

For each route, recordings were made at stop points, where some changes in the landscape were observed, such as the transition from the river boulevard to the street; from a building to an open area. This was done considering that sounds change with surfaces, and obstacles on the way.

Each recording was set for 1 minute long and was made using a cell phone, positioned at a height of 1,10 meters, on average.

Walking & scoring

After covering all the routes, which can be seen on the map, the recordings were transferred to a visual set of scores, where the sounds of Biophony, Geophony and Antropophony were quantified as low, medium or high (values).

The routes were represented through pictures and the recording points were identified with an icon of a person. Each route also is represented with topographical sections.

Many conclusions can be drawn with this method. However, the main one probably is the surprising dominance of Antropophony sounds in an area very close to the river. Biophony also gave interesting results. Birds and ducks are the major representatives of this category.

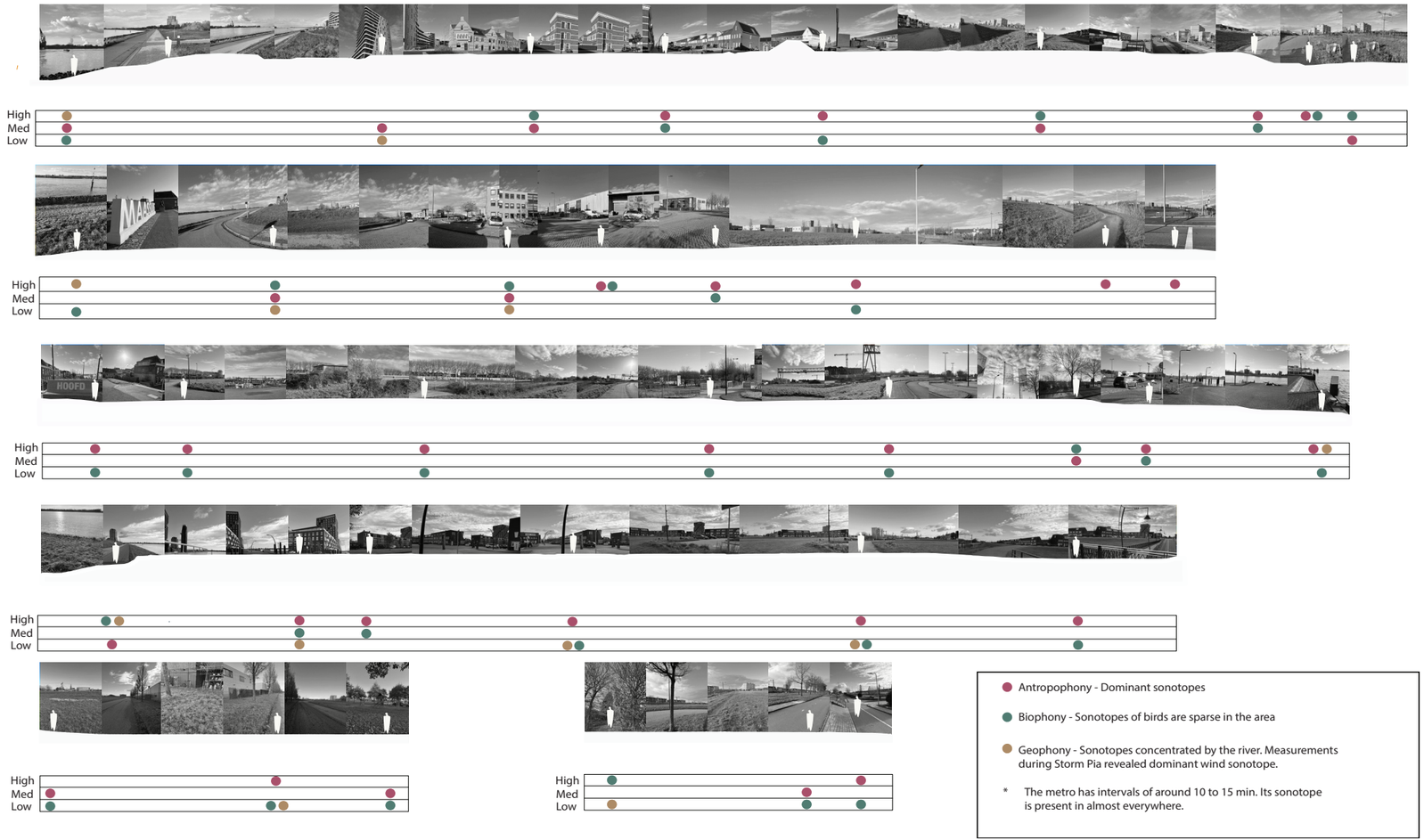


Figure 81
Walking & scoring method - outcomes

Source: By the author, 2024.

"How do organisms perceive spatial configurations in land-scapes? Through soundscapes: heterogeneous structure across the landscape". (Pijanowsky, 2012)

5 Soundscape design applications

The phenomenological approach of Soundscape as a essential “tool” for landascape architecture design is the main focus of this research. The theoretical framework showed clearly that this is an accurated way to design landscape projects with Soundscape, which offer enhanced life quality for all living organisms while promoting social interactions and increasing biodiversity, within liveable and resilient environments.

However, how could we visualize and inform sounds through design then? The phenomenological approach implies perception, which was already discussed to be individual and as mentioned, contains a sinesthaetic component. So, the possibilities of compositions become obviously uncountable.

A good way to address these compositions would be by sistematizing them considering the way sounds are propagated. As mentioned by Muhar and Brown (2004), landscape compositions determine which kind of sounds are generated in the outdoor spaces. Spatial landscape configuration affects sound propagation and thus, soundscape patterns, which has to happen in a positive way.

For that, it was needed to define and interprete the main elements of landscape architecture compositions and their sonic characteristics for sound propagation - diffusing and absorption. Based on the categorization of Johan van de Zwarte for the landscape analysis (2004) and adapted to this research framework, these elements were defined into paths, walls, water, vegetation and topography. For instance, vegetation and topography play a crucial role as design elements for the Soundscape ecology, as shown in the theoretical framework.

The arrangement of these elements in landscape compositions create different auditory experiences, different Soundscapes. It was like composing different musical arrangements for the same song, using different instruments.

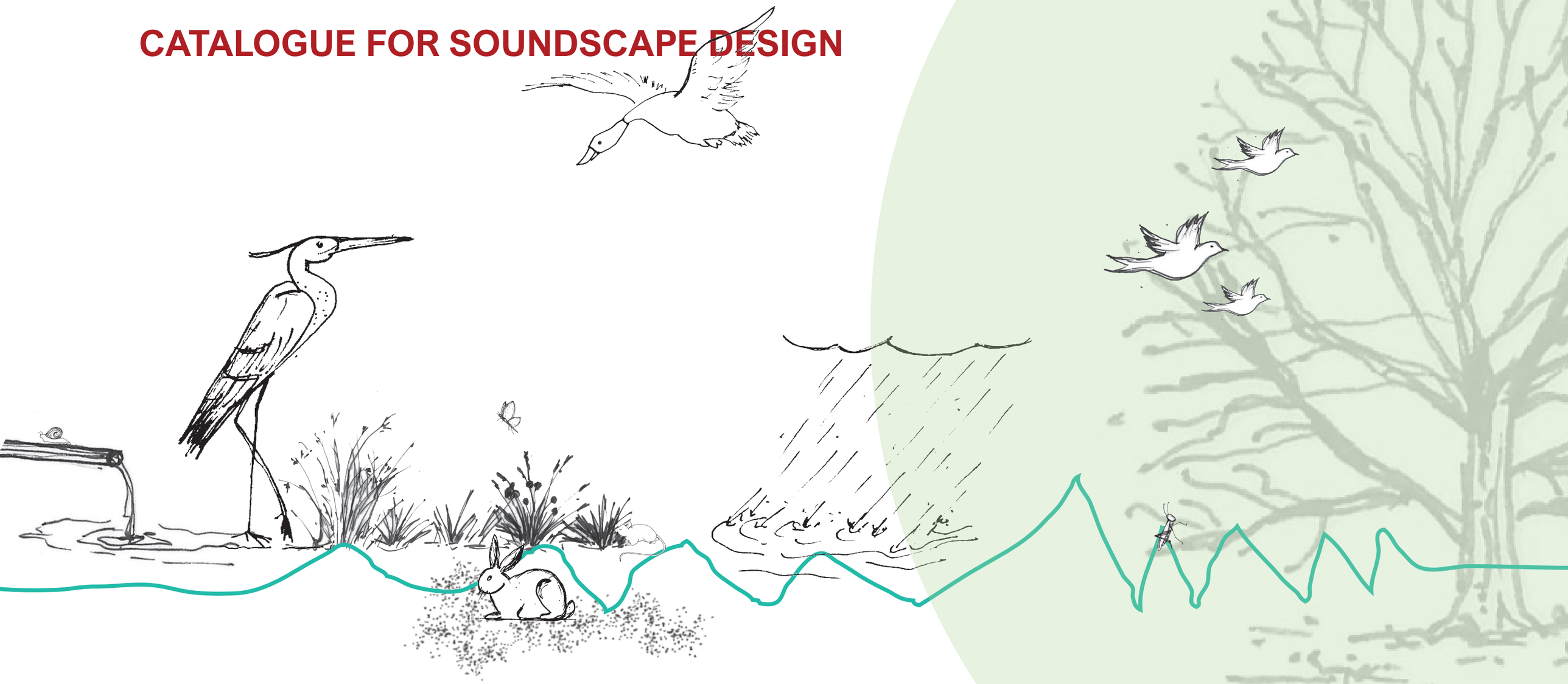
These compositions were organized into a **“Catalogue of Soundscape Design”**, which is separated booklet but part of this report.

By creating new sonic environments, we can create landscapes that can not only inform sounds, but offer high spatial qualities, which improves human health, biodiversity and resilience, and use of a place.

How can soundscape ecology design be relevant to the design of the park and contribute to future climate adaptive design/solutions??

Can these sounds promote social interactions and well-being of the people, and contribute to biodiversity?

CATALOGUE FOR SOUNDSCAPE DESIGN



6 Symphony for the Delflandsedijk- City Park

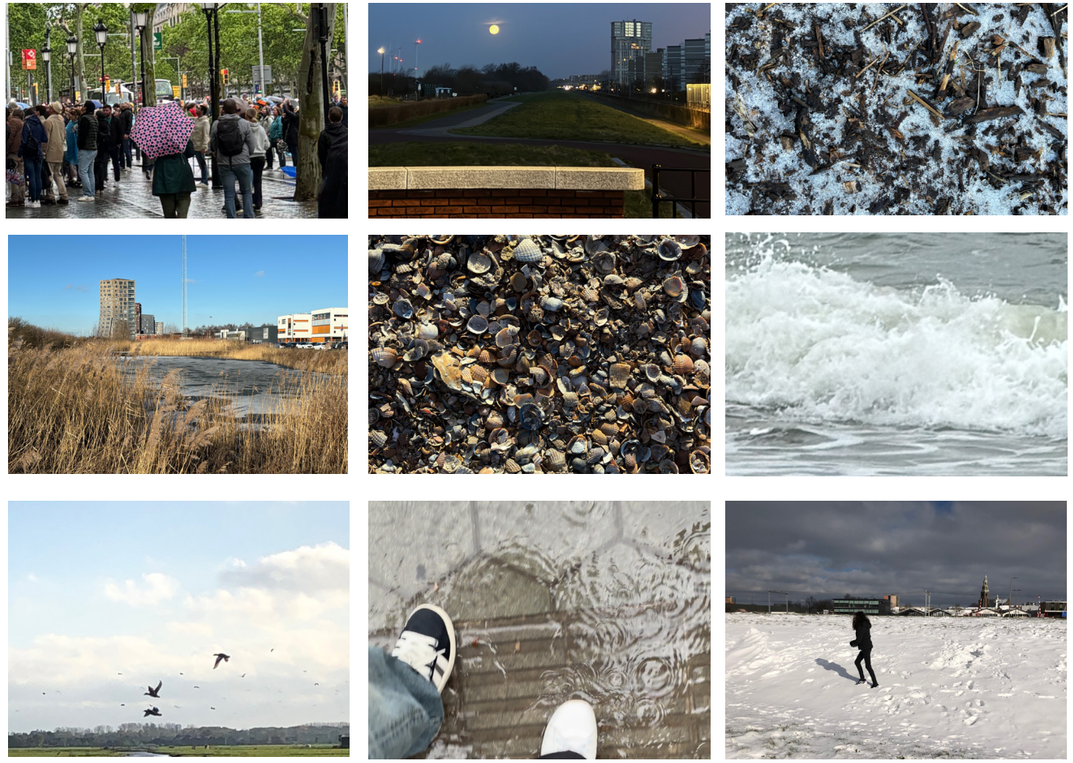


Figure 82
Soundscapes

Source: By the author, 2023 and 2024.

“Every environment can be treated as a concert hall”
(Cerwen, 2017, p.19).

Symphonies are meant to be played in concert halls. Landscape symphonies are meant to be played in the landscape.

Our project for a city park in the Delflandsedijk has the ambition to transform it into a large concert hall in the open air, public, to be enjoyable by everyone who lives, transit or visit it; it has to be an inclusive design.

Those pictures represent some of the experiences that will be part of the “concert”.

The city park will consider as of great value the contributions of the residents from *Het Balkon*, where the park will be, to complement the special public space we want to create.

As a symphony, every instrument counts.

Symphony for the Delflandsedijk- City Park

The analyzed study area was stated between the two main metro stations of Maassluis: Centrum and West. However, due to academic schedule restrictions, two sections of this area were defined for the City Park and only one was chosen to be presented with a project.

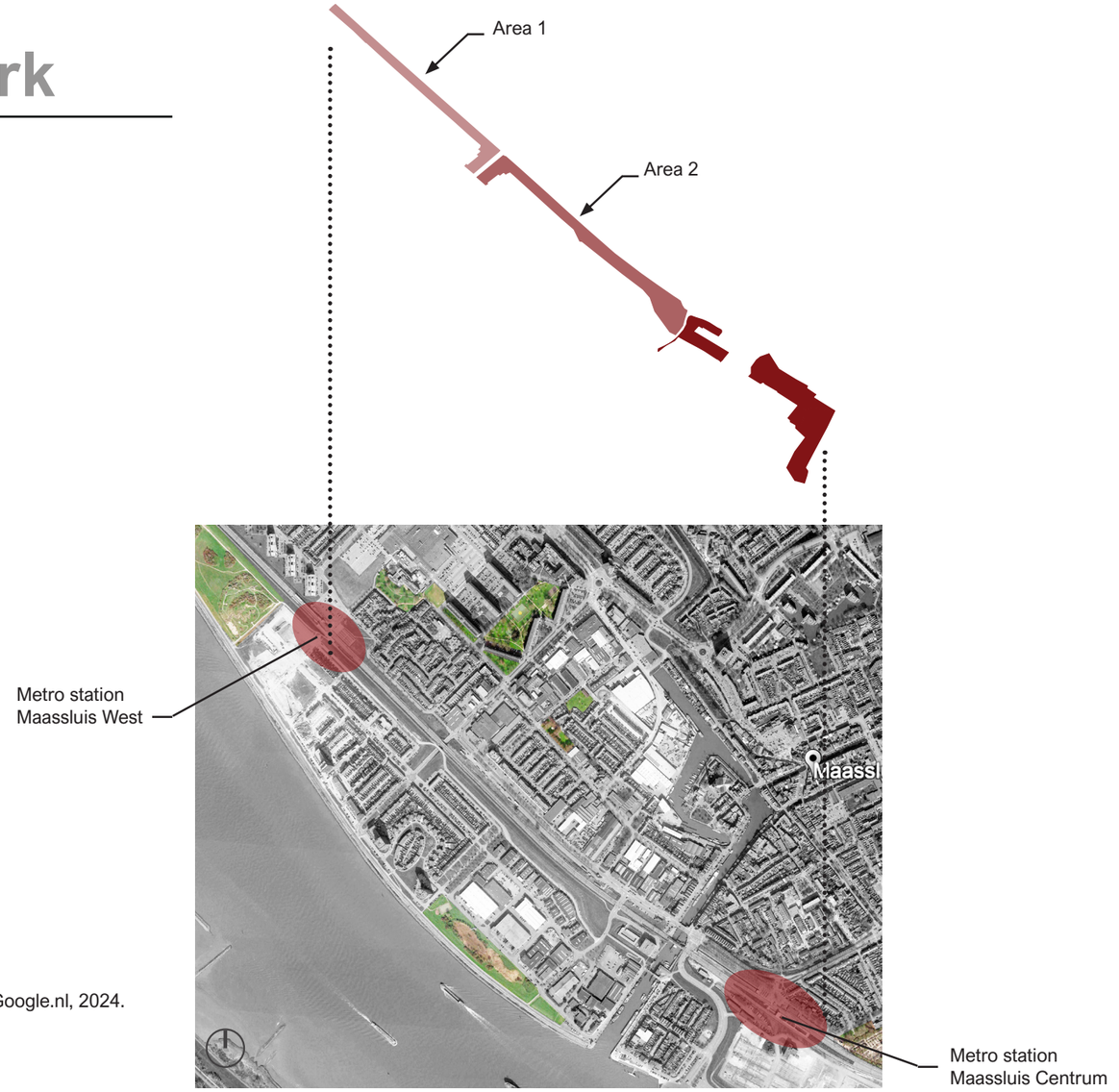


Figure 83
Study area and project areas.

Source: Adapted by the author from Google.nl, 2024.

Concept

To begin the composition of this symphony, some basic knowledge of music was used, since we would like the audience/ users, to have the same experiences as if he/she were in a concert hall. For that, we read the dike as a musical notation, divided in segments/ tempo of 50 meters long each. Like in music, the melody vary between calm and vibrant accords, represented here by *Presto*, *Allegro* and *Adagio**. These are italian words used in music to state the rhythm. In the project will determine the same in each parcel. In other words, all the elements proposed by the composition of the city park are organized and placed in such a way that the users can experience the “melody that is being played”.

The symphony is for everyone. The “expectator” can choose to “listen”to a small piece of the play or the entire song, and can repeat the ones that are more pleasant at that moment.

* *Presto* - very rapid
Allegro - moderate
Adagio - calm

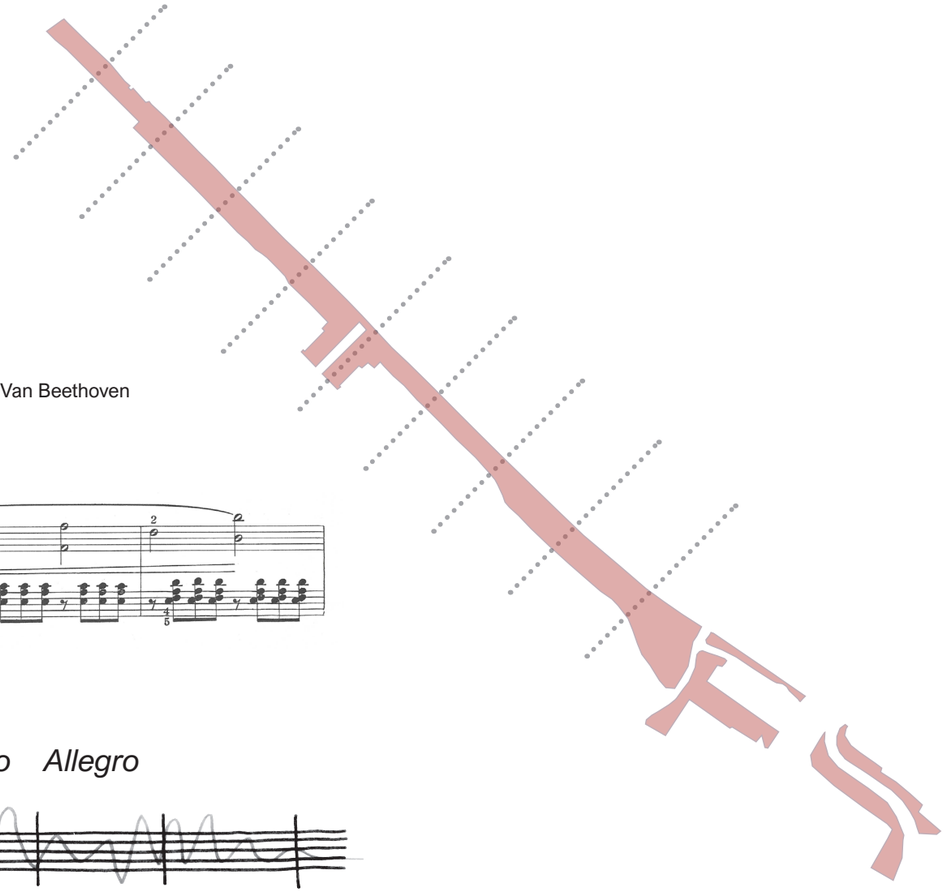
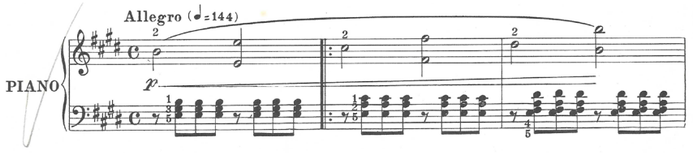
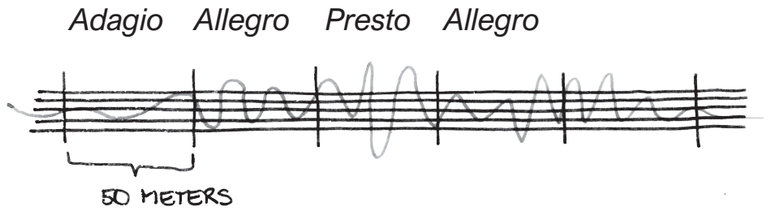


Figure 84
Music notation of Sonata Op. 14, no.1, L. Van Beethoven

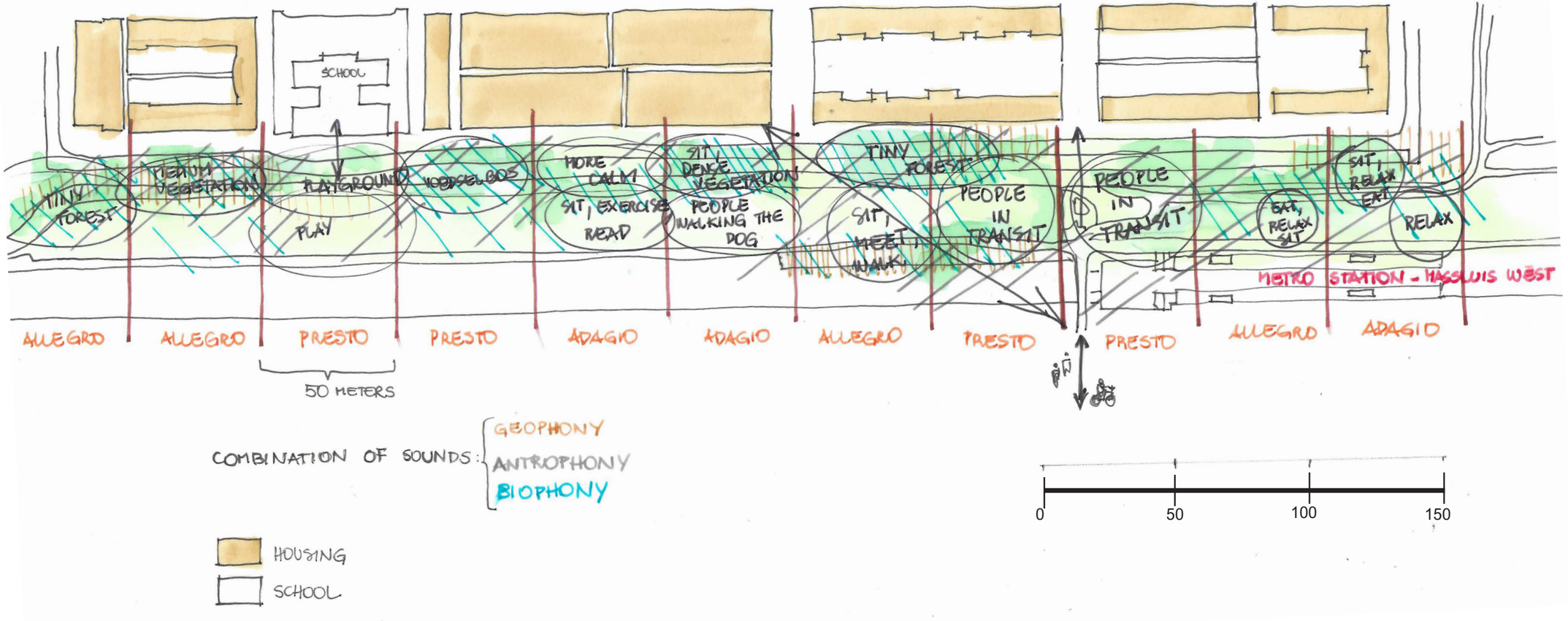


Source: Lima, Souza.



Concept

Figure 85
Concept for the City Park - Area 1



Source: By the author, 2024.

Concept

With the rhythm of the melody defined, the sound sources and the compositions with the landscape elements were located throughout the area, observing the programme of needs for the park and the wishes from the local residents (See “Questionnaire for the residents of *Het Balkon*”, in the Appendix).

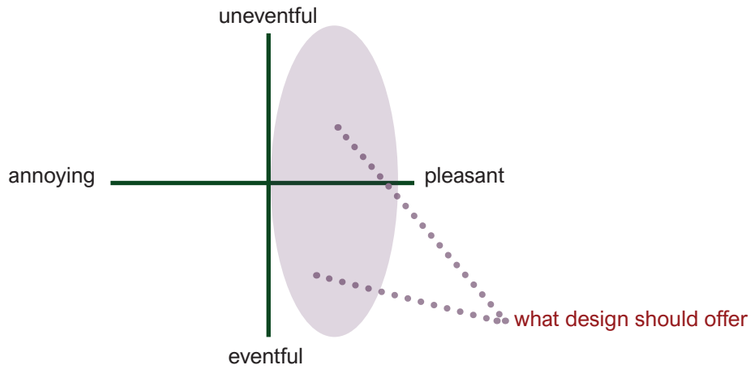
The **“Catalogue for Soundscape design”** was used as reference and practical application of scenarios in the park.

Programme:

- Playground
- Food forest
- Tiny forest
- relaxing areas
- water fountains, curtains
- cycling pathways
- walking/ running pathways
- picnic areas

For the Soundscape design of the City Park on the Delflandsedijk, the scheme proposed by Axelsson (Cerwen, 2017) will guide our concept for the design, once it states clearly what is desired: a pleasant place for anyone, no matter what kind of event is placed. (Fig. 86)

Figure 86
Axelsson's model for soundscape individual perception



Source: Adapted by the author.

Concept



Soft and organic lines

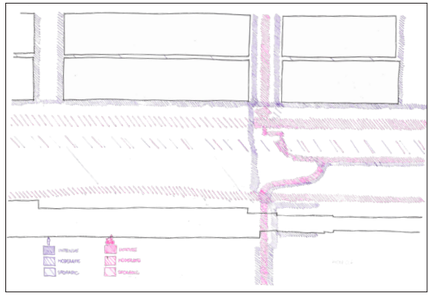
Harsh lines

The dike is a linear structure and everything that happens or is placed next to it also follows a linear structure.

Therefore, our intention was to oppose to this through organic pathways.

Observing how do people walk, bike or run throughout the area (see fig.87 and the complete analysis in the Appendix), the natural design of the pathways were established with organic lines, more soft and inviting structures.

Figure 87
How do people walk?



Source: By the author, 2023.

Concept

The dominant orthogonal of the dike contrasts with the organic riverfront.

The harsh orthogonal lines will be used in the project, but with as connector of viewpoints.



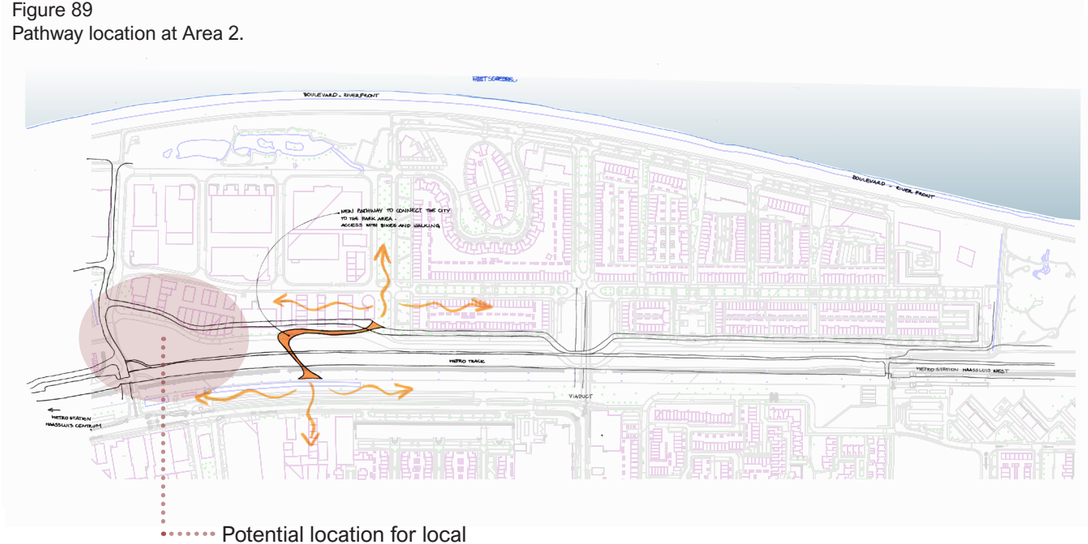
Figure 88
Graphic visual lines of the area.

Source: By the author, 2024.

Concept - connections

The park is designated to occupy the Areas 1 and 2. Considering that, an analysis of the connections was carried out, since the dike and the metro track are performing as dividers within the urban fabric. Looking at the map, the River *Het Scheur* is disconnected from the city. To enforce the dike as a park an potential element to bring people from different parts of the city, a pathway crossing over the metro track is suggested. People will not walk long distances to enjoy a park and it is our task to attract them and create conditions for that. This pathway with pedestrian and bike lanes is located in the middle of Area 2, which has aproximatelly 650 meters long. A potential location for school facilities is also being suggested for Area 2, since city hall has a high demand for it and does not know yet where to place it (fig.89).

Figure 89
Pathway location at Area 2.



Source: By the author, 2024.

Within the city, the future city park on the Delflandsedijk will be a very important element of connections. It will connect fragmented green structures, building a “green corridor” with the robust structures on the surroundings. Consequently, this will increase biodiversity and will attract people to use the area for walking, running, cycling or just staying there. Visual connections with important elements will also happened. As a strong reference, the ***Grote Kerk*** will be a symbol of visual and historical connection with any place of the park(fig. 90).

Figure 90
Connections within the city



Source: By the author, 2024.

Project contextualization - “Sounds of history”

The “Sounds of history” will be literally present, specially when the bells of the *Grote Kerk* are played (fig. 90). Aditionally, sounds of prosperity are still being represented by navigation, with an intense maritiem traffic on river *Het Scheur*, connecting Maassluis to its essence. There are still some barges entering the old city harbor and these sounds can be heard from the park. The sounds of ships travels throughout the transversal streets that connect the river to the park (fig. 91). Some vessels still attract people with their horns, specially the cruise ships.

To design the park, in addition to these connectors, one of the concerns was regarding to how people would access it and how would be their walkability. The neighborhood’s streets are ortogonally directed towards the river and the dike, as was said before. Due to this, we wanted to assure that everyone could easily enter the park from everywhere by designing cross over pathways throughout the area. By analyzing how people move around the area, we designed more options to reach out the common places such as the commercial area, metro stations (Maassluis West and Centrum), boulevard, *Sterrenbos* and of course, the neighborhood *Het Balkon*.

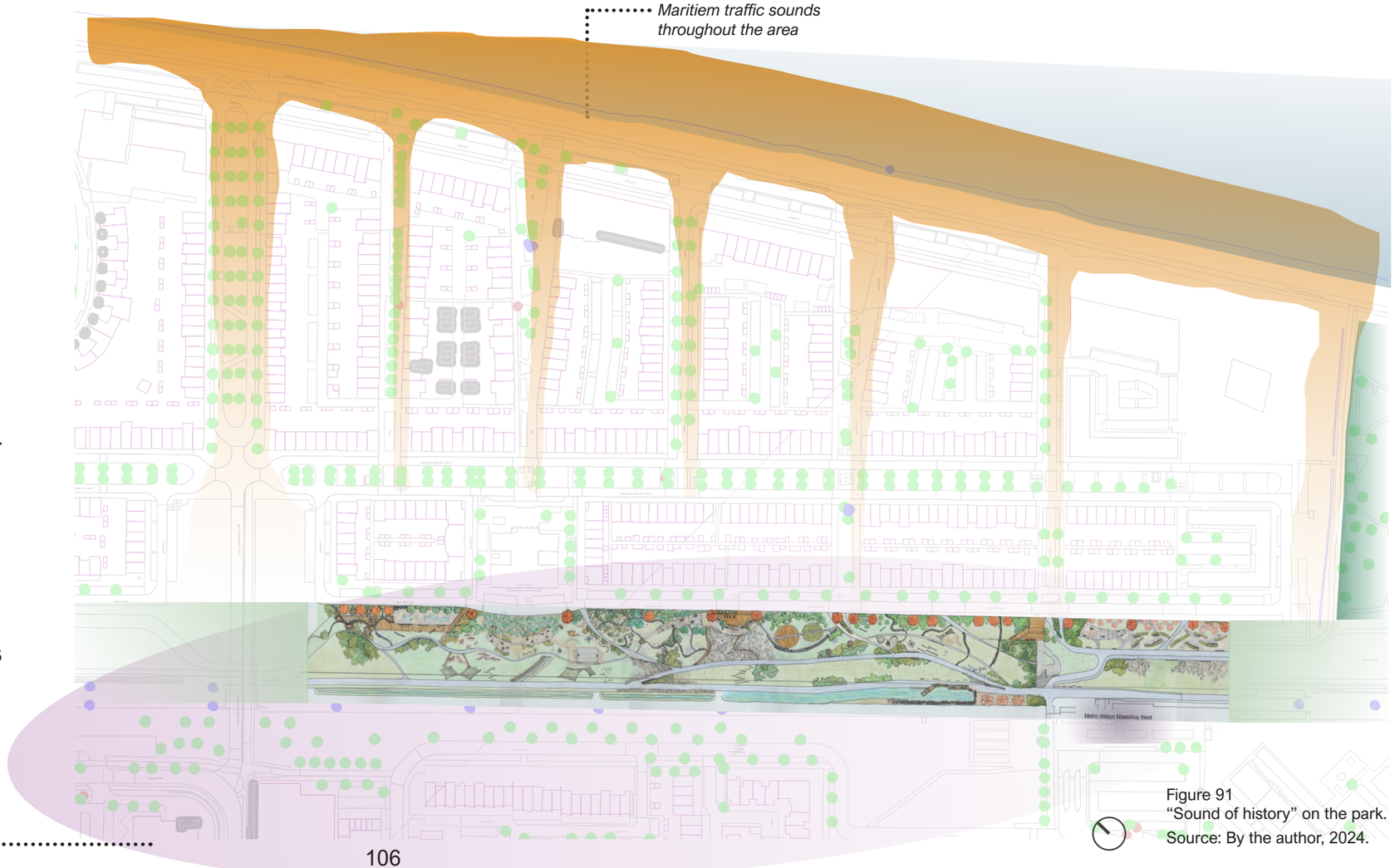


Figure 91
“Sound of history” on the park.
Source: By the author, 2024.

