



UNSEEN WORLD

Propositions for a Sensing Architecture

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Declaration

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor used artificial intelligence tools or generative artificial intelligence tools (unless it is clearly stated, and referenced, along with the purpose of use), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

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Positionality Statement

Growing up with my father, who has significant sight impairment, I noticed from a young age the difficulties of living with such impairment, especially in navigating different spaces. I quickly learned that our urban spaces are not well suited for people with experiences like my father's. Our designed buildings are full of obstacles and barriers preventing free movement.

Now, as an architecture student, my personal experiences have led me to engage with a topic that could make a difference for him: the topic of sensory architecture, which relies less on optical elements and more on the body's whole experience. This is a poetic end to my architecture degree, remembering that the first project in year one was framed around architecture as haptic multisensory experience.

I dedicate this project to my father. I have faced many challenges and dark days throughout the thesis year but his struggles and challenges, along with all the help I received from others, has helped me push through. The Thesis outcome may not be perfect but addresses the lived experience of many who are underserved by our current scopic architecture model. This research reframes architecture as the design of powerfully sensory and haptic living environments that enable social and ecological connection.

Abstract

The methodology of multisensory design is explored in the research. Through the development of this methodology, architecture is explored here as a sensory, haptic condition. Human senses are placed at the core of the design process. This leads to the development of a richly experiential space that interacts with the senses, providing a more haptic and environmentally grounded experience.

The key methods for this multisensory design methodology are sensory model making, designing for multisensory experience, and research into sensory elements and theory. Through these models and research, different design exemplars and sensory-related experiential effects are navigated.

The project works with a haptic and sensory approach to architecture to show the benefits of design that emphasizes users' experience and memories with space, rather than just function and form. Being in a space that engages with multiple senses provides a more profound, more rooted, and multi-layered experience, creating meaning and affect. This research project presents a multisensory approach to architectural design as a critique of the current architectural emphasis on the scopic. By incorporating haptic and sensory approaches, the research hopes to inspire an architecture that deeply connects and communicate with the communities it engages.

Contents

- Declaration3
- Acknowledgements.....4
- Positionality statement5
- Abstract6
- Content list.....7

- Introduction..... 12
 - Research Question 13
 - Visual Impairment..... 14
 - Aims 18
 - Chapters 19

- CHAPTER 1: DESIGN CONTEXT 20
 - Introduction 21
 - Part One - Critical Texts.....22
 - Part Two - Case Studies..... 30
 - Part Two - Site 38

- CHAPTER 2: METHODOLOGY 44
 - Introduction 45
 - Part One - methodology..... 46
 - Part Two - Theoretical Framework for the Senses 48
 - Multisensory Methods 51
 - Sensorial Drawing and Modelling Methods..... 53

Chapter Three - Design.....	63
Introduction	64
Part One - Initial Design.....	65
Part Two - Concept Design	74
Part Three - Developed Design	82
Part Four - Final Design.....	144
Conclusion.....	170
Figure list	176
References	183

"Architecture is essentially an extension of nature into the man-made realm, providing the ground for perception and the horizon to experience and understand the world. It is not an isolated and self-sufficient artifact. It directs our attention and existential experience to wider horizons." (Pallasmaa, 1994)

Introduction

Research Question

How might multisensory design shift, deepen, inform or transform the experience of those coming into contact?

Further how might haptic and multisensory approaches to architecture be regenerative as they enable social and ecological wellbeing.

How could our buildings and wider urban environments be designed more inclusively? How might they attend to the different sensory capacities of the blind or sight impaired while also potentially deepening architecture's capacity to touch and benefit communities (human and nonhuman) more broadly? Living with my father who has a significant sight impairment led me to observe that our buildings and urban landscape does not consider the spatial experience of the visually impaired, as I have seen him struggle to navigate through unfamiliar spaces. Academics Gayatri Saoji and Sarika Bahadure (2012) note that modern architecture prioritizes aesthetics more than spatial feeling. They express that the need for sensory design in architecture as a celebration of our senses is what truly enables us to experience a space. People who are blind or have sight impairment face difficulties in navigating through unfamiliar spaces, adding stress or distress to their everyday lives. Moreover, much contemporary architecture is scopic in nature, dominated by visual languages without a deep regard for the haptic, experiential and affective capacities of architecture. The personal connections and meanings that could be developed with the space are neglected.

This thesis explores a multisensory architecture that is regenerative as it improves the spatial experience and wellbeing of people and the environment it is situated within. The project enhances experience in space through multisensory design by integrating the sensory world of the ecological environment to the design. It improves ecological functioning, enhancing local biodiversity, creating edible gardens for humans and

non-human, and restoring local water systems, blending both human and more-than-human environments together. Sensory gardens contain aromatic plants as well as edible vegetables. Collected rainwater is retained through sensory devices such as rain chains and basins so wildlife can interact. The rainwater then flows through open channels throughout the site before entering a wetland system that regenerates clean water and builds ecological diversity by providing another home for non-human users. The research aims to create spaces that form personal meaning, existential rootedness, connections and memories with its users, from both sight-impaired and sighted users to more-than-human entities who live or engage in the space.

Visual Impairment

Visual impairment is defined as a loss of visual function ranging in a wide continuum, meaning there are many variations and aspects to the impairment (Douglas & McLinden, 2004). The World Health Organisation (2023) notes that visual impairment occurs when a condition of the eye negatively impacts the visual system and its functions, and can be mainly caused by cataracts, glaucoma, and age-related macular degeneration. In the most severe visual impairment, blindness occurs. Blindness, according to the Cleveland Clinic (2022) is the full lack of vision, with the most severe cases having the inability to see even light. However, blindness has a spectrum, from partial blindness and legal blindness to complete blindness. Partial blindness, known also as low vision, is when a person still has some vision remaining in their visual system. Legal blindness occurs when there is little vision remaining, but the field of vision and peripheral vision is severely reduced (Cleveland Clinic, 2022). Complete blindness is when a person has fully lost sight. There are also cases like my father, called 'legal blindness' which is a term that describes a severe sight impairment that is below the test thresholds defined by government agencies (Cleveland Clinic, 2024).

For those with visual impairment and blindness, experiencing and navigating an unfamiliar environment can pose difficulties. Research looking into the perspectives of blind people in navigating unfamiliar spaces conducted by Watthanasak Jeamwatthachai, Mike Wald, and Gary Wills (2019) found that people with visual impairments experience significant challenges and difficulties navigating through unfamiliar spaces. They noted that participants face multiple obstacles and feel lost in these environments which reduces their capabilities and confidence to visit and move around. Navigational aids such as canes are unable to detect certain obstacles such as wall mounted objects or certain walls or sudden drops. Furthermore, lack of landmarks or lack of knowledge of the whereabouts of landmarks reduced the capability to locate themselves in the space and navigate without a sighted person's help (Jeamwatthachai, Wald & Wills, 2019). The researchers found that visually impaired people often use their senses and feelings paired with methods like footstep counting to find their location and orientation and

navigate through a space (Jeamwatthachai, Wald & Wills, 2019).

Sensory cues help the visually impaired as compensatory senses aid the analysis and perception of built environments and spatial qualities (Bakir et al., 2022). In a study exploring the importance of multisensory perception for the visually impaired and blind by Dina Bakir and colleagues (2022) argue that designs which consider non-sighted users through multisensory approaches could make haptic architectures that are memorable and engaging for all users including both sighted and sight-impaired. The study highlights that different sensory cues such as touch, hearing, and smell were highly significant in helping sight impaired people to experience a built environment. It revealed how these senses assist in perceiving spatial structures, including volumetric and geometric configurations. By hearing sound echos, feeling different kinds of materials, sensing the sunlight, or sensing ceiling height through airflow, complex spatial insights are forming. By observing the built environment through multiple senses other than sight, the sight impaired participants in the study were able to create mental images and cognitive maps to help their navigation and orientation in the space (Bakir et al., 2022). The study also evidenced how natural elements like the sun, wind, and bird sounds helped to enhance spatial experience for the sight impaired, as they helped participants to create mental imagery, locate spatial components such as windows, and tell the time of the day. Sensory impact can also improve experience for all users, not just the sight impaired. Academics Aakangsha Roy and Ar. Aashima Arora's (2023) study found that sensory elements such as lighting, textures, colours, sound design, and signature scents have all significantly influenced the perception of the studied space. This indicates that sensory design is not just for a single specific community but can be a holistic approach.



Figure 1. Perspective of navigation from my father

Aims

The aim of this thesis is to explore how a haptic approach to the often scopic field of architecture might shift, deepen, inform or transform the experience of those coming into contact. Sensory design can be incorporated into architecture to create more meaningful and enabling spaces that connect, communicate, and provide enhanced experience to its users, considering both sighted, sight impaired, and more-than-human beings that may occupy the space. For sight-impaired users, haptic design strategies that enable enhanced experience or navigation through touch, sound, or smell are empowering as the building communicates more expansively and affectively. For sighted users, the quality of experience within space can be enhanced as architecture enables wider human senses rather than sight alone. As space is perceived through a wider sensory perspective, bodily sensation and experience is enhanced. Incorporating design elements that involve hearing, smelling, seeing and touching enriches experience, creating a more memorable and affective architecture that communicates to its users in multi-sensory ways.

According to Deepashree Choudhury, architecture is not a scopic regime concerned with aesthetic form but is rather about intertwining experiences which have a significant impact on people's quality of life (Choudry, 2016). Architectural space is experienced through the human body and its senses as it lives in and moves through designed space, and potentially over time creates deeper and more meaningful connections (Choudhury, 2016). Architect Juhani Pallasmaa describes how modern architecture's heavy focus on visual aesthetics creates a disconnect between space and user and robs one of the potentials to fully experience one's existence within space and the wider environment (Pallasmaa, 2005). In contrast, Pallasmaa explores the design of multisensory space that supports users to be grounded in time and space, enabling them to connect with their existence, with a richer more affective architectural experience, and with the wider environment within which the architecture is situated. As an architecture student I'm invested in the idea of making powerful affective space, but this project also has a deeper resonance with its origin in the experience of my visually impaired father. In the following research I explore directions for a haptic and experiential architecture that affirms and creates celebratory experiences for the visually impaired.

Chapters

Chapter one of this thesis explores key contexts behind the research, addressing multisensory design and sensorial experience in architecture. The architectural experience and challenges of the sight-impaired are disclosed here to help direct the design intentions. Relevant case studies are described here again as a foundation for the subsequent design project.

Chapter two, methodology, discusses the design-led methodology. It describes attendant methods, addressing the series of makings, drawings and interventions undertaken to progress a haptic design that engages our bodies and sensory perceptions. Precedents which share similar methodologies are discussed.

The final third chapter addresses the design itself. It explores the answers to the research question by walking through each of the design steps from initial design, concept design, developed design, to the detailed and final design. Design development progress throughout the year is recorded here, along with significant design decisions undertaken. In this chapter, each of the sensory design elements incorporated in the design are discussed especially in relation to how they answer the research questions. The exegesis concludes by summarising the findings and discussing the potential of this design research for architecture as a discipline.

CHAPTER 1

DESIGN CONTEXT

Introduction

As humans live and experience their surroundings, the senses are constantly engaged. Through the body, we interact with environmental sensations and sensory elements to perceive their environment. Academic James J. Gibson describes how human senses convey information about our surrounding environment (Gibson, 1966). Academic and architect Juhani Pallasmaa (2005) emphasises the centrality of the haptic or sensory to architecture as he discusses how our bodies and movements are constantly engaging and interacting with the world to gain information, direction and experience. One could argue that human senses are the gateway to perception of the physical world. Without our senses we would be unable to perceive the wider environment within which we exist. Architecture has a powerful capacity to bring the hapticity, materiality, the matter of that wider world into presence through its sequencing of space, light, material, sensation, affect.

Pallasmaa (2005) describes how a walk through a forest can elicit a healing response due to sensorial interaction, disclosing how sensorial experience can influence one's experience and mood. For those with sight impairment such haptic environments may register even more strongly as non-scopic senses are necessarily enhanced. This research aims to explore how the incorporation of sensory elements into architecture might improve and affect the experience or wellbeing for sighted and sight-impaired people, and non-human entities alike.

This chapter explores contexts for this design research. Part one of the chapter covers some key critical texts that set up the context for the project by discussing different readings based on human senses, space, and perception. Part two of the chapter discusses existing projects that incorporate sensory design in architecture, delving into what kind of methods and designs were used to engage with senses to improve the quality of experience for a variety of users. Finally, part three addresses the site located for the project as a key foundation for sensory architecture.

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Part One - Critical Texts

The Eyes of the Skin: Architecture and the Senses

Architect Juhani Pallasmaa's seminal text *The Eyes of the Skin: Architecture and the Senses* (2005) delves into the world of sensorial architecture and its importance and potential for the discipline. The author emphasizes the potential of a multisensory space to provide a deeper connection and sense of being so that users can be better grounded within the world and the moment.

Pallasmaa (2005) posits that architecture is the primary instrument which helps humans to connect with space and time, relating to the human existence. However, the current trend of architecture mainly prioritizes vision and ocular senses, resulting in alienation and detachment of its users from the space (Pallasmaa, 2005). The author described it as not "facilitating human rootedness in the world", and criticized the ocular sensory dominated style, stating "The dominance of the eye and the suppression of the other senses tends to push us into detachment, isolation and exteriority..." (Pallasmaa, 2005, p. 19). In comparison, an architecture design which considers all the human senses can connect its users with the space in full richness of experience, and their sense of being (Pallasmaa, 2005). Such a design approach keeps inhabitants rooted in the space, creating dreams, memories, imagination, and existence. Pallasmaa spoke of how architectural experience is multi-sensory, a dense interfacing of different haptic, spatial, and sensory conditions that constantly interact and influence each other. The concept of the human body being connected to the world through the senses applies for architecture, where spaces are designed to constantly give information to its users. Through human senses, the users of buildings measure sensation, turning haptic information and effect into experience and memory. The deep capacity and essence of architecture is this hapticity and sensorial complexity and power.