Project contextualization

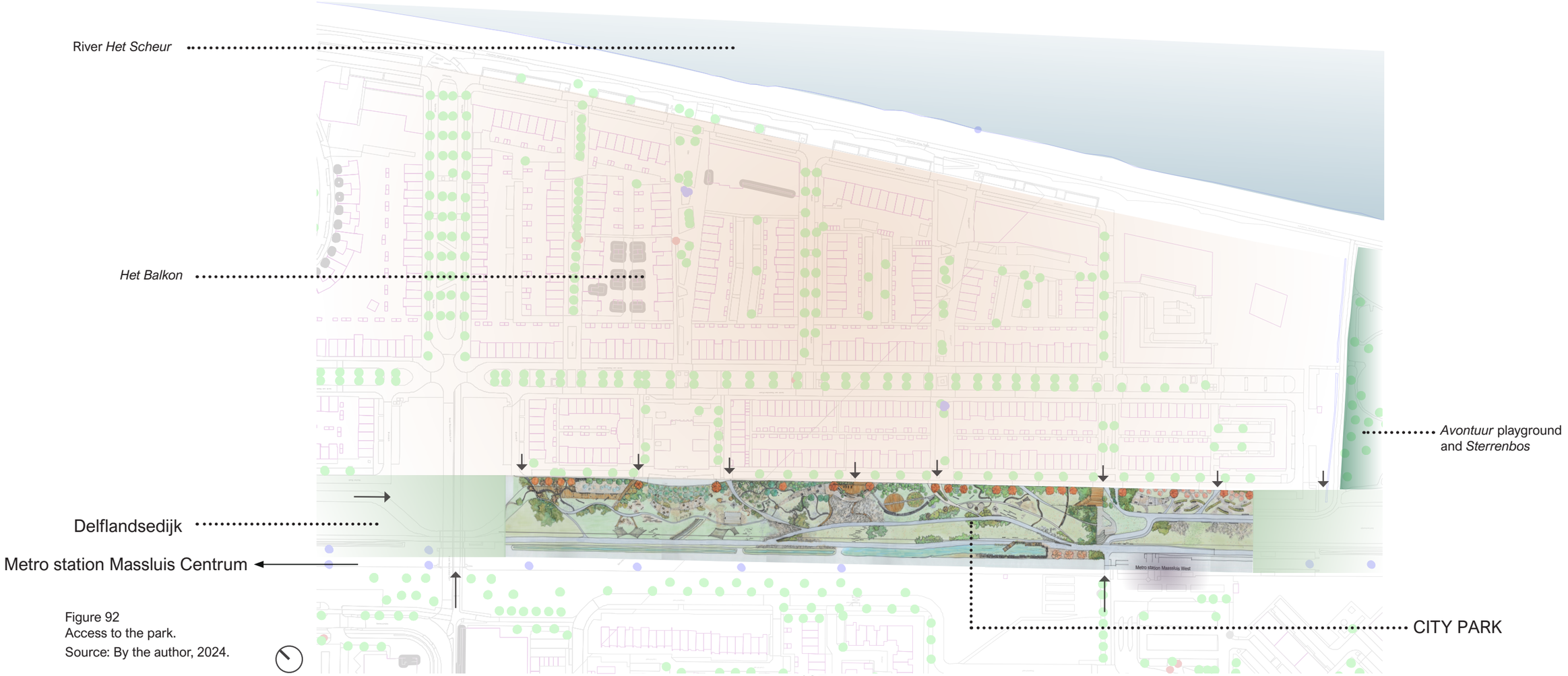


Figure 92
Access to the park.
Source: By the author, 2024.

The Delflandsedijk City Park - Plan view

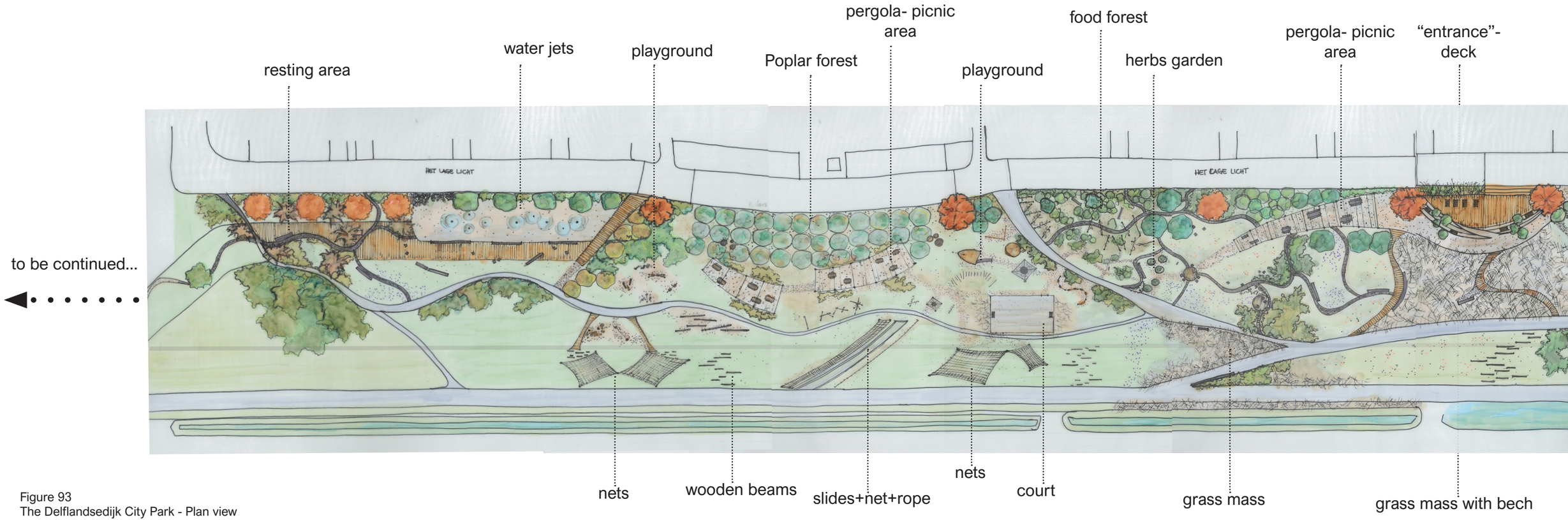
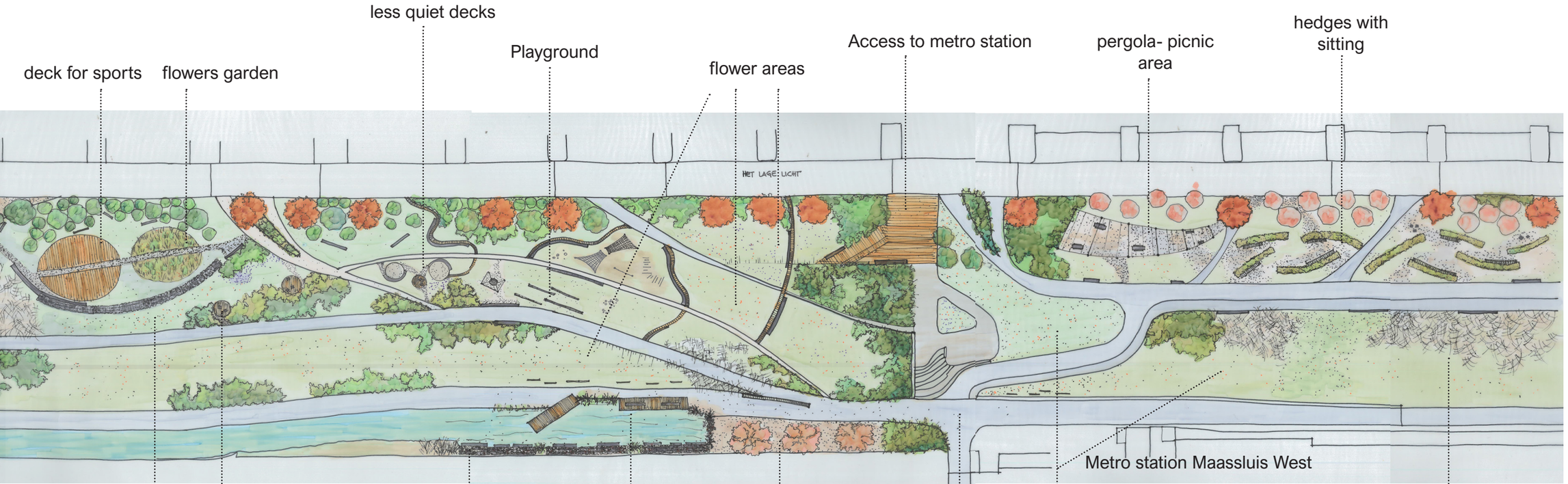


Figure 93
The Delflandsedijk City Park - Plan view
Source: By the author, 2024.


deck for sports
flowers garden
less quiet decks
Playground
flower areas
Access to metro station
pergola- picnic area
hedges with sitting
HET LAGE LICHT
Metro station Maassluis West
flower areas
quiet decks
gabion walls with water cascades
“room for the ditch”
meeting area with sitting under trees
Access to commercial center
flower areas
grass mass

The Delflandsedijk City Park

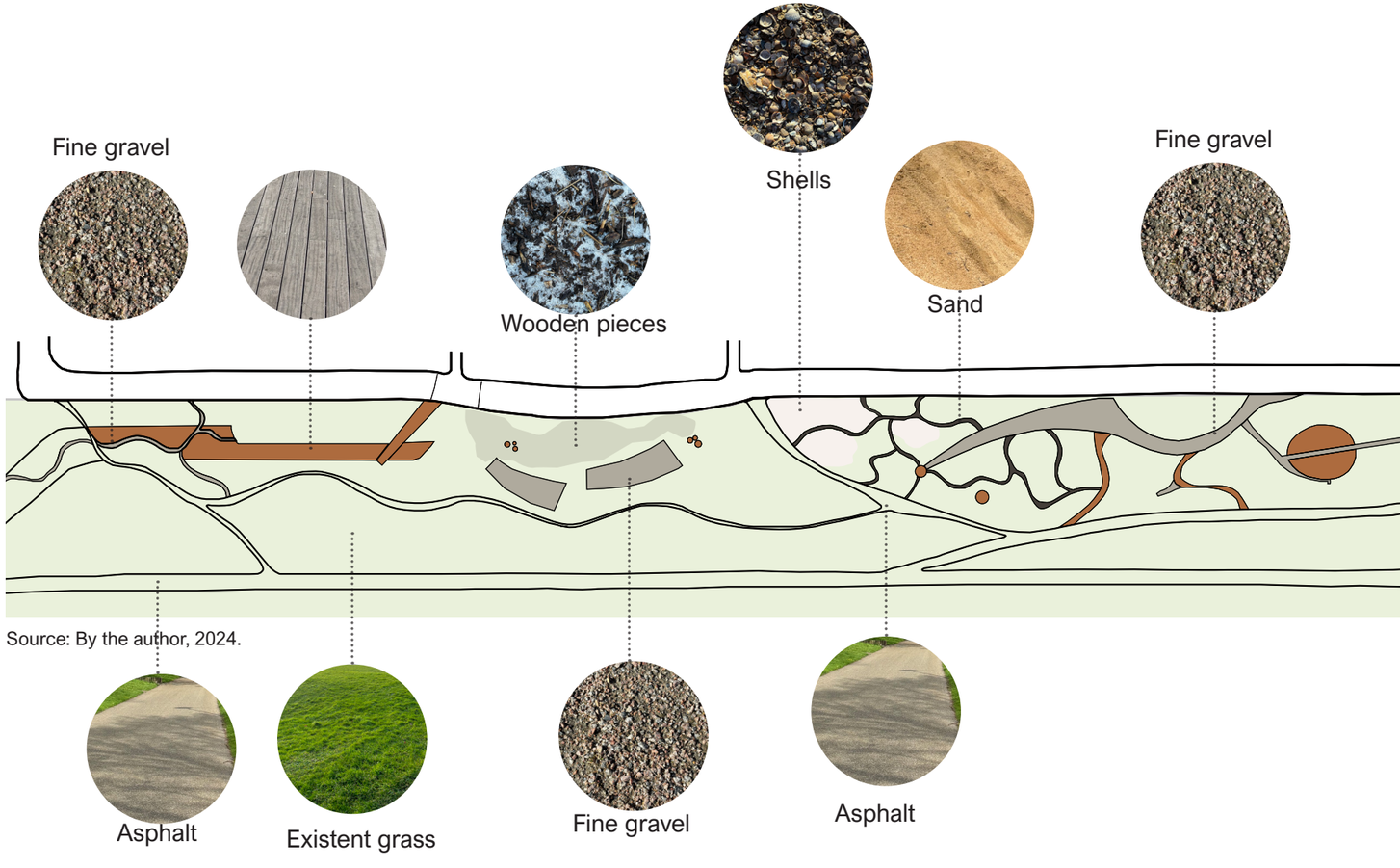
Pathways and Materials

As mentioned earlier, the pathways were defined according to fieldwork, observations and analysis of the area in the city context. However, they were designed for the park's concept, contributing to the soundscape intended for a determined part.

In the "Catalogue of Soundscape Design" there is a selection of common landscape materials, which were used for the research and in the park design. These materials are fundamental throughout the park and contribute significantly to the designed soundscapes.

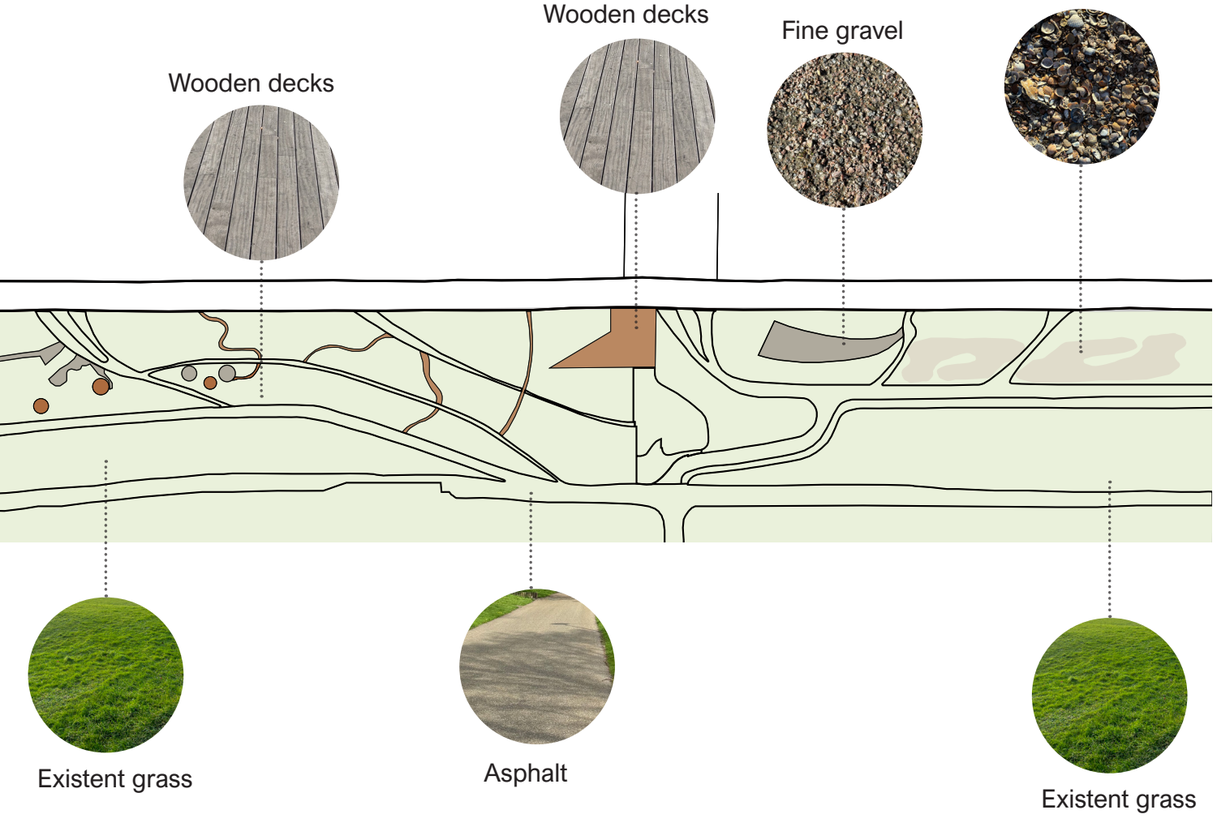
They were placed on the project according to the concept, always providing a different sonic experience for the users. They rarely function as isolated sonic sources but in composition with the vegetation, users and animals that eventually inhabit there.

Figure 94
Planting scheme: pathways and materials.



Source: By the author, 2024.

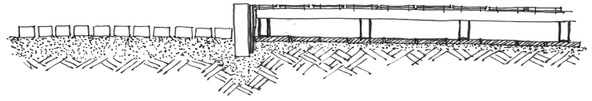
The Delflandsedijk City Park



Pathways details

The transitions among the pathways indicate a change in the soundscape. They can be executed in a simple way. The maintainance must be performed seasonally.

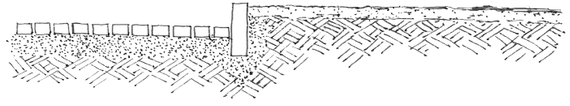
transition brick-wooden deck



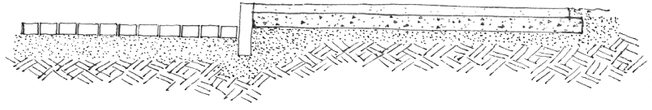
transition brick-gravel



transition brick-subgrade



transition brick-concrete/ cement



transition subgrade-concrete/ cement - gravel



Flora

As instruments of an orchestra, fauna and flora influenced the park soundscape throughout the area. Due to seasonality, they alternate their role in the landscape, playing solos or just becoming silent for a certain time.

All the species used in the project were chosen from what is found on the area and is well adapted. It is important to read the landscape.

The pictures below show some of the species that were listed for the park in the local situation.

Figure 95
Species found in the area of the project.



Source: By the author, 2024.

A park requires maintainance and currently at the dike, this is done by the City Hall, who has all the services planned throughout the seasons. This year a different strategy for mowing was adopted to enhance biodiversity. In most of the open spaces only a stripe of approximately 1 meter wide is being mowed, only to allow people to walk through (fig. 96 and 97). As a result, an exhuberant spring of flowers and grasses are enriching the landscape, attracting a lot of fauna. Considering this, the areas in the park were normal grass will remain, will not need to be mowed to create pathways, only to remove the dry plants. This is important for a park, since other places will require frequent services.

Figure 96
Shells pathway with 1 meter mowed on both sides mowed.



Source: By the author, 2024.

Figure 97
Pathway mowed within a flower, grassy area.



Source: By the author, 2024.

Flora - trees

Planting scheme - trees

Due to safety restrictions stated in the Waterboard documents for the Delflandsedijk in this area, trees, some shrubs, and constructed elements could not be placed on the “kruinlijn” and protected zones of the dike. This restriction led to concentrate the big interventions on one side of the dike, where a working road is currently located to provide access to trucks and machinery while building the neighborhood *Het Balkon*. In addition to that, as the **tree** planting inside the neighborhood follows the urban planning grid (in line planting), a certain continuation of it was thought, by placing *Fagus sylvatica* trees, which has a distinctive seasonal reddish color, were planted isolated or arranged in groups of two, approximately every 50 meters (concept).

In addition to that, medium size **trees** such as *Prunus serrulata, Prunus yedoensis, Betula pubescens, Populus nigra and Hippophae rhamnoides* were distributed in this layer. *Ginkgo biloba, an exotic species,* is also used because it is already planted on the neighborhood and developing well. We decided to add more due to its good adaptation. Special remarks goes for a tiny forest of *Populus nigra*, which brings a special soundscape between the school and the playground.

Figure 98
Planting scheme: *Fagus sylvatica*

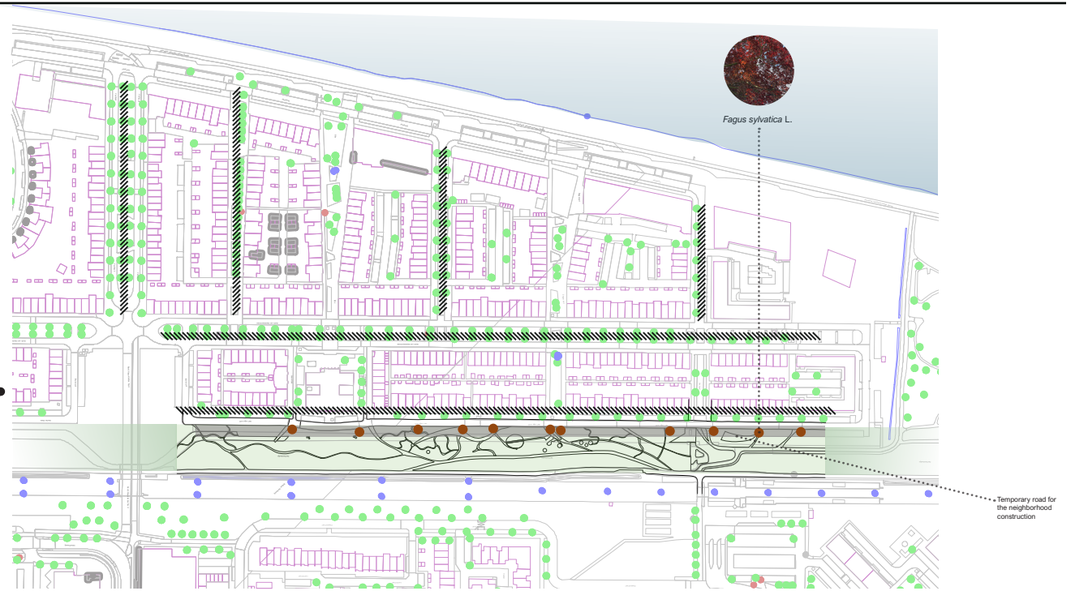
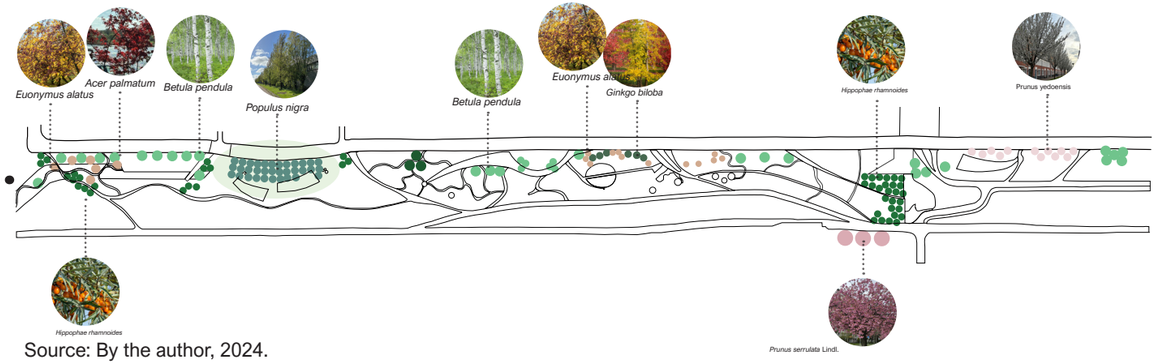


Figure 94
Planting scheme: small and medium size trees.



Source: By the author, 2024.

Flora- shrubs and grasses

Shrubs were located along the pathways, with the intention to absorb sounds and enclose the users in certain places. Varying from dense to more spread, they also offer colors with their fruits, flowers or leaves, such as *Rhododendrum poticum, Skimmia japonica and Viburnum lantanoides*.

The species chosen for the park are mostly perennials and will preserve the sonic condition of the area where they are located.

Grasses and **reed** were also used for creating special soundscapes in certain moments at the park. They covered some areas as a mass and sometimes, a bench is placed just in the middle. The sounds of the thin stems when the wind blows is a relaxing sonic experience. Some species will grow more than a human average size, which will offer an enclosed sonic experience.

Figure 99
Planting scheme: shrubs.

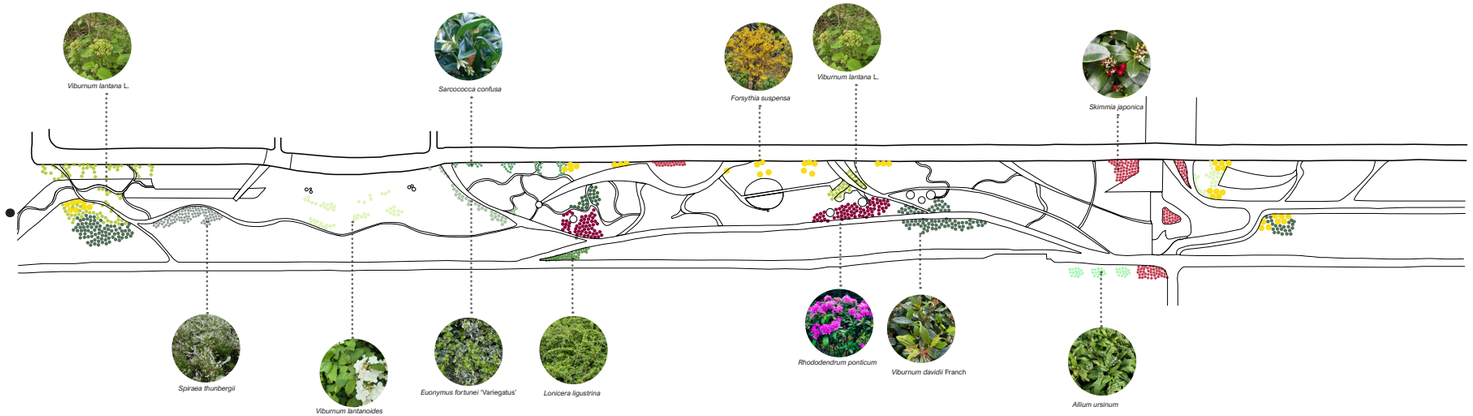
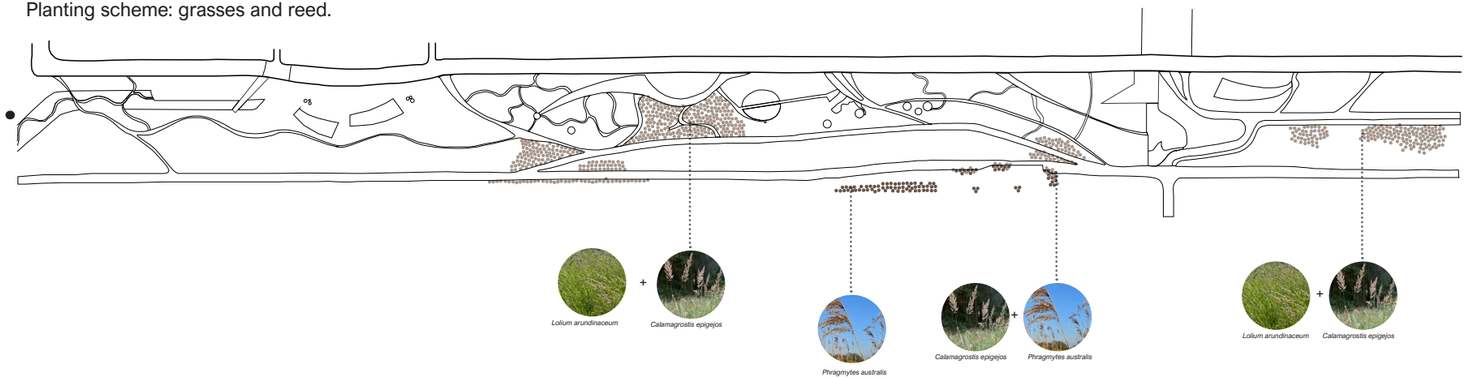


Figure 96
Planting scheme: grasses and reed.



Source: By the author, 2024.

Flora - flowers and hedges

Flowers were distributed all over the park, to spring beautifully during 2 seasons; very important for pollinators.

The great importance of these plants relies on recent research showing that besides attracting pollinators, their roots in clay-soil base make the subgrade structure stronger. This is being considered as the ultimate solution for reducing costs of dike enforcements and also minimization of mowing frequency (https://www.ru.nl/en/research/research-projects/future-dikes).

As absorber elements, **hedges** (*Laurus azorica*) were used artistically, providing a nice soundscape for those who look for some unique places to pass by or just stay for a while (see references on the “Catalogue for soundscape design”). Pergolas covering areas for picnics also offer the same environment (**vine**: *Hedera hibernica*). Other species are placed in the Appendix.

Figure 100
Planting scheme: flowers.

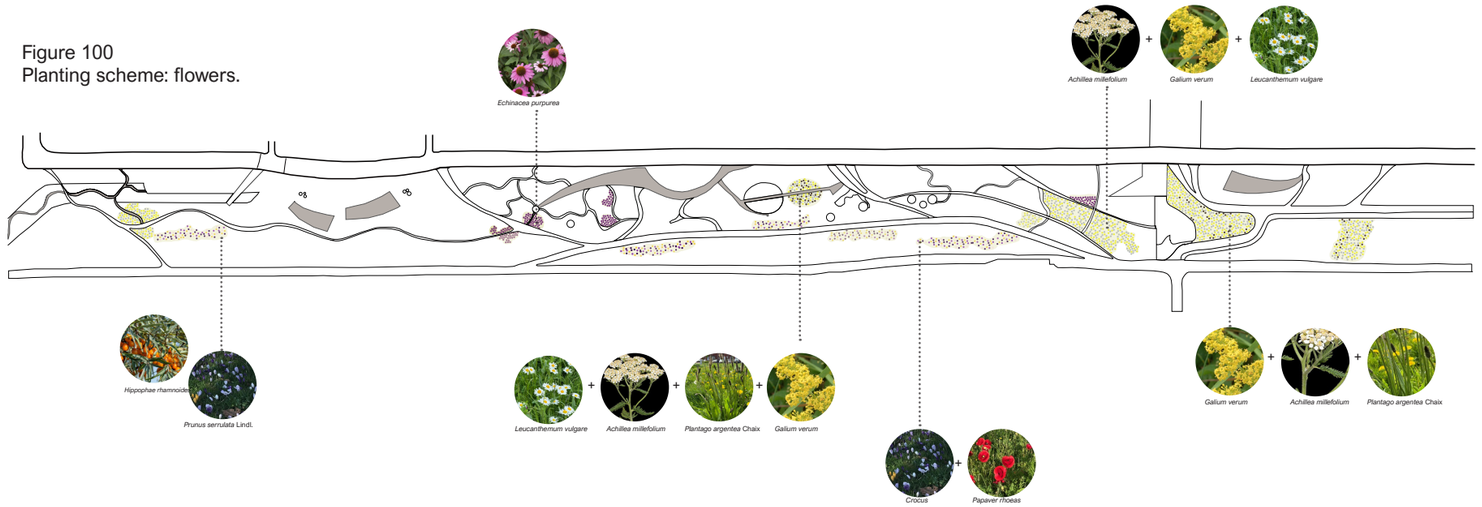
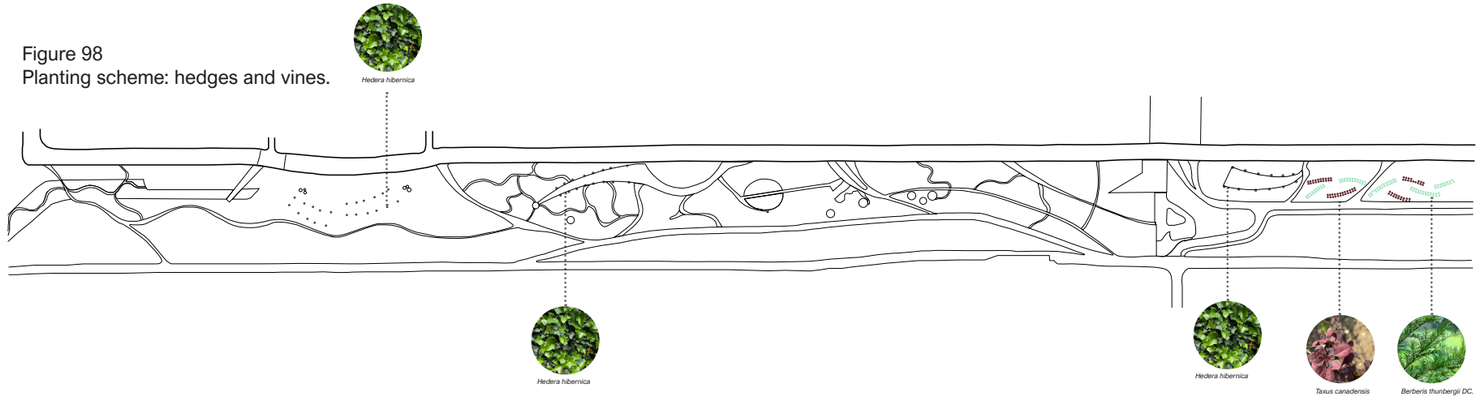


Figure 98
Planting scheme: hedges and vines.



Flora - food forest

Food forest

A food forest is also planned for the park, strategically located to be used by the residents and visitors. It is not a simple structure but can be easily started and maintained by the residents. This food forest is an interesting and attractive place for social encounters, and interactions, as well as an activity that has proved to be profoundly connected to well-being since people release stress while working with their hands in contact with soil, and plants (Litt et al., 2023). See fig. 101 and fig. 102. In the Netherlands, the "*volkstuinen*" * are very popular but not accessible to everyone. At the park, the food forest will create another use for the dike, where people can cultivate crops, as well as collect fruits, building new social interactions.

Figure 101
People in a crop garden.



Source: https://www.permacultuurnederland.org/wp/wp-content/uploads/2021/11/community-garden.jpg

Figure 102
The contact with soil and plants releases stress



Source: https://thankyourgarden.com/wp-content/uploads/2023/03/1.-What-Is-Crop-Rotation.jpg

Figure 103
Longevity- my mother, 80 years old with her crops

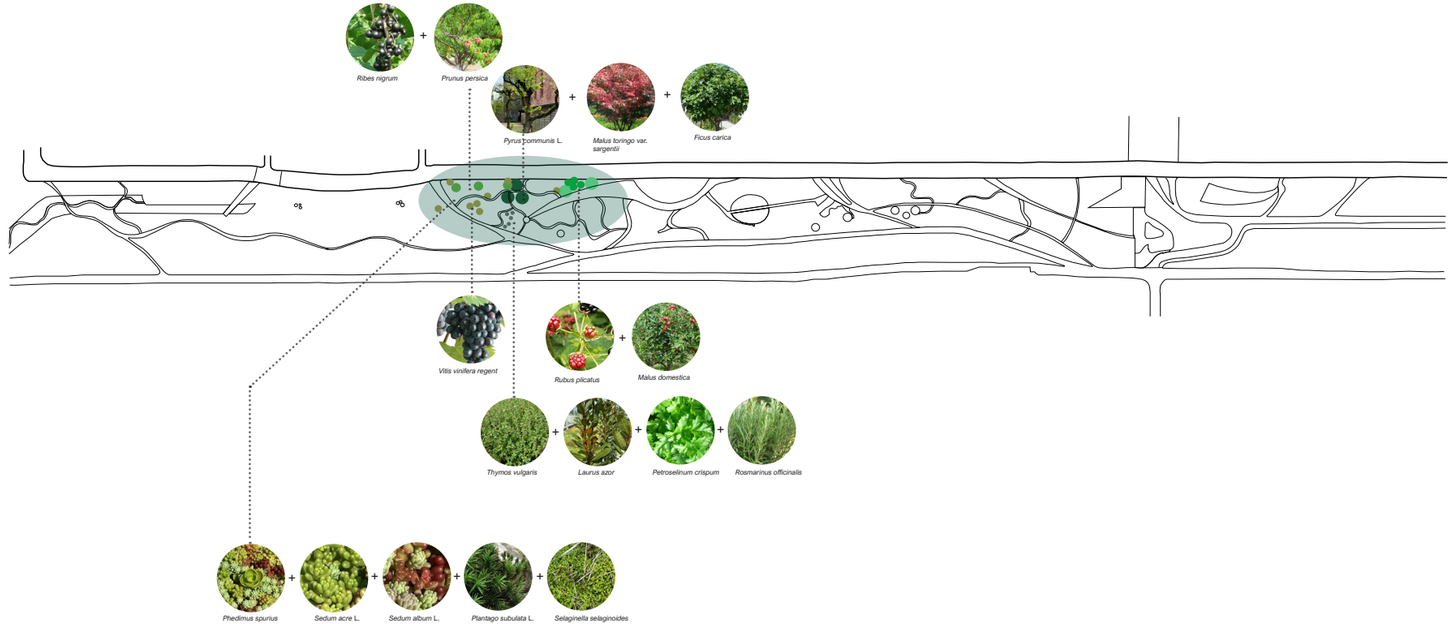


Source: By the author, 2023.

A food forest requires seven vegetation layers, as a circular environment (www.bosadvies.eu): tall trees, low trees, shrubs, herbs, ground cover, vines, and roots. These elements were used on the project and more species can be added anytime.

As a seasonal environment, it is considered an *Allegro* sonic environment most of the year, performing as an absorber in Summer with the dense canopies, attracting more living organisms. Different soundscapes will certainly bring people together and a significant life quality to everyone.

Figure 104
Planting scheme: food forest.



Source: By the author, 2024.

**Volkstuinen* - a small parcel of land where people cultivate diverse crops, and produce honey for example. They are located next to each other in certain places within the city. Sometimes they have a small shelter to keep the tools and other items for working in the garden.

Fauna

Preparing a landscape where there is food, shelter and a harmonic soundscape will certainly bring fauna.

With the planting of a variety of trees, shrubs, flowers and grass, together with water elements, the park will attract animals and establish new habitats. The expectation is that the area hosts as many species as possible given the new created conditions.

Many birds and ducks fly over the area. As a green connection is established, they will not only fly over, but also nest there. Special attention is given to pollinators, which are currently under threat. Flowers and the food forest were designed to help increasing their numbers.

The list of expected species for the area when the park is executed can be found in the Appendix. It is not a final one, since nature can surprises all of us with unexpected animal life that before was not possible to be found there. As we are connecting fragmented green structures in a large scale, these “surprises” are welcome, as long they do not interfere on the ecological balance.



Alopochen aegyptiaca



Dasypoda hirtipes



Pararge aegeria



Abramis brama



Rana temporaria



Sturnus vulgaris



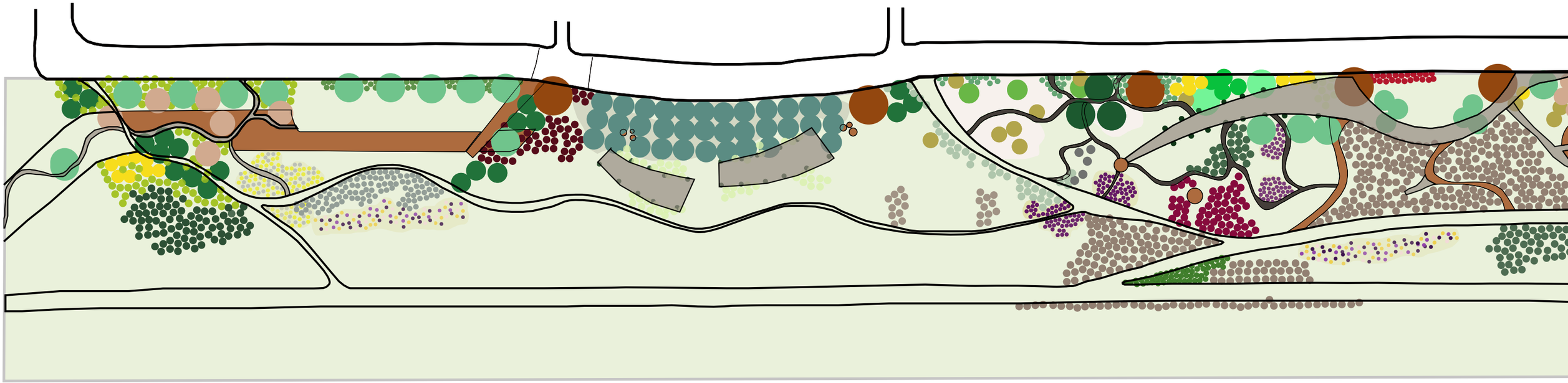
Coccinellidae



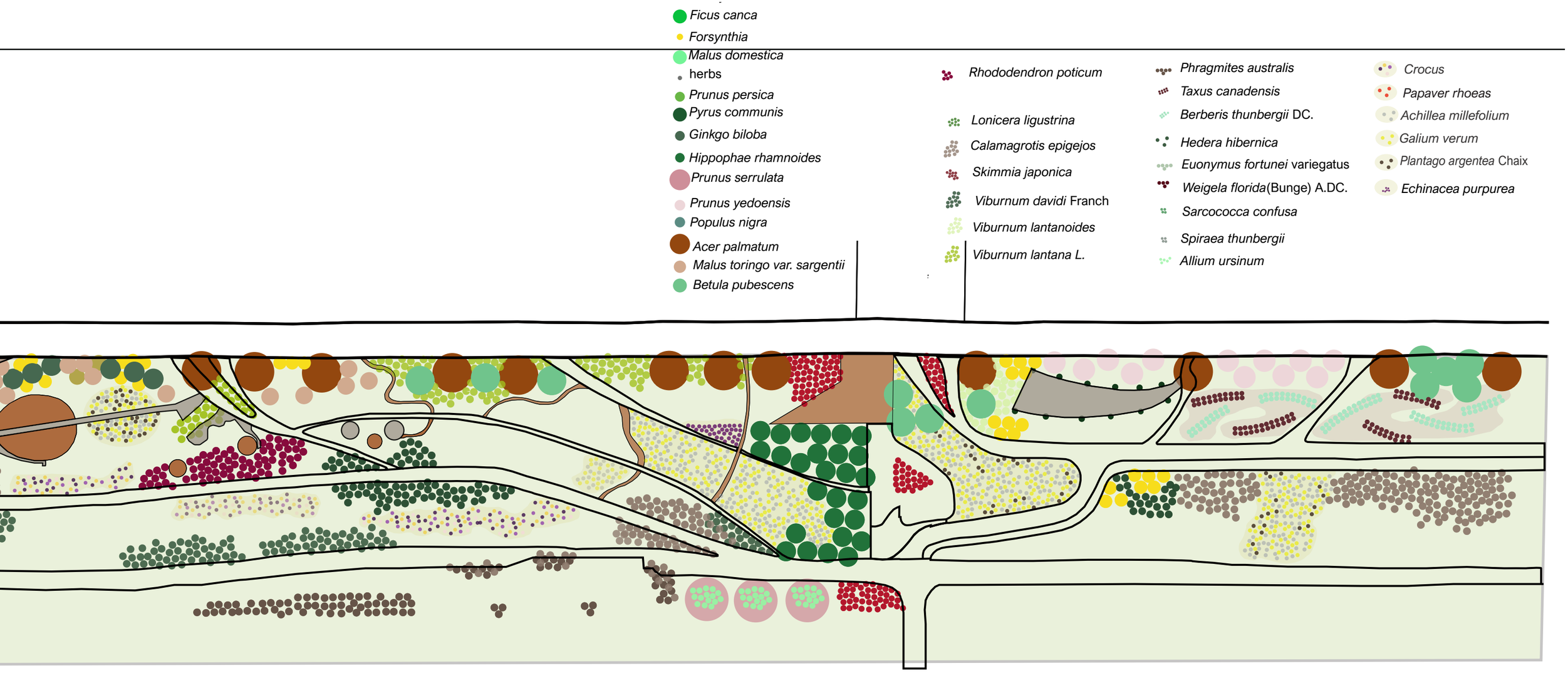
Figure 105
Green corridor .
Source: By the author, 2024.

Planting scheme

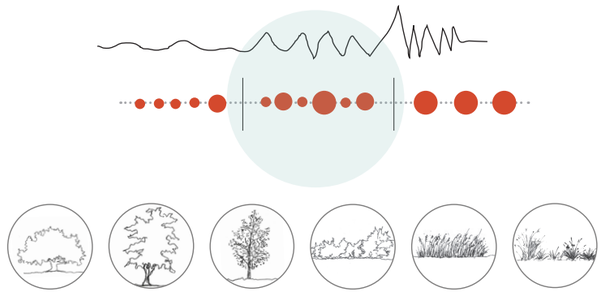
Figure 106
Planting scheme: plan view of the planting scheme.

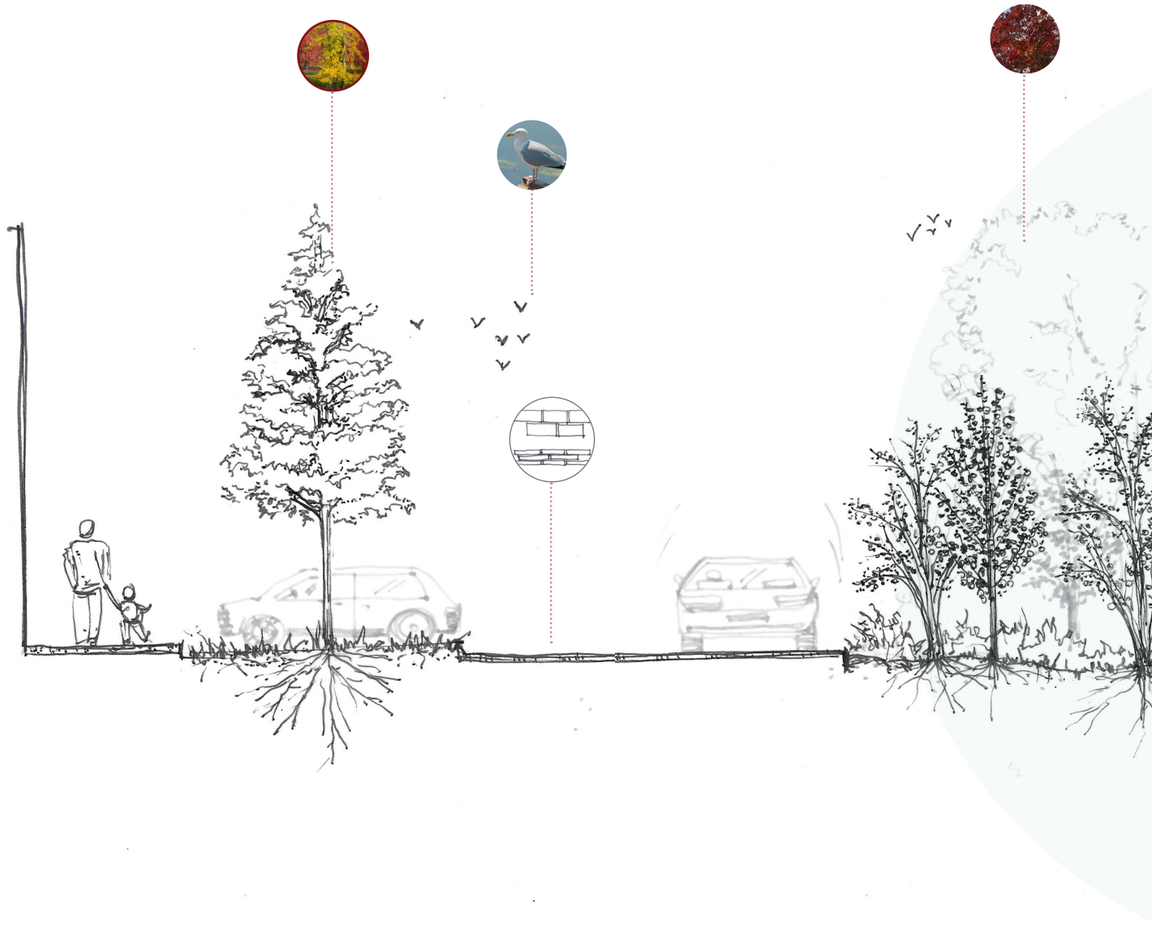


Source: By the author, 2024.


Ficus canca
Forsynthia
Malus domestica
herbs
Prunus persica
Pyrus communis
Ginkgo biloba
Hippophae rhamnoides
Prunus serrulata
Prunus yedoensis
Populus nigra
Acer palmatum
Malus toringo var. sargentii
Betula pubescens
Rhododendron poticum
Lonicera ligustrina
Calamagrotis epigejos
Skimmia japonica
Viburnum davidi Franch
Viburnum lantanoides
Viburnum lantana L.
Phragmites australis
Taxus canadensis
Berberis thunbergii DC.
Hedera hibernica
Euonymus fortunei variegatus
Weigela florida(Bunge) A.DC.
Sarcococca confusa
Spiraea thunbergii
Allium ursinum
Crocus
Papaver rhoeas
Achillea millefolium
Galium verum
Plantago argentea Chaix
Echinacea purpurea

Sections



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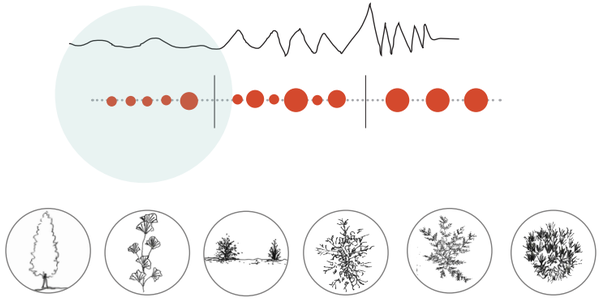

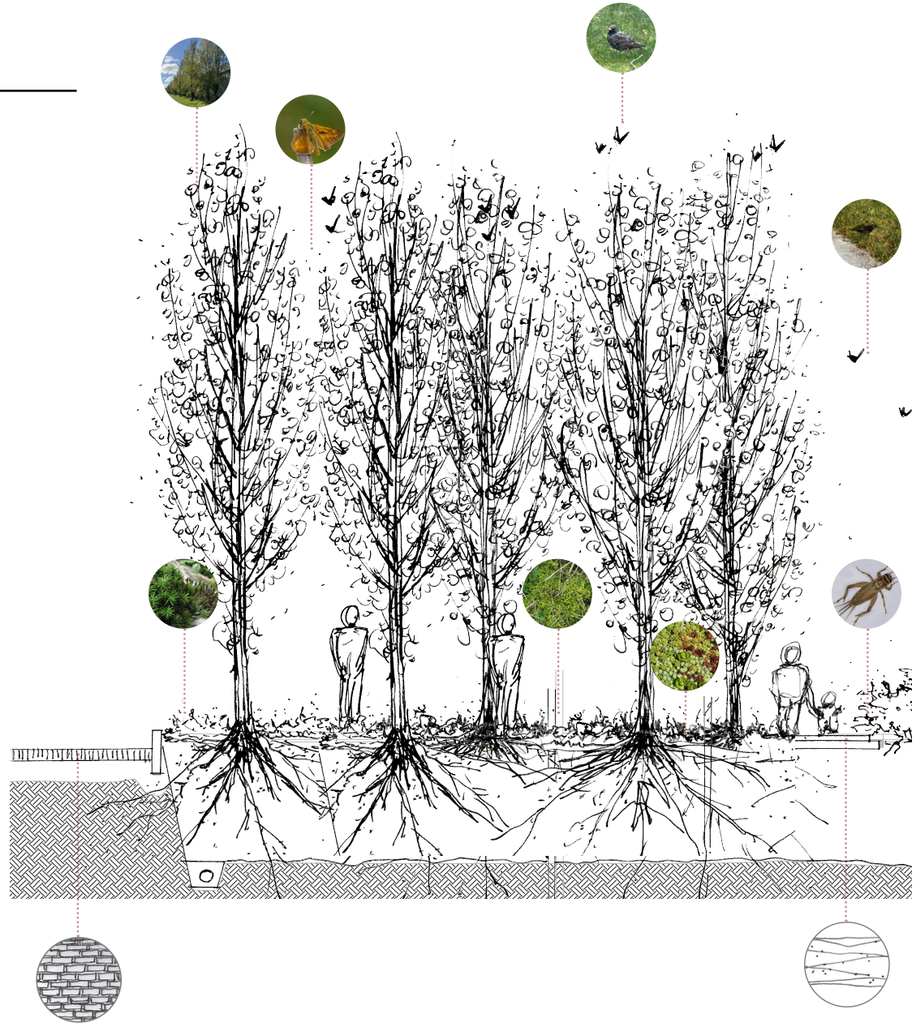



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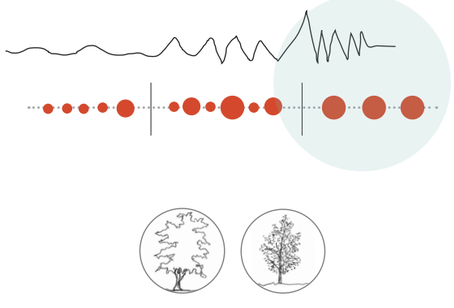

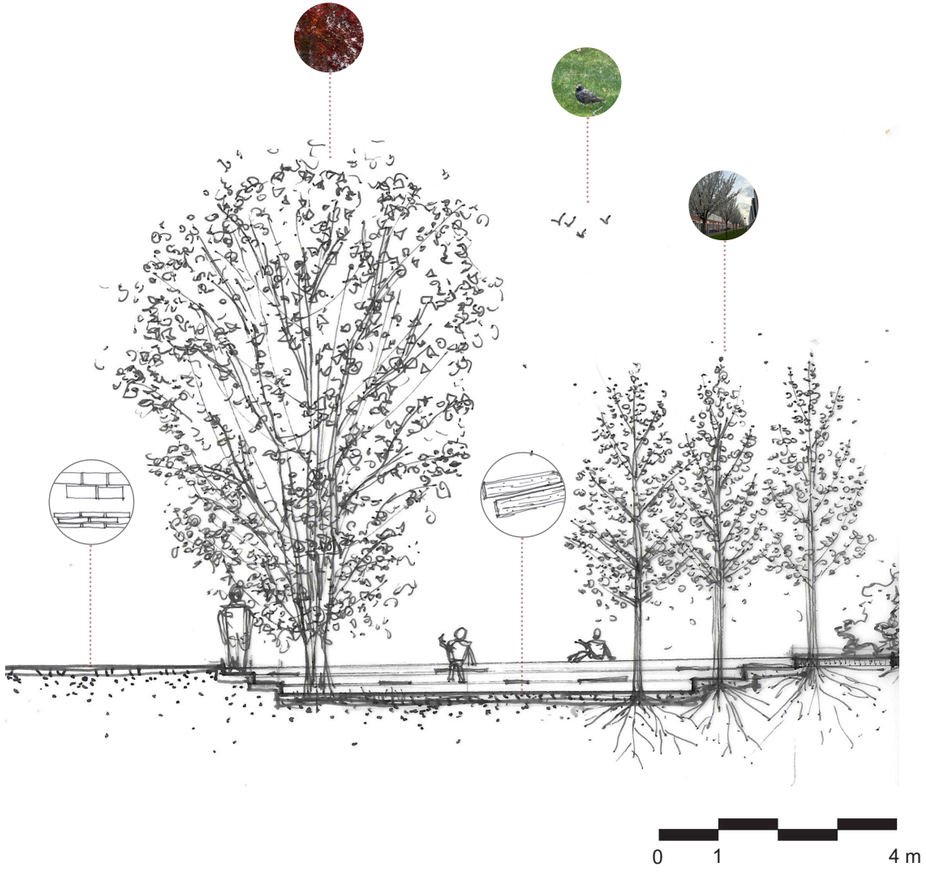

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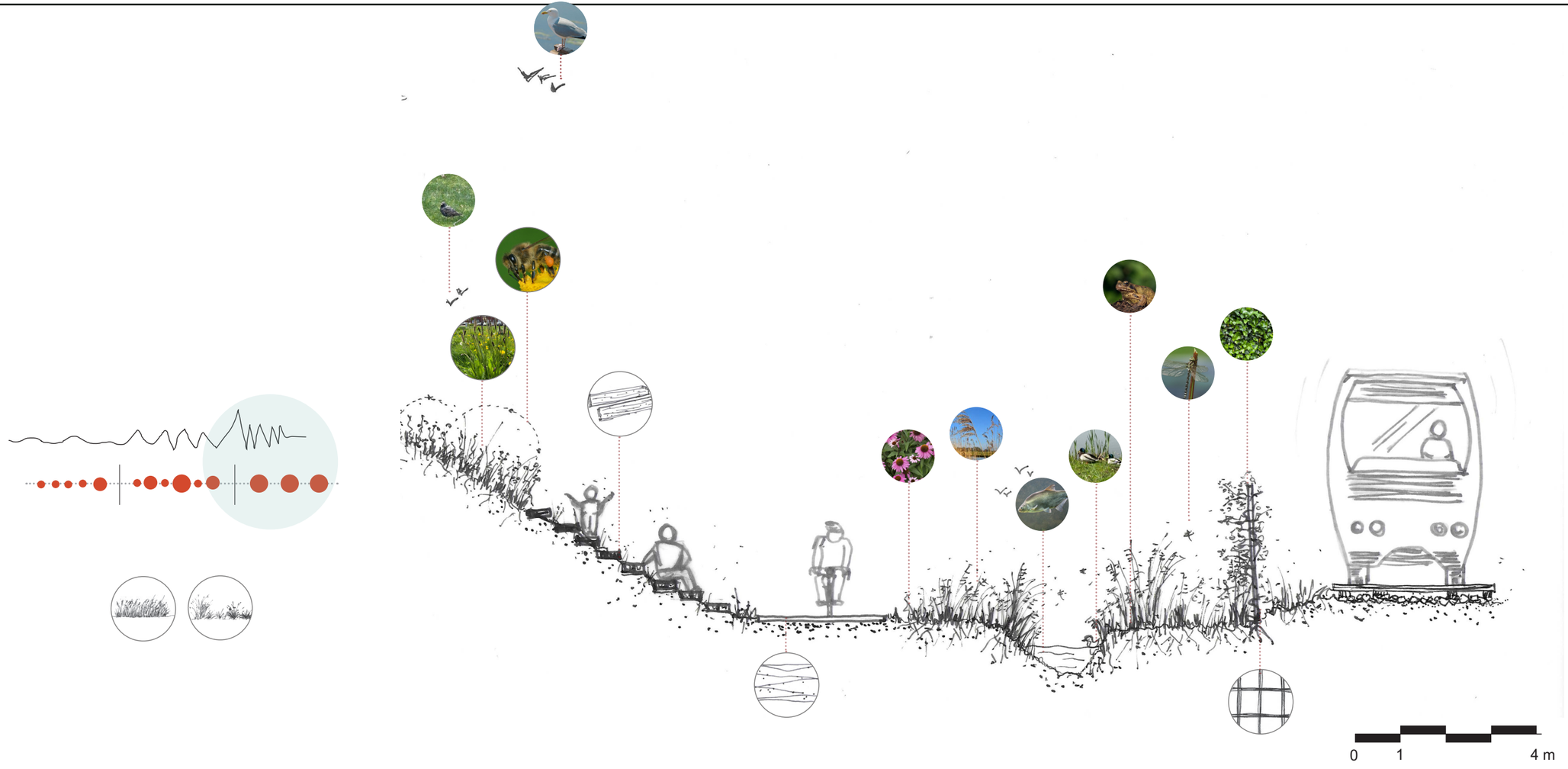


Sections throughout the seasons

As mentioned earlier, seasonality has an intrinsic relation with Soundscape.

The following sections show the changes performed on the landscape throughout the seasons. The drawings were made with different colors to highlight the changes regarding the three main sounds sources on the Landscape: Antrophony, Biophony and Geophony.



Spring



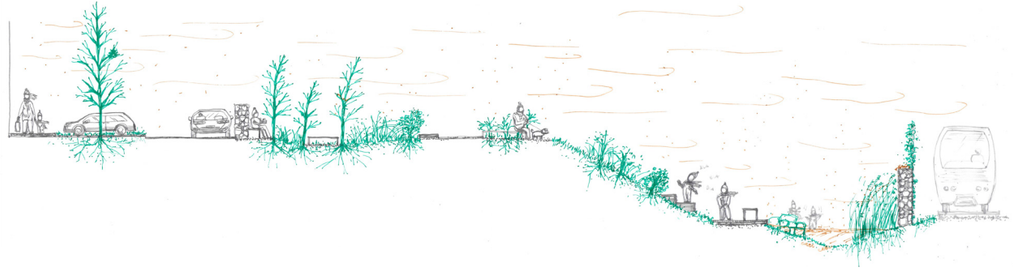
Summer



Fall



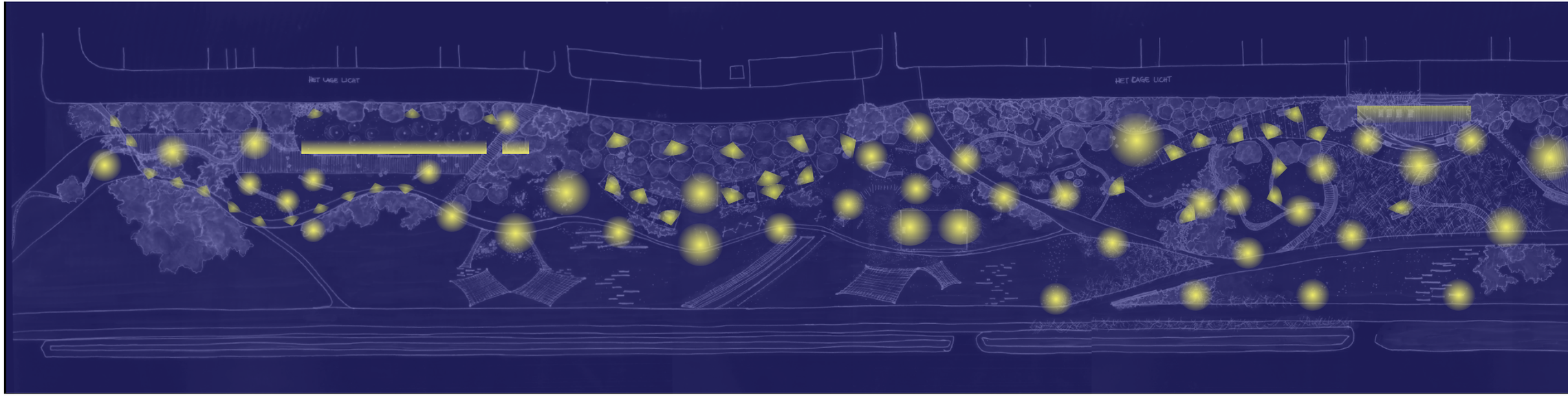
Winter



Lighting scheme

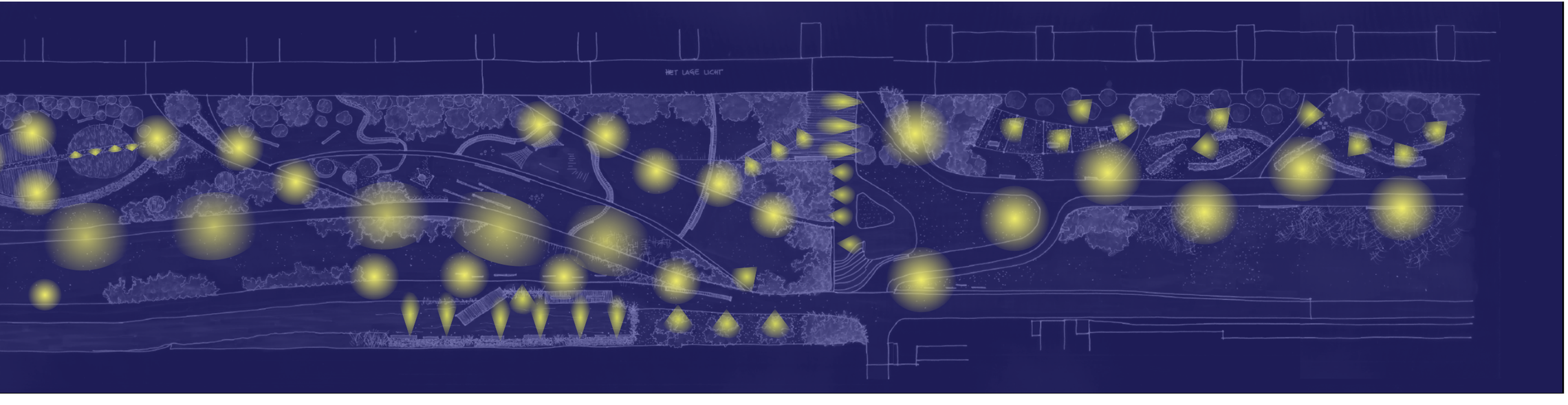
The city park is not designed to be used only during the day. Residents from the neighborhood walk by the dike at various moments, including at night. Safety is also essential for people who use and live near the park. Considering the different routines of people, the lighting scheme proposed for the park makes the pathways visible with low lights with open focus. Posts are also used along the park, especially where the trees are because they can reach a broader area under the canopies, guaranteeing the safety of all places for everyone. Important to consider that public lights from the streets. They also reach some parts of the park.

Figure 102
Planting scheme: plan view of lighting scheme.



Source: By the author, 2024.

Some places have indirect light, to indicate stairs or other change of level. The lighting uses LED as technology and should be detailed with timers. Light interferes with animals with nocturnal behaviour. The challenge is to balance between safety for people and animals. It is not the aim of this project to detail a lighting project but it is important to give some directions about it, for future advice.



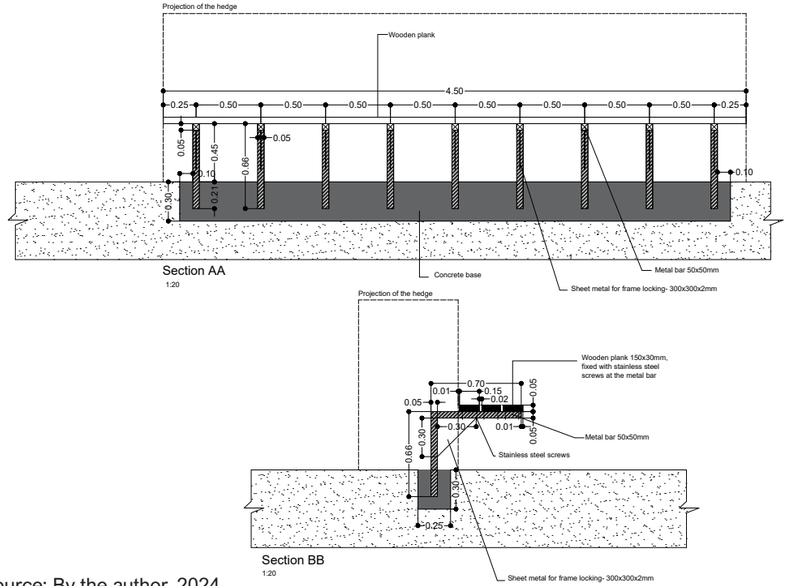
Technical details

The hedges are excellent solutions for sound absorption, as shown in the “Catalogue for Soundscape Design”.

In the project, they were used artistically, combined with sitting. The benches were designed incrusted in the hedge structure.

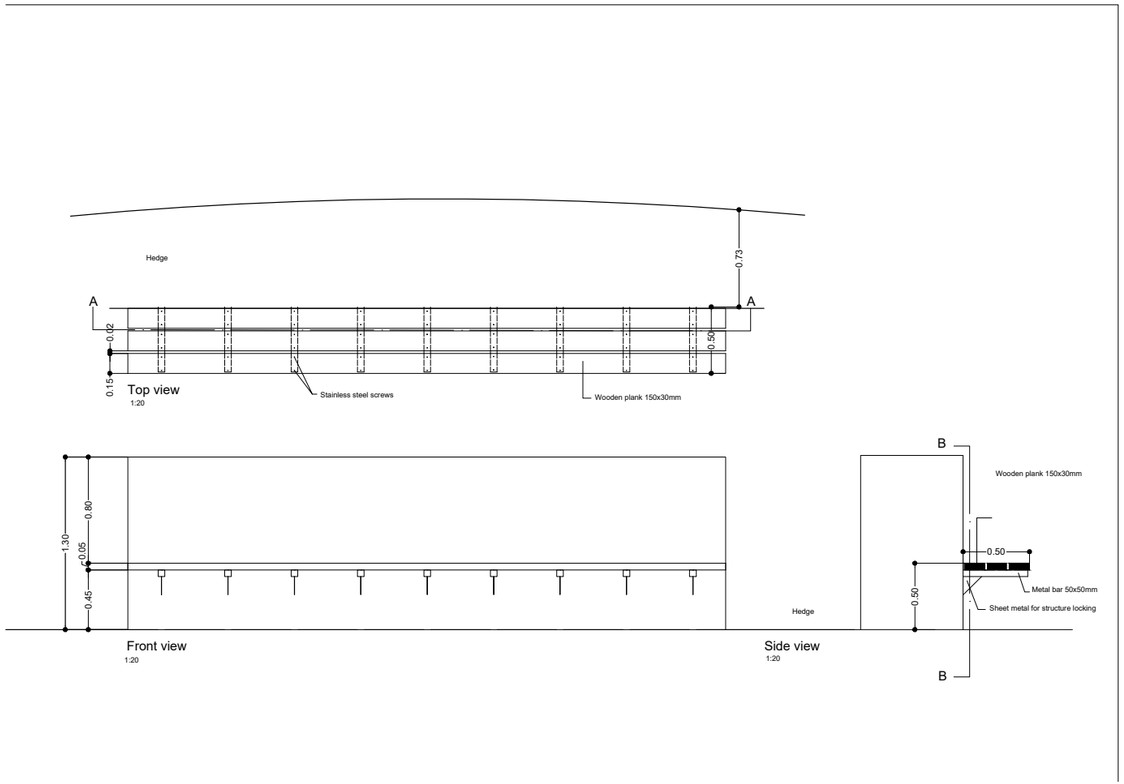
Because they have variations in height, the detail shows one of the used dimensions.

Figure 107
Detail of the hedges with a bench.(a)



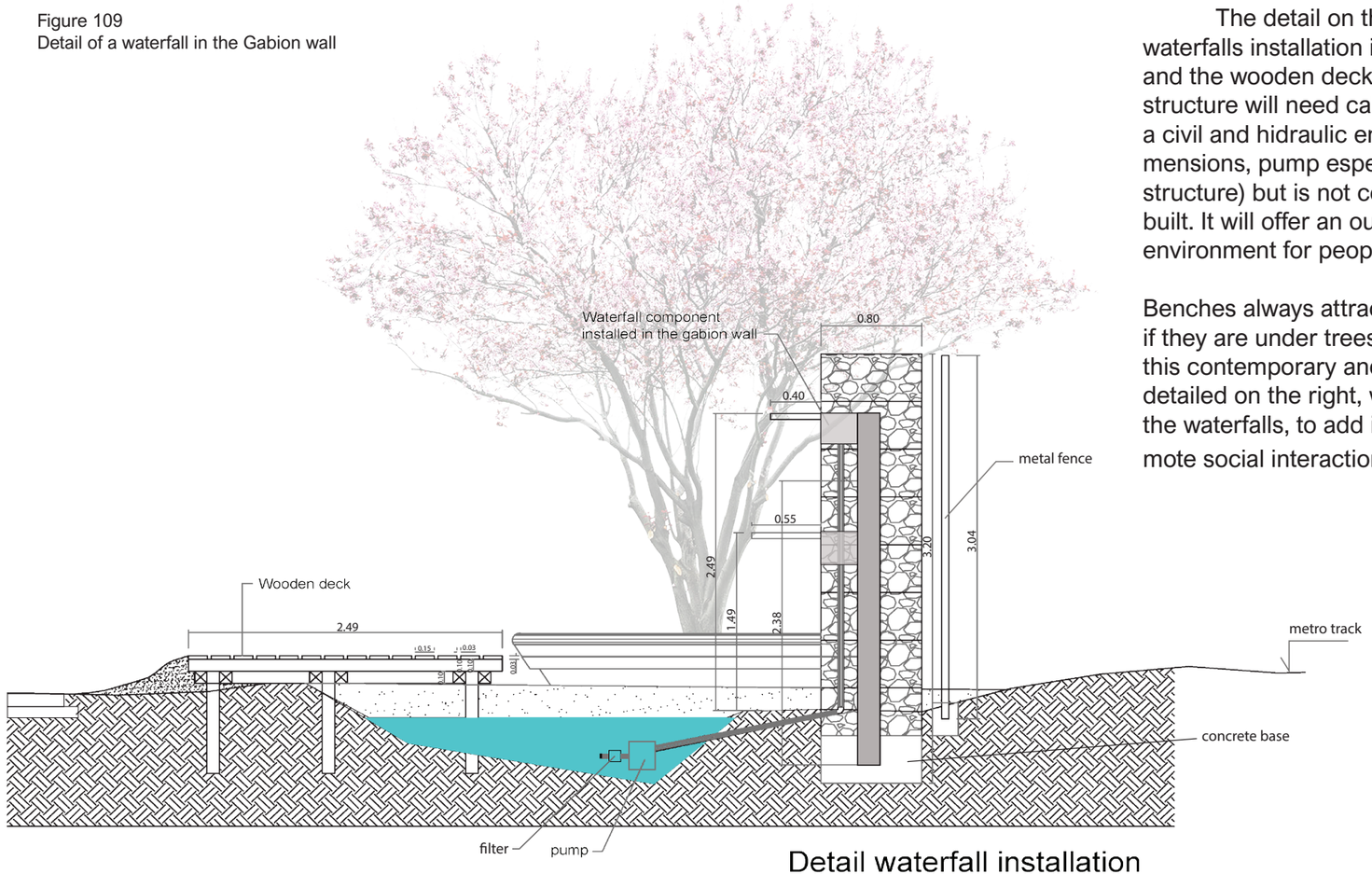
Source: By the author, 2024.