Figure 2. Collage including including Michelangelo's Creation of Adam, from the ceiling of the Sistine Chapel, Rome, 1508-1512, fresco (Italian Renaissance, 2012) by Jemma Rose Baldwin.

Pallasmaa describes how the different senses can work spatially. The sense of hearing constructs the extents and scope of space, the reflectivity or absorptive nature of material (Pallasmaa, 2005). Scent and smell can invoke powerful memories of the past. Pallasmaa writes of his own experience, his vivid memory of the scent of home in his grandfather's farmhouse. Our skin is capable of reading space through touch, as it gathers information on the texture, weight, density and temperature of matter (Pallasmaa, 2005). Small design elements such as doorhandles can provide a memorable tactile experience, as doorhandles that became shiny through the use of thousands of people can attract the user's hands to stroke (Pallasmaa, 2005). Also, the skin traces temperatures, such as the warmth of a sunlit spot, or the coolness of a shadowed space under a tree, turning spaces into experience (Pallasmaa, 2005).

Poetically and radically, Pallasmaa (2005) concludes that architectural experience does not consist of only retinal images, but rather sensorial encounters, experiences, and interactions which create further layers of memory and affect those layers into the architectural experience, and enable recognition, connection and remembrance of our existence within the world. Pallasmaa encourages us to consider the design of spaces through a haptic filter. He emphasises the importance of research into this field to enhance and expand the affective and beneficial capacity of architecture.

Senses of place: Architectural design for the multisensory mind

An article exploring multisensory architecture by academic Charles Spence (2020) also explores the effects of architecture on users and the importance of sensory design in influencing emotions, experiences, behaviours and health and wellbeing. Spence advocates for incorporation of sensory and haptic components into designs to provide more engaging architecture. He draws attention to the impact of a scopic architecture which lacks multisensory elements, suggesting that sick-building syndrome (SBS), noise pollution, and seasonal affective disorder (SAD) are all potentially triggered or made worse by such reductive built environments (Spence, 2020).

For example, certain uses of sound can elicit specific emotions and behaviours. Spence's (2020) research finds that use of nature's sounds such as the sound of running water, can result in the emotion of relief to listeners, compared to those who are listening to nothing or industrial noises. The tactile element, which is often ignored in architecture, is described as the first point of physical contact with a building by the users, emphasizing its significance (Spence, 2020). In addition, elements like the tactility of the floors, and handrails can give a sense of tactility. Tactility is important in engaging with the user's experience as it evokes different imaginations on the physical feeling of the building materials (Spence, 2020). The sense of tactility is described as fundamental to the multisensory experience in architecture, whether the materials are directly touched or not (Spence, 2020). The research elaborates the positive impact of scent in affecting people's moods, therefore experience within a space. The author gives an example showcasing some examples such as a healing garden filled with flowers and plants that are placed to provide a restorative effect from their smell. Flowers like lavenders have been found to be used in aromatherapy, leading to reduced stress, better sleep and improved healing in some cases (Spence, 2020). Scents can also evoke certain emotions, with research demonstrating how people are usually familiar with the scent of their own home, providing emotions of warmth and comfort, when to others it will only feel like a normal building odour (Dalton & Wysocki, 1996, & McCooey, 2008, as cited in Spence, 2020). Such examples show how different sensory cues in an environment can result in eliciting different moods, emotions, and therefore experiences to users.

The author showcases the importance of multisensory congruency as well, explaining

how different sensory designs must be congruent to be pleasant for users so that they do not lead to sensory overload, and how multiple senses can result in engagement of another sense (Spence, 2020). For example, warm hued lights can elicit a feeling of warmer temperature than cooler shaded lighting. This highlights that the visual sense should also be carefully considered and incorporated to maximise sensory engagement to users.

This article further elaborates the evidence of multisensory design in providing an architectural space that is more engaging to users. The research conducted by the author lays out clear benefits of the incorporation of multiple sensory elements in designs that go beyond just sight. The findings about multisensory congruency, and behavioural and emotional responses of people from engagement with different senses provide insights that can be used for this project's design as they laid out how each of the senses can be engaged with through environmental cues and that no element should be implemented in exaggeration to ensure that it does not cause sensory overload.

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Figure 3. Ira Keller Fountain, Portland OR by Charles Birnbaum

The spatial experience of visually impaired and blind: An approach to understanding the importance of multisensory perception

An article written by academics Dina Bakir, Yasser Mansour, Shaimaa Kamel, Yasser Moustafa, and Marwa H. Khalil (2022) analyse how the visually impaired and blind rely on senses other than sight to experience a space (Bakir et al., 2022).

A series of interviews and experimentation provide material for analysis and direction for the development of different design strategies that support the visually impaired and blind to navigate and position themselves within a space and experience it to the fullest using their senses (Bakir et al., 2022). Different sensorial strategies were explored for their capacity to support orientation. For example, a sound echoing throughout a space assisted in the perception of the space's volumetric configuration for a visually impaired participant in the study, helping him to navigate himself (Bakir et al., 2022). Other sensory elements like the smell of a space had similar orienting effects in addition to providing a pleasant experience (Bakir et al., 2022). The different sensations of touch from different building materials, or the sensory experience from natural elements such as warmth of the sunlight or a cooling breeze were evidenced to help visually impaired participants to not only navigate themselves in space, but also identify nearby obstacles, and reach a deeper experience from the sensory benefits and positive affect of the haptic elements (Bakir et al., 2022). Design elements like having different floor patterns near obstacles were specifically found to be useful in avoiding dangers, with some participants also feeling a sense of happiness stepping on different flooring materials with bare feet (Bakir et al., 2022). Natural elements such as the sun, wind/air, and smell of vegetation were also found to provide not only orientation within the space, but also to enrich multisensory experience more widely as participants projected beautiful mental images from non-scopic sensory inputs (Bakir et al., 2022). Further, such inputs provided information on time of the day, season, or the nature of the environment they were within. Through enhancing the sensory experience of visually impaired individuals,

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Figure 4. Library for the blind, by Andra Perenznieto

the authors state that sensory design strategies could significantly help to improve the spatial and affective experience for both sighted and blind individuals by stimulating different human senses, not just sight (Bakir et al., 2022).

In terms of learnings for this design-research project, a range of strategies to enhance multisensory experience were disclosed in the research. Design elements considering natural elements such as the placement of windows was shown to be very important to the affective experience of the space. Designing for sunlight and breeze, which can also then incorporate the scent of nearby greenery were found to be viable strategies to incorporate for this project. Further, tactile elements incorporated into the building skin can not only help to create a visually engaging design, but can communicate to users, enabling wayfaring and orientation. As noted above, for some users this haptic approach – a line of paving in the floor, a sensory strip on a wall, translated to a sense of joy or affective pleasure, bringing a further depth to the experience of this more haptic architecture.

Our natural world is full of sensory elements. Academics Phoebe R. Bently and her colleagues note that engagement with nature is a multisensory experience. For example, a dense treescape creates multiple sounds that are pleasant to our ears, such as the rustling noise of leaves in a breeze, the clacking of branches in a windstorm, or the songs of the birds that reside in the trees. Further, the plant-life within the natural environment gives off a grassy, earthy smell. Sensing nature in this way can help people to feel peace and calm, improving their well-being (Bently et al., 2022). Research conducted by academics Lara Franco, Danielle Shanahan, and Richard Fuller (2017) also found that natural odours from blooming plants in a fragrant garden can improve mood and promote calmness. Such multisensory elements related to nature can bring an enrichment of experience and improve the wellbeing of users. The architectural potential here is to design with respect to the sensory cues of nature such that the architectural structure becomes a sounding box for bird song and wind, or a sensory space in which to feel the breeze from the sea on a hot day, or an aromatherapy space filled with the perfume of flowers, green space or growing earth.

Academic Hendrik Schifferstein stated that being aware of the specific meanings and experiences communicated by sensory stimulation leads to more success for those trying to design a specific experience for people (Schifferstein, 2011). From this note, I also visualised my own experiences with sensory design, and what makes a space memorable and personal to me. It was always the spaces that engage with more of my senses. A space only filled with bland concrete walls was memorable to me due to the warm, comforting smell of old furniture and sound of children's laughter. Remembering experiences like these helped me to gain a clearer direction on what kind of space I wanted to design, and how to answer the research question.

Part Two - Case Studies

There are many different ways to incorporate or create haptic environments. I explore here three examples of buildings that incorporate the sensorial. Each has impacted my design thinking and inflect my final design project. The first project I explore is situated in South Korea, the second in India, while the last project is sited in the United States, with each of the examples containing design elements that engage with the senses.

Audeum

Audeum by Kengo Kuma & Associates is located in Seoul/Gangnam South Korea. The Audeum is a museum of sound which emphasizes the use of sensory design, especially the sense of hearing (Abdel, 2024). It is a space where users can experience a sensory world, enriched with manipulation of sound, wind, light fragrance, engaging with the human senses other than just sight (Abdel, 2024). The architect Kengo Kuma designed the space so that sound can be experienced firsthand, creating an architectural instrument that allows its users to return to their most natural state, experiencing the five senses (Peacock, 2024). The architect achieves this by using a number of sensory designs. The façade is formed of aluminium pipes in overlapping layers over a glass skin which creates a pattern of light and shadow inside, mimicking patterns of shadow in a forest (Peacock, 2024). At the same time, the random arrangement of the pipes emphasizes the randomness that exists in the natural environment. The interior of the building is formed of timber, which contrasts with the hard exterior aluminium façade (Abdel, 2024). These interior spaces are enriched with the scent of the wooden material, and are designed with acoustics in mind (STIRworld, 2024; Peacock, 2024). The architect also manipulates the space to enhance the immersive experience, by incorporating darker interiors in certain spaces to maximise the sound echoes and immersive experiences (STIRworld, 2024). Fabrics are used to create an enfolding structure over the exhibit to soften light and sound (STIRworld, 2024).

The connecting spaces are laid out in a coherent way so that the visitors are led from one to another, smoothly transitioning from one sensory space to the next (STIRworld, 2024). This also creates sensory congruency where the senses engaged are not overlapping each other causing overstimulation. The careful consideration of the design elements' arrangement and orientation, combined with the design strategies themselves, informs my design project as it lays out a clear example and method for creating an affective multisensory architecture.

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Figure 5. Audeum (Audio museum), by Kengo Kuma and associates.

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Figure 6. Audeum (Audio museum), by Kengo Kuma and associates.

School for blind and visually impaired children

The second case study is the school for blind and visually impaired children by SEAlab, located in Gandhinagar, India. The school is designed for children who are from nearby remote villages to provide better education and future opportunities (Abdel, 2022). As eight out of ten thousand students suffer from visual impairment or full blindness, the architects wanted to create an educational space for their future (Lertwicha, 2022). The architects wanted to focus on how students could navigate through the school and experience the space through senses (Lertwicha, 2022). Several sensory design features were used to achieve this. Firstly, the architecture manipulates the sense of sight. Many sight impaired students can still distinguish high contrast spaces with light and shadow (Abdel, 2022). Consequently, openings and skylights were installed in specific places to manipulate light and shadow, creating spaces with high contrasting visuals between light and dark making it easy for the children to observe and distinguish these spaces (Abdel, 2022). Contrasting colours on doors, furniture and boards were also used for similar effect.

Sound was the second haptic strategy utilised in this design. The school was designed to engage with sound, achieved by maximising echoes in the corridors and rooms (Abdel, 2022). Walkways were designed to have different heights ranging from 3.66 to 2.26 meters with differing widths as well to produce different types of echoes and sounds in each spatial programme (Lertwicha, 2022). This not only helps the students to have an enriched sensory experience but also to orient themselves in the space. Thirdly, the architects used natural elements such as aromatic plants to engage with the sense of smell (Abdel, 2022). These aromatic herbs are placed between classrooms and walkways with unique plants in each of them, giving each of the rooms a unique sense of space so that the students can easily differentiate them (Lertwicha, 2022). Finally, different materials and textures were used on the floors and walls, utilizing both smooth and rough textures to engage with the sense of touch (Abdel, 2022). Rough stones were used to mark entrances to different rooms to guide the students with visual impairments, and five different wall plaster textures were incorporated with longer sides having horizontal textures and shorter sides having vertical textures (Abdel, 2022). This allowed students to identify which side of the corridor they were touching. In the process of design, 3D printed models showing touch-interactive floorplans were used to help the visually impaired students to gain a sense of the design before it was built (Abdel, 2022). The clarity and power of the haptic strategies employed in this project situates this as a key design precedent.

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Figure 7. School for blind and visually impaired children by Dhruvad Shukla

Manitoga house

The last case study is Russell Wright's Manitoga house, located in Hudson Valley, New York. The designer built the house by transforming the site of an abandoned quarry, located in the beautiful Hudson valley into a living space inspired by artistic principles and appreciation of nature (Cabasin, 2024). The design is embedded and integrated into the surrounding environment, making it seem like the house is part of the environment itself. The house is composed of natural materials such as stone and wood, seemingly becoming part of the site. A natural pond is used as a pool (Cabasin, 2024).

The house is a simple glass skin with timber frames and a green roof. The surrounding site has been carefully designed and tended into a landscape of boulders, trees, and walking trails for family and guests (Cabasin, 2024). Exterior and interior blend using highly transparent boundaries (glazed walls) and natural materials such as the contrasting wood grains. They are used for walls in the hallway that create a mix of visual pattern and tactility (Menking, 2018). Wright sought to use materials from the local site (Menking, 2018). Hence local stone is used for flooring and steps, tree trunks are utilised as structure, and iron doorhandles are repurposed from the quarry (Cabasin, 2024).