Figure 108
Detail of the hedges with a bench.(b)



Technical details

Figure 109
Detail of a waterfall in the Gabion wall

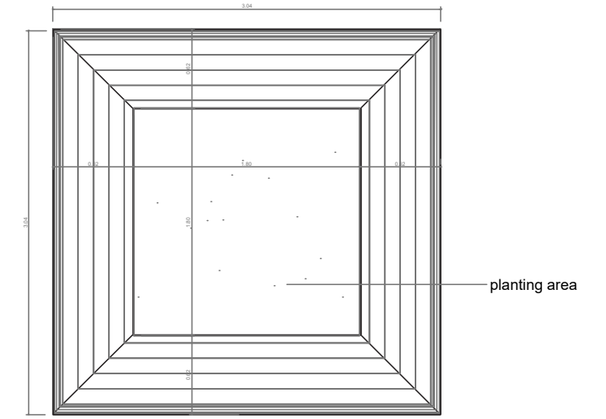


Detail waterfall installation

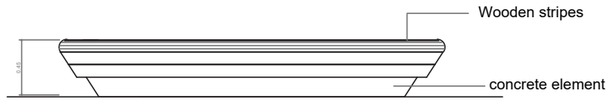
The detail on the left shows the waterfalls installation in the gabion walls and the wooden deck by the ditch. The structure will need calculations from a civil and hidraulic engineer (pipe dimensions, pump especifications, gabion structure) but is not complicated to be built. It will offer an outstanding sonic environment for people.

Benches always attract people, specially if they are under trees. Three units of this contemporary and informal element, detailed on the right, were placed next to the waterfalls, to add identity and promote social interactions.

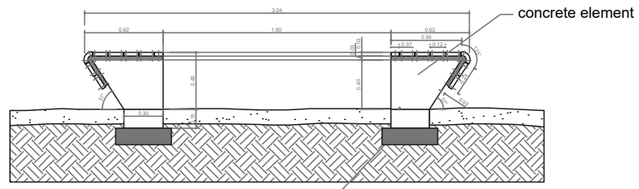
Figure 110
Detail of a bench



Sitting element - Superior view
Scale 1/10



Sitting element - Elevation
Scale 1/10



Section
Scale 1/10

Technical details

Wooden decks

Along the park, wooden decks of various dimensions were created for multi-purpose uses. Visitors can just sit, stand, do exercises, meditate, and more. They were strategically placed in different sonic environments, performing as absorber themselves, having the same construction detail shown as follow.

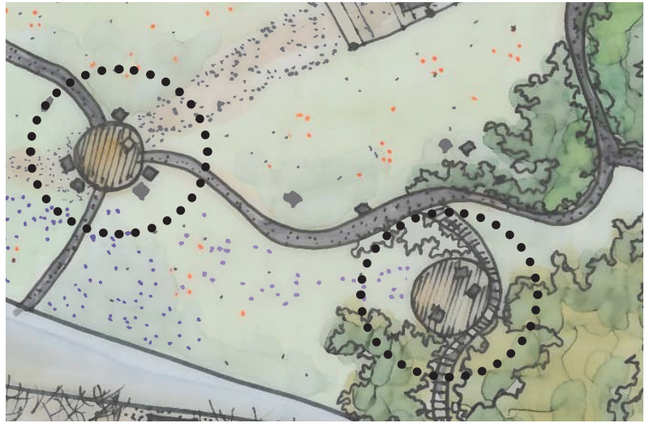
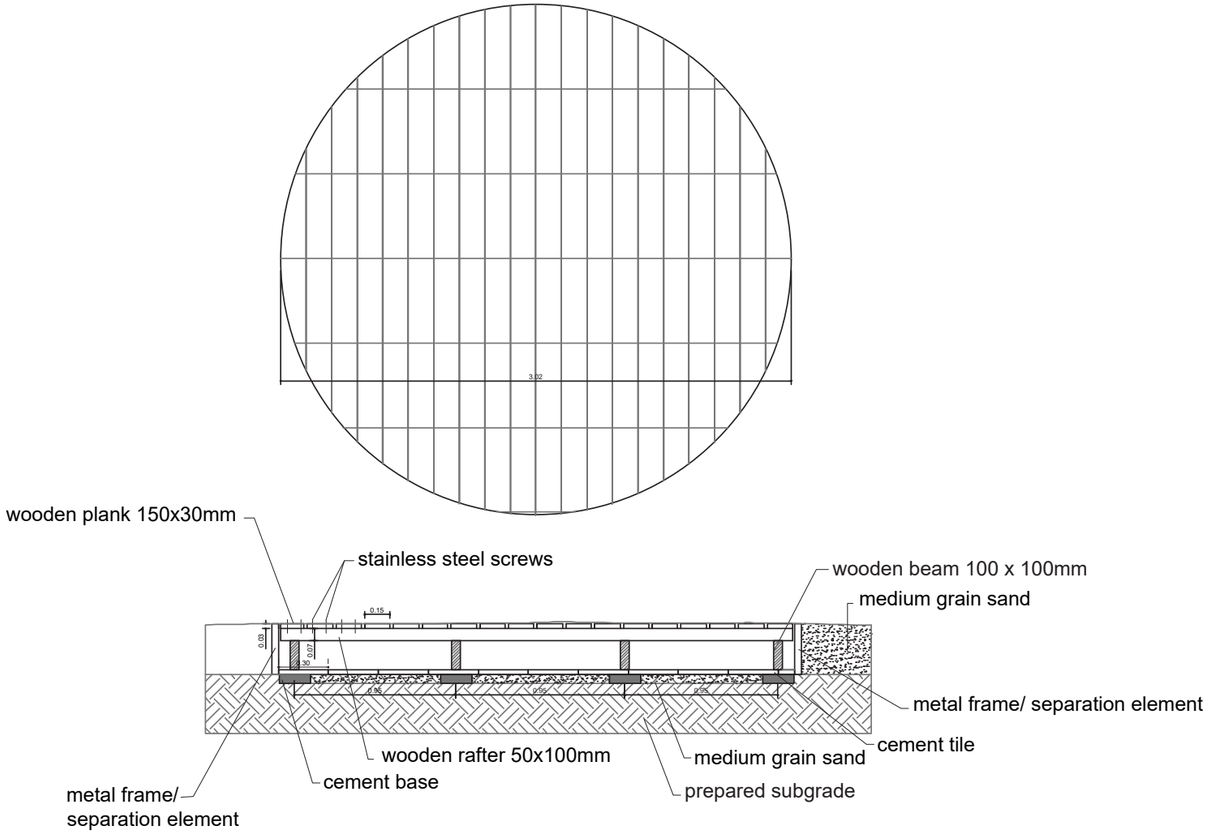


Figure 111
Detail of round wooden decks.



Listen to the “Symphony for the Delflandsedijk”.....

Axonometric view

Figure 112
Axonometric view

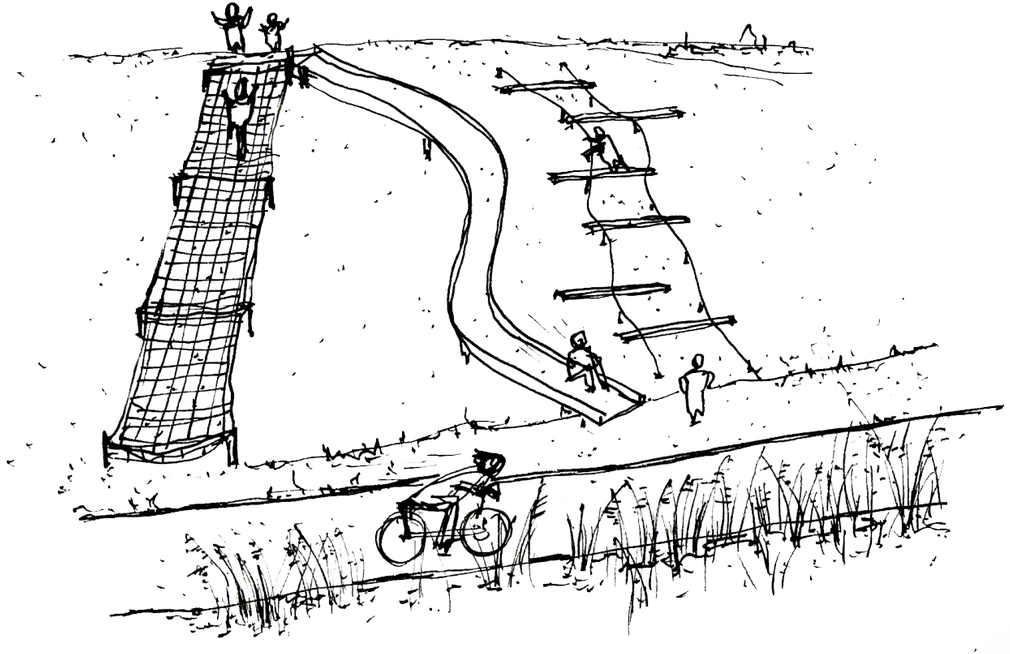


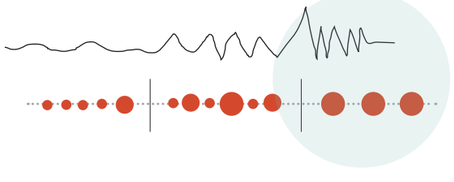
Source: By the author, 2024.

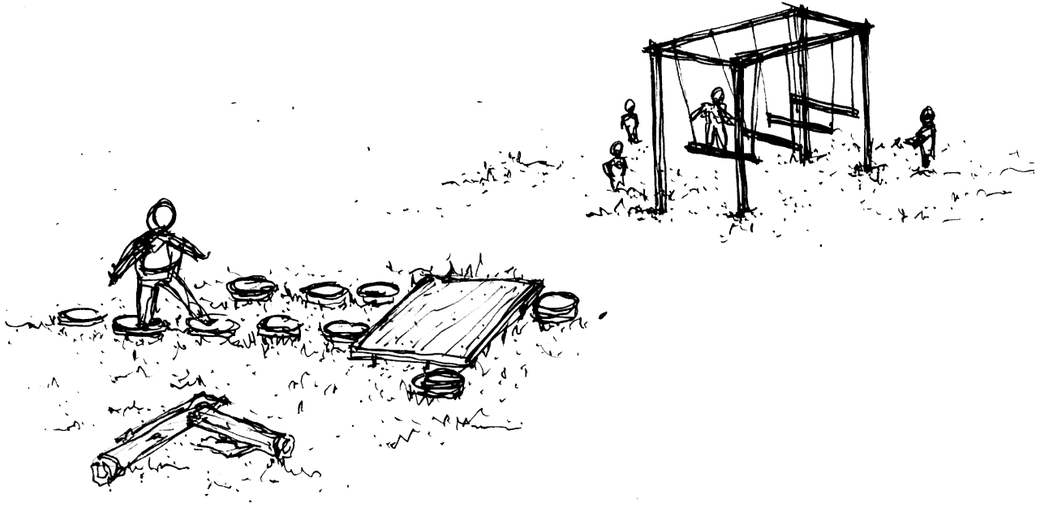


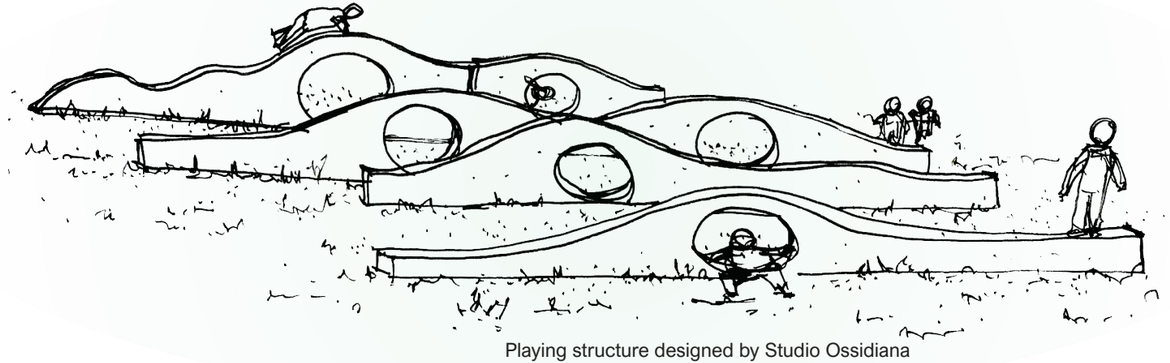
Impressions

Soundscape: *Presto*





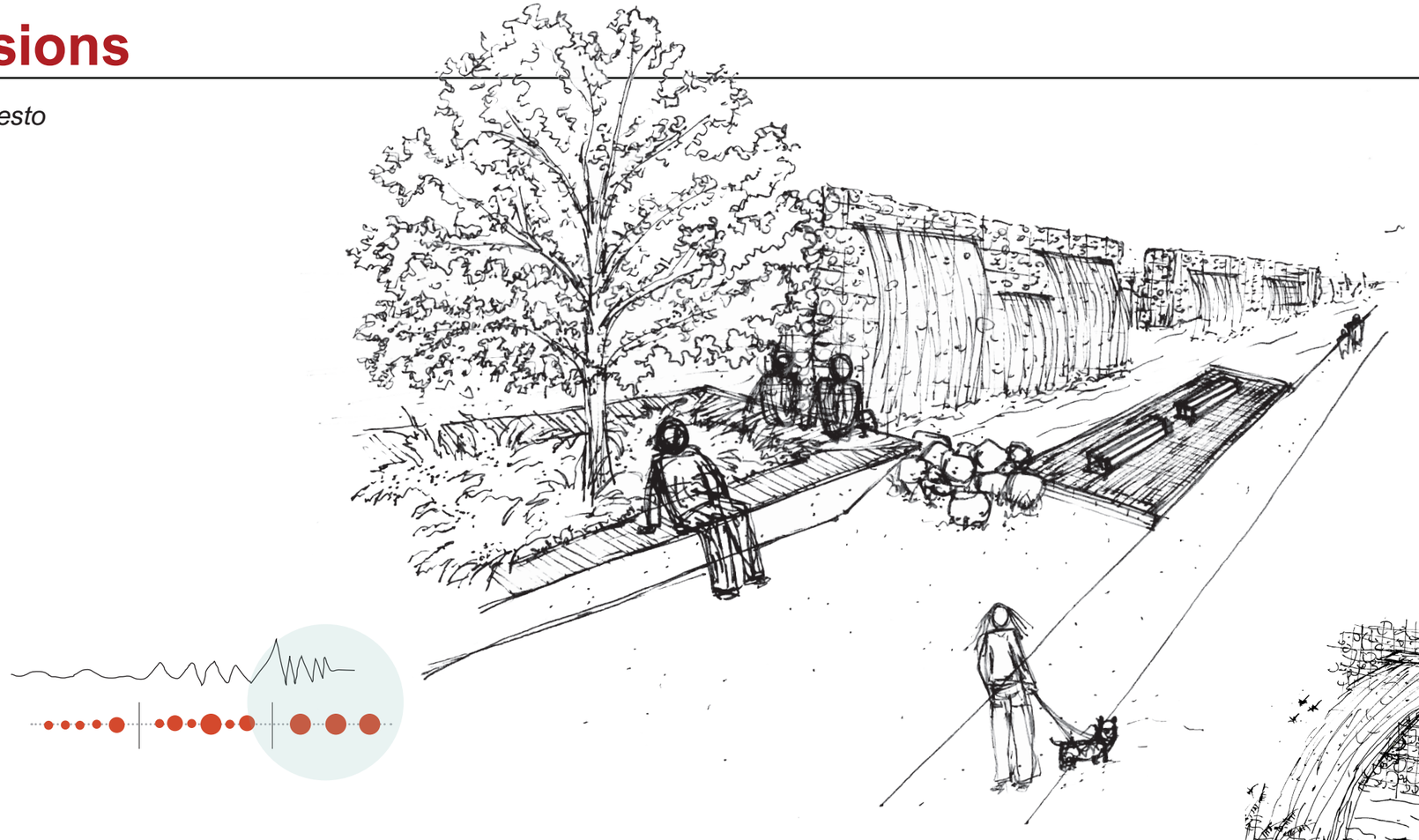


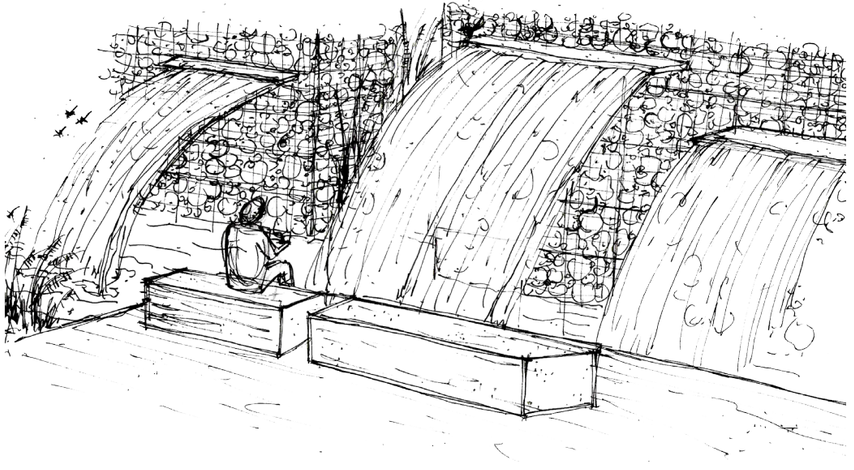


Playing structure designed by Studio Ossidiana and adapted for the park.

Impressions

Soundscape: *Presto*





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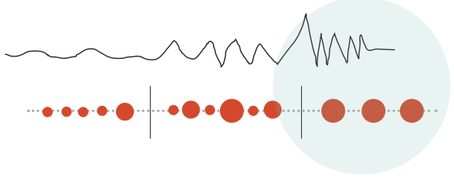

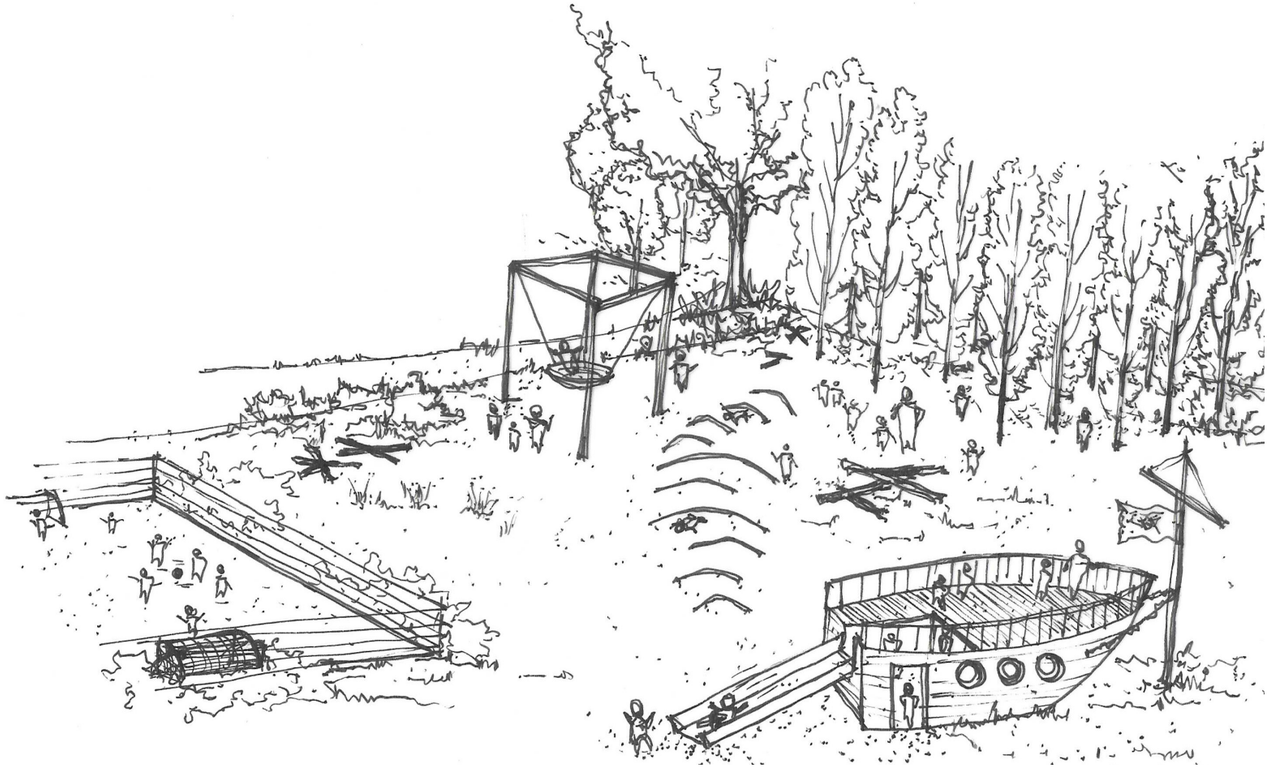

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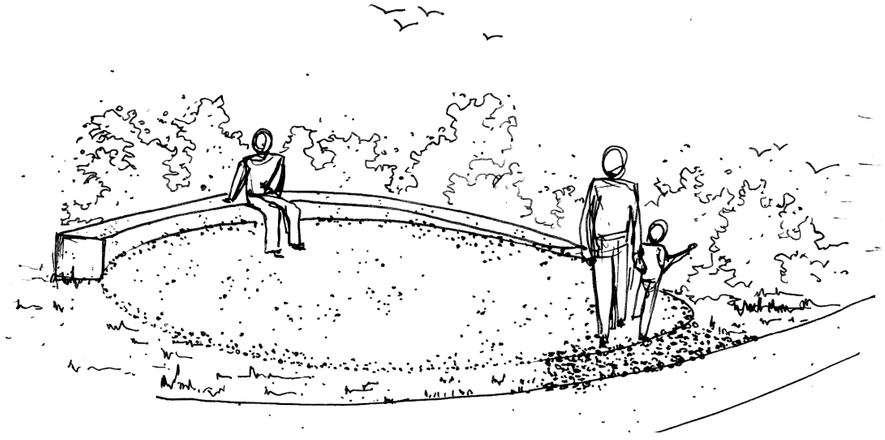

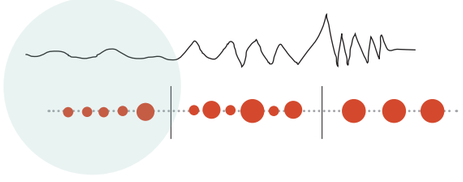



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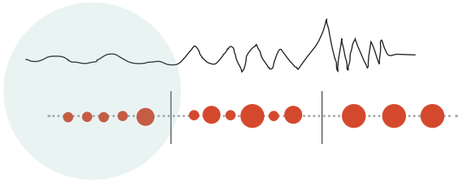

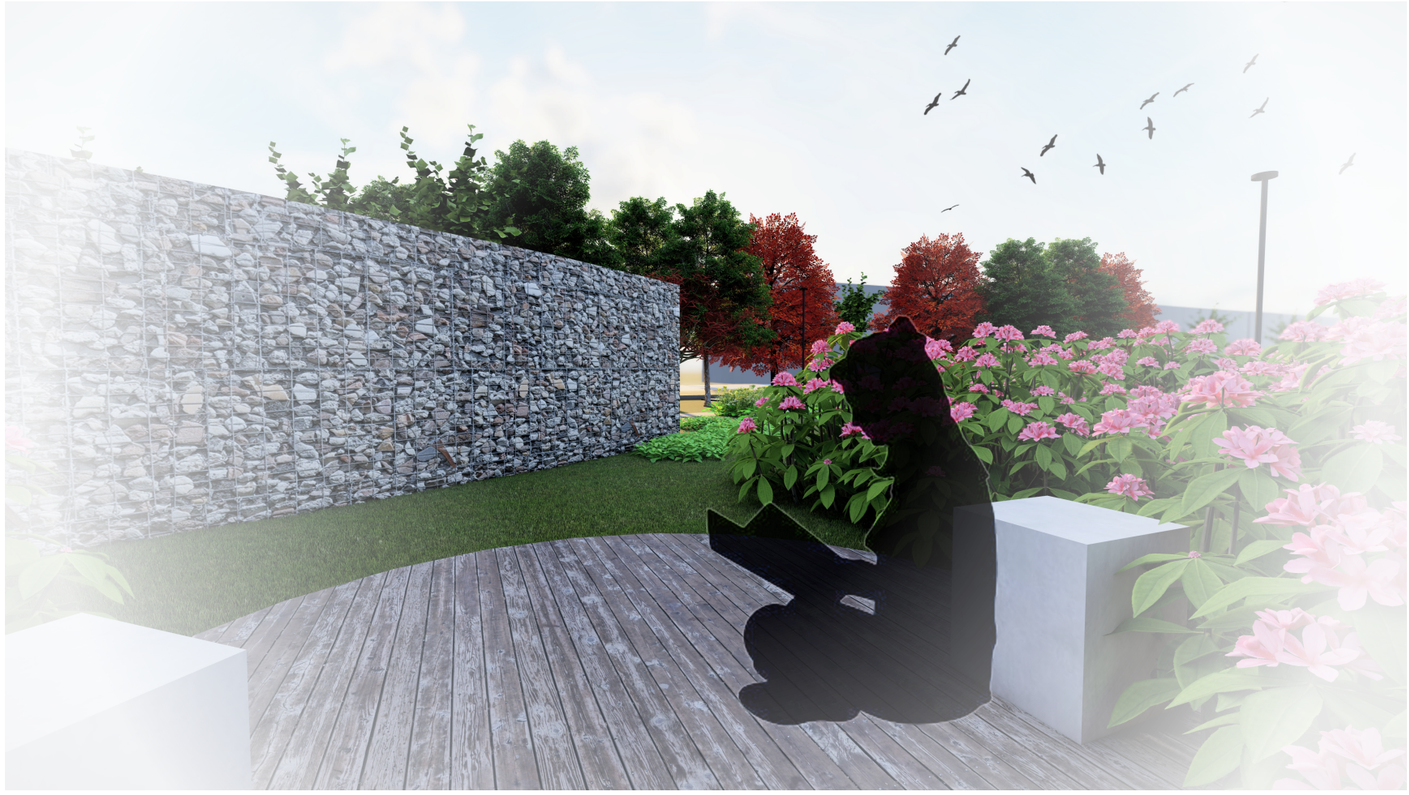

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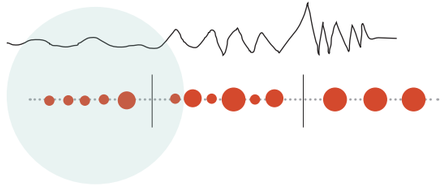

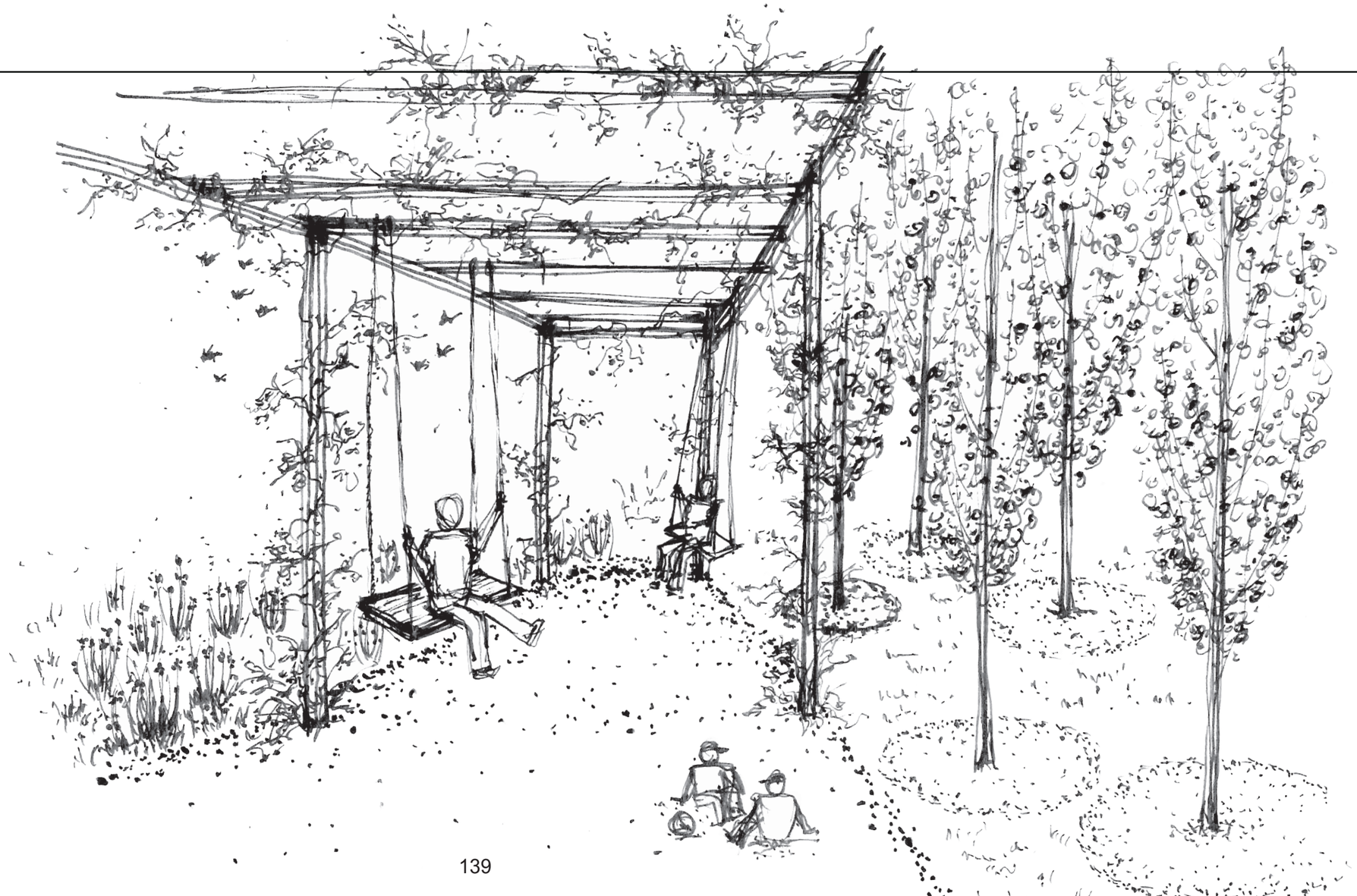

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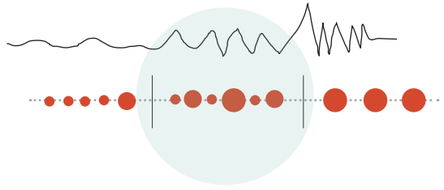

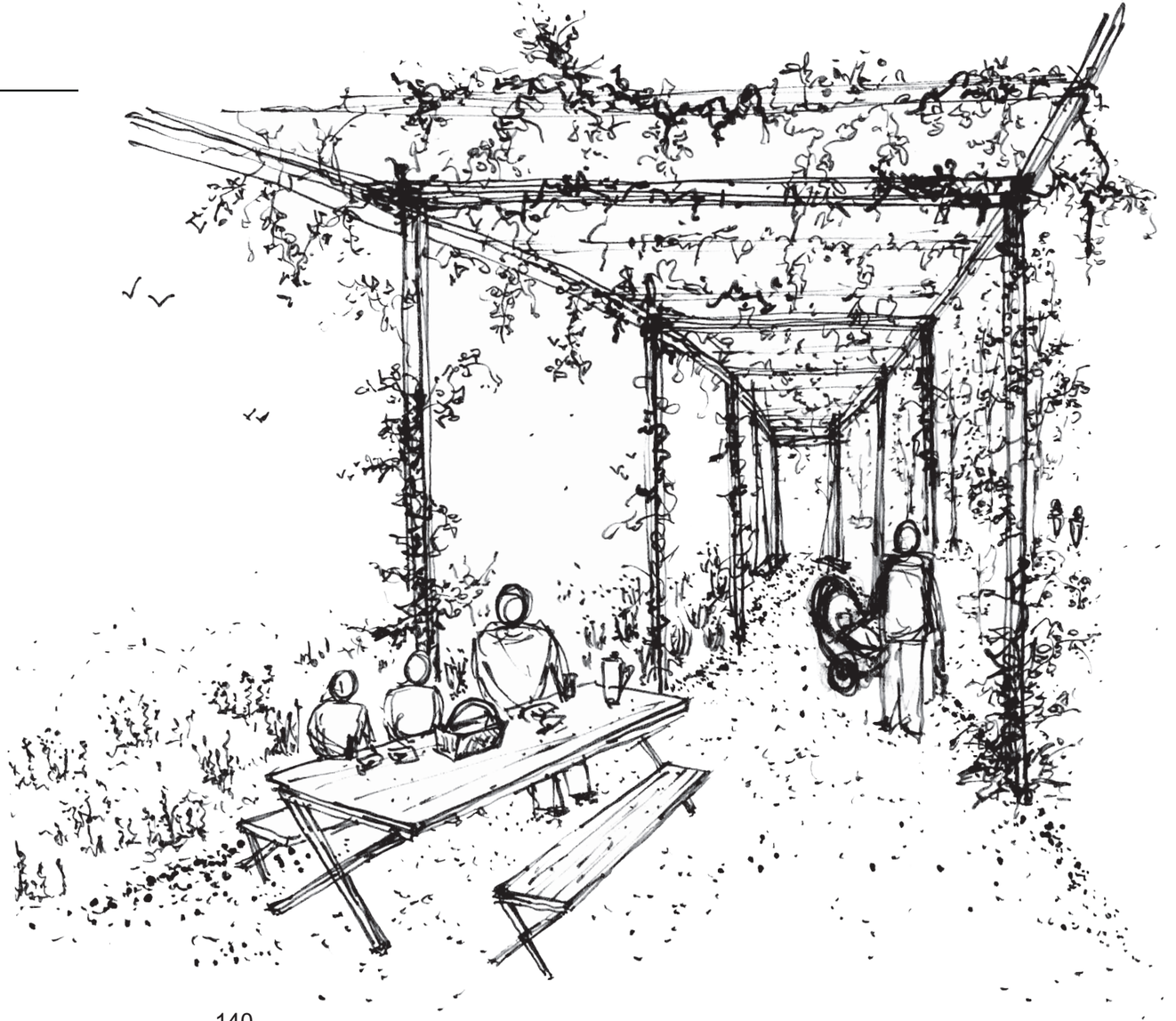

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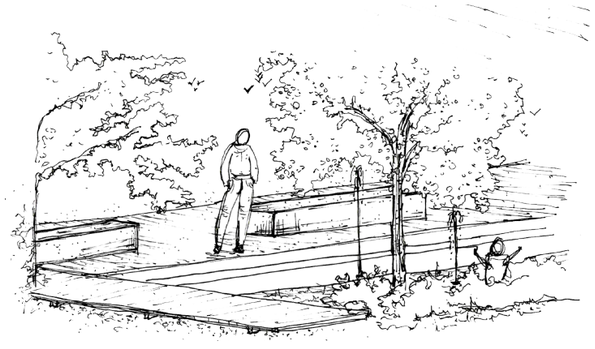

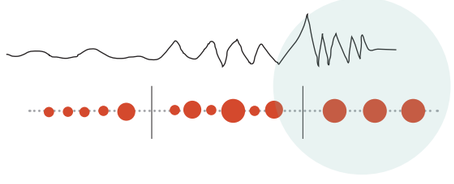

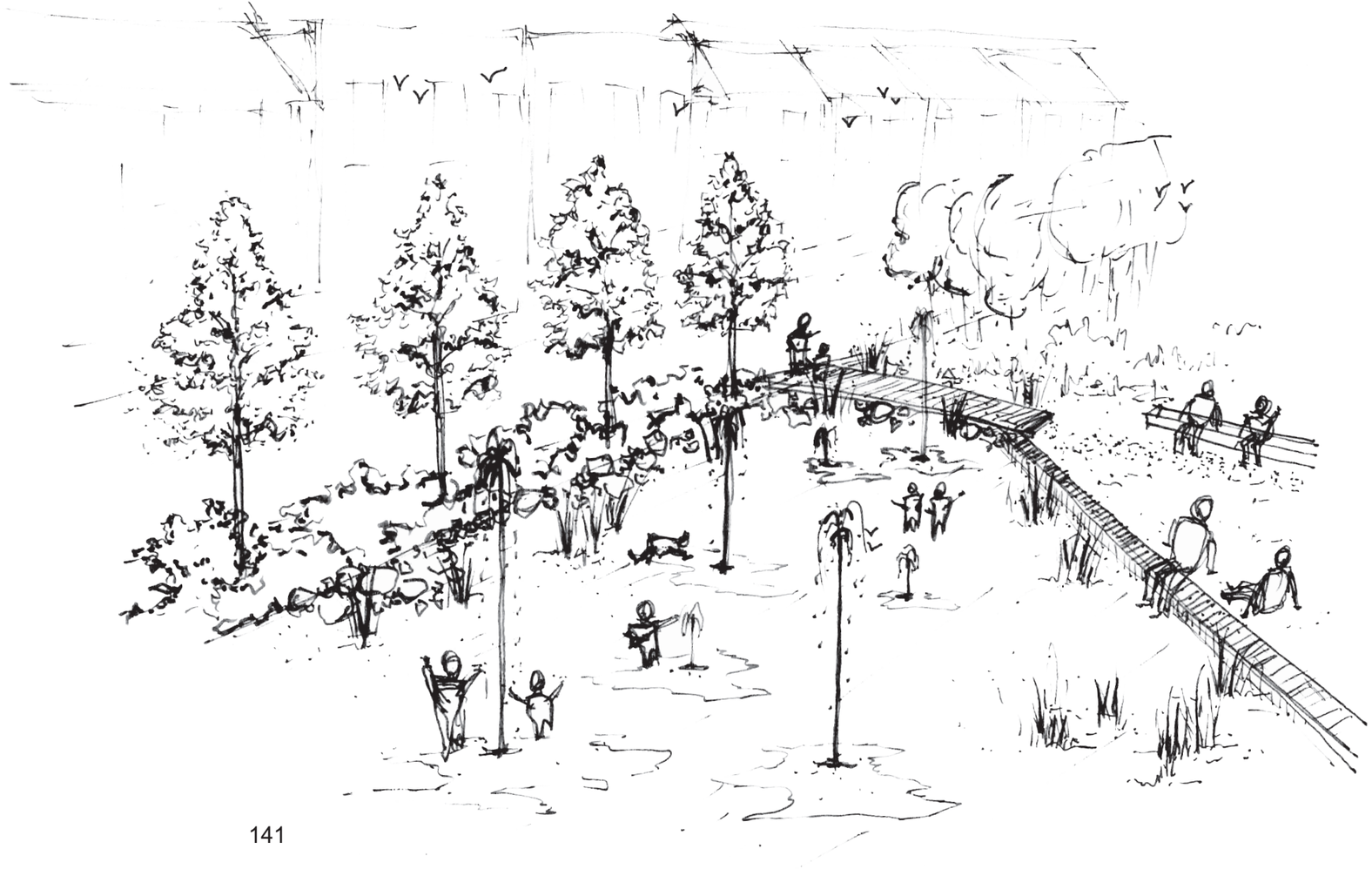

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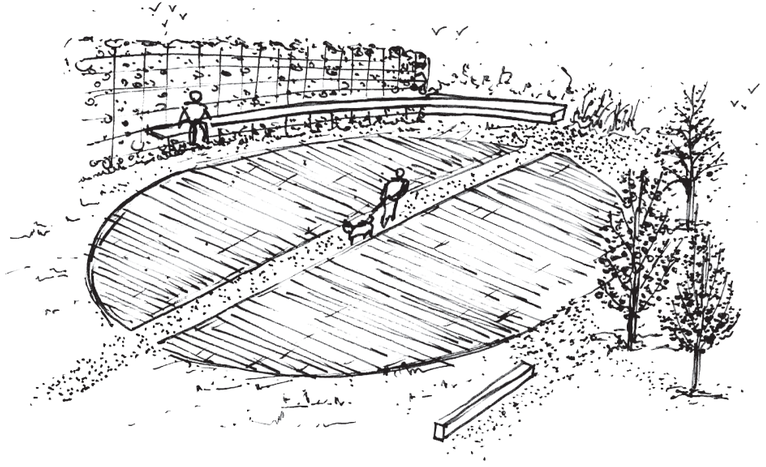

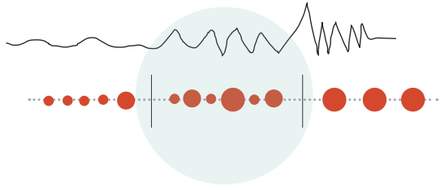



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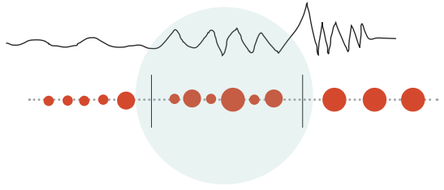



Impressions

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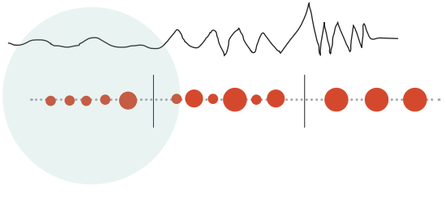



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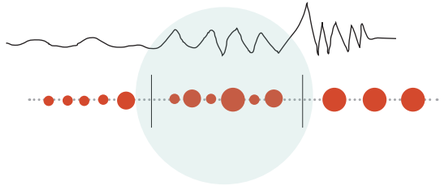



7 Research findings - Conclusions

To orchestrate the symphony at the Delflandsedijk in Maassluis, this research aimed to analyze its landscape potentialities to be used in the design of a city park, using Soundscape ecology- a phenomenological scientific approach - to improve the liveability of this public space, promoting well-being, social interactions, and biodiversity.

After an extensive investigation of the study area, understanding its rich past, ongoing urban development and landscape changes over time, it can be concluded that the Delflandsedijk indeed has the potential to host a City Park for Maassluis and the larger context. The utilitarian character will remain, but the underused public space will be transformed with additional layers of uses, pathways, flora and fauna, creating a truly public place. The City park will also offer opportunities for recreation, sports, tourism and most importantly, social interactions, integrating areas within the urban fabric and connecting the fragmented green structures. It will bring many benefits, like making the whole structure more resilient to climate change and increasing biodiversity.

The sounds of the Delflandsedijk did not offer a pleasant experience for the users and residents. Besides, there is an unbalance among the local sound sources and Antrophony showed to be the most prominent, especially regarding to Technophony, represented by the metro and cars and confirmed by the various fieldwork in the area, highlighting the potential to work with Soundscape.

Another challenge of this research was to find a way to inform sounds through landscape architecture design. Its specificities and numerous possibilities of interpretations because it is phenomenological, were translated into a method that could put the right sound on the right place. This was achieved by elaborating the “Catalogue for Soundscape Design”, where soundscape design compositions were created to show the feasibility of informing sounds through design.

Additionally, the design compositions can also contribute to people’s well-being and health, since sounds can be managed or chosen to offer pleasant places to everyone. Correct use of sounds can transform an unpleasant public space into a restorative environment. Balanced soundscapes in urban landscapes offer uncountable benefits for both humans and non-human living organisms.

In conclusion, how can soundscape ecology design be relevant to the design of the park and contribute to future climate adaptive design/solutions? Soundscape ecology considers all sound sources, natural or non-natural. The challenge is to create a balance between them, achievable with Soundscape. A balanced sonic environment means a balanced habitat for all living organisms. In the case of the City Park on the Delflandsedijk, soundscape is the core of the project, from the concept to the program placement. The different “scenarios” created throughout the park not only brought new sonic experiences to the area but transformed a grassy field into a complex ecosystem, with more flora and fauna. Replacing an asphalt road with a long stripe of permeable surface has created more infiltration possibilities, but more importantly, it allowed the planting of various trees and shrubs, which is highly advised for carbon sequestration. Through, good solutions to fight climate change.

Sounds can contribute in many ways to making this world better. When well-orchestrated, they play a beautiful symphony, pleasant for all living organisms.

Discussions

Soundscape as a Key Element in Urban and Landscape Architecture

Soundscape is indeed a fascinating research topic. Associated most of the time with noise mitigation, it has recently been valued as a way to solve landscape and urban planning challenges because it is phenomenological. Sound is an acoustic sensory perception that almost everyone can experience, and it affects well-being, making it essential for urban and landscape architecture projects. Soundscape has a holistic approach, considering the harmonious interactions in the world, and it implies a balanced environment. When the right sounds are present in the right places, a sense of balance is achieved. When some sounds drown out others, it should aim for balance; otherwise, it indicates something is wrong. The phenomenological aspect allows different people and living organisms to perceive sounds in various ways.

Urban planners and landscape architects should integrate Soundscape into their regular practices to create pleasant spaces for all. Soundscape cannot be used as an “end of pipe”* solution anymore (*an expression once used for pollution solutions with filters at industries). It contributes to the assessment of any project by offering information accessible to anyone. Any landscape can profit from a pleasant soundscape. What makes it special and enjoyable is the quality of the elements and the compositions designed for it.

Important research contribution

The literature review of this research revealed a gap in how to inform sounds through design. This gap created an opportunity to develop the “Catalogue for Soundscape Design”, a great research achievement and a valuable contribution to Landscape architecture, since the method used in the Catalogue to inform sounds through design can be applicable across various locations. After selecting a desired sonic environment for a particular place, the local landscape elements need to be listed and analyzed regarding their sound propagation.

By doing that, it is possible to combine these elements in compositions that can express the sonic environment desired for the project. For example, in tropical regions, trees with large, dense canopies that do not leave leaves in Winter can maintain the designed soundscape year-round, with perennial living organisms responding to specific biological behaviors (Fig. 114). Even in arid landscapes, the method of the catalogue can be used. With scarce vegetation, attention should be focused on the soil. Sandy soil has a higher absorption capacity, compared to dry clay soils and a Japanese zen garden is a good example (Fig.113). The absorptive elements are represented by the vegetation located around the sandy area. As an open space, it delivers what is supposed to: a calm and relaxing environment.

Research limitations

This research had some limitations. Since it started in September, sounds could not be evaluated in Summer. Fieldwork was done during fall, winter, and spring, but previous experiences of the author at the project location supplemented the analysis. Unfortunately, sounds from the summer season could not be recorded.

Future Directions and Climate Adaptive Design

The search for climate-adaptive design solutions is crucial nowadays and can be addressed through soundscape design. The world constantly emits loud sounds of environmental unbalance (catastrophes)—flooding, droughts, high temperatures, severe snowstorms, etc. These sounds alert us to ongoing crises, and we need to start listening more seriously. Soundscape design offers a fertile field for further research in landscape architecture and urban planning, providing innovative solutions to contemporary environmental challenges (Fig.115).

Soundscape is indeed a fascinating research topic with great potential to enhance urban and landscape environments, promoting well-being and resilience against climate change.

Figure 113
Japanese zen garden.



Source: https://livinator.com/wp-content/uploads/2020/03/japanese-dry-garden-sand-rocks-raked-daily-matador-flickr-1466x977-1.jpg

Figure 114
Non-perennial vegetation in Winter at tropical landscape



Source: By the author, 2023.

Figure 115
Natural border of water layers. Rich ecological habitat.



Source: By the author, 2024.

Reflection

This graduation work became an ambitious project after delving deep into Soundscape theory. The initial project was already a challenge since it aimed to transform an important dike for the Netherlands- the Delflandsedijk-, in the city of Maassluis, into a city park. From my point of view, this “untouchable” utilitarian element could make some contribution to people and climate change.

However, the intense research on soundscape revealed a gap that led to the development of a “Catalogue of soundscape design”. This suddenly became the core of this research, since it turned out to be a valuable contribution to Landscape Architecture. So, the second challenge. Therefore, considering that the design/ drawing of the landscape is phenomenological, as the field itself, I could not draw one single line using a computer! All the drawings were naturally appearing, being designed by hand, and my pens were drying out, while the roll of sketch paper was finishing! But the drawings were being revealed through uncountable lines. Third challenge!

What about the first challenge (the city park on the dike)? It became the fourth since the computer “did not want to accept” any line, after seeing the joy and happiness of my pens, papers and me! So, the city park was designed entirely by hand, with a solid concept, orchestrated pleasantly, with a range of events per passing the landscape architecture project development.

Using all the resources, information, and knowledge (especially that acquired during the first year of the Master's*), conversations with people from the Landscape and Urbanism fields or not, suggestions from everywhere (even from Gaudi’s constructions, during a short visit to Barcelona), this graduation project turned out to be a pleasant holistic experience, as it should be! The City Park was done! Concluded? No! I never heard about a Landscape architecture project that is concluded!! Nature does not allow it, fortunately!

Certainly, I have settled my boundaries and desires as a future landscape architect. As a designer, I feel comfortable with the future challenges that might come. No matter the scale, they will be treated as the most important at the moment. Landscape architecture is a profession in which social interactions are essential. Projects are not meant to be done alone. They need discussions, evaluations, criticism, opposition and applauses. I have learned a lot! The initial mission of doing a second Master became an adventure full of sounds, from varies sonotopes! There were a variety of rhythms as well: *Presto*, *Prestissimo*, *Adagio* (only on the first and last day of each quarter !), and always *Allegro*, because there are people! Such as public places, if there are no people, aren’t a place. People brought the meaning to the Master.

I hope to orchestrate more soundscapes as a proud Landscape Architect, but always having in mind the four perspectives of TUDelft Landscape Architecture: Palimpsest, Process, Perception and Scale Continuum.

Glossary

Adagio
Italian word used in music notation to mean a calm rhythm.

Allegro
Italian word used in music notation to mean a vivid rhythm.

Decibels
Unit to measure sound intensity.

Genius loci
Greek expression that means the “spirit of a place”.

Hi- Fi
In Acoustics it means high frequency.

Low- Fi
In Acoustics it means low frequency.

Presto
Italian word used in music notation to mean a fast rhythm.

Sonotope
The sound produce by one determined source. Ex.: bird’s sonotope, human’s sonotope.

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Catalogue for Soundscape Design

The “**Catalogue for soundscape design**” was developed to present possibilities of design compositions that addresses Soundscape using elements commonly used in Landscape Architecture projects. The scarce examples of informing sounds with design awaken the need to fill this gap for landscape architects.

The whole version is a separated booklet.



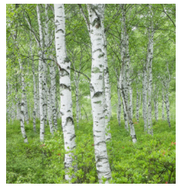
Flora

Trees


Populus nigra


Acer palmatum Thunb.


Prunus serrulata Lindl.


Betula pendula


Prunus yedoensis


Fagus sylvatica L.

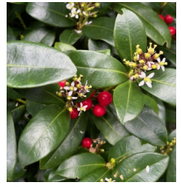

Ginkgo biloba


Euonymus alatus


Hippophae rhamnoides

Shrubs


Viburno lantanoides


Skimmia japonica


Viburnum lantana L.

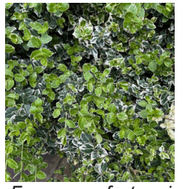

Viburnum davidi Franch

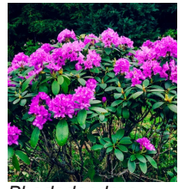

Sarcococca confusa


Weigela florida (Bunge) A.DC.


Lonicera ligustrina Wall


Forsythia suspensa


Euonymus fortunei 'Variegatus'


Rhododendron ponticum


Ligustrum vulgare L.

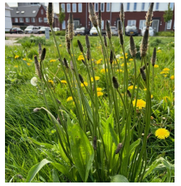

Spiraea thunbergii


Allium ursinum

Flowers

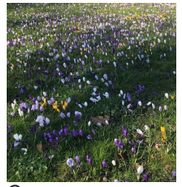

Achillea millefolium


Galium verum


Plantago argentea Chaix


Echinacea purpurea


Papaver rhoeas


Crocus

Flora

Moss


Phedimus spurius


Sedum acre L.


Sedum album L.


Plantago subulata L.


Selaginella selaginoides

Grass


Phragmites australis


Calamagrostis epigejos


Lolium arundinaceum

Fruits

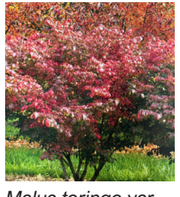

Ribes nigrum


Ficus carica


Prunus persica


Malus domestica


Pyrus communis L.


Malus toringo var. *sargentii*


Rubus plicatus


Vitis vinifera regent

Herbs

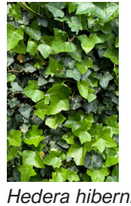

Thymos vulgaris


Laurus azor


Petroselinum crispum


Rosmarinus officinalis

Vine


Hedera hibernica

Hedge


Berberis thunbergii DC.


Taxus canadensis

Fauna



Abramis brama



Leuciscus_rutilus



Rana temporaria



Oryctolagus cuniculus



Coccinellidae



Acheta domesticus



Dasypoda hirtipes



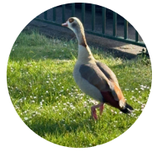
Ochlodes sylvanus



Aeshna cyanea



Pararge aegeria



Alopochen aegyptiaca



Anas platyrhynchos



Coloeus monedula



Sturnus vulgaris



Fringilla coelebs



Larus argentatus



Ardea cinerea

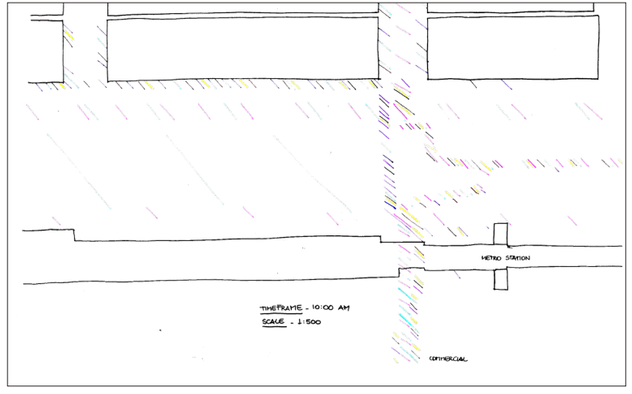
How do people walk?

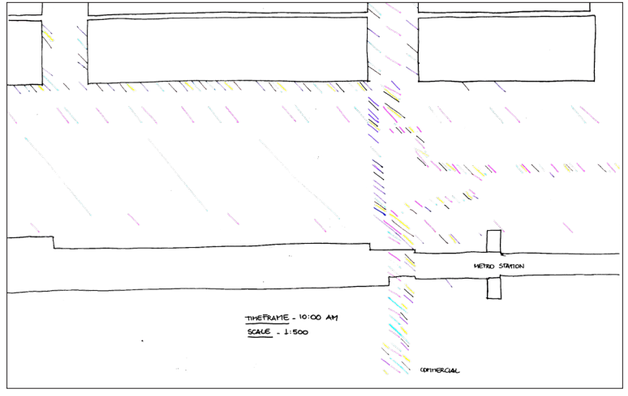


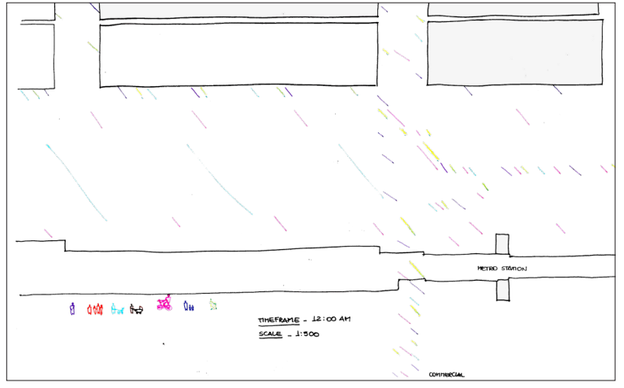
People

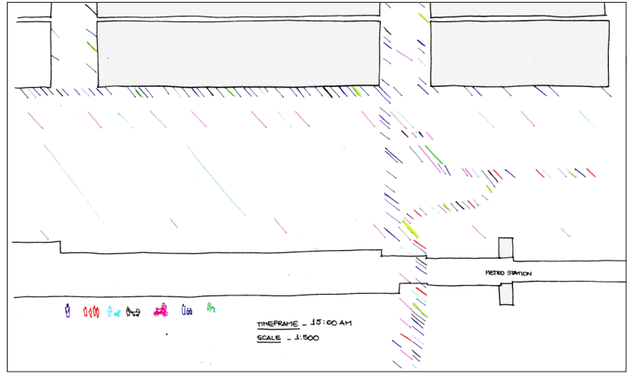


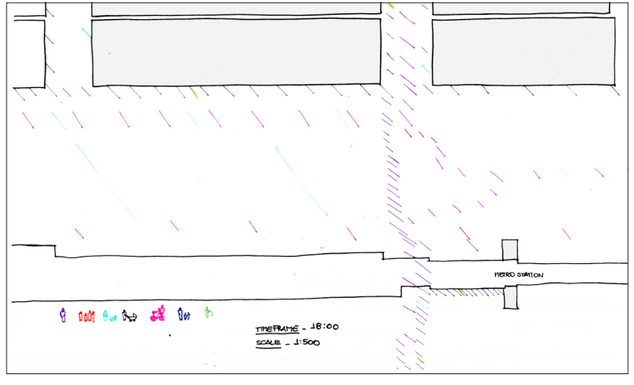
Legend



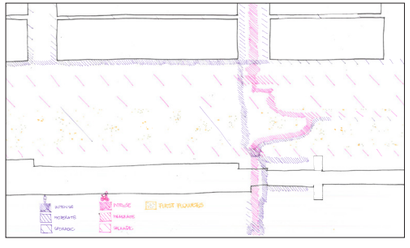




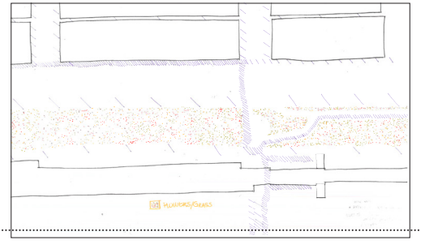




Spring



Summer (authors'observations as resident of the area)



Questionnaire for the residents at *Het Balkon*

City park in the Delflandsedijk- Maassluis

The questionnaire was sent to the residents of *Het Balkon* through the neighborhood *app*. There was no identification of the participants with personal information such as name or nick name, age, address, photo, professional or educational background. In total, 25 answers were collected, which could help on the design approach.

1. How do you or a family- member use the area where the park will be?

I dont use it
I walk past it everyday in the morning and in the evening when going and coming back from school
I do not use this area
We only pass by on the way to the shopping mall.
Gewoon om te lopen
Wandelen
Wandelen of fietsen als dat daar kan
Nature walks
Walking and running
I ran past it.
Only crossing over to go to the shopping mall
We are just walking there and some of members of our family walks with a dog.
Wij komen hier niet
Voor ontspanning en recratie
Op dit moment niet
Hardlopen, rondje wandelen, even in de zon zitten voor een praatje.
Walking with the dog
Walking
Ja
Momenteel gebruiken we de dijk niet.
I walk the dog here
Nature for the view
Ik gebruik het niet. Ik kijk er alleen op uit
Onze honden spelen hier hee erg veel en heel graag!
Het is mij uitzicht. Loop er over.

2. What do you think this city park should have?

a small football pitch like the cruyff arena that you can find everywhere in rotterdam
Because it is an area with a lot of kids, maybe if could have swings or a small play area
plants and trees that are edible, like with fruits or nuts
Bush, perhaps a piece of art.
Meer boommen en struiken
Bescherming en een ontspannings gedeelte voor ouderen.
Speeltoestellen, picknicktafels sport mogelijkheden, water
Art and if possible a watch tower with sightseeing over waterway and trees
Trees and flowers
Low trees and other plants.
benches to sit on and beautiful flowers
Playground for children, nice trees, plants, benches that we can take a sit, or an outdoor gym,
Bankjes, speeltoestellen voor jong/oud, koffie/thee/drink/snack faciliteiten, dierenweide.
Verschillende bomen, bloemen en misschien hobby tuinen
Veel bomen en mooie struiken, looppaden
Bomen, beplantingen, wandelpad, bankjes
Trees, a nice path, water, water point, flowers
Nice paths and trees and some small play items. Maybe some water
Veel groen, bomen, speelplaatsen voor kinderen en bankjes
Een stadspark zou heel mooi zijn. Voor de groene omlijsting van de wijk het balkon, voor biodiversiteit, voor extra zuurstof in een omgeving met veel uitlaatgassen. Maar ook om een mooi rondje te kunnen lopen vanaf een van de stations langs de waterweg en weer terug door dit park. Het zou een mooie uitloper van het sterrenbos kunnen zijn.
More trees, some small hill's (trail) and water
Green and flowers
Boompjes, struiken, bloemen en andere beplanting
Kiezelpad/schelpenpad om op te lopen, het zou ook gaaf zijn als er wat fruitbomen worden geplaatst die door de omliggende bewoners geoogst mogen worden Klimobjecten/natuurlijke speeltuin Hele stuk omringd met schapenhek, zodat de hondjes daar veilig kunnen spelen
Picknick bankjes

3. What sounds do you listen in the area?

metro sound even though I have my own music on
When I have my headphones in I can't hear anything, but when I do hear something it is mostly the sound of the metro
I do not recreate in the area, but I guess the netro
Wind, childern playing, some birds , metro cars
Geluid van de metro en wijnig geluid van vogels
Metro en auto's
Rustige muziek
wind
Birds
Wind. Passing metro.
Metro rail , Opening and closing sound of barriers , birds singing
Cars and metro, people on the scooters,
Rustige muziek
Birds en water
Ik snap deze vraag niet
rust. ik kom in een park voor rust.
water, wind, (but also metro sound)
Metro, playing kids, dogs, planes
?
De metro hoor je voornamelijk
Only the sound of the metro
None
Vogels
Vogels, de wind, de boten, heel soms de metro, maar ik heb daar geen last van, heel veel auto's die te hard rijden
Auto schepen

Questionnaire for the residents at *Het Balkon*

4. What are the pleasant sounds? Consider all the sounds you can perceive.

Birds
Vogels
I dont hear anything but the metro
Sounds of birds, dogs, bikes
birds
Wind , childern playing, birds
Er zijn geen andere geluiden
Geen
Vogel geluiden, water en klankschaal
The sound of the wind.
sounds of birds singing
Wind
Rustige geluid
Birds en water
geen geluid
water, wind, birds,
Dogs, kids
Vogel geluiden en regen
Deze vraag is me wat onduidelijk in dit perspectief maar zingende vogels en de ontluikende natuur zijn fijne geluiden.
Nature
Dieren geluiden
De geluiden in mijn eigen huis, de vogels, de wind

5. What are the unpleasant sounds? Consider all the sounds you can perceive.

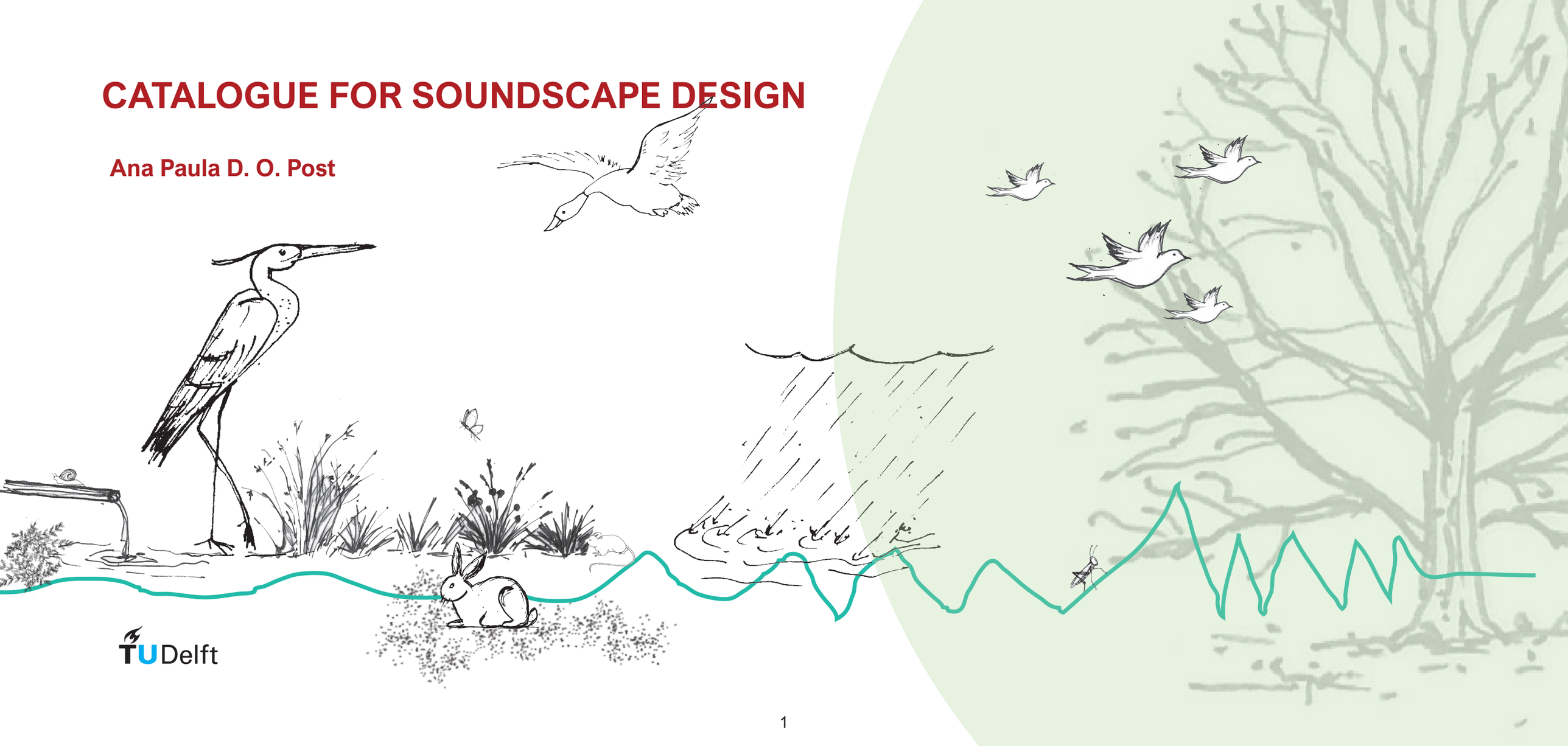
Metro sound and cars
Sounds of loud motorcycle engines or trucks
industry, cars, peep peep from trucks that move backwards
Metro, cars
Vrachtverkeer
Auto's en metro plus bouwverkeer
Motor, auto, kettingzaag, harde muziek, schreeuwende mensen
Traffic
Cars music
The metro cross over alarm.
metro rail sounds
Screaming and drunk people, sometimes barking dogs
Hangjeugd, harde boxen
Auto sounds
Industrie geluiden, autogeluiden
auto's
metro,
X
Geluid van industrie, verkeer, metro
Harde geluiden, lang durende geluiden.
Metro
Industy, motorbikes
Cross motoren en scooters
De geluiden van de buren die klussen, de auto’s die er rijden
?

6. What sounds would you like to listen in the park?

bird sounds and people talking
Sounds of birds singing or children playing
birds
Wind, children playing, laughing, birds, water, silence
Een hoop vogels.
Kinderen en vogels.
Vogels, water, natuur….
Wind passing through the leaves of plants and trees. Birds.
Birds and wind
Birds singing ,children laughing ,some kind of music also ,
Spelende kinderen
Birds en water
Veel vogels
geen
natural sounds
Geen
Vogelzang
Birds and water
Spotify
Dieren geluiden
De wind door de bomen heen, vogeltjes, honden die spelen, kinderen die spelen
Natuur, vogels of niets

CATALOGUE FOR SOUNDSCAPE DESIGN

Ana Paula D. O. Post



TU Delft

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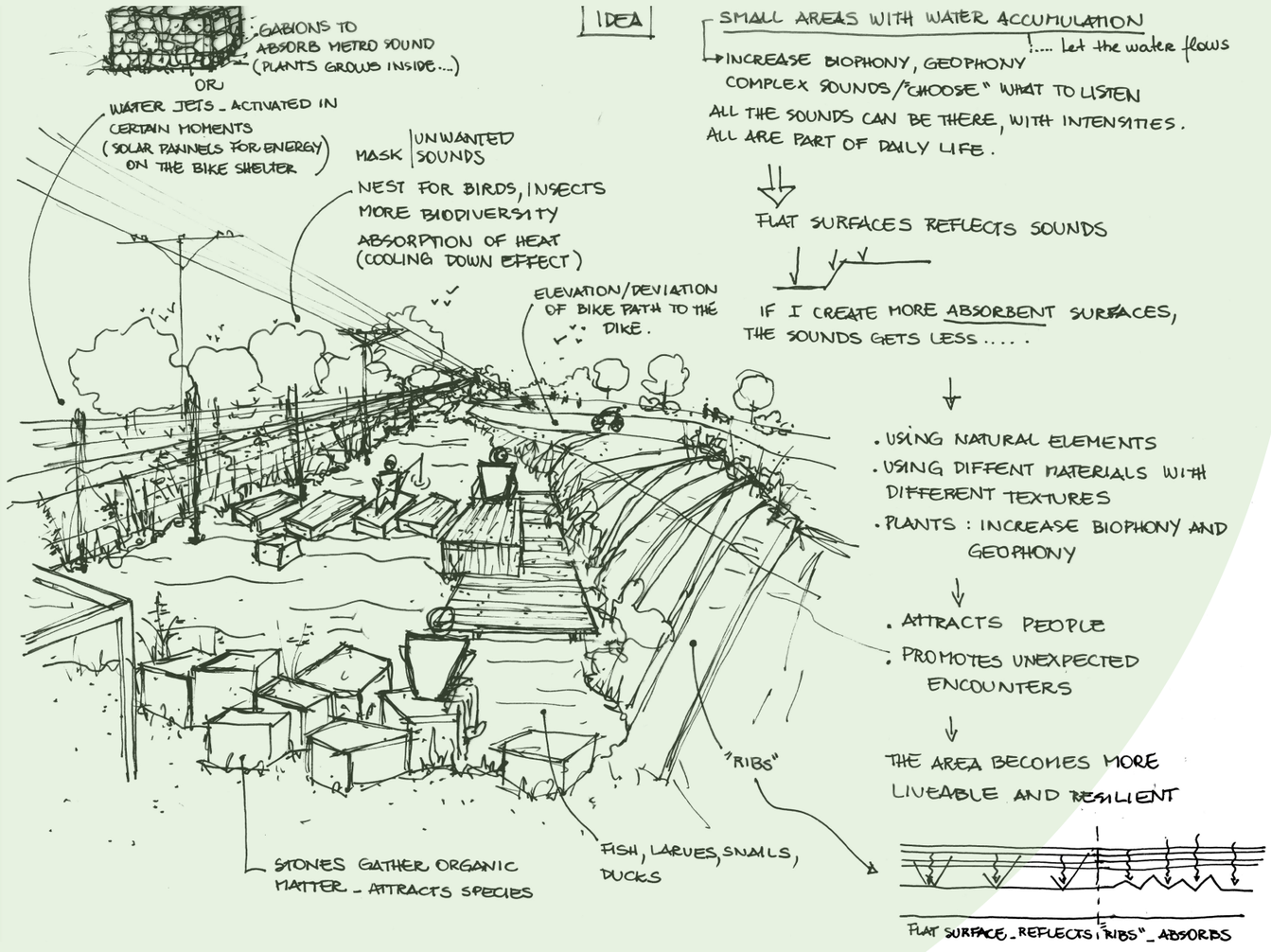
1 Soundscape - addressing sounds with design



This catalogue was designed to present possibilities of design compositions that addresses Soundscape using elements commonly used in Landscape Architecture projects. The scarce examples of informing sounds with design awaken the need to fill this gap for landscape architects. Many interventions on the landscape use sounds but with non-natural elements, such as amplifiers or recorded sounds triggered by some equipment. As we are willing to enforce the individual experience of the landscapes by revealing the real sounds that are naturally present in the environment, there is no room for artificial solutions.