Key tactile interfaces are differentiated. Different doorhandles and fixtures were used for every room of the house, such as one made from a rock fitted into a brass fitting (Menking, 2018). Materials like birch bark was used as a covering of specific doors, creating yet another variation in tactility, engaging with the sense of touch along with different doorhandle designs (Menking, 2018). While the case study is not primarily focused on creating multisensory design, it naturally engages with it. As Pallasmaa (2005) notes, doorhandles are the handshake of the house, and this case study has designed for unique doorhandles that provide different handshakes to the users. The seamless blend of the interior to the nature filled exterior allows the users to be engaged in the sensorial world of nature, enriching in the senses of smell, sight, and hearing of the dense nature. A variety of materials used for walls, floors and door covers provide a range of tactility to the bare skin of the users. This project works as a design precedent as it provides an example of finely detailed sensory design elements that are closely connected to the local environment.

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Figure 8. The Hudson Valley's Manitoga / The Russel Wright design centre by Vivian Linares

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Figure 9. Russel Wright's renovated Manitoga shines with hand-crafted details by Menking.

Figure 10. Russel Wright's renovated Manitoga shines with hand-crafted details by Menking.

Part Two – Site

The site for the project is in 414 Titirangi Road, Titirangi, a small urban cluster in the western ranges of Tāmaki Makaurau Auckland. The site is situated at the edge of the village, with an expansive view to the Manukau harbour and the lush vegetation of the Waitākere ranges. The village has cafes, a refillery, art galleries, and a nearby school, public library and community centre.

The site has a strong dominant south-westerly wind. The average wind speed records 19.67kmh, which is considerably stronger than Auckland (Weather and Climate, n.d.). Data gathered from Weather and Climate (n.d.) shows that the annual rainfall records around 122.56mm, which is 5mm more than Auckland, with the wettest month being June. Data also shows that it has more wet days than Auckland. The shortest sun hours were recorded as 8.93 hours in June, with the longest being 12.96 in December. In contrast with Auckland, Titirangi has slightly more sun hours on average.

Titirangi is part of the Waitākere ranges, thus they share the biodiversity and species. Te Wao Uni a Teiriwa (n.d.) showcases some iconic species that are present in the area, including kererū, Wētā, miromiro, mokopirirakau, pepeketua, and more. According to Griffiths et al, (2023), some of the trees that are present in this area are a range of native flora such as Kauri, Nīkau, Pōhutukawa, Mānuka, and Rimu, with Kauri and Nīkau being some of the most abundant. Rats, possums and climate issues are listed as main pests/ threats. For bird species, there are species such as tauhou, tūī, kererū, and pūkeko residing, with tauhou and tūī being some of the most abundant (Griffiths et al., 2023).

In terms of sensory affect, despite being adjacent to a bustling public space, the sounds and other conditions of the site register strongly. Birds sing, leaves rustle in a breeze that comes up the hill from the sea. The tang of sea salt is in the wind, but what registers most strongly is the scent of dense greenery. Perhaps because of its elevation and the cooling effect of the dense treescape, the air is crisp and refreshing. In the shadow of the trees I find myself pausing, taking a deeper breath, my heart rate slowing.

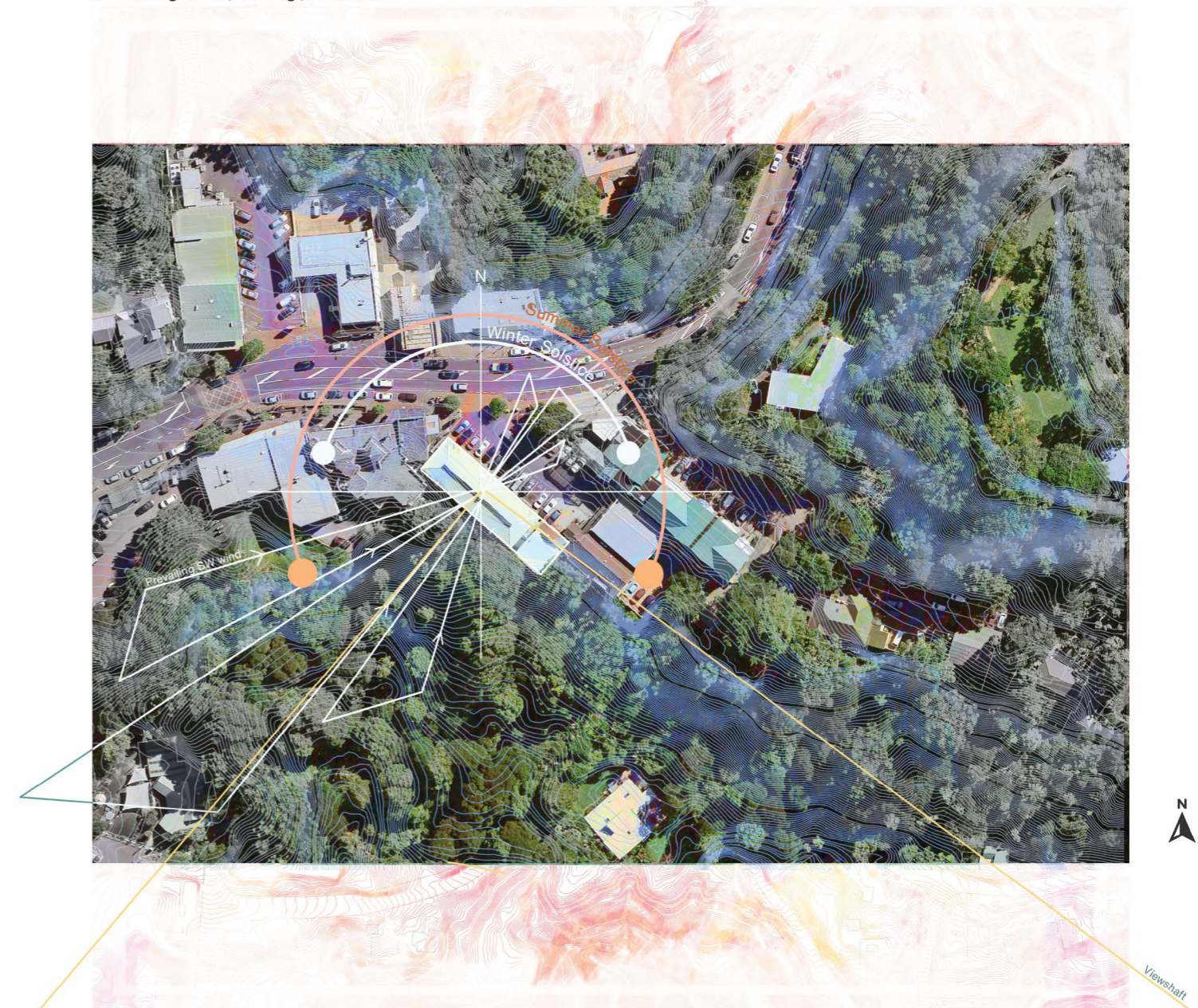
One factor to note is Titirangi Road, which brings in fast-travelling vehicles, producing unwanted noise and smell from the cars and petrol. To combat this, a strategy is necessary.

In reviewing a range of key design contexts this chapter has situated and grounded subsequent design explorations. In the following chapter I describe the methodology that directs the design research.



Streetview of the Site

TITIRANGI
402 Titirangi Road, Titirangi, Auckland



Viewehaff



View towards Waitemata River

Figure 11. Titirangi Site analysis map

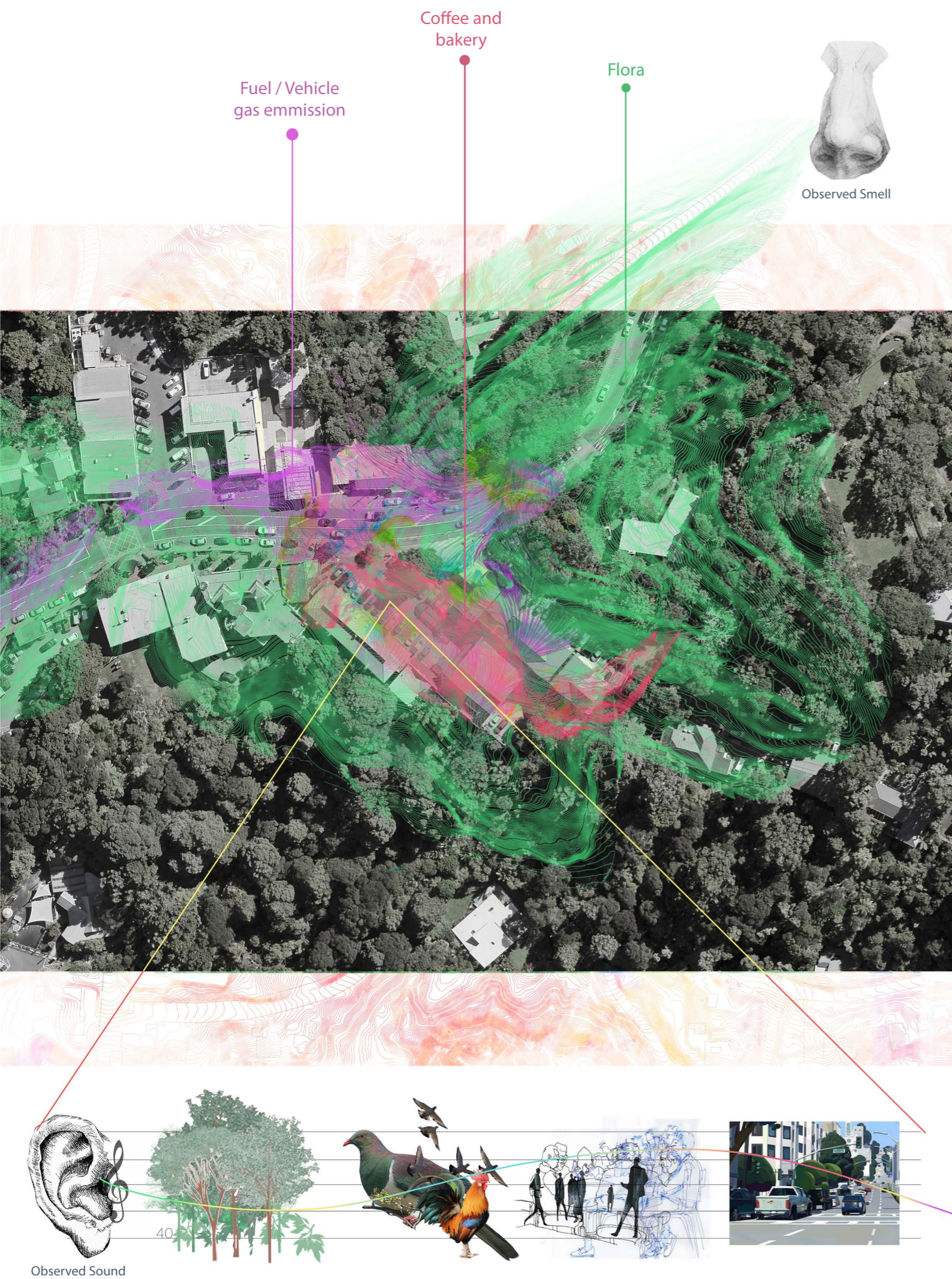


Figure 12. Site sensory analysis map

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Kererū

Matuku/Bittern

Mokopirirakau/Forest gecko

Miromiro/
Tomtit

Pepeketua/
Hochstetter's frog

Mātātā/Fern
bird

Tūturiwhatu/
NZ Dotterel

Figure 13. Titirangi Species and ecology, by Te Wao Nui Wa Tiriwa



Figure 14. Titirangi site photographs.



CHAPTER 2 METHODOLOGY



Introduction

Chapter one introduced a variety of contexts for this design research. Chapter two of this thesis investigates the methodology and methods of this research project. It discusses the design-led methodology of the research and then explores how multisensory engagement is used as a framework to guide this research. Finally key methods used to drive the design process are discussed.

Part One - methodology

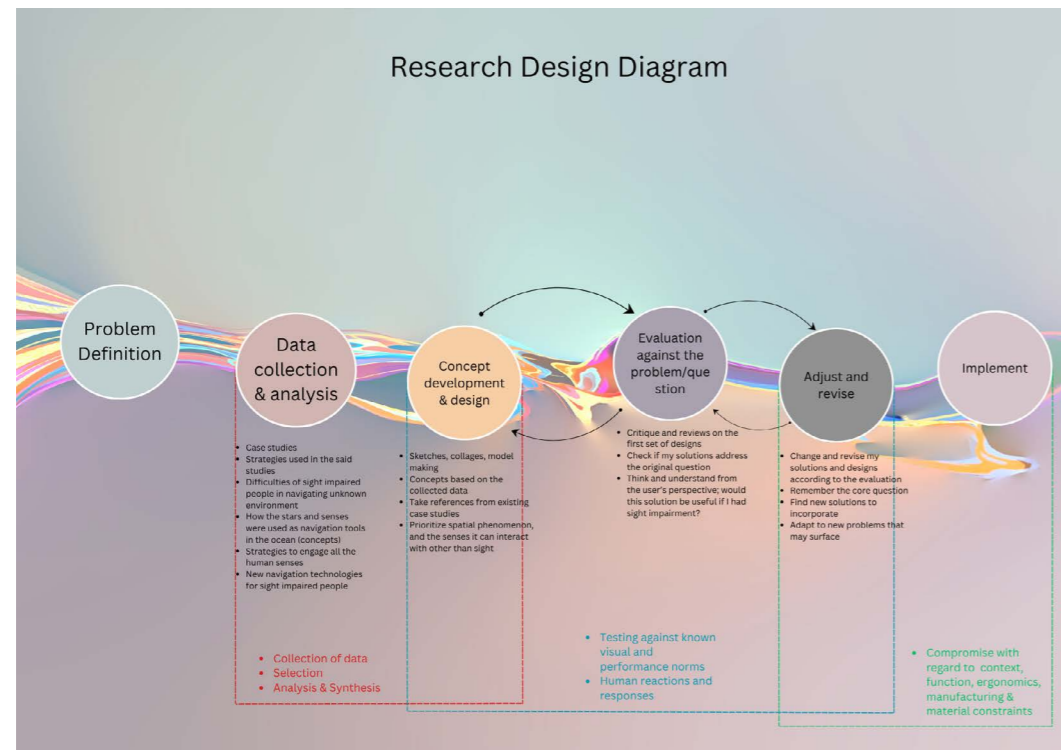


Figure 15. Research design diagram.