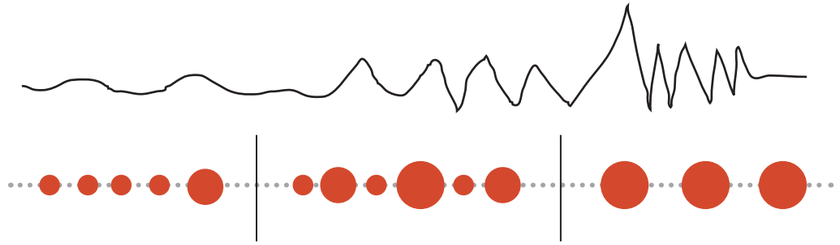
Based on the absorption and diffusing capacity of the chosen elements - **paths, walls, water, vegetation and topography**-, different possibilities were created to show that a place can have distinct soundscapes by varying the combination of them. For instance, water is a crucial element in the landscape and in some situations can change the whole atmosphere of a place. Wanted and unwanted sounds are addressed through the design, choosing the desired diffusers and absorbers to mitigate, alleviate or modulate the sonic environment in numerous possibilities.

The Catalogue uses music rhythm to guide the design compositions, from the rapid *Presto*, passing by a moderate *Allegro*, reaching the calmness of *Adagio*. They represent 3 different sonic environments in which biodiversity plays an equally important role, demonstrated by the possible living organisms from the main classes that can be expected to be present.

While visualizing sounds may seem complex, these compositions show that it is achievable through careful design, prioritizing perception as the primary sensory cue. They are adaptable and versatile, serving as a reference for other landscape projects. Obviously, they should consider the local values and identity as the foundation for a robust design.

Soundscape - addressing sounds through design

The compositions will inform sounds as in music. For each composition, a tempo is associated: *Presto*, *Allegro* and *Adagio*.



Adagio (slow)	*Allegro* (lively, quickly)	*Presto* (very rapid)
- Calm and soft sounds - Tranquil, serene - Sounds are controlled - High absorption - Low diffusing	- Moderate sounds - not too fast - some sounds are controlled - moderate absorption - moderate diffusing	- various sounds together - fast, dynamic - loud - low absorption - high diffusing
Elements:	**Elements:**	**Elements:**
Paths: sand, asfalt, concrete, recycled rubber **Walls**: gabions and hedges higher than an average person, pergolas **Vegetation**: more dense, forming enclosed spaces, mounds, tiny forests, moss coverage of the ground **Water**: single dropper, static layer or with slow movement.	**Paths**: stones in pieces, wood in pieces **Walls**: hedges in different heights, concrete (with rough texture), pergolas **Vegetation**: less dense gradient for shrubs and trees, mixed species. **Water**: single jet or combination of few.	**Paths**: gravel, shells **Walls**: none, permeable, low **Vegetation**: sparse, low shrubs, gradient of trees (caducifolias) **Water**: jets, curtains (cascate), fast flow

2 Common landscape elements

Paths


Gravel


wood


Stones


Grass


Sand


Shells


Concrete/asfalt


Recycled rubber


Bricks


Metal

Walls


Bricks


Concrete


Metal (solid)



Metal (permeable)


Green wall


Glass


wood


Gabion

Vegetation: trees (high); shrubs (middle-low); foliage; moss and grass (ground coverage)


spreading


colunar


open


irregular


piramidal


weeping


sparse


winter tree


dense


mid-dense


sparse


isolated


sparse


dense


grouped


sparse


mid dense


dense


spreading


sparse


spreading

compact

grass

Water

layer

canal

single jet

drop

cascate

multiple jet

among stones

hollow

Topography

flat

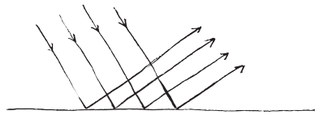
soft ondulations

high ondulations

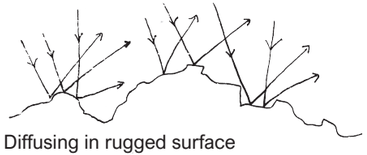
rugged

3 Sound propagation through elements

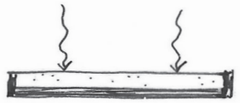
The propagation of sounds varies across landscape elements due to their unique diffusing and absorption characteristics.



Diffusing in flat surface



Diffusing in rugged surface

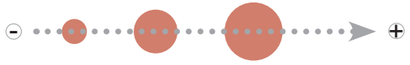


Absorption in flat surface



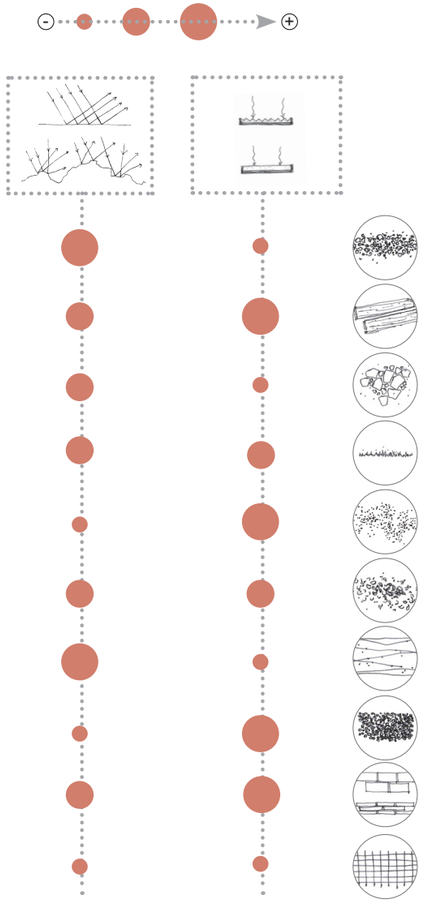
Absorption in rugged surface

To begin, each element is assessed and graded based on these acoustic qualities, using perception instead of numeric values. This grading is the foundation for composing the Soundscape designs presented later on.

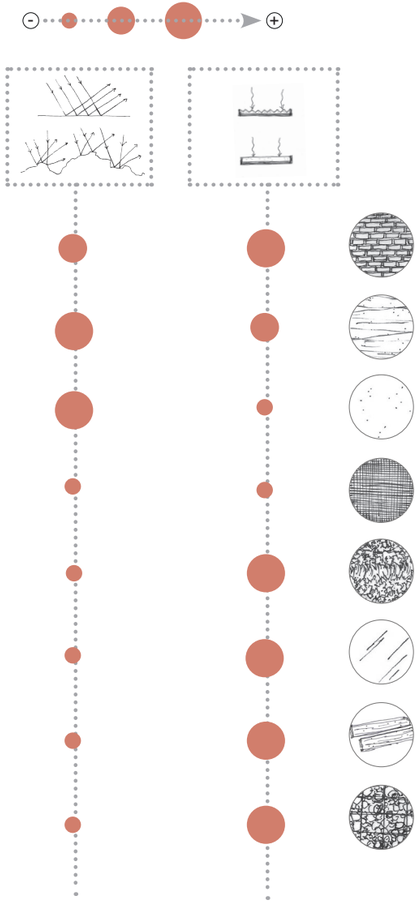


Sound propagation through elements

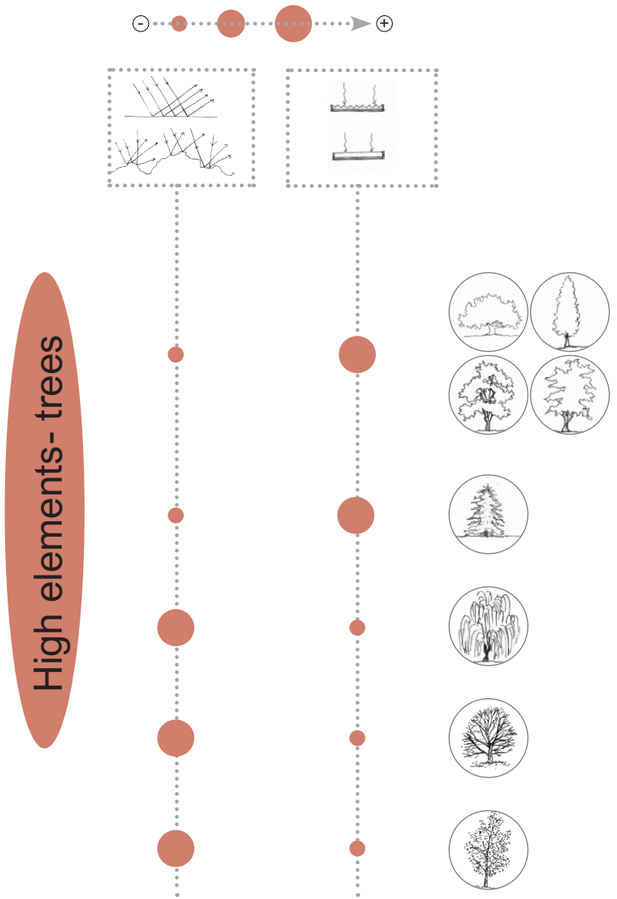
Paths

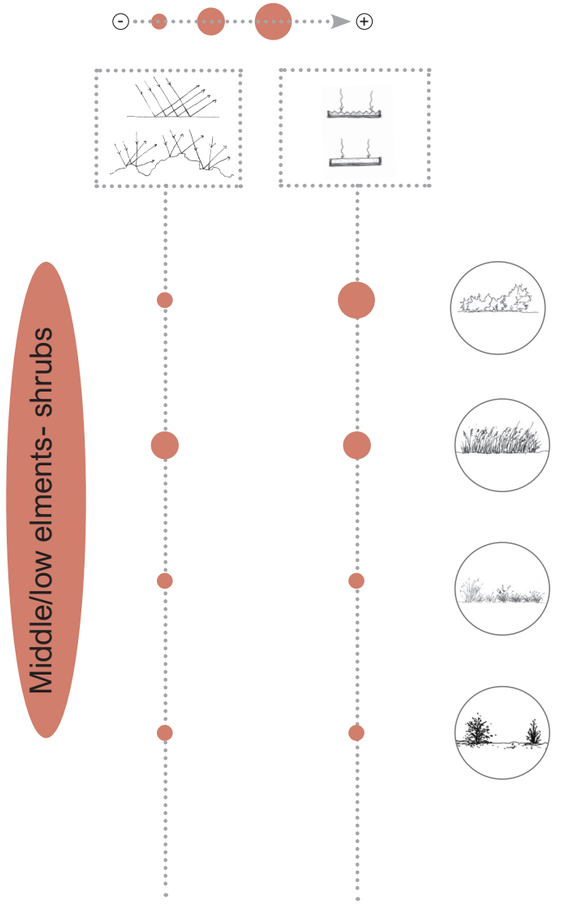


Walls

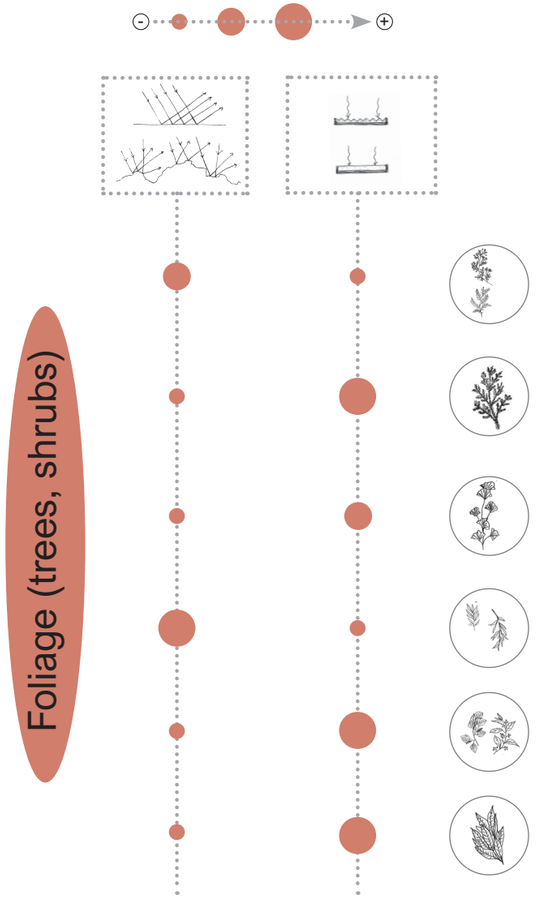


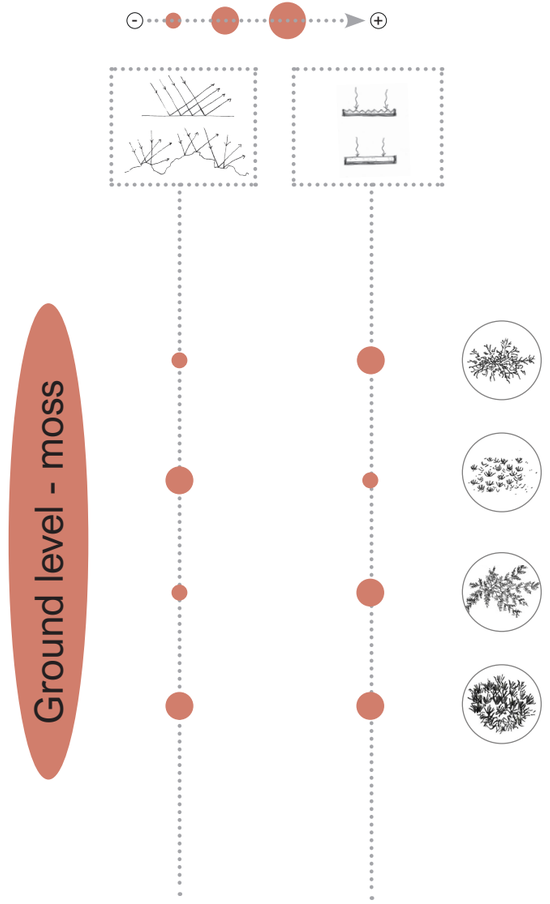
Sound propagation through elements



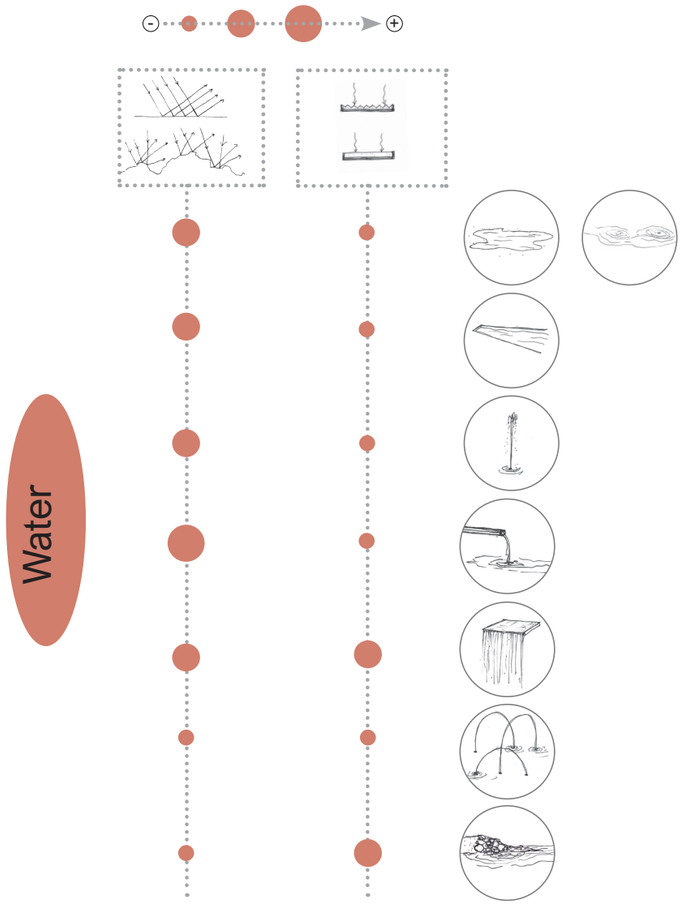


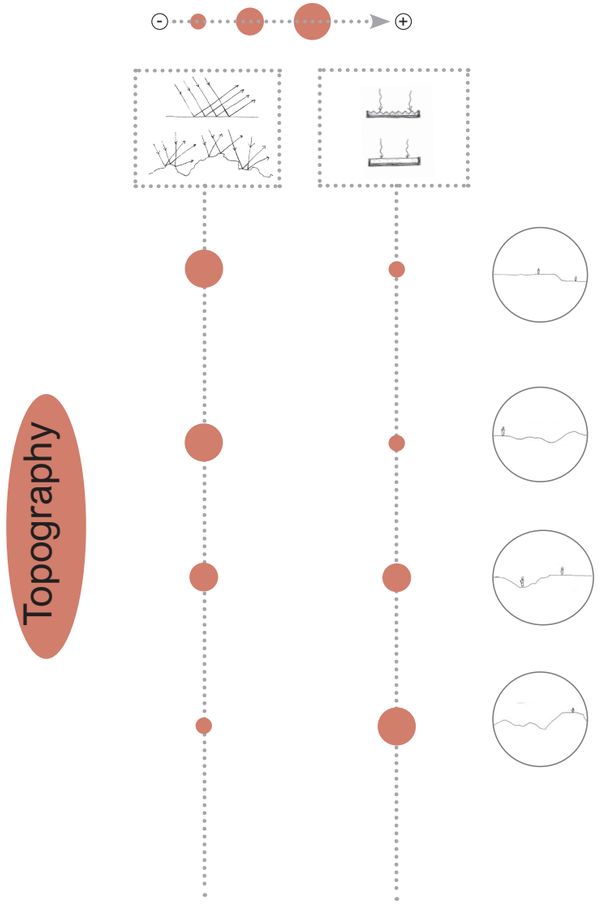
Sound propagation through elements





Sound propagation through elements

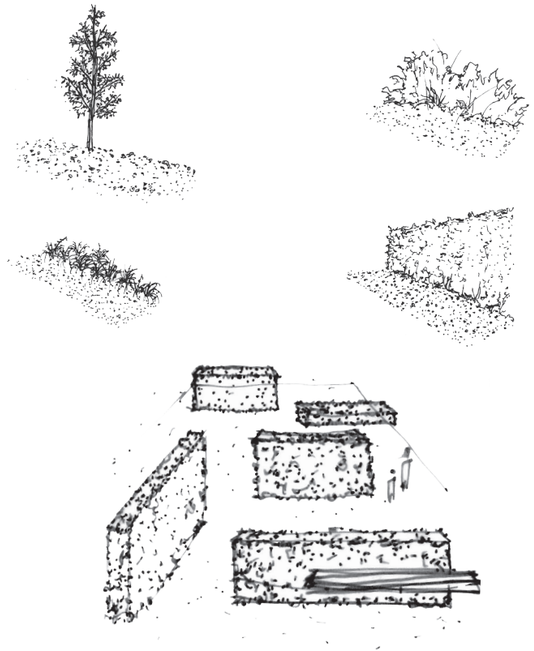




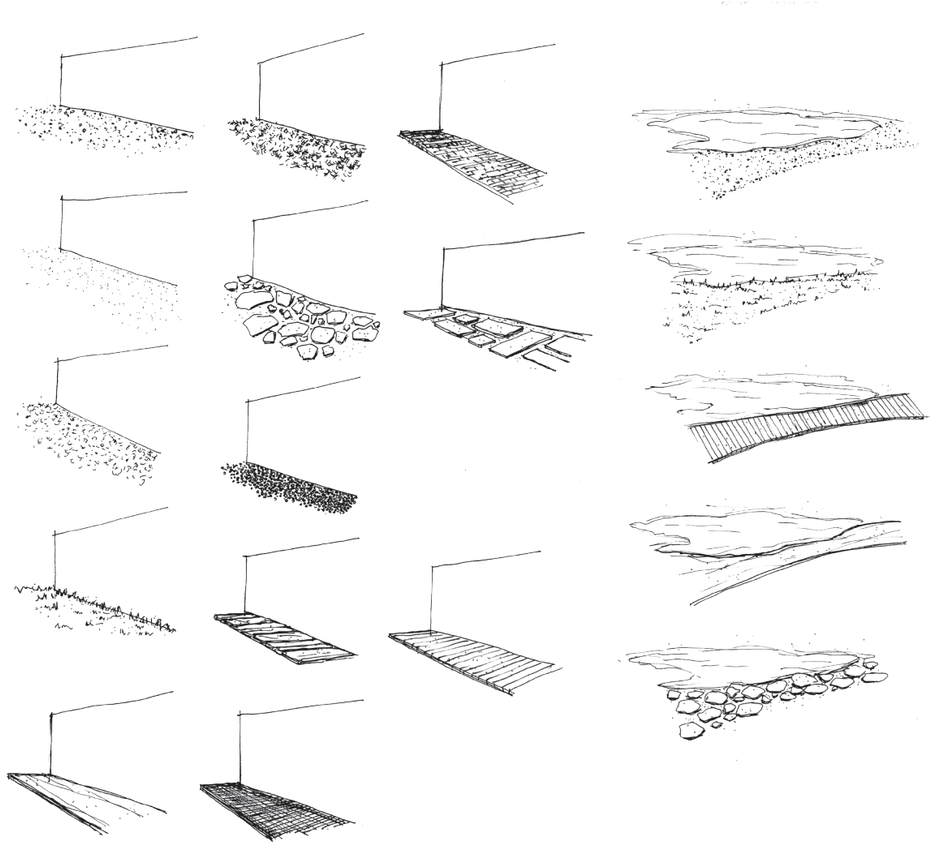
4 Simple elements compositions

The elements can be combined in simple compositions to create a pleasant soundscape, tailored to the specific context where they will be implemented. For instance, it is common to see houses with separated borders utilizing green walls. If the intended purpose of the soundscape is physical isolation, the choice of pavement material may not be relevant. However, if there is a need to enhance absorption, then the selection of pavement material becomes crucial.

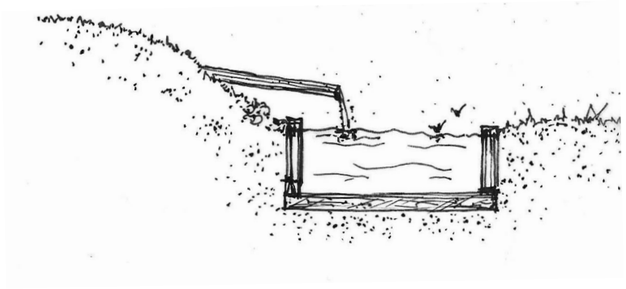
In urban parks, certain areas are designed to offer tranquility for users. For these specific environments, elements like high hedges strategically placed as ground-level diffusers can offer and effective solution. Some examples are shown below.

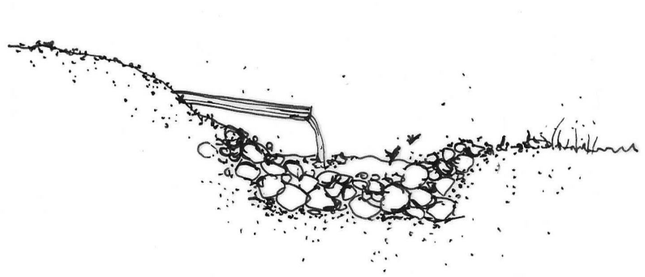


Isolated or associated to another one, elements indeed act as sound sources. By altering materials, the sonic characteristics of a single path can offer diverse experiences. In Soundscape design, these simple interventions bring interesting results, particularly concerning well-being and biodiversity.



Simple elements compositions

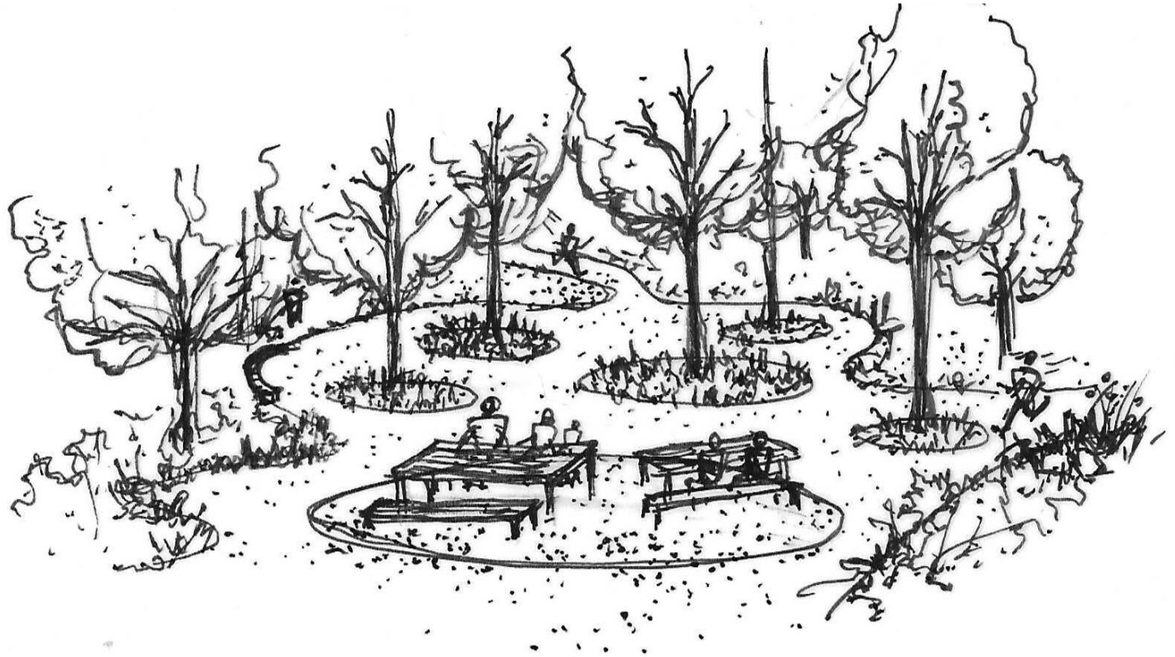




Here, the examples present slightly different soundscapes, varying in terms of ecology. This difference becomes more noticeable when water levels decrease, altering the sound of water flow as it interacts with small stones.

The second example offers higher ecology values since the natural borders attract many insects and provide conditions for unrestricted growth of vegetation, such as grasses and mosses.

Simple elements compositions



Sketch of “The third train garden”, in Compiegne (France), designed by Gilles Brusset, Marc Blume and Francesca Liggieri.

Compositions do not need to be complex and include many elements. This project basically utilized vegetation (trees, shrubs and grass) along with gravel pathways. Wooden furniture completed the design, creating an inviting landscape with a prominent serene soundscape.

In terms of biodiversity, the landscape provides shelters and food for a variety of species like insects, birds, worms.

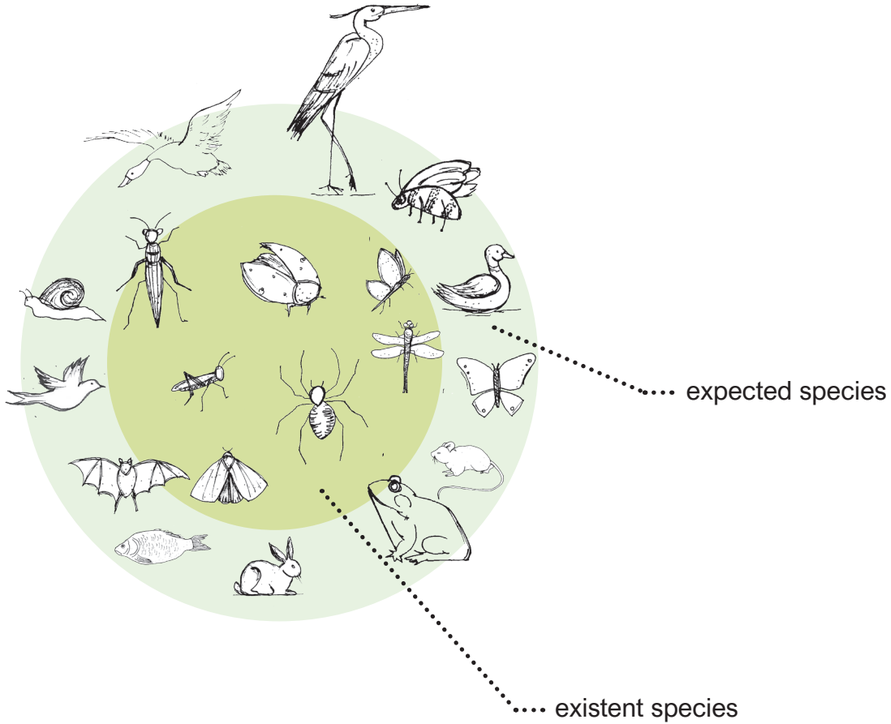
5 Design compositions

Our landscapes are composed of intricate structures and compositions, making it challenging to distinguish individual sound sources.

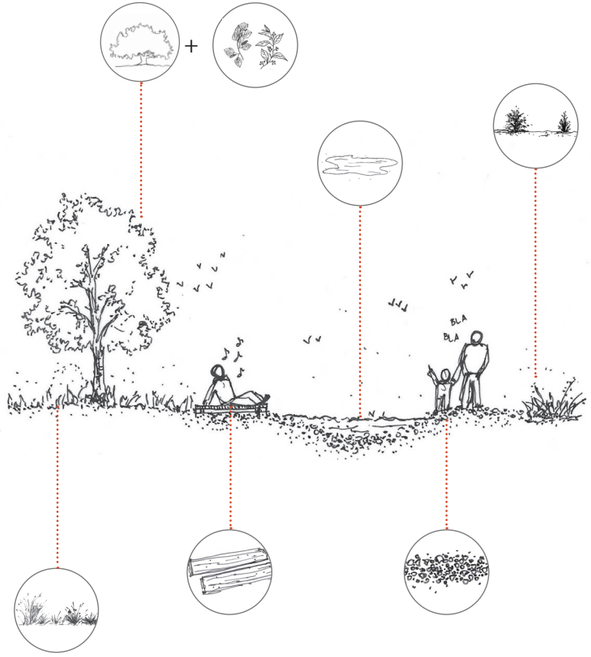
The following examples are compositions that incorporate multiple elements resulting in blended sounds. Three different possibilities are designed for the same area, each offering distinct soundscapes: *Presto*, *Allegro* and *Adagio*.

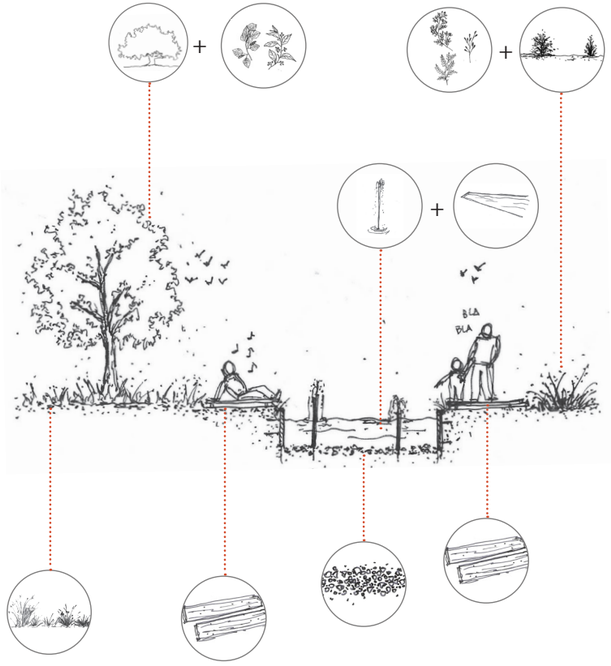
The main elements are indicated for a clear reading.

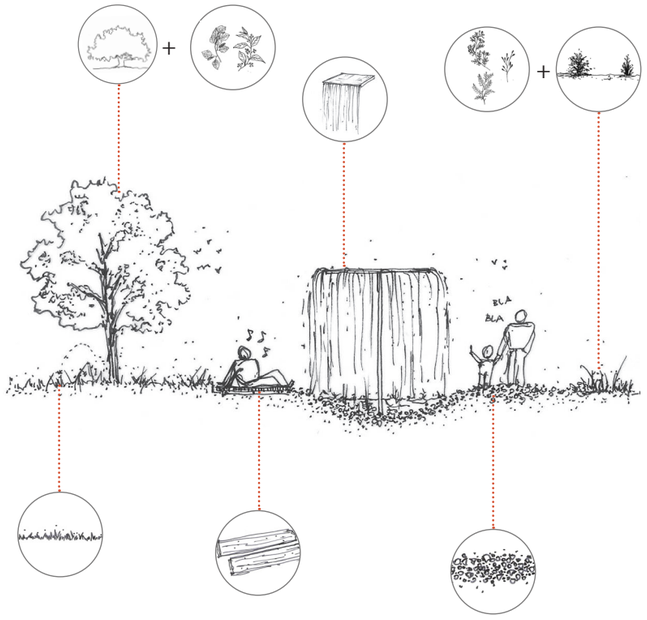
In addition, biodiversity is a key consideration, and for each design there is a scheme outlining the expected living organisms in that specific soundscape.

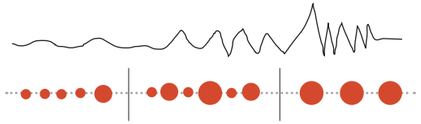


Design compositions









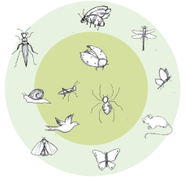
These compositions represent a common landscape featuring a single tree and a water element. As water flows freely in an open, stone-bordered ditch, a diverse range of living organisms find an ideal ecosystem to thrive. Various species of vegetation naturally grow along these borders due to the deposition of organic matter resulting from water level fluctuations. Water jets bring joy to people and create a pleasant sonic environment for relaxation. However, water curtains produce a different type of sound: harsher and more vibrant. They can mask other sonotopes in the surroundings but remain enjoyable.

All three soundscapes are attractive to fauna.