This research's methodology is design-led. The diagram above shows the general design methodology for this research. This involves the definition of a problem or opportunity; the collection of contextual materials and data, and analysis of sensorial theme and exemplars; concept development and design; evaluation against the problem and theoretical framework; revision; and implementation of the developed strategy.

The problem definition is the research question of this thesis which asks how sensory design can be implemented in architecture to enrich the experience and wellbeing of its users and communities. Collection of data and analysis is part one, which covers critical texts and exemplars about sensory design in architecture. Concept development and design is the beginning of design work, integrating the data collected into account. As the design progresses, evaluations are made against the original problem and theoretical framework which was developed to measure the effectiveness of the strategies. This framework is further discussed below. After feedback, revisions are made to the design. The process from concept development and design up to this point repeats until the final design is reached.

The design-led research model was based on a methodology for artists and designers developed by academics Carole Gray and Julian Malin. Gray and Malin note that methodologies for design can be highly personal and differ based on the designer's

workflow and this is the case here. The design approach is multi-sensory and so my methodology becomes one that advances exploration and proposition in multi-sensory design.

In the thesis, different methods have been undertaken to land the design-led multisensory methodology. To understand the theoretical context of the research a literature review was conducted exploring the theory of sensory design and reviewing sensory design case studies as real-life examples as key design research modalities, model-making and drawing were used to start the process of sensory design exploration. Models tested out tactile languages. Other forms of model explored different types of senses, such as smell and sound. Different conceptual models were made to engage with these elements, such as exploring model-making with the incorporation of herbs, leaves, and other materials to create a scent to explore the emotional impact of the incorporation of such sensory cues.

Part Two – Theoretical Design Framework for the Senses

With the design-led multisensory methodology in mind, a theoretical framework was developed to measure the level of sensory elements included in the design, defining a more specific methodology for the research. The sensory conditions that frame my design approaches are summarised as sight, sound, smell, touch, basic orientation and sight, all of these explored particularly in relation to environmental sensing and connection. My architectural design decisions are made in relation to this sensory framework.

The framework is a measuring system that weighs design elements developed in this project. It analyses each of the design elements that are integrated on whether they provide sensory engagement that lead to sensation, and result in enrichment of spatial experience. The scale begins with identification of which sense the design element interacts with and further identifies the intensity of perception and sensation as it gets closer to the centre of the circle. For example, a pathway filled with seashell pieces that lead to the main entrance provides a sensory engagement through haptic and hearing, as it physically engages with the feet, providing tactility and sound as the shells crunch under the feet. This allows the body to perceive the phenomena and therefore lead to sensation, ultimately resulting in a more vivid experience. In comparison, a flat concrete pathway only makes a dull sound when stepped on and does not provide much tactility. There is less sensory engagement as there are less phenomena, therefore leading to lower sensation and less vivid experience. Thus, the concrete pathway would not be a satisfactory strategy. Roy and Arora (2023) discuss perception in architecture stating that it is an interpretation and analysis of sensory stimulation through physical feeling leading to understanding their environment. They state, “On the foundation of sensory input, perception adds the subjective elements of time, thought, and memory”, (Roy & Arora, 2023, p. 1145), noting that perception helps the users to be grounded in the space.

The sensory framework for this research is intended to work in a similar way to academics Joy Monice Malnar and Frank Vodvarka’s sensory slider, as cited in sensory readings in architecture by Sheryl Boyle (2014). The slider assesses sensory elements in different sensory experiences, such as sight, sound, odour, and touch, as well as basic orientation (Malnar & Vodvarka, 2004, as cited in Boyle, 2014). They used the tool to assess existing buildings for their sensory elements, and as a design aid. My framework takes inspiration from this exemplar – it too assesses for sight, sound, smell and touch. This sensory design-based framework helps to guide the design research process, keeping it tightly connected to sensory effect, and the enhancement of sensory experience. The final chapter’s discussion of the project at the developed design stage is ordered by this sensory framework.

The framework aims to bring the sensory to the centre of the design process given the extent to which sensory experiences such as sound, smell, sight, and touch engage with human perception, evoking personal experiences, meaning, and imagination leading to the experience of space. This bridges the connection between the designed space and its surrounding environment (Soltani & Kirci, 2019). In respect to the sensory design, Pallasmaa (2005) notes that architecture means the constant interaction of different realms of sensory experience that infuse each other. To Pallasmaa, every engagement with architecture is multisensory. He notes how “...a walk through a forest or a Japanese garden is invigorating and healing because of the essential interaction of all sense modalities reinforcing each other; our sense of reality is thus strengthened and articulated... anyone who has become entranced by the sound of water drops in the darkness of a ruin can attest to the extraordinary capacity of the ear to carve a volume into the void of darkness. The space traced by the ear becomes a cavity sculpted in the interior of the mind” (Pallasmaa, 1994, p. 42-43). As described, sensorial elements in the surrounding environment can evoke vivid imagery and perception, leading to strong memories as observed through his writing. The description of the sensorial experience by Pallasmaa showcases how perception of the sensory interaction through the body results in a sensation, which forms a vivid spatial experience. The framework is based on this notion, beginning with the sensory element which engages with the body, forming perception. This perception leads to feeling sensation, and experience, forming meanings to the space. All this process accounts for the enrichment of spatial experience.

THEORETICAL FRAMEWORK

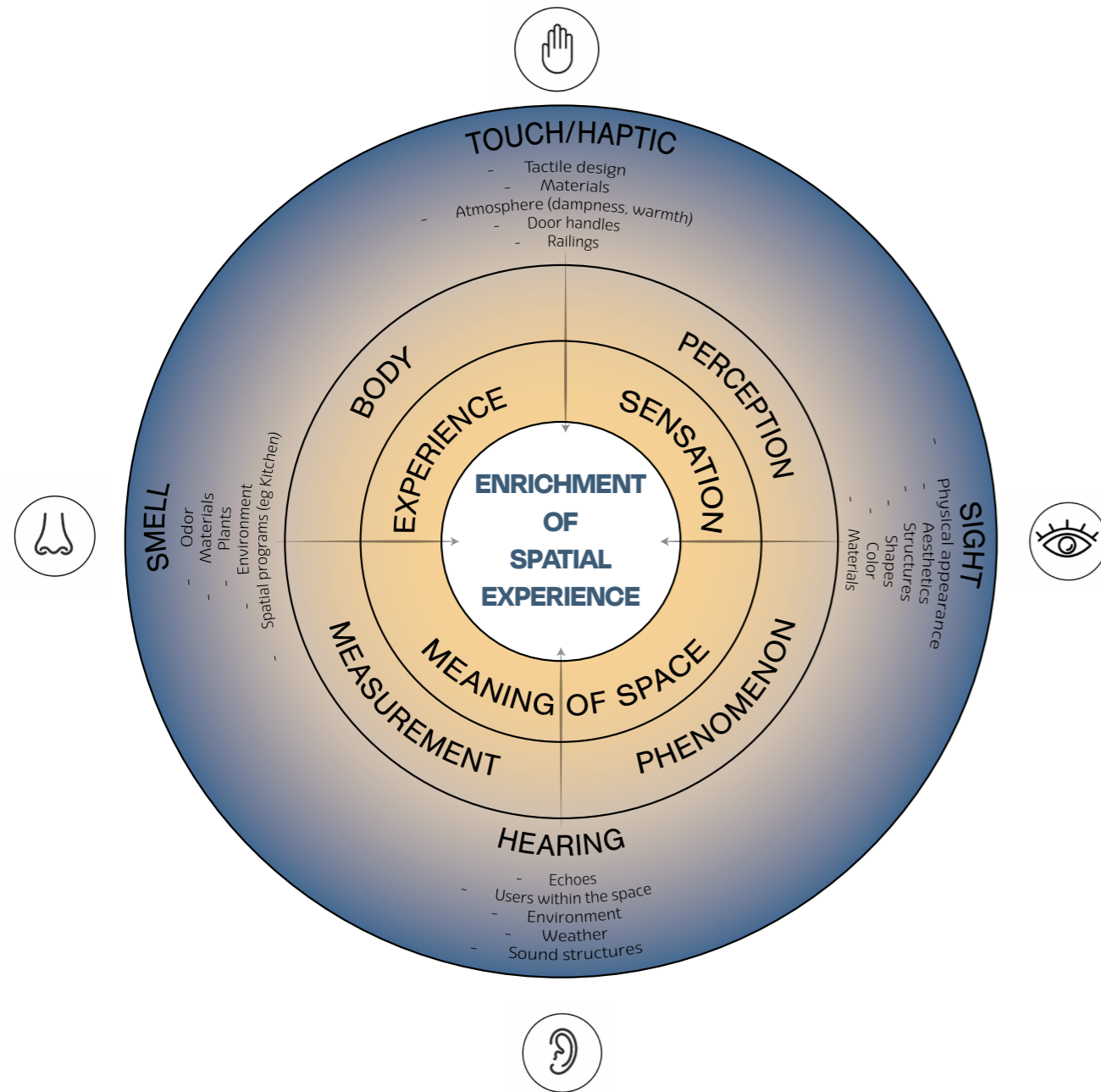


Figure 16. Theoretical framework diagram.

Multisensory Methods

As part of this research, I've searched for exemplars of tactile tools, methods or makings. One example is the artwork Finger gloves by Rebecca Horn. The work consists of a pair of prostheses that are like hands with five thin, rigid, and long fingers in each hand made of wood and fabric (Tate, n.d). The artwork performs just like a normal pair of gloves, where Rebecca puts them on and controls the long fingers like a normal glove as they are made of light materials. Through the artwork, she can feel, touch, and grasp the environment and objects around her. She notes that the lengthened fingers help her to feel the sense of touch more intensely as it enables her to grasp and sense the distance between herself and the objects (Tate, n.d). Horn was able to elicit a certain feeling by incorporating the sense of touch in her creative process. This precedent is useful to me for the way that it radically brings touch to the forefront through a constructed element.

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Figure 17. Finger gloves by Rebecca Horn.

Sensorial Drawing and Modelling Methods

Following the example of Rebecca Horn and Anne Patterson, my tactile and sensorial methods test out how to realise, foreground, amplify or enable different senses in space. Drawing was used to both map sensory and affective experience and to test out design strategies for sensorial space. Models or material tests were developed to engage different senses, such as touch, scent, and sound.

Model-making and drawing enabled the testing of ideas through iterations while the manifestation in the physical world allowed me to assess the explorations with my senses. Academic Matthew Mindrup notes that models help us to explore and connect theories into the real world (Mindrup, 2021). Models are an instrument that resides between imagination and reality. As I could touch, smell, and hear the model, it allowed me to observe whether the design element enriched my multisensory experience. For example, using different materials such as wood or plaster allowed me to test different tactilities and scents. Incorporating different herbal plants into models helped me to observe the effects of a pleasant smell. Collecting different materials and grouping them together into a mix gives an invitation to take a step on it to allow me to hear what sounds it produces. Model-making here became a rich ground for testing multisensory effects and exploring ideas through experimentation and exploration. Mindrup (2021) notes also that model-making enables the translation of theories into the real world through this testing process, a valuable effect for design-led research such as this. In the following Chapter I describe how this design-led methodology and sensorial methods approaches gave rise to a haptic sensing architecture.

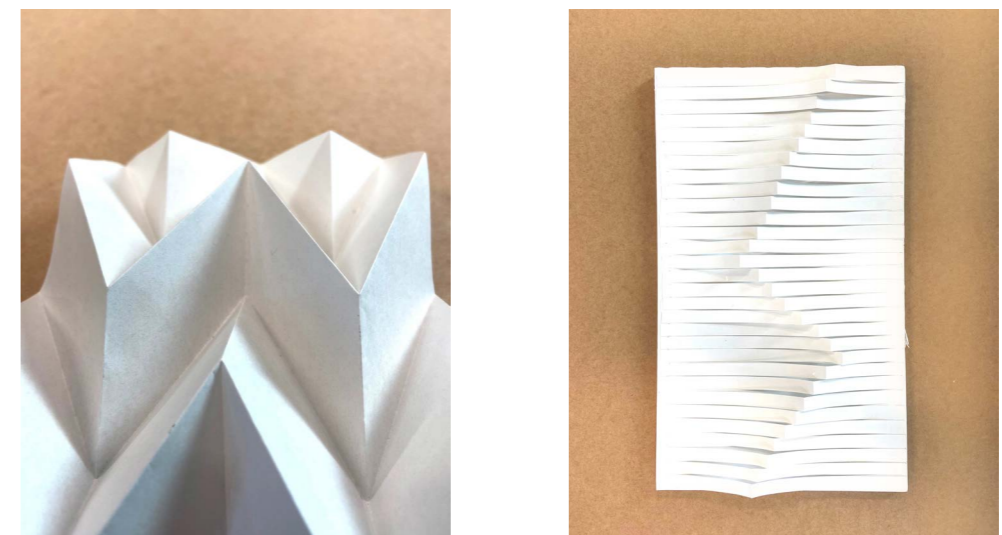


Figure 19. Sensorial modelling: Paper haptic exploration

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Figure 18. Pathless woods installation by Anne Patterson.

Another multisensory precedent that utilizes multisensory methodology is Anne Patterson's Pathless woods installation. The designer has synesthesia, which is a condition which allows her sensory perceptions to overlap, such as seeing colours when she hears sound (Choe, 2016). This has led the designer to create an installation space that produces rich and vivid multisensory experience exploring the synesthetic environment. In the installation, multiple colours of ribbons draped from the ceiling, creating a dense woodlands-like aesthetic full of vibrant colours, with videos of moving branches, rain, and flow of water are played in the background (Choe, 2016). Meanwhile, classical music can be heard in the space, with the scent of rainfall and pine enriching the room (Choe, 2016). This installation takes the visitors into a specific rich multisensory experience that the designer is trying to convey, which in this case is the synesthetic environment. Through the use of design elements of each sense, Patterson has achieved showcasing the multisensory experience to visitors. Such use of specific design elements used as a system to guide her final design matches with my research methodology, therefore it is a helpful example to learn from.

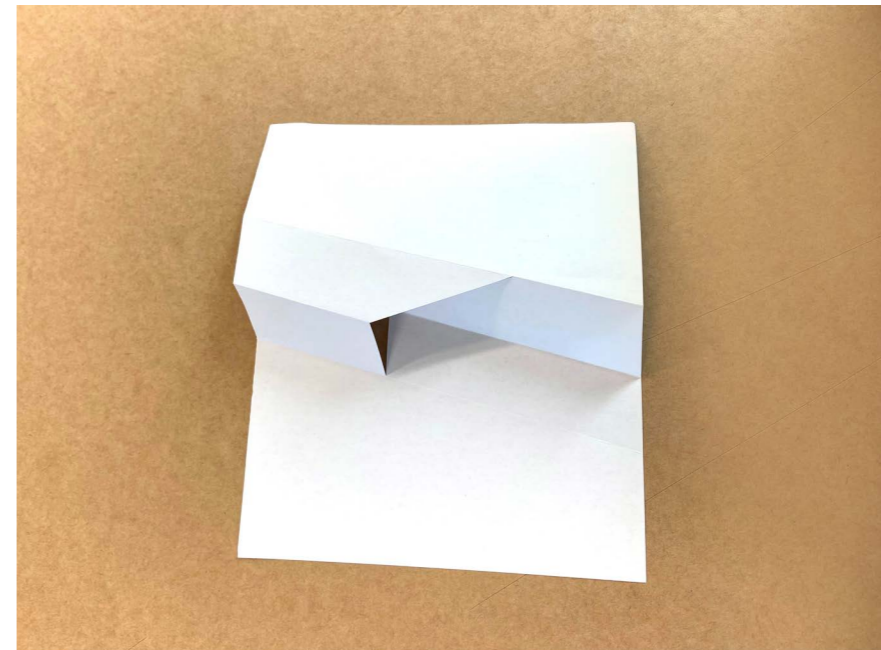
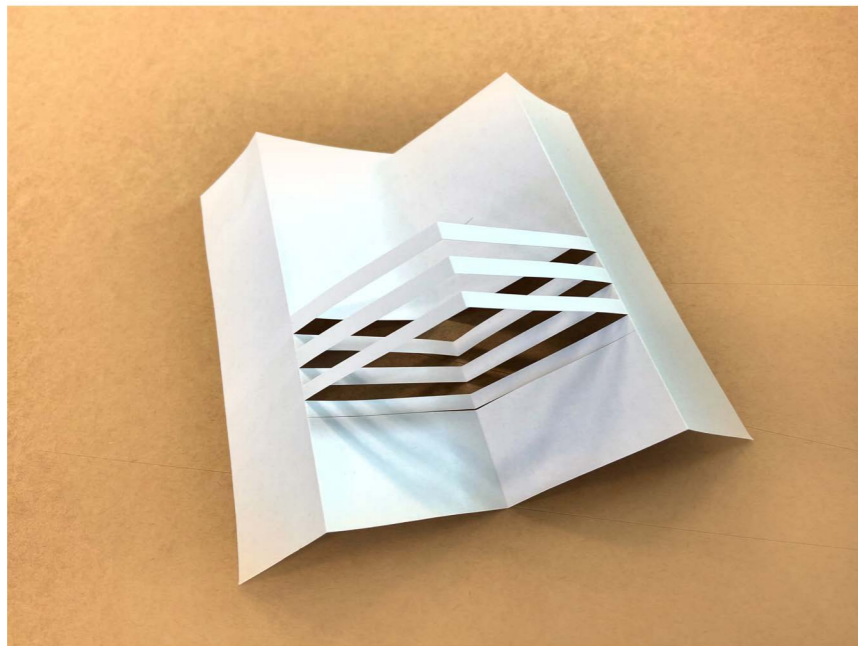
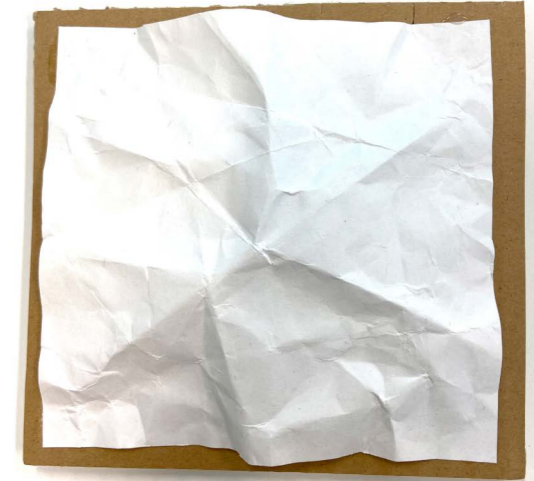
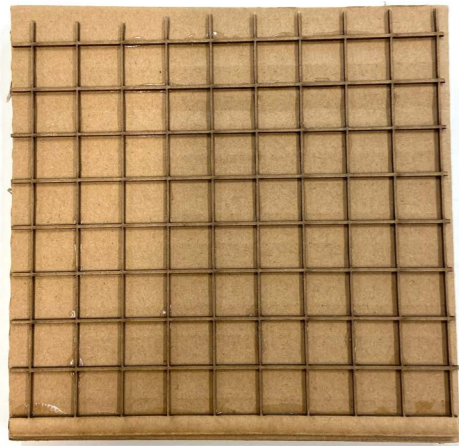


Figure 20. Sensorial modelling exploring haptic with variety of materials



Figure 21. Sensorial drawing and collaging of Titirangi site



Figure 22. Sensorial drawing and collaging of Titirangi site. around the bushes



With the photos taken from site visit, collages and drawings were made to map out the type of mood, emotional response, and atmosphere that I wanted to be present in the design.

Figure 23. Sensorial drawing and collaging of Titirangi



Figure 24. Drawing of observed sensory elements around the site



Chapter Three
Design

Introduction

In this chapter, research and methodology are brought together in a sequence of design explorations that explore how sensory design might amplify and enable a more affective and beneficent architecture. The chapter contains four parts. Part One describes a range of sensory tests using drawing and modelling as primary modalities. Part Two explores subsequent iterations of design at concept stage. Part Three showcases the project at developed design as sensory strategies begin to be tested in detail. Part Four delves into the final showcase of the project, describing what strategies were implemented.

Part One – Initial Design

Here I discuss initial methods for design development. These initial explorations aimed to test out different ways to achieve or map or express sensory conditions. To begin, I asked my father, who is sight impaired, to share his experience of visual impairment. I asked him to capture this visually and affectively by drawing his emotions while experiencing different environments. Since the research question was formed with his circumstance at core, I wanted to incorporate his emotions into the design. One drawing was about his feelings when going through an unfamiliar space, and the other about when he was in a familiar space.

My father's drawings showed his emotions experienced in different kinds of environments. In the drawing representing unfamiliar space, jagged lines showed sharp corners and represent his feelings of worry, sense of danger, unfamiliarity, anxiety, and difficulties when navigating through a space that he does not know well. The drawing where he is in a familiar environment, however, shows more curved visuals throughout the drawing, with lots of wavy lines and a sense of flow, trajectory and ease. He described being in a familiar environment as being present, having a sense of calm, tranquillity and ease. This is because in a familiar environment, he can navigate, move and live in a space much better than an unfamiliar one. From his answers and representations of his feelings, I concluded that I wanted to design a project that could evoke a sense of calmness and tranquillity, enriching one's experience through multisensory design. The design driver here became a focus on how to make spaces that flow easily, that are connected and distinguished and differentiated by sensory cues and haptic navigational strategies. Alongside this I sought to explore spaces that created feelings of ease, wellbeing or environmental connection.

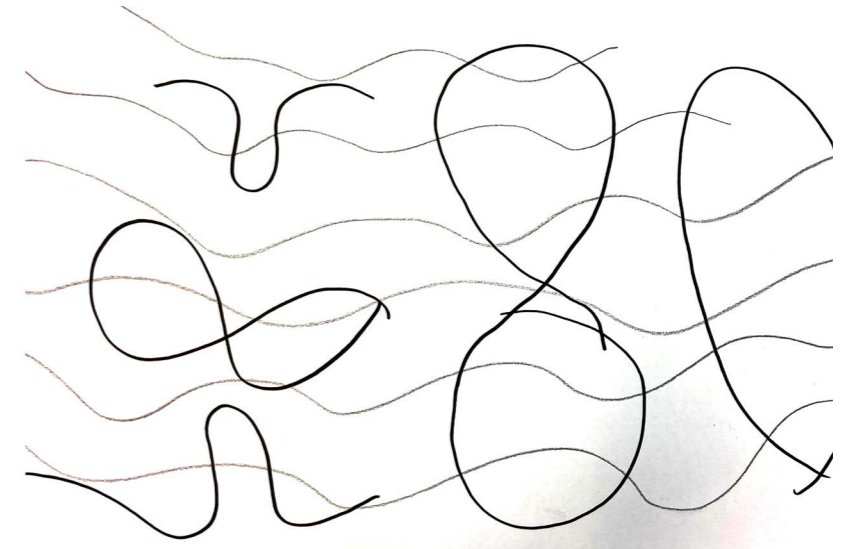


Figure 25. Dad's drawing when he is in a familiar environment.

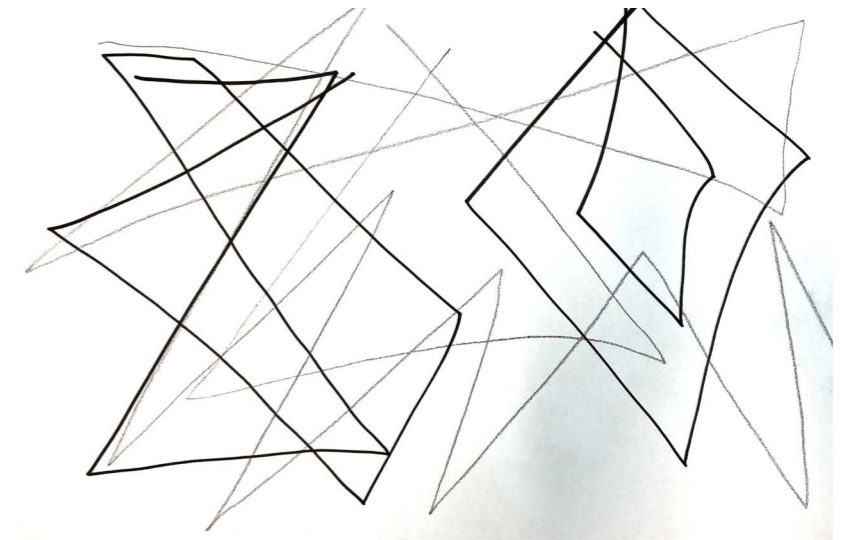


Figure 26. Dad's drawing when he is in an unfamiliar environment.

Based on these drawings, I began a series of initial models. The models attempted to spatialise the smooth, fluid, calming effect of Dad's drawings. Paper was used as a material that enabled fluid, textile-like folds and flows, that continued the fluid language of Dad's drawing. The models aimed at capturing a sensorial ease, a sense of motion or trajectory.

The outcomes offered a spatial approach that focused on forms that enabled trajectories of movement and flow, and floating or folding languages that captured a sense of ease, safety, fluidity.

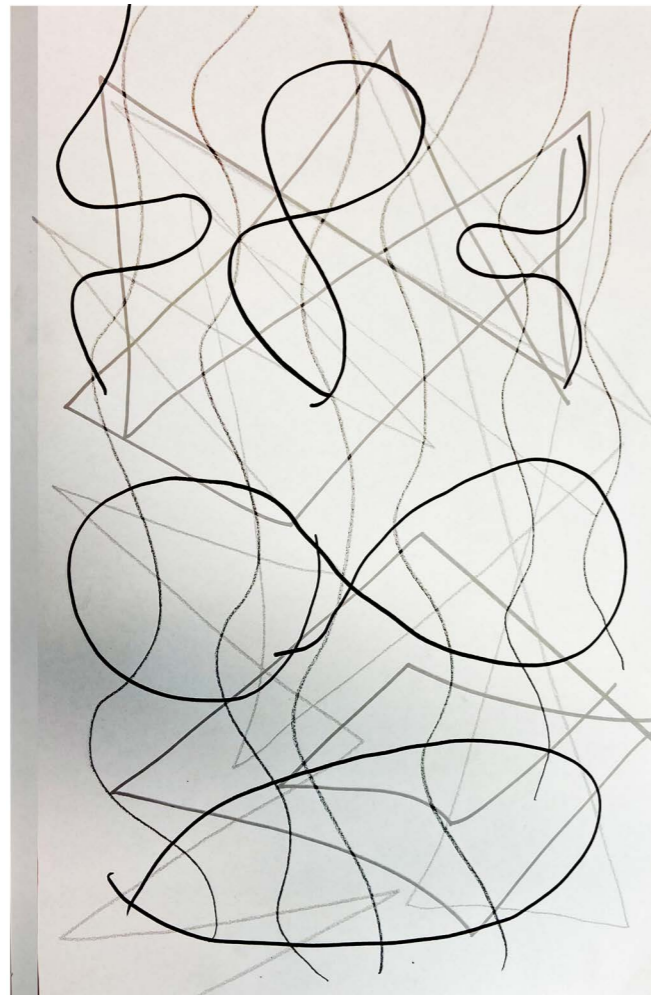


Figure 27. Combination of dad's artwork.