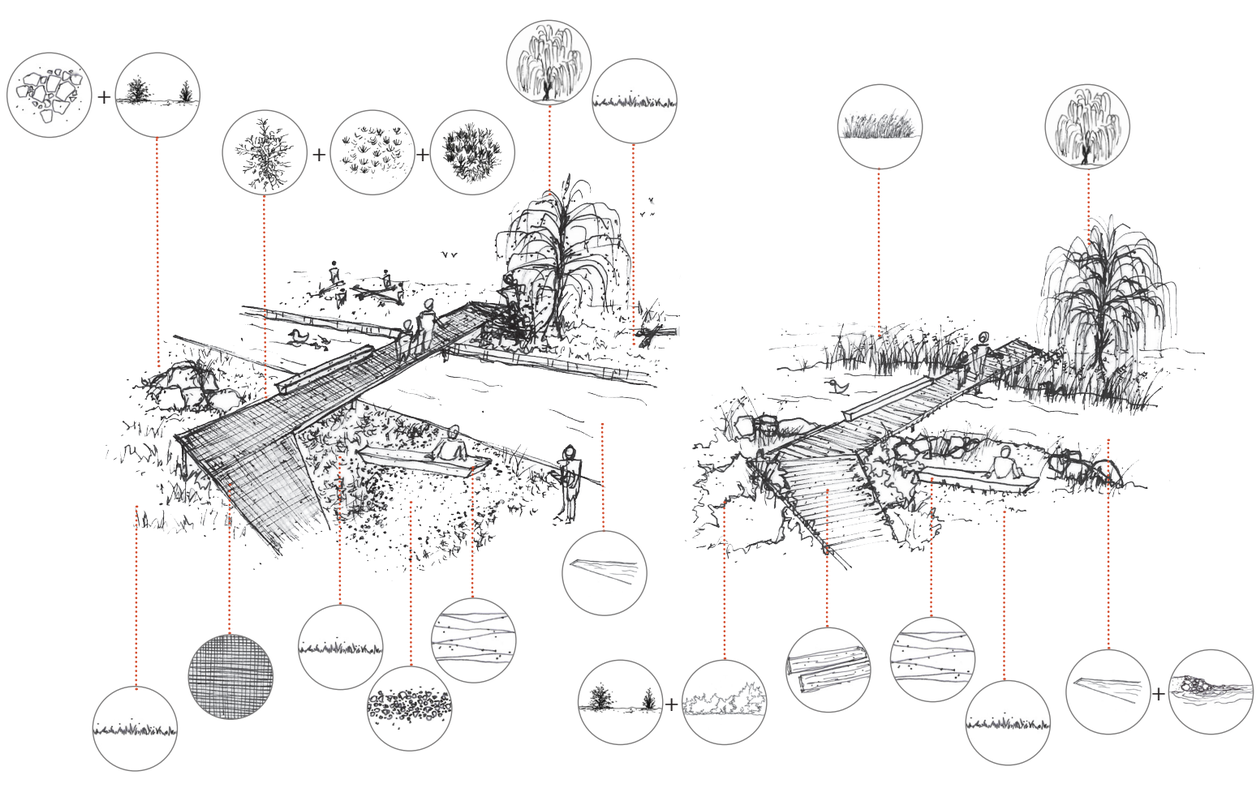


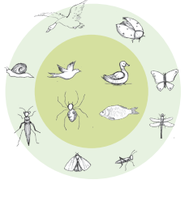




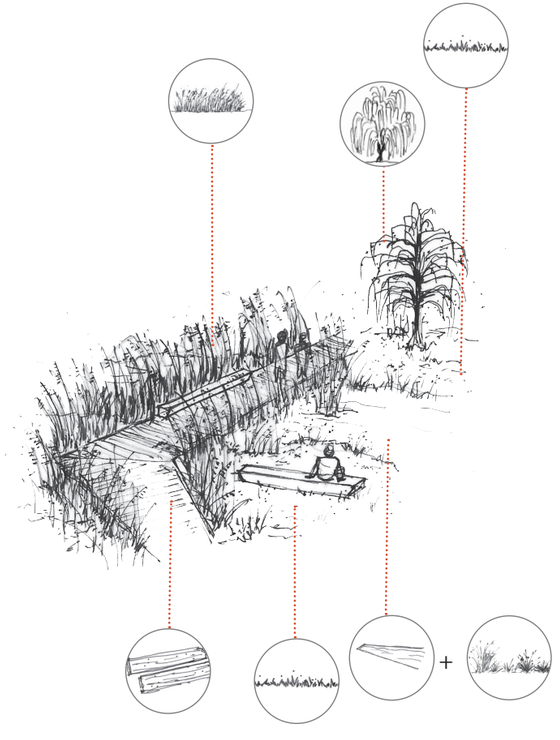


Design compositions

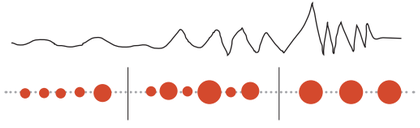












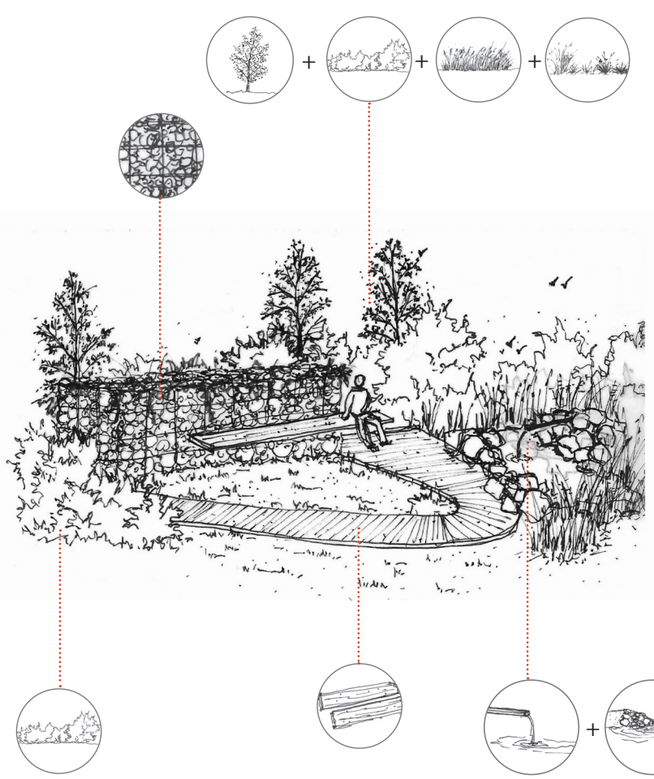
Landscapes with water always attract people, because this element is associated with calmness and relaxation. People look for places to sit and enjoy the place.

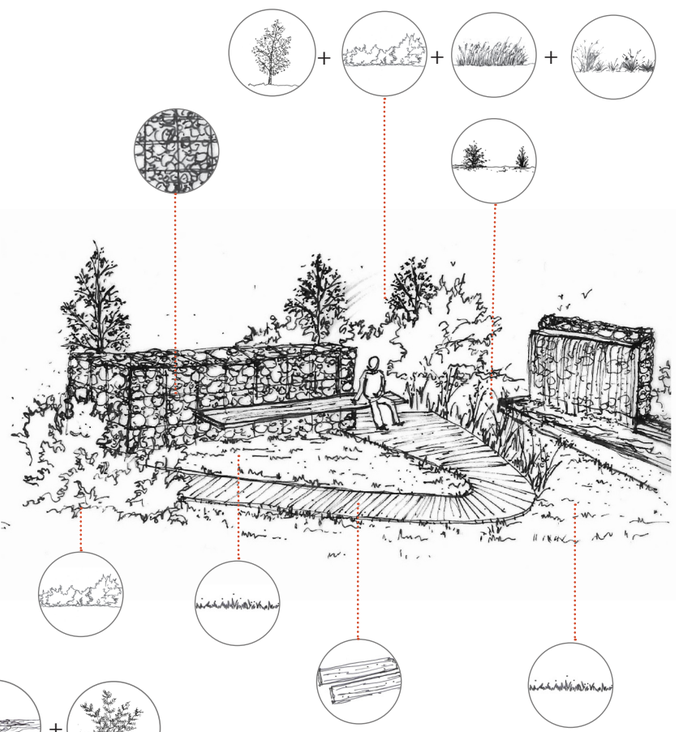
Pathways made of metal allow mosses to grow underneath, which are absorption elements. The wooden paths are good absorbers. The vegetation makes the difference in these cases. The sounds of the fine stems and leaves create a pleasant soundscape, especially under windy conditions.

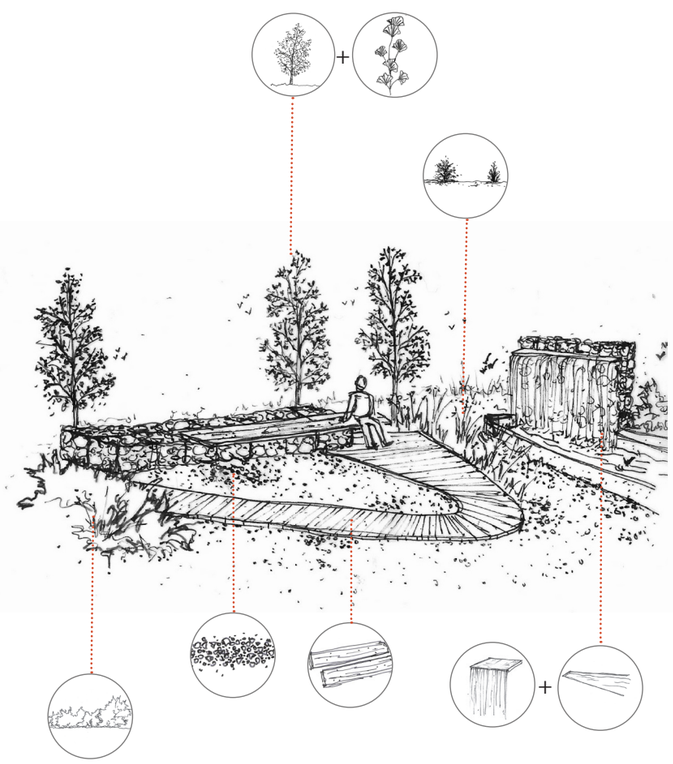
The landscapes differ in experiences. A special remark can be made regarding the playground, which brings a vibrant soundscape with kids playing.

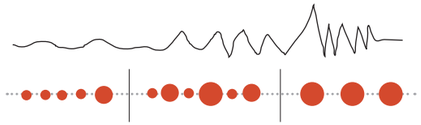
Birds, insects, frogs, mice, fish, and dragonflies are some examples of fauna in these three compositions.

Design compositions









These sonic environments are composed with elements in different configurations. Designed to be a place for relaxation, it offers three expierence possibilities. A tranquil soundscape is composed with high gabion wall and water dropping from a pipe. The dense vegetation around the area completes the *Adagio* scenario .

For a more vibrant soundscape, the water element was altered. A water curtain brings intense sound to this almost enclosed place in *Allegro*.

As the main absorber element, the gabion wall, is lowered, another soundscape is created, because the sounds enter freely in the place. The vegetation is placed sparse and in a less dense way, bringing the vitality and the loud sounds characteristics of *Presto*.

In all three compositions, different species find their habitat: birds, insects, frogs, dragonflies and more.

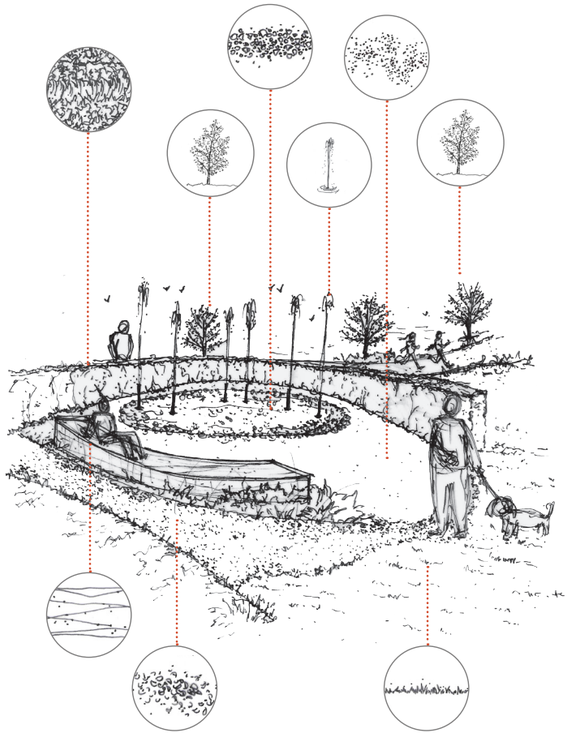


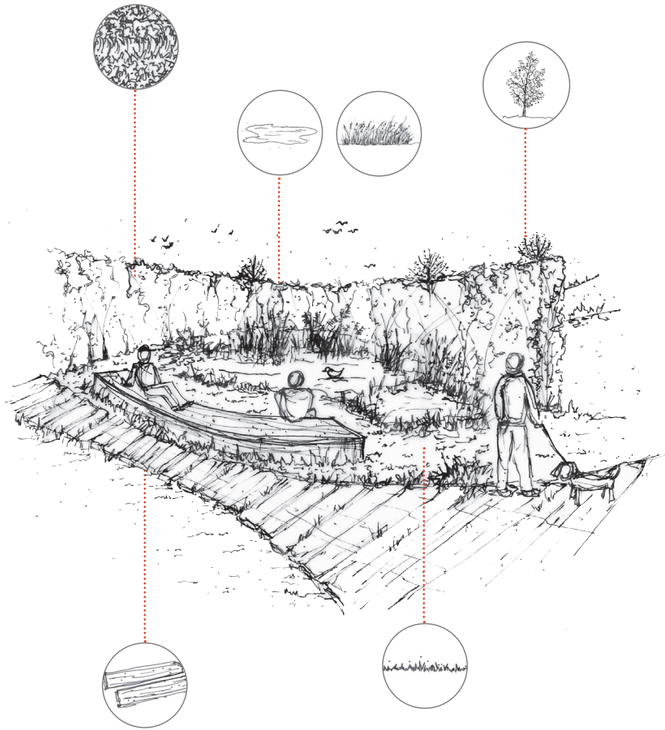


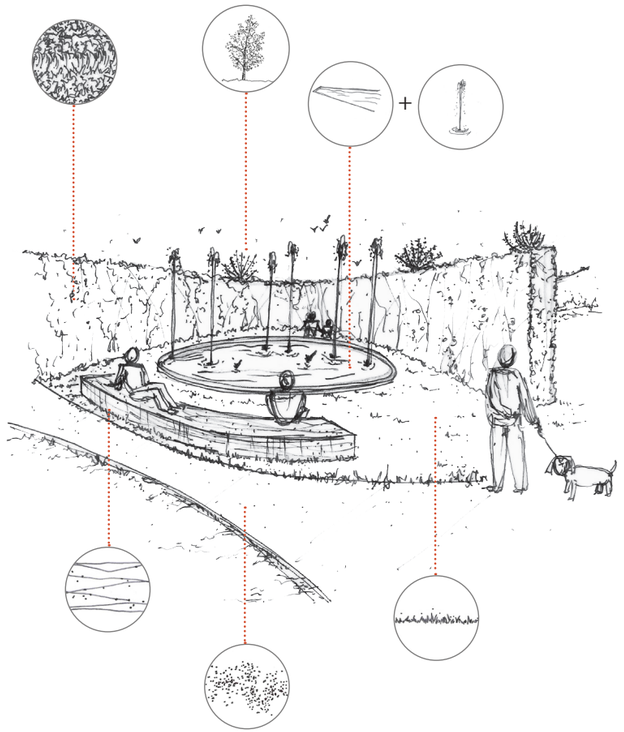


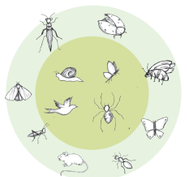


Design compositions



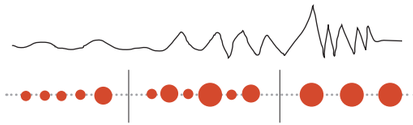










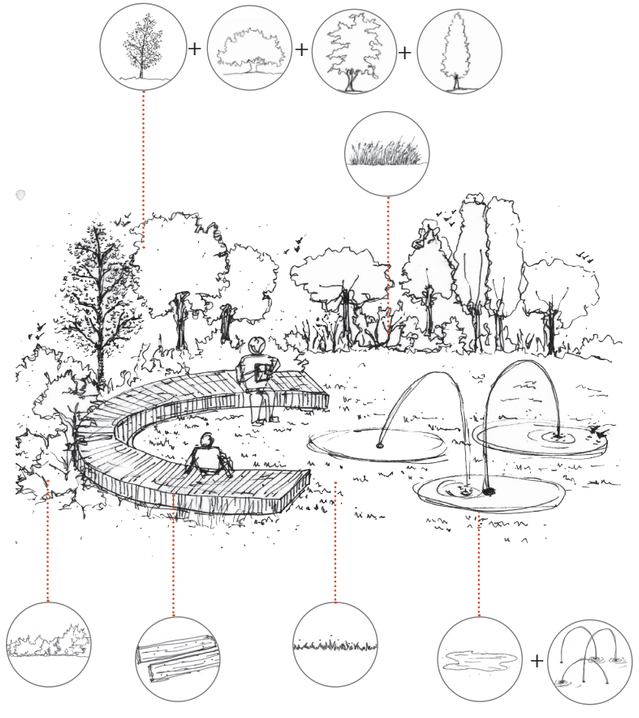


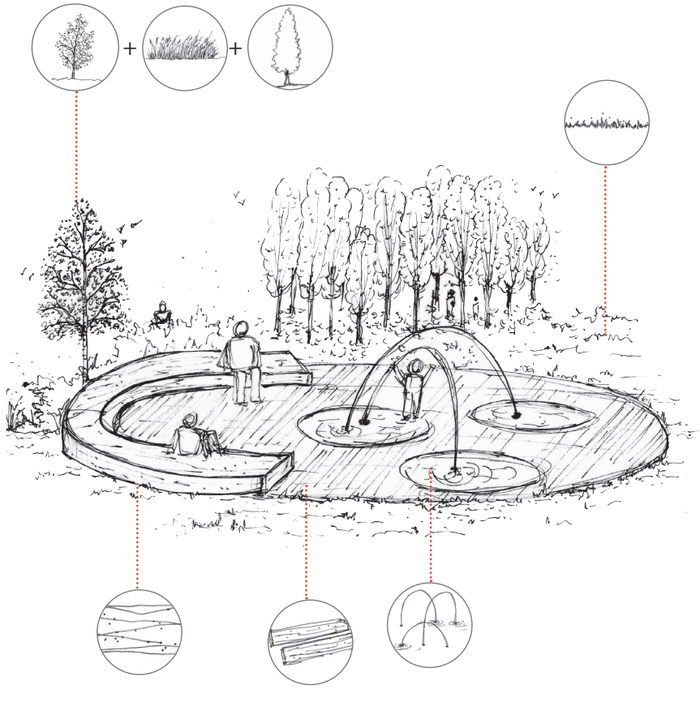
These three compositions are designed with hedges, creating enclosed spaces. The absorption capacity changes with their height, which reflects on the experience of the place. Additionally, the presence of water introduces varied soundscapes, with water jets offering different auditory experiences, whether they hit stones or form a layer on the ground.

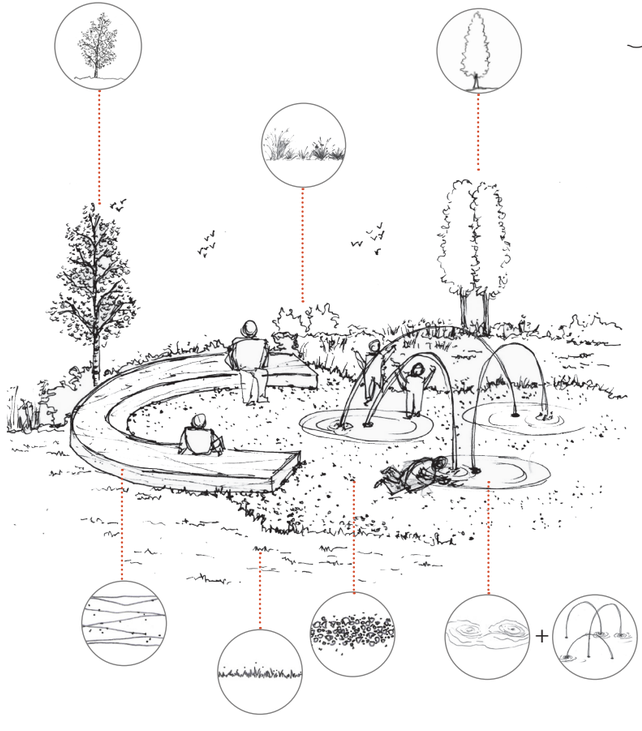
A layer of water offers another sonotope and offers another soundscape.

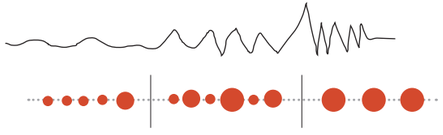
For either one of the examples, fauna will be enriched with different species.

Design compositions



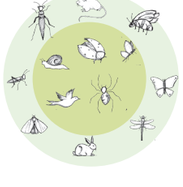


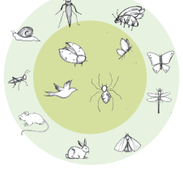


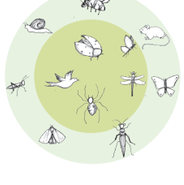


Vegetation is the main element in these landscape compositions. Variations of soundscapes are created with dense, partial and low number of trees. The gradient provides a high absorption of sounds and also more biodiversity. The ground with a wooden floor decreases the diffusing as the vegetation does not offer enough absorption. The water jets bring a joyful atmosphere to attract people.

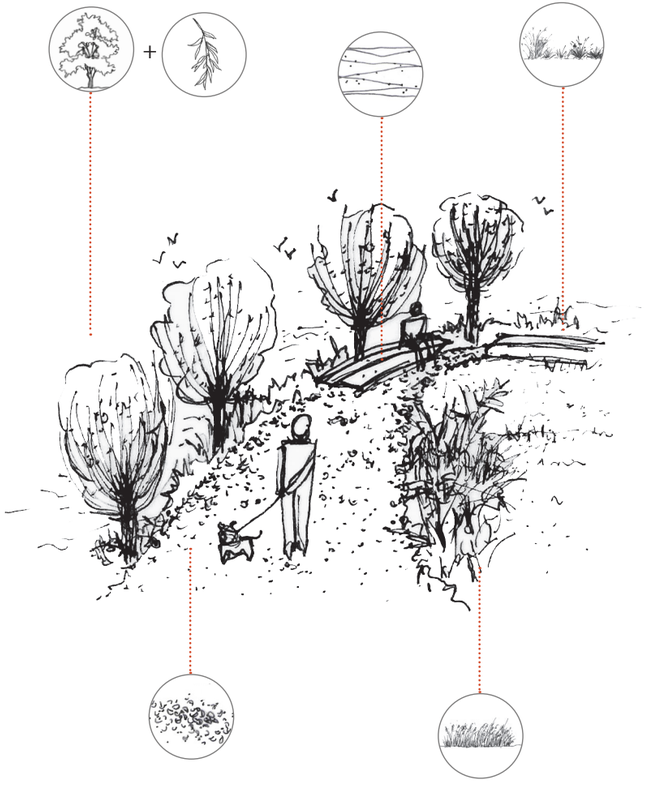
As said, biodiversity is enhanced with the vegetation gradient, since it provides a rich ecosystem.

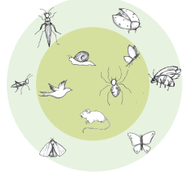


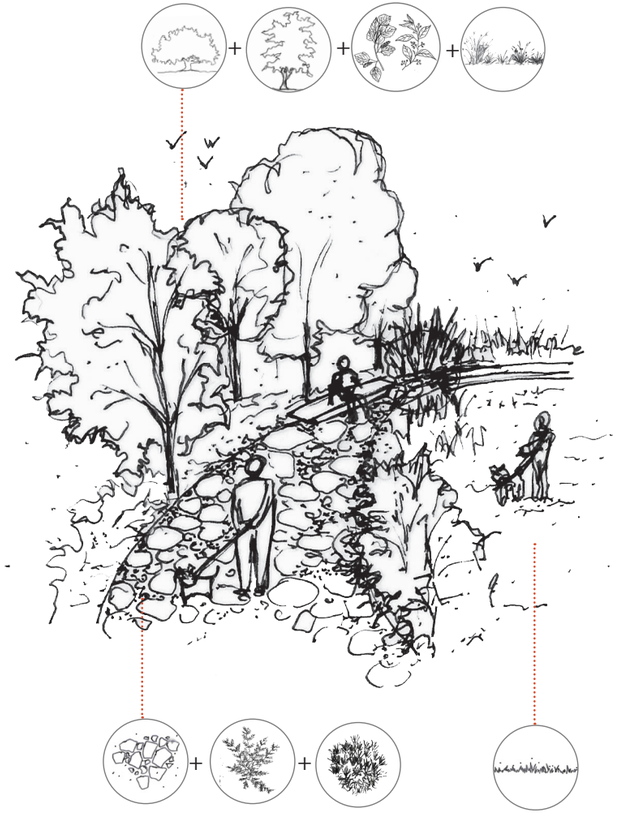




Design compositions

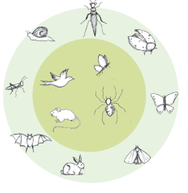


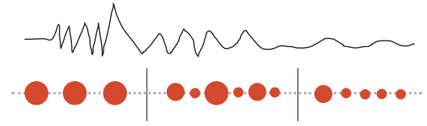








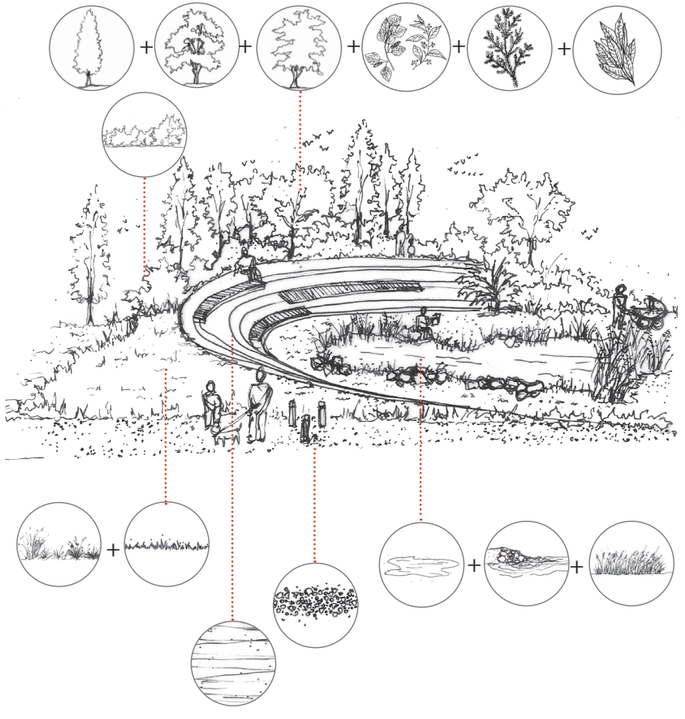


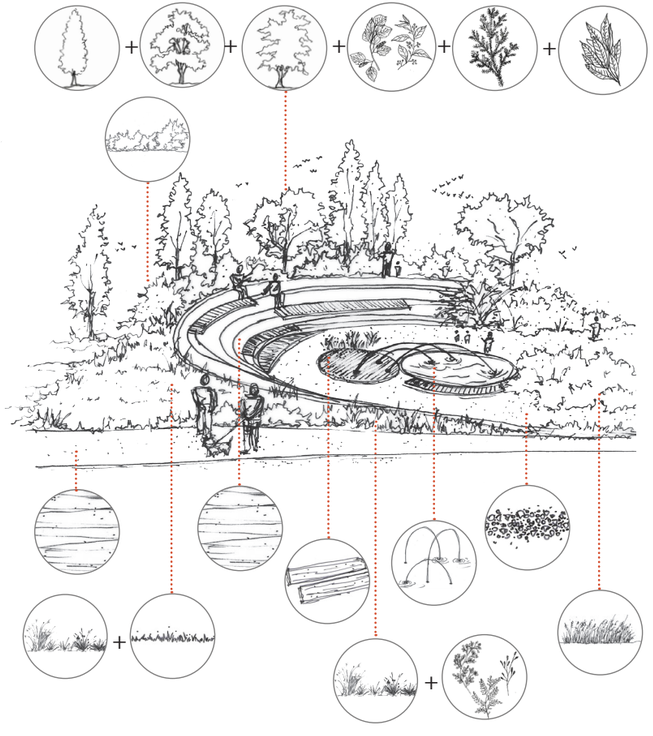


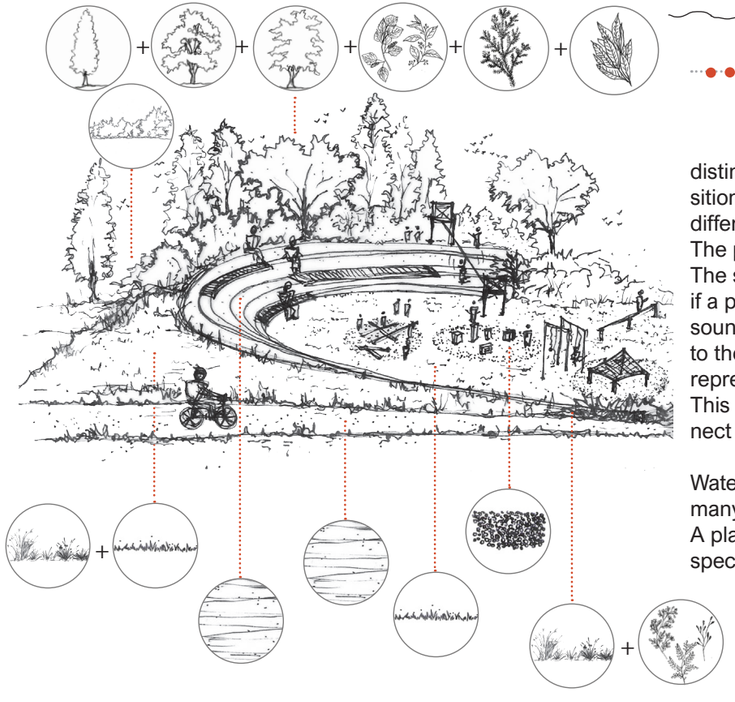
Pathways within parks can provide a variety of soundscape experiences. Shells produce a pleasant sonotope while walking over. Stones have a low absorption but also offer a tranquil soundscape. When the pathway is surrounded by dense vegetation, concrete or asphalt do diffuse the sounds. However, due to the variety of species and the enclosure, the sound sources are mixed and the sonic environment becomes exclusive to the local sounds, which are intensively perceived.

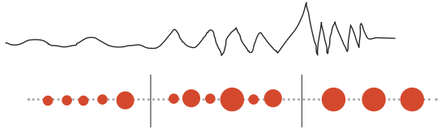
Fauna follows the complexity of ecosystems.

Design compositions







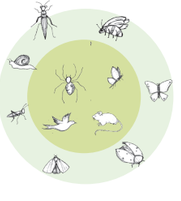


Enclosed spaces already offer distinct soundscapes. These compositions reflect that but are significantly different regarding their interior condition. The presence of water brings tranquility. The same environment is transformed if a playground replaces the water. The soundscape in this case is mostly vibrant to the presence of kids, which is a real representation of a well-used public place. This is a perfect place for people to connect with each other (social interaction).

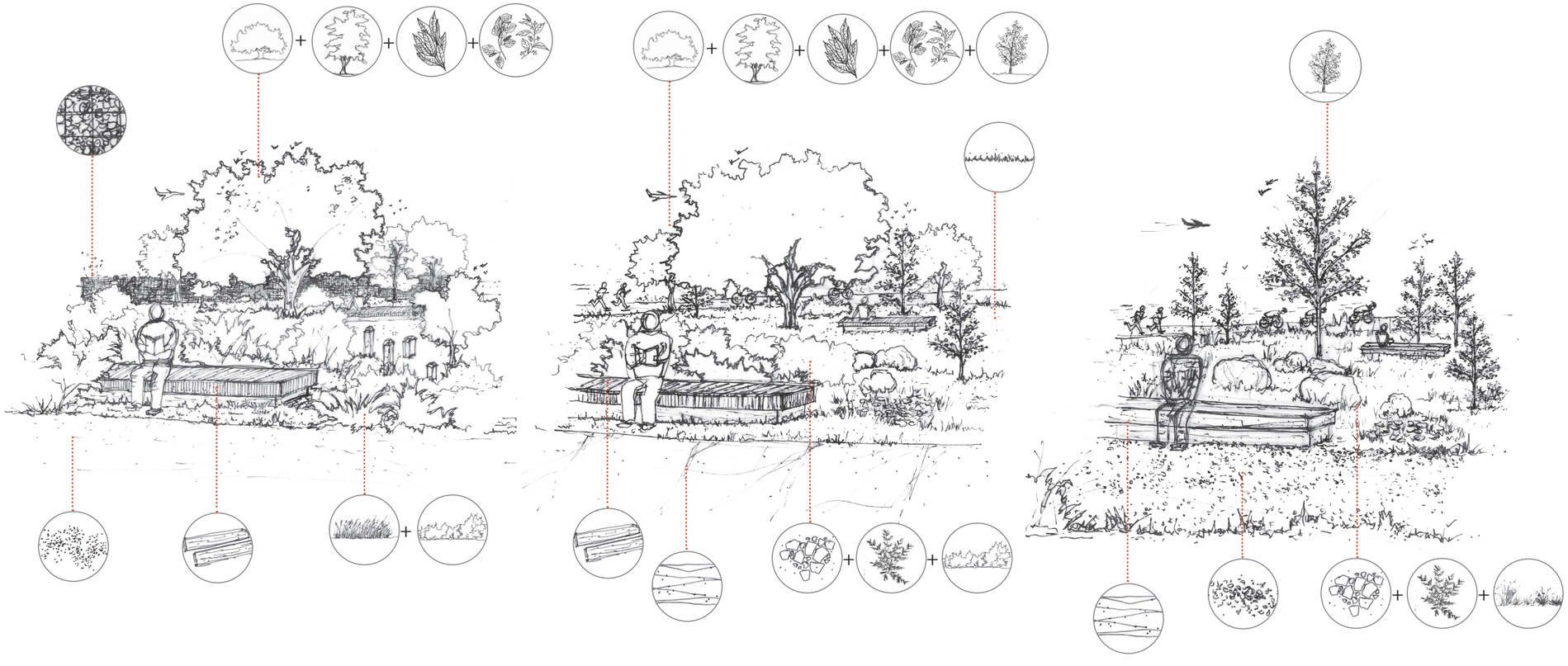
Water is a habitat and refreshment for many species, though, rich biodiversity. A playground's soundscape scares many species who will look for a nearby ecosys-

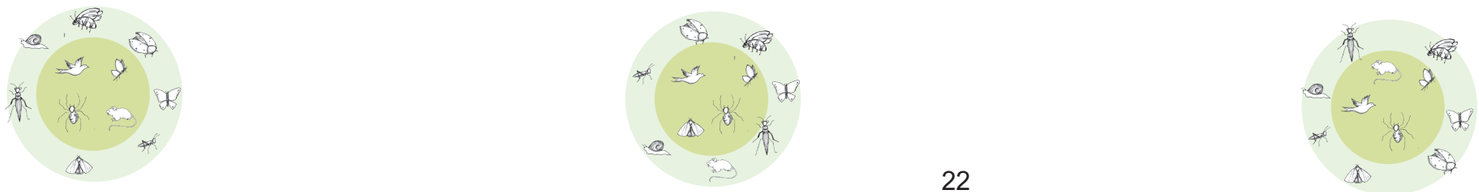


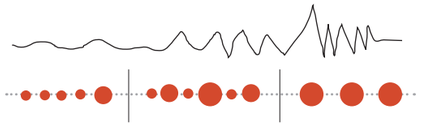




Design compositions



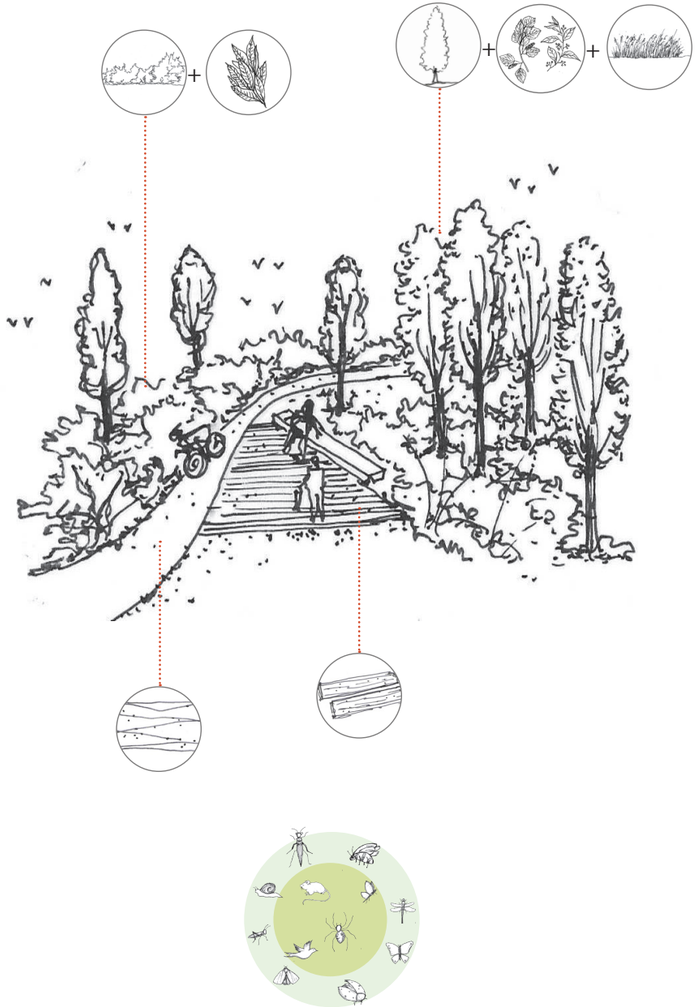


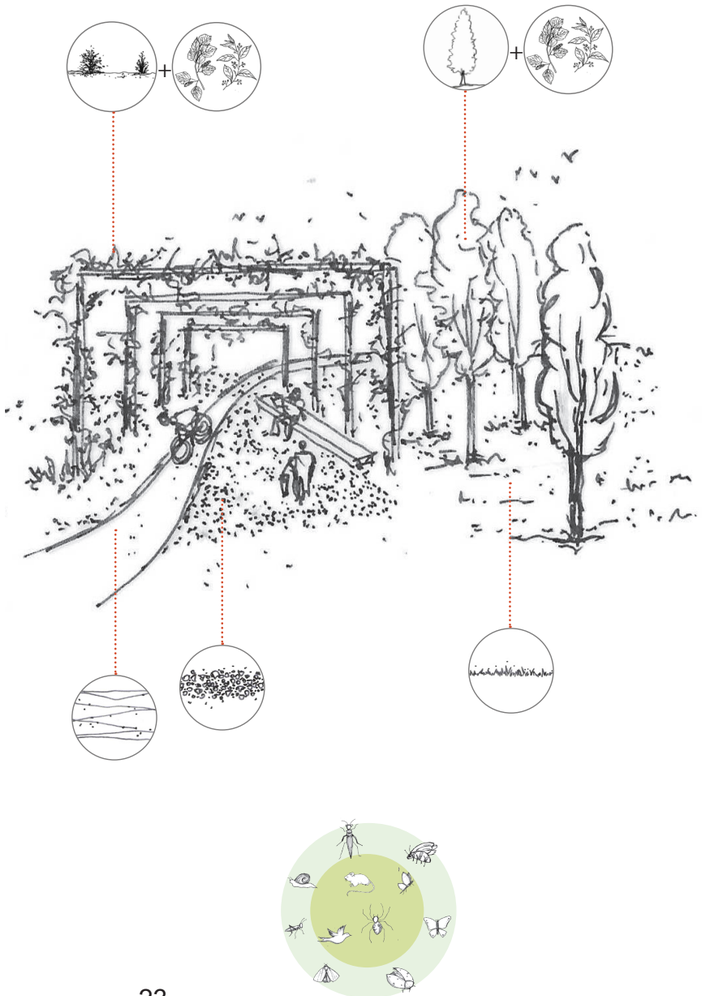


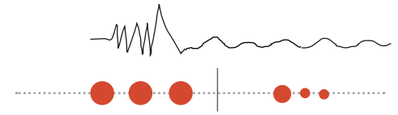
Few elements are used to change the soundscape of these compositions. Gabion walls are excellent for sound absorption and perform an aesthetic role as well. Trees have different leaves, sizes and shapes. A round canopy of dense foliage absorbs sounds effectively. Species with sparse leaves are efficient diffusers. Combined with dense of sparse shrubs, the compositions creates sonic environments with varied sound levels.