Figure 28. Flowing paper models.

At the same time, tactile experiments were initiated. Using a variety of different materials, methods and patterns, I generated a series of haptic tactile models which explored touch and pattern in a range of ways. The emphasis here was on how it feels to run one's fingers across textures. The intention was for this touch-based work to be developed at an architectural scale particularly at those 'handshake' points where the building and the person come into contact. Hence these models were developed with a consideration for how they might seed the development of sensory door handles, haptic balustrades, navigational floor or wall strips, or patterned floor or wall linings or claddings.



Figure 29. Bamboo wall, a tactile exploration.



Figure 30. Tactile wall with greenery.

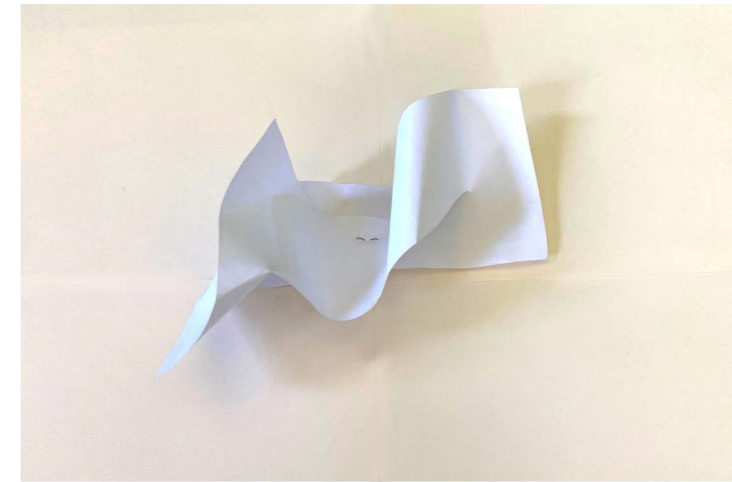


Figure 31. Paper tactile explorations.



Figure 32. Sensory concept drawing of sound.



Figure 33. Sensory concept drawing of smell.



Figure 34. Sensory concept drawing of touch/haptic.

Series of drawings were conducted, laying out ideas for sensory design elements. These drawings considered how I could achieve the sensory response. Ideas involving natural materials for the skin of the building, use of existing flora and aromatic plants, and utilizing the sound of local ecology and water were explored.

Figure 35. Collage of programs and sensory design elements.



A collage was made to showcase the different design elements that I wanted to incorporate in the design. It highlights a variety of sensory design strategies such as tactile walls and floors, sensory gardens with herbal plants for the sense of smell, and sound of birds flying through the dense greenery around the site. It also shows programmes of the design including having painting/sculpting workshops for both the sight impaired and non-sight impaired users. The sensory elements were influenced by the research and case studies discussed in Chapter one.

Part Two – Concept Design

Building upon the initial sensory tests the concept design phase explored design potentials for a four-story apartment building with a community centre that emphasizes and incorporates sensory design. The explorations focused on the sensory aspects of the site and programme.

The fluid, textile-like folds and flows of the initial paper models that continued the fluid language of my dad's sensory drawings suggested a spatial approach of trajectories of movement and flow, and floating or folding languages, all aiming to create that sense my father expressed of calm, ease, tranquillity. Through an iterative process of drawing the modelled forms and then modelling and redrawing, the initial explorations developed into a long linear architectural form (the apartment) with bounding corridors for easy movement and a sense of spatial fluidity, and a series of folding floating roofs over a roof garden.

Small sensory touch models explored in the initial phases of design were expanded at the concept stage to an architectural scale. Emphasis was particularly on those 'handshake' points, those moments of encounter where someone arrives at an entry, opens a door, holds onto a guard rail, or trails their fingers along a sensory navigational strip.



Figure 36. Form model of building concept.

Explorations for different types of door handles, balustrades, and wall linings were made in this stage, gathering different examples online, sketching, and model-making. Quick model-makings were done to experiment with the feeling of the shapes and materials.

The initial exploratory collage described in part one above tested out a range of sensory design strategies including touch-patterned walls and floors, aromatic gardens, and sound-box spaces that draw in environmental sounds from the exterior. Subsequently more collages were developed at a conceptual level to explore how other areas or spaces could have a sensorial aspect. One collage shows the living space, with tactile floors and sensory garden spaces open to the adjacent forest and resound with forest sounds and scents. Another collage showed the communal space, once again with tactile walls, formed of timber cutouts that are minimally processed, retaining their original shape to provide the sense of touch and to guide the sight impaired people. The programme in this collage shows an art workshop, an activity where the sight impaired people can also participate and enjoy. The exterior cladding is pictured as timber, chosen to integrate with the tree-rich environment of the surrounding site.



Figure 37. Early rooftop visualization.



Figure 38. Collages showing living areas (top) and community spaces showing program and tactility (bottom).

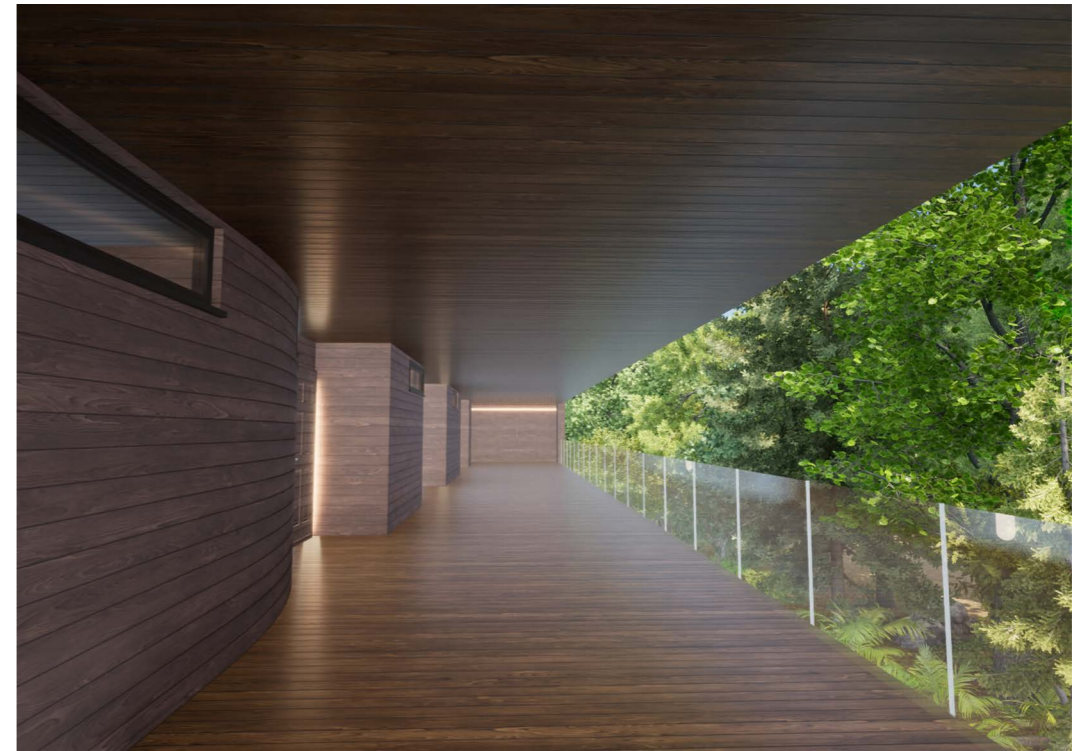


Figure 39. Early concept visualization of sensory corridor.

Further concept design development led to a significant change as the initial singular building became two. Initially the design comprised of a single building with corridors facing towards the south-west and the forest. With this, I wanted to capture the experience of users walking through the corridor, a transitional space, enriched with the forest's sensory elements. However, during the development, the design was changed to have two separate buildings next to each other, a smaller communal building and a larger residential building. The floorplan was changed so that the apartment living spaces could face towards the forest side instead of the connecting corridors, to give a richer sensory experience and affect to the living spaces. With this change, all living spaces were able to have windows and a nature-rich view.

Additionally, separating the building into two enabled the creation of a mediating outdoor space that gave an opportunity to incorporate a sensory garden filled with aromatic plants. The north-east side of the building faces away from the forest and toward the village. A long walkway extends along this aspect of the building and the main entrances to the building are here. Initial concepts were to have balconies that would face towards the bounding paths with different aromatic plants on the ground floor, enabling the residents to experience a rich scent of the plants and flowers, engaging with the sense of smell, and sound of the people walking through the footpaths composed of percussive materials such as pebbles or seashells.



Figure 40. Early explorations of floor plans, considering sensory corridor (bottom), and separated apartment layout (top and middle).

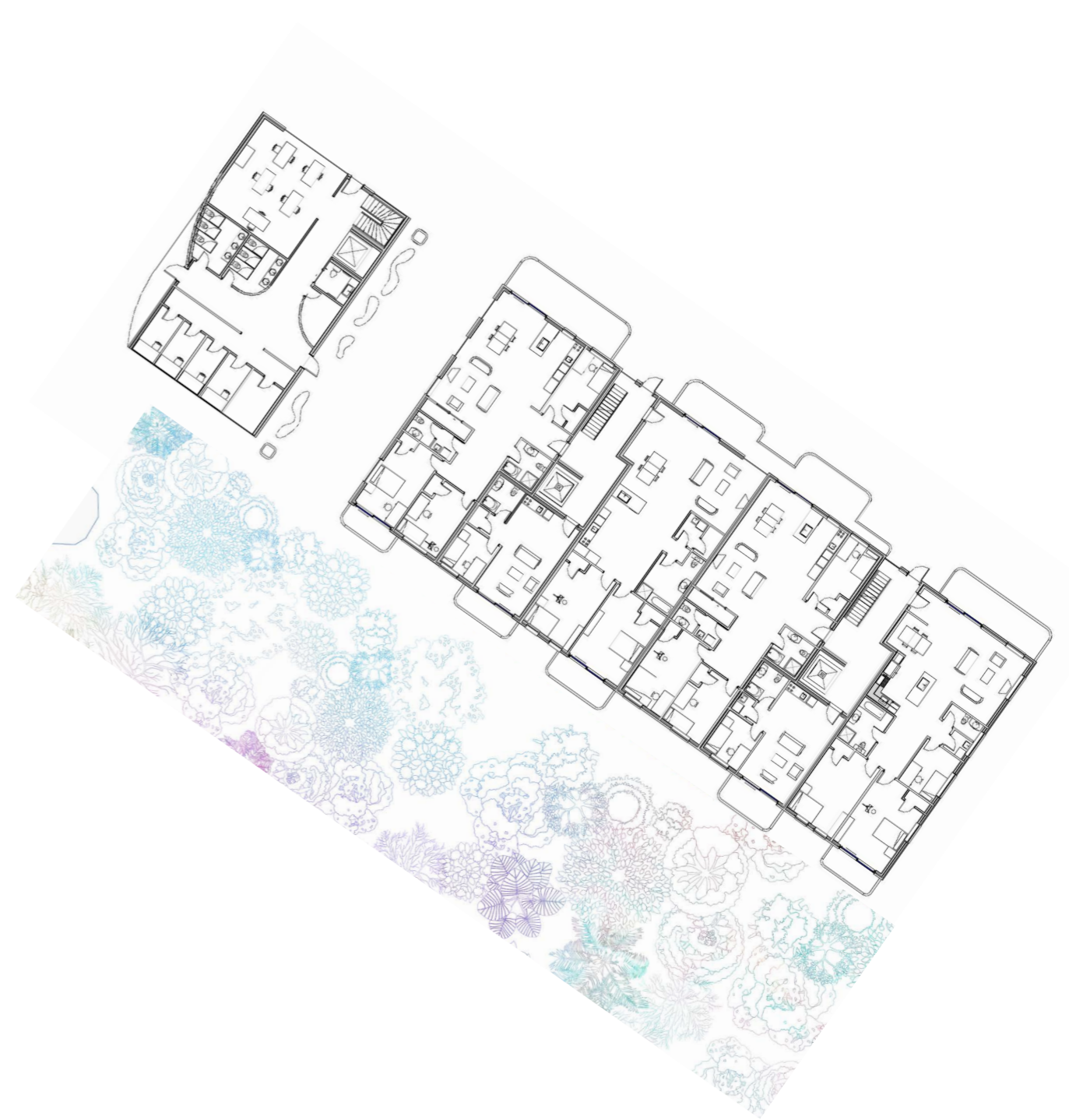


Figure 41. Further developed floor plan, incorporating separated apartment layout, sensory spaces towards forest, and sensory garden which separates the two building.