Elements such as loose stones are suitable for moss growth, which bring more fauna to the area.

Design compositions



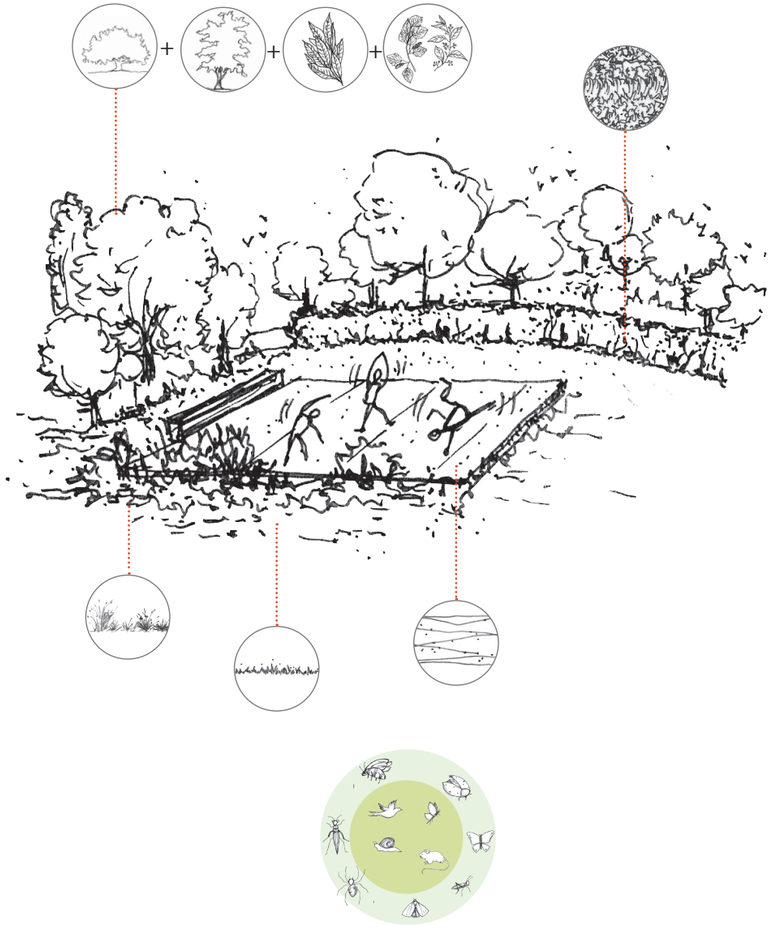


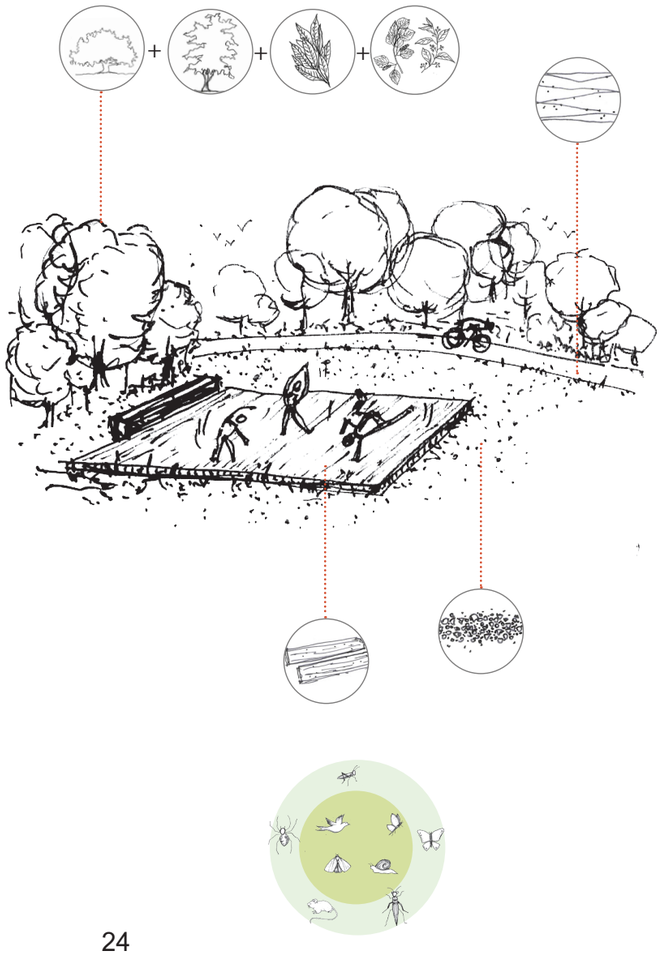


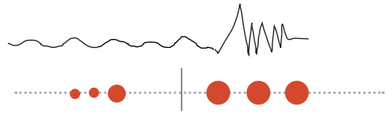
Elements like pergola are frequently used in landscape projects, to create shadow and support for climbing plants. Absorption increases since the pergola works like acoustic panels surrounding a certain place.

As the plants grow and get dense, the sense of enclosure increases, creating a nice soundscape full of natural sonotopes. Foliage, gravel, birds, insects and people build a harmonic sonic environment.

Design compositions





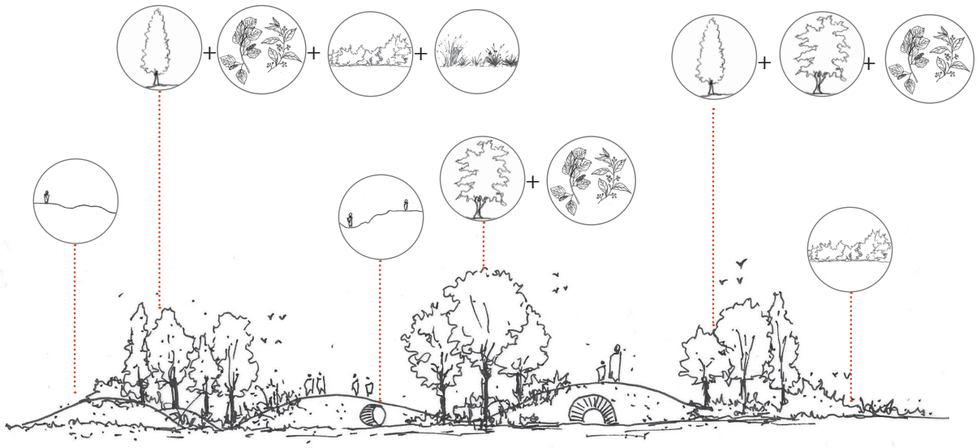


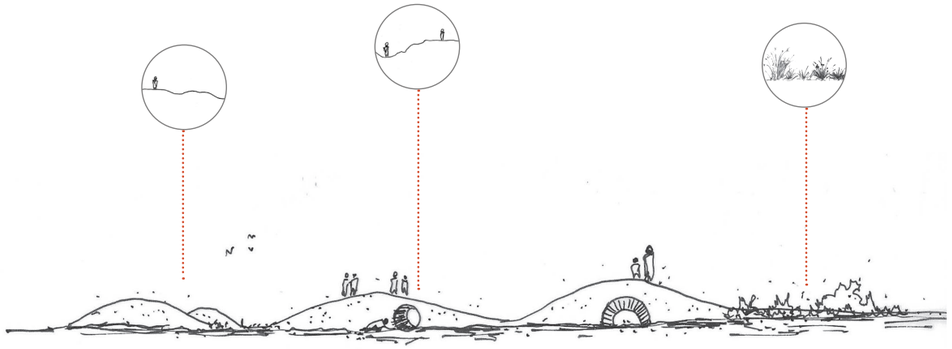
People seek natural environments to practice their physical activities which are highly influenced by the soundscape.

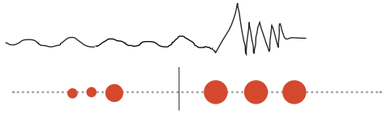
Effective absorption is needed for these situations, achievable through dense vegetation and walls, which can be green wall or gabion.

Fauna will be present. If artificial sounds are used by people, some species will feel threatened, finding refuge nearby.

Design compositions







Topography responds to a large part of the absorption of sounds in the landscape. Hilly places tend to be more tranquil. With dense vegetation they offer a typical soundscape, in which numerous sonotopes take place, in an intimist environment, promoted by diffuser landscape elements.

This is why rugging the ground or creating mounds on flat surfaces are effective solutions to increase absorption levels and improve diffusing. Vegetation is a crucial element to enhance the quality of these solutions. Vegetated or not, rugged topography provides interesting soundscape experiences in the landscape.

Fauna follows the constitution of the local ecosystem.





6 Design compositions and seasonality

The soundscape is intrinsically linked to time and seasonality, with significant changes throughout the four seasons. In this Catalogue, compositions were designed to capture the landscape in its entirety, offering a deeper understanding of the guiding concepts behind each example.

However, it is also important to present examples of how the soundscape evolves with the changing seasons. For example, in Wintertime, animals look for warmer climates or protected shelters, resulting in muted sonotopes that are vibrant in Spring (people also prefer protected and warmer places). Additionally, if the landscape is covered by snow, the soundscape varies even within the same season.

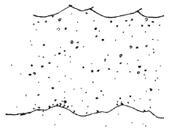
Snow, wind, rain and rays of light are events that happen with some regularity in determined seasons. Due to climate change they are having unexpected occurances.

The essence of this work lies in demonstrating the potential of absorption and diffusion of sounds within the landscape's elements. With this in mind, the associations become easily comprehensible and perceptible when the seasons change.

Events during the seasons



Wind



Snow

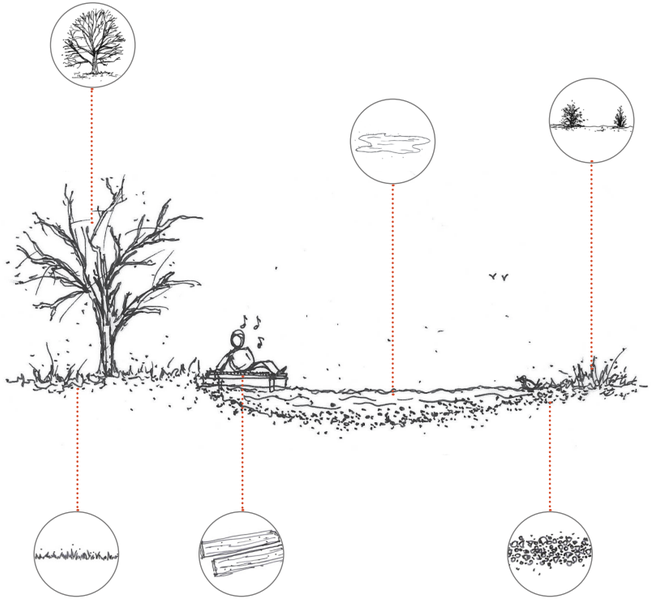


Rain

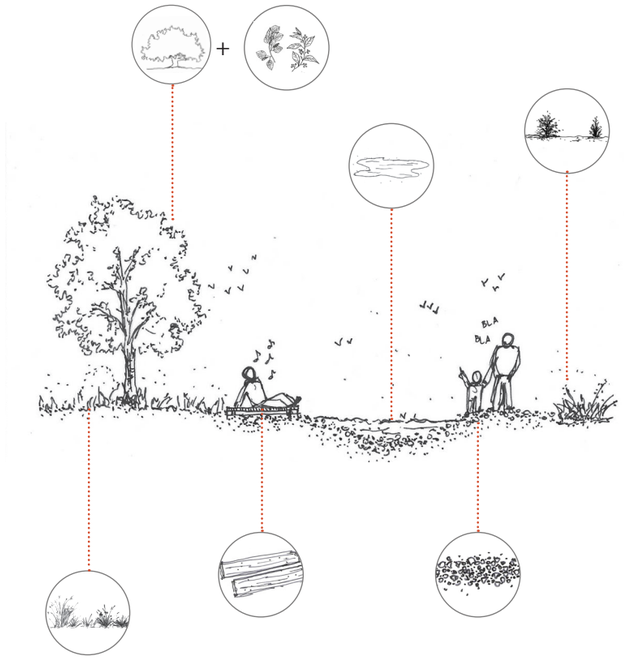


Ray of light

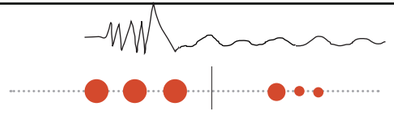
Design compositions and seasonality









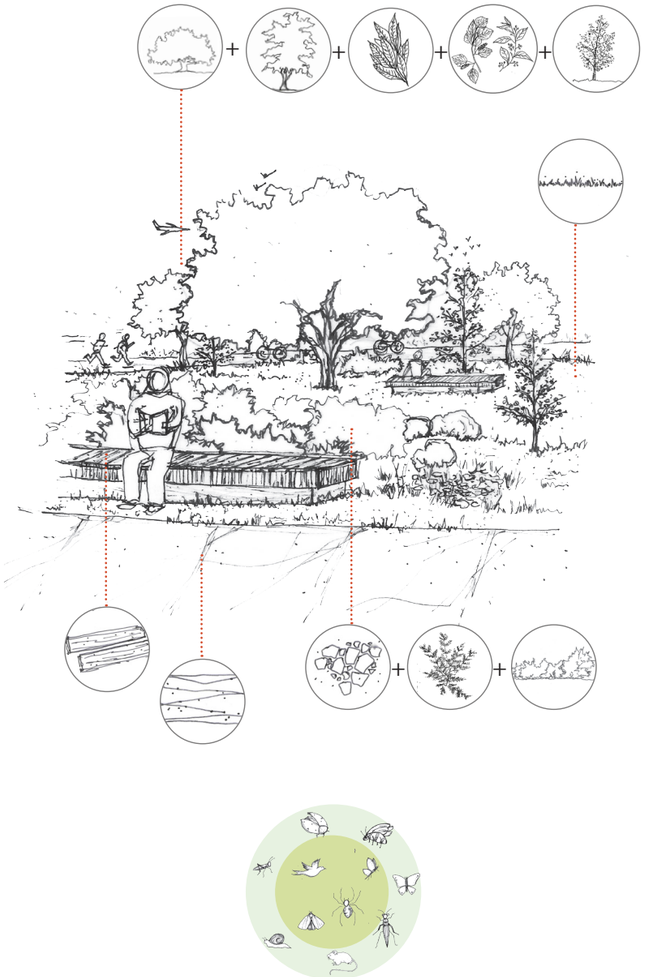


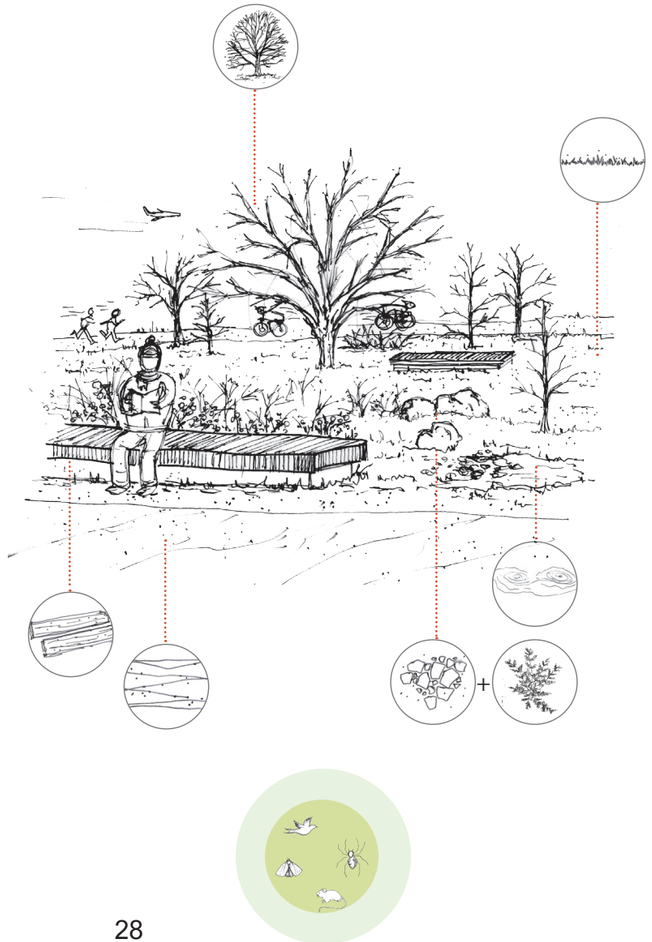
During Winter many trees are leafless and this causes a drastic change on the absorption capacity of this element. The ground level vegetation loses density, lowering the absorption as well. This results in a landscape where sound sources are diffused, louder than in other seasons.

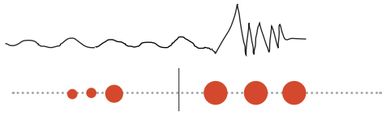
On the other hand, the water level tends to increase due to rainfall, inundating the borders and providing nutrition for small living organisms.

As for fauna, Winter tends to be more quiet, with some exceptions for insects or few birds.

Design compositions and seasonality



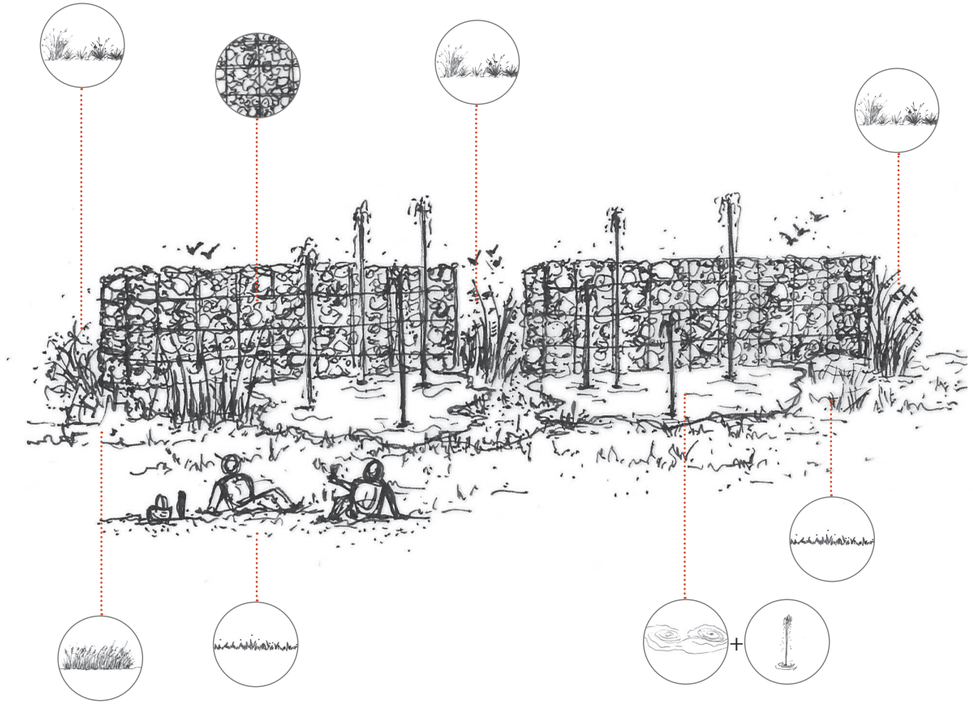


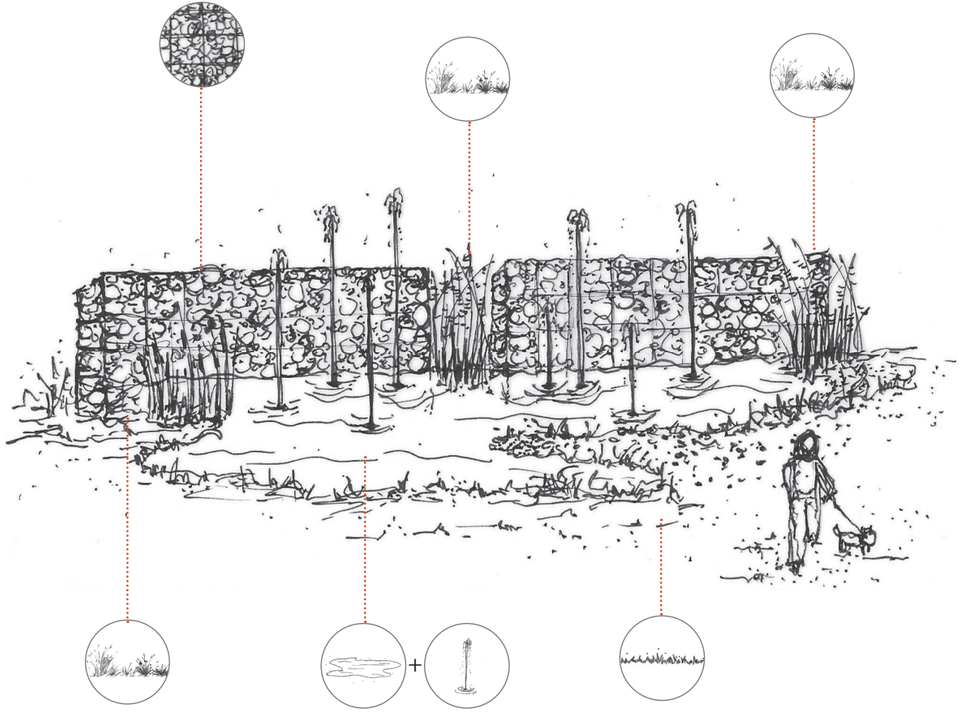


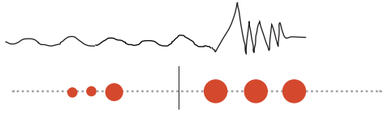
The contrast between Summer and Winter is reflected on the soundscape. People continue to do their activities while the landscape changes, affecting its sonic environment. With the loss of leaves on trees and some shrubs, absorption decreases, and sounds propagate differently. Diffusion increases, transforming a once calm and relaxing environment into a place with a higher volume of sonotopes.

As mentioned earlier, fauna is less present on winter.

Design compositions and seasonality







Seasonality is represented in these compositions by the water layer, which fluctuates between dry and rainy seasons. During rainy periods, the hollows do not hold the water, which floods beyond the borders.

Gabion walls are used to absorb the sounds and create enclosed spaces, where water jets brings a soft soundscape for users.

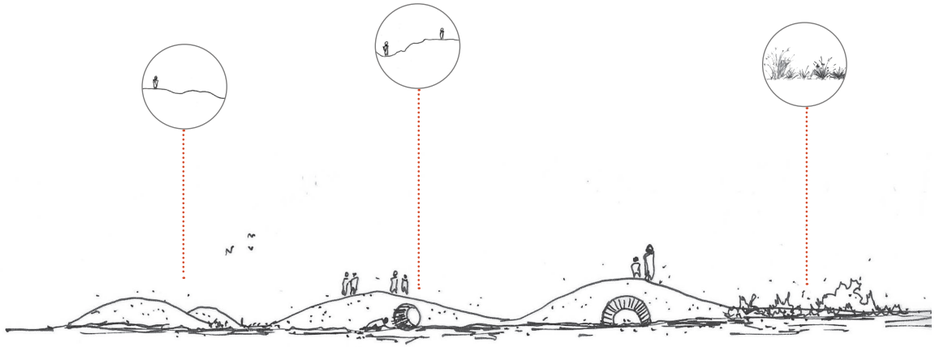
The experience is pleasant in both situations.

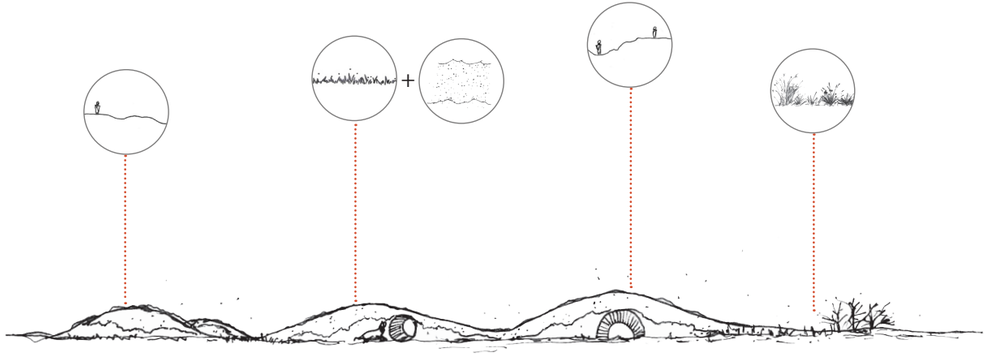
The richness of this kind of space lies in biodiversity increase. Many species take advantage of the ecosystem for nesting, feeding or just inhabiting.

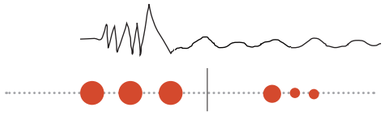




Design compositions and seasonality







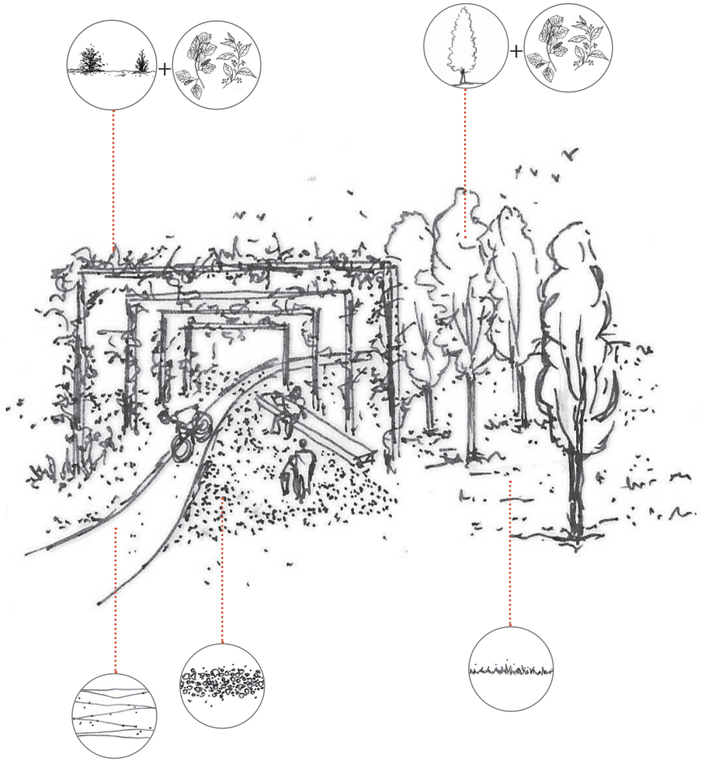
These examples shows the change of soundscape in the landscape with snow-fall. The topography and the snow change from *Presto* to *Adagio* while vegetation responds to Winter.

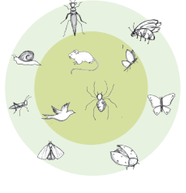
Fauna is scarce or almost nonexistent at this time because animals seek for shelter somewhere else or migrate.

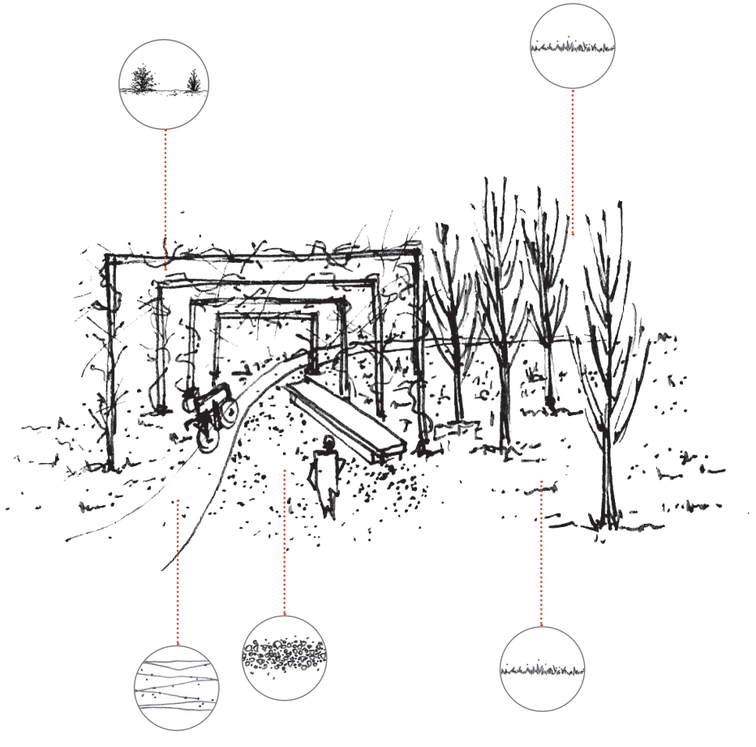


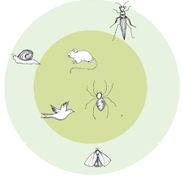


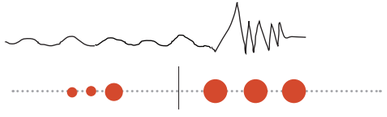
Design compositions and seasonality











Another example of soundscape changes between seasons is evident in the transition from a calm and relaxing environment in Summer to a place with higher sonotope volume in Winter.

Fauna also follows the seasonality.

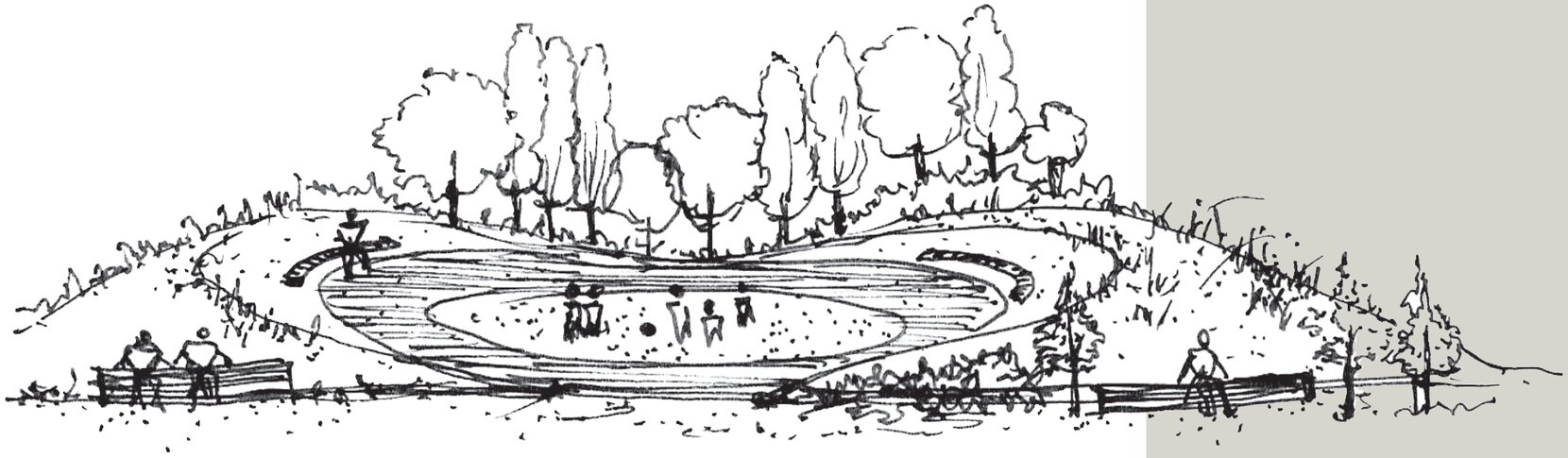
7 Conclusions

This Catalogue provides a practical framework for visualizing soundscapes through design compositions. As mentioned, sound is perceived in the landscape through our auditory capacity, engaging our senses to recognize the sonotopes present.

The examples presented here demonstrate different soundscape compositions for the same area, highlighting the importance of landscape architects to consider each element when designing their projects carefully. A single change of elements can alter the entire soundscape. Additionally, seasonality plays a significant role, completely transforming a place's soundscapes.

The design compositions in this catalogue serve as guidance and reference for landscape architects. The main idea is to observe the landscape elements of a determined area and analyze their sound propagation characteristics. By doing that, the method used in the catalogue can be used anywhere. The compositions will respond to the intended sonic environment: a *Presto*, *Allegro* or *Adagio*. Landscape architects should read and interpret a landscape objectively and subjectively.

Soundscape influences the life and well-being of all living organisms. Using the appropriate sounds in the right places is crucial for creating more liveable and resilient landscapes.





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