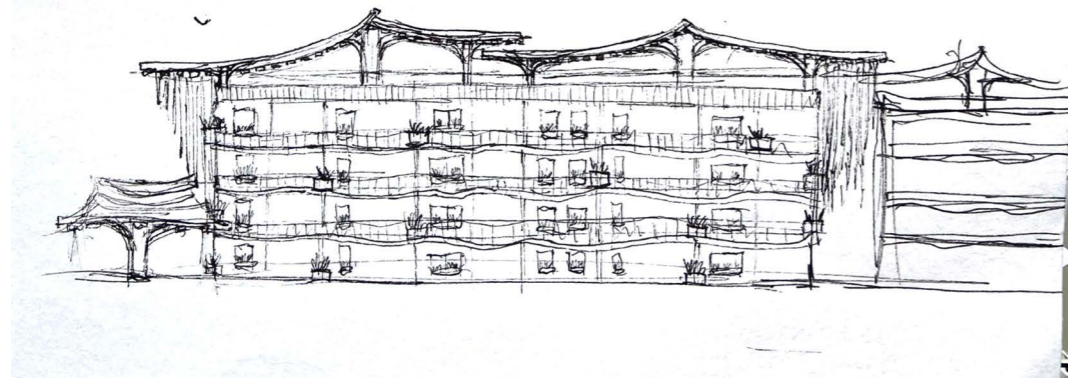
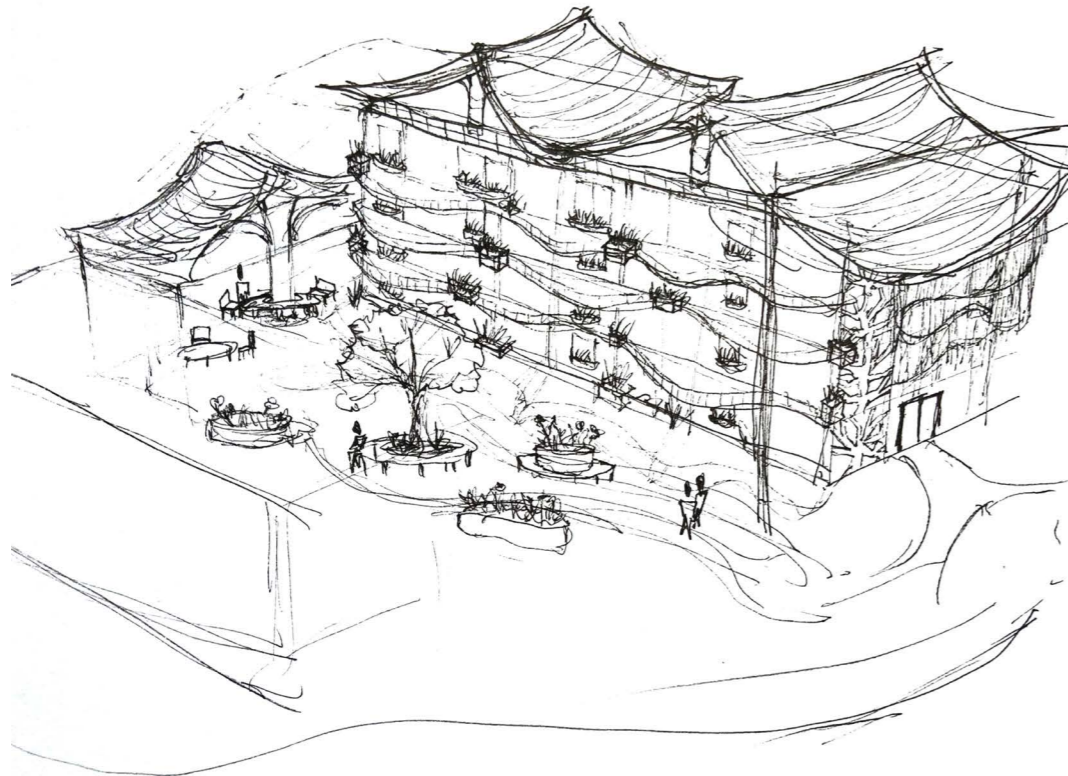


Figure 42. Drawing of the design thus far, showing hints of sensory gardens, roof and balcony design.



Figure 43. Early design visualization



Figure 44. Street view of the early design.

Part Three – Developed and Detail Design

This part discusses the developed design of the project progressed from the concept design stage, and specific sensory design strategies that are incorporated to answer the research question.

As the design progressed, I had the intention to mimic the sensory nature of the surrounding forest. Therefore, I have decided to integrate the sensory aspect of the site into the project itself, making the design to blend into the surrounding environment in both visual and experiential ways. The design applies the sense of touch/haptic, sound, smell and sight to improve the experience of the users as much as possible instead of relying purely on sight, because visual reception is only a small part of how people perceive the world.

Engaging with all the senses will help to enrich how the users experience a space. To measure the effectiveness of the sensory design strategies mentioned here, they are measured against the sensory theoretical framework introduced in part two, discussing the impact of the strategies on sensation and perception.

The theoretical framework compass developed during the methodology section has been applied throughout the design process to measure and compare different sensory design strategies. When initial designs were created, the compass was used to check how strongly the design provided sensation and experience. For example, concrete ground on the feet provides minimal sensations and a less vivid experience with little engaging phenomena or sensations perceived through contact. In comparison, a path full of seashells and gravel provides engaging sensation through multiple haptic registers as the sound and feel of the crunching shells are perceived. This provides a vivid experience through rich sensory elements, enriching the spatial experience. All the sensory design elements included in the design have been developed through this process, compared and measured to choose the designs that create stronger enrichment and experience.



Figure 45. Sensory experience visualization.

Touch/haptic

The sense of haptic/touch was incorporated into the design by incorporating tactile elements such as wall linings, handles, and designing for adequate airflow, sunlight and shadow. Tactile elements were implemented through use of different materials on walls and floors to provide variation in the physical feelings of what the user's feet and hands experience. It was also used to guide users who are sight impaired, as the tactile elements communicate to these users to help them navigate through a space. In the design, stone flooring tiles were used in specific areas such as in front of the stairs, entrances and doors to act as a cue and to communicate to users their immediate surroundings. Different wooden materials were used on the walls to help the users' hands to flow through the walls to guide them through the space. A long walkway that leads towards the entrances of the building consists of pebbles, stones, and broken seashells. Making a step on this walkway creates an uneven yet interesting tactility to the feet as each step taken generates a unique sensation. This use of variation in materials to mark specific zones and provide different tactility to the hands and feet were influenced by the case studies explored in Chapter one.

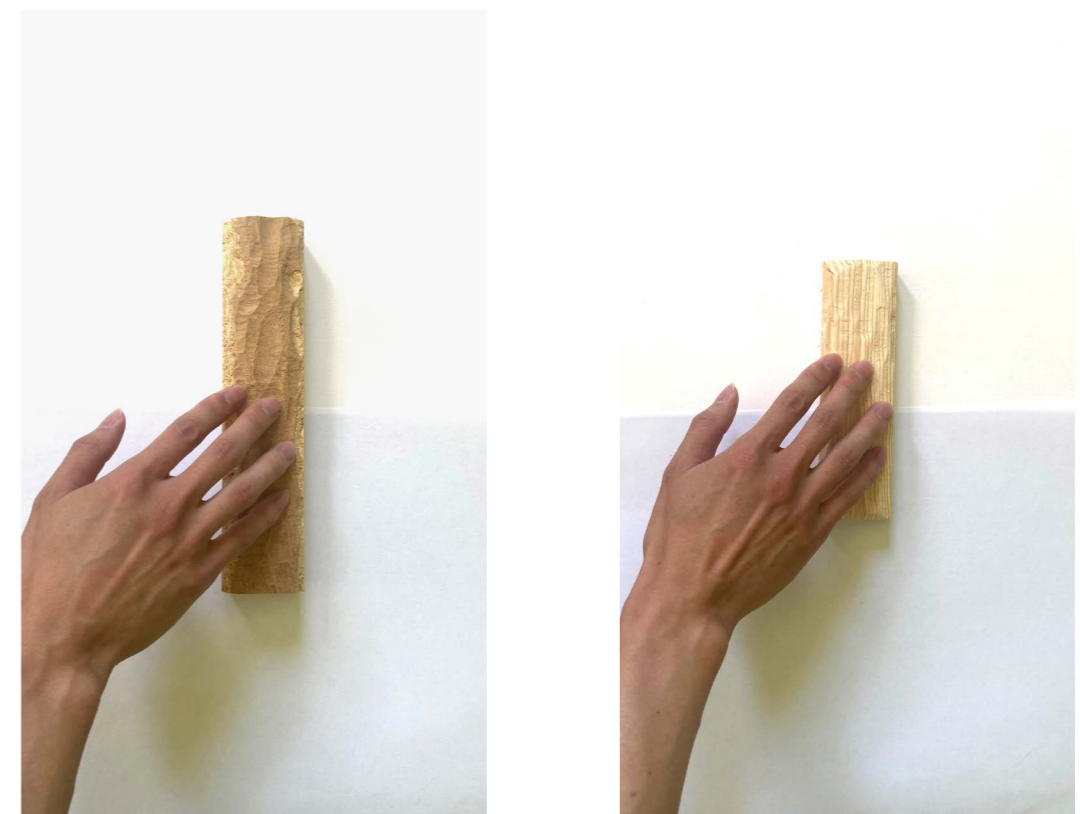


Figure 46. Developed haptic model making, mimicking a surface of door handle.

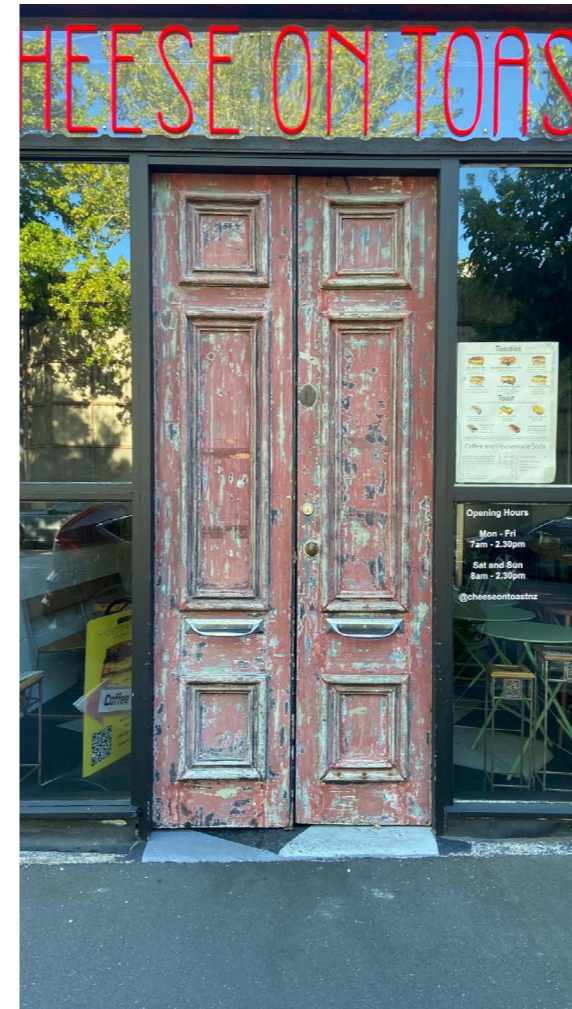
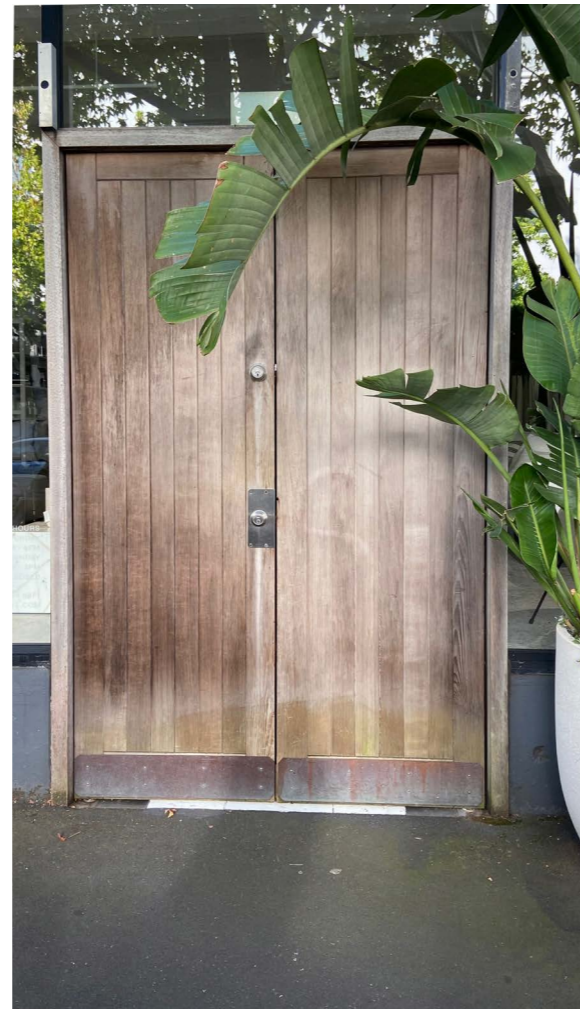
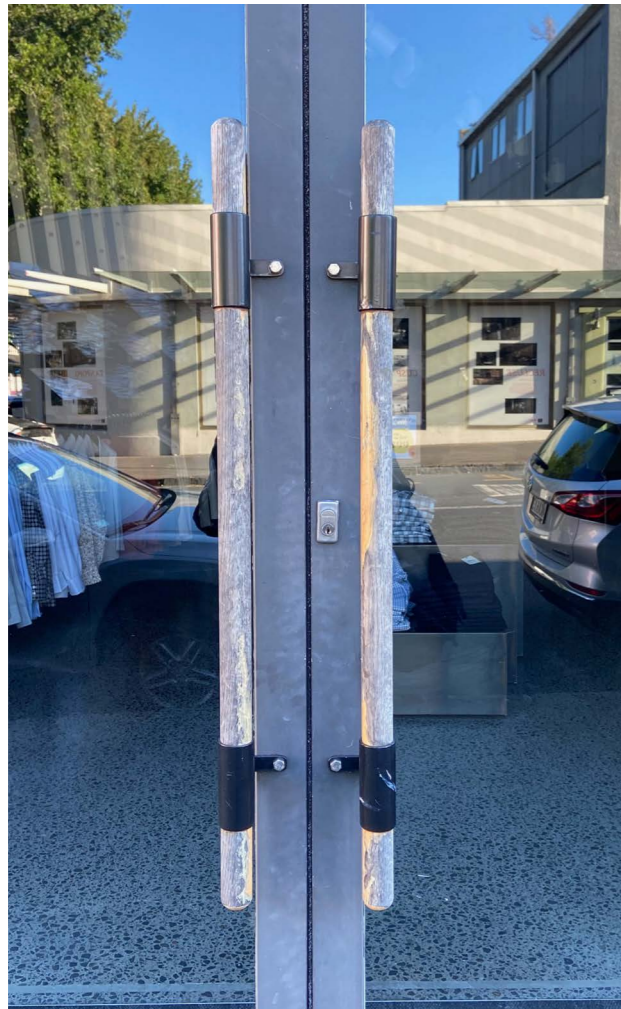


Figure 47. Door exploration photography.

Daily, I have encountered doors that were great examples of a design I wanted to achieve. The doors' interesting designs and unique door handles evoked my curiosity and interest. It felt like an open invitation to a space. I took these encounters as good experiences that would help me direct my door designs and determine the emotional response I wanted them to elicit.

For buildings, door handles are the handshake of the building (Pallasmaa, 2005). It is the first point of physical contact from the building to our body, engaging with our haptic senses. Following this statement, I wanted to give character to the building by incorporating unique door designs to the project. This was explored through different experimentations of drawings and visualisation which involved different types of door handles and balustrade handles such as knobs, short and long handles, and their placements, such as vertical or horizontal. The material of the doorhandles involved wood that is differently shaped for each of the doors, providing a unique sense of feeling for each door. Having smooth yet imperfectly shaped handles provide a pleasant, flowy feeling to the user who touches them. The inorganic, irregular smoothness of these handles will be pleasant to the touch, therefore making the first handshake a memorable one to its users. The imperfection provides a more natural feeling of the forest as in our natural environment, there are often no perfectly smooth organisations or shapes.

These unique feelings of touch for each of the doors not only provide a positive feeling to the touch but also provide an indication of the space itself, telling the users where they are located. It will be a point of navigation for sight impaired users as they will be able to tell apart which spaces have certain doorhandles, and whether they are in front of the correct door. The materials for each of the doors' skins also differ with different types of wooden timber and bark. In conjunction with the door handles, each apartment's entrance provides different feelings of touch to the user's hands. This design element gives unique character to each of the spaces in the building, helping the residents to feel a stronger feeling of home and belonging when they touch their own unique doorhandle.



Figure 48. Compilation of door and door handle designs explored.



Figure 49. Visualization of tactile elements applied in design.

To ensure pleasing airflow and sunlight of living spaces, an adequate number of openings and windows were implemented, making sure that air can flow from one end of the living space to the other. Wind can provide a pleasing haptic sensation to the skin. Cool breeze is a refreshing touch in hot summer days, and warm sunlight can become a place of rest in cold winter. Arranging the living spaces in the apartments so that one end can face the forest side and the other the walkway side can form openings for air to move from one end of the living space to another, providing a pathway. Placing the main living spaces such as living rooms and main bedrooms towards the north-east and south-west side enables the sunlight to penetrate, while the balconies provide shade to prevent overheating and provide coolness during hot summer.

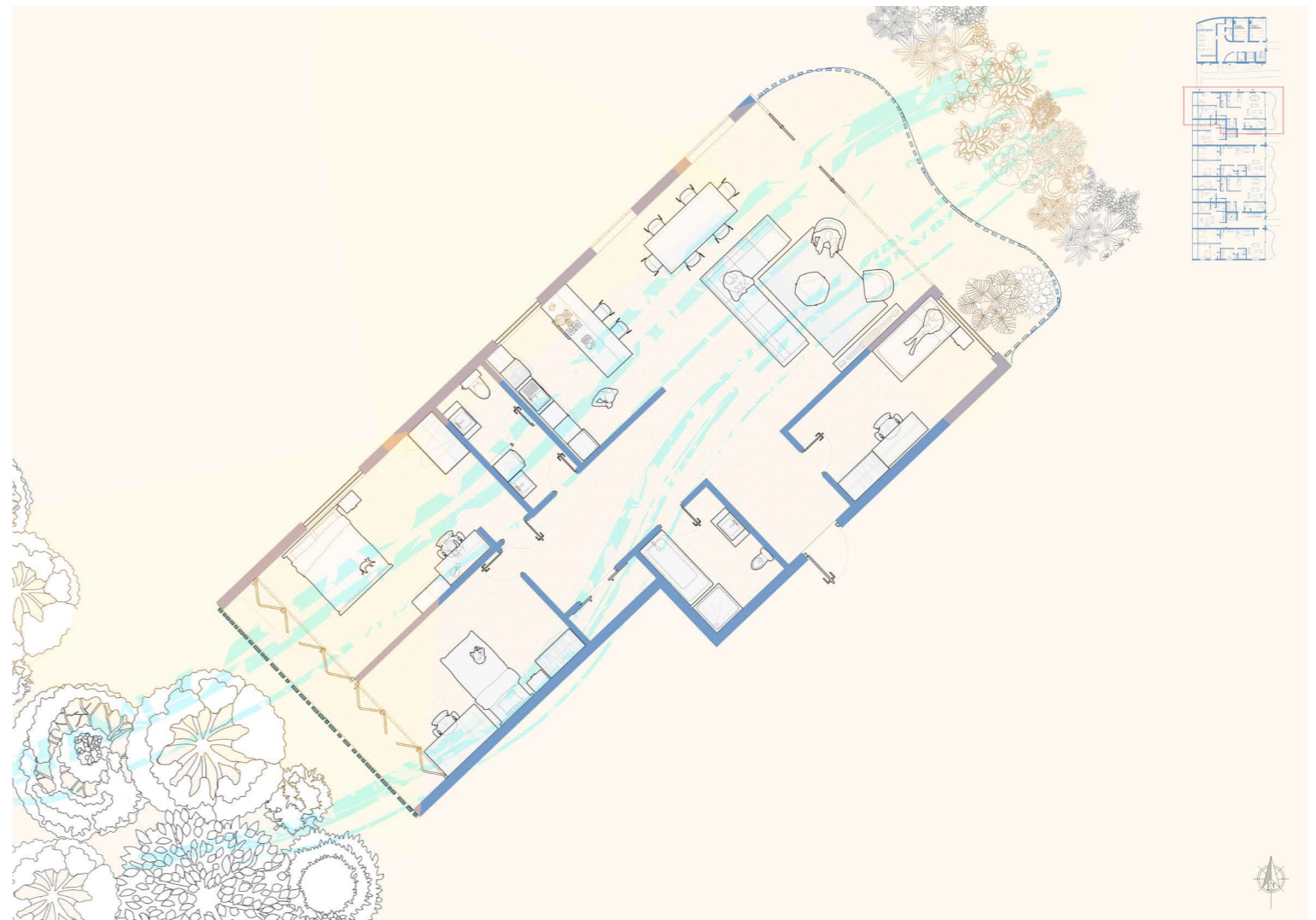


Figure 50. Floor plan showing airflow and sunlight diagram.

The use of the sustainable materials such as timber, wooden barks for the walls and handles relate to the regenerative strategy of using bio-degradable materials. The materials used in the project has minimal treatment to maintain the natural qualities of the original materials and will be sourced from recycling waste materials from wood workshops.

Measuring against the sensory theoretical framework, the design element of using a variety of materials and spatial arrangement engages with the haptic sense and the sense of touch. Contact with the unique materials from guiding walls, doors, and handles lead to a sensation of touch that is unique to each space. These unusual and interesting feelings of the building's skin results in a richer experience. While the arrangement of rooms does not provide any direct sensation like the materials, it provides a necessary use of essential haptic elements such as sunlight and airflow.



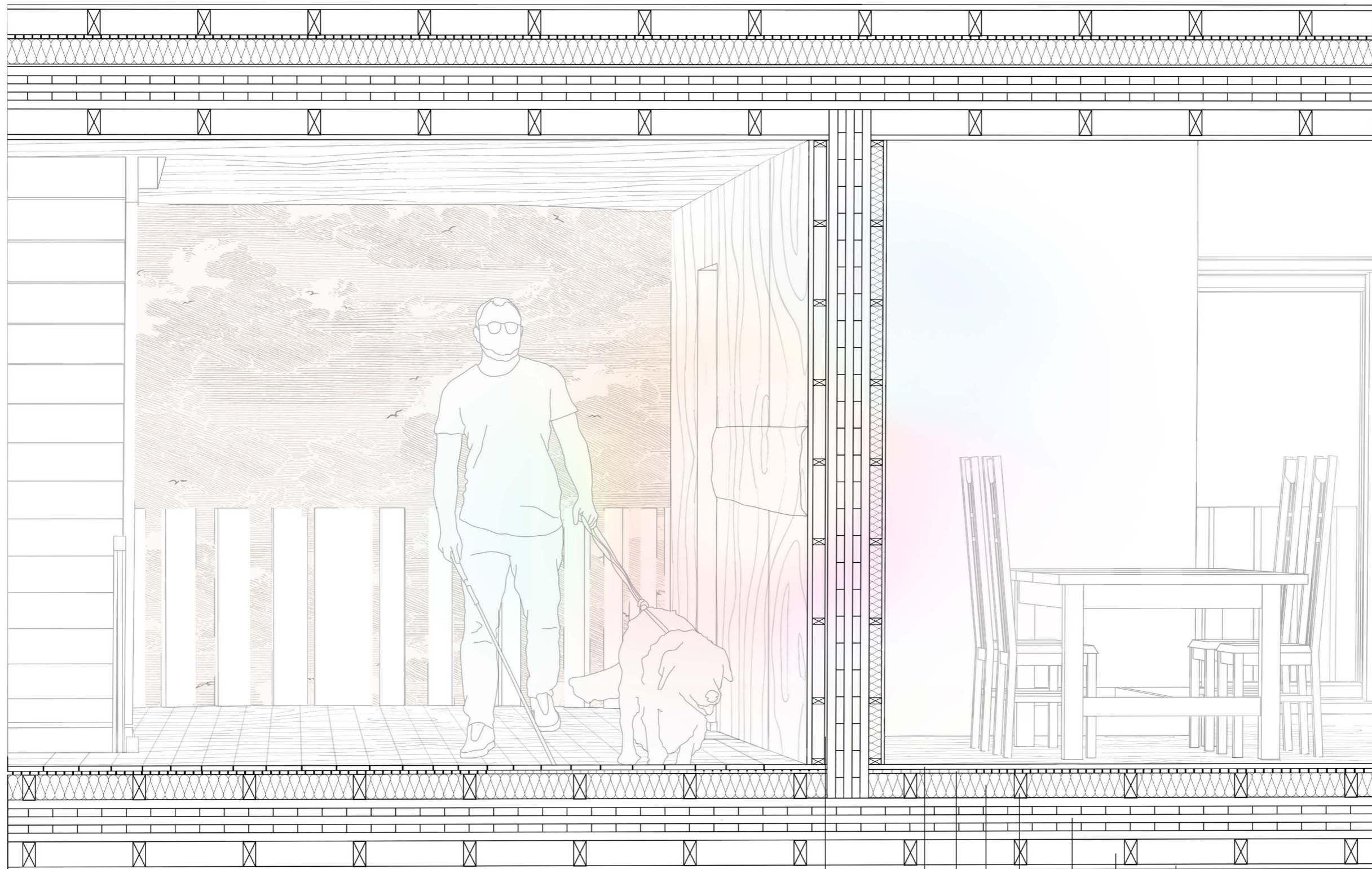
Figure 51. Close-up view of door and door handle.



Figure 52. Corridor view visualization.



Figure 53. Corridor view visualization towards outside.



Lables

- 1. Weatherproof layer
- 2. Timber flooring
- 3. Vapor layer
- 4. Sheep wool insulation
- 5. Timber batten
- 6. Structural CLT panel
- 7. Air cavity
- 8. Ceiling lining

Figure 54. Detailed drawing of corridor.



Figure 55. Close up view of balustrade design.

Sound

Franco, Shanahan and Fuller (2017) showed the significance of the impact of sound in a space, stating that sounds play a role in creating an attachment to a place, and form a connection to the environment which improves the feelings and mood towards it. They have also stated that sounds related to nature are much preferred over industrial, urban landscape sounds such as traffic and industrial noise to people, providing a good reason to incorporate natural sound related design elements. To engage with the sense of sound, the surrounding environments, gutter/water features, and interior materials were incorporated. Sensory living spaces (“Sensory boxes”) were designed and placed towards the southwest side where they are facing the forests to maximise nature’s sound, smell, and sight. Having smooth, hard walls maximises the sound and echoes of the birds’ songs and voices of the trees heard from the forest when glass panels are open by making sure the sounds do not get absorbed and lost in the materials. These sounds from nature evoke calm, peaceful and tranquil emotions to the residents. Facing this side are mostly bedrooms, where the users can be in their own space and experience the sensory elements of the forest located right next to them with fewer barriers as possible.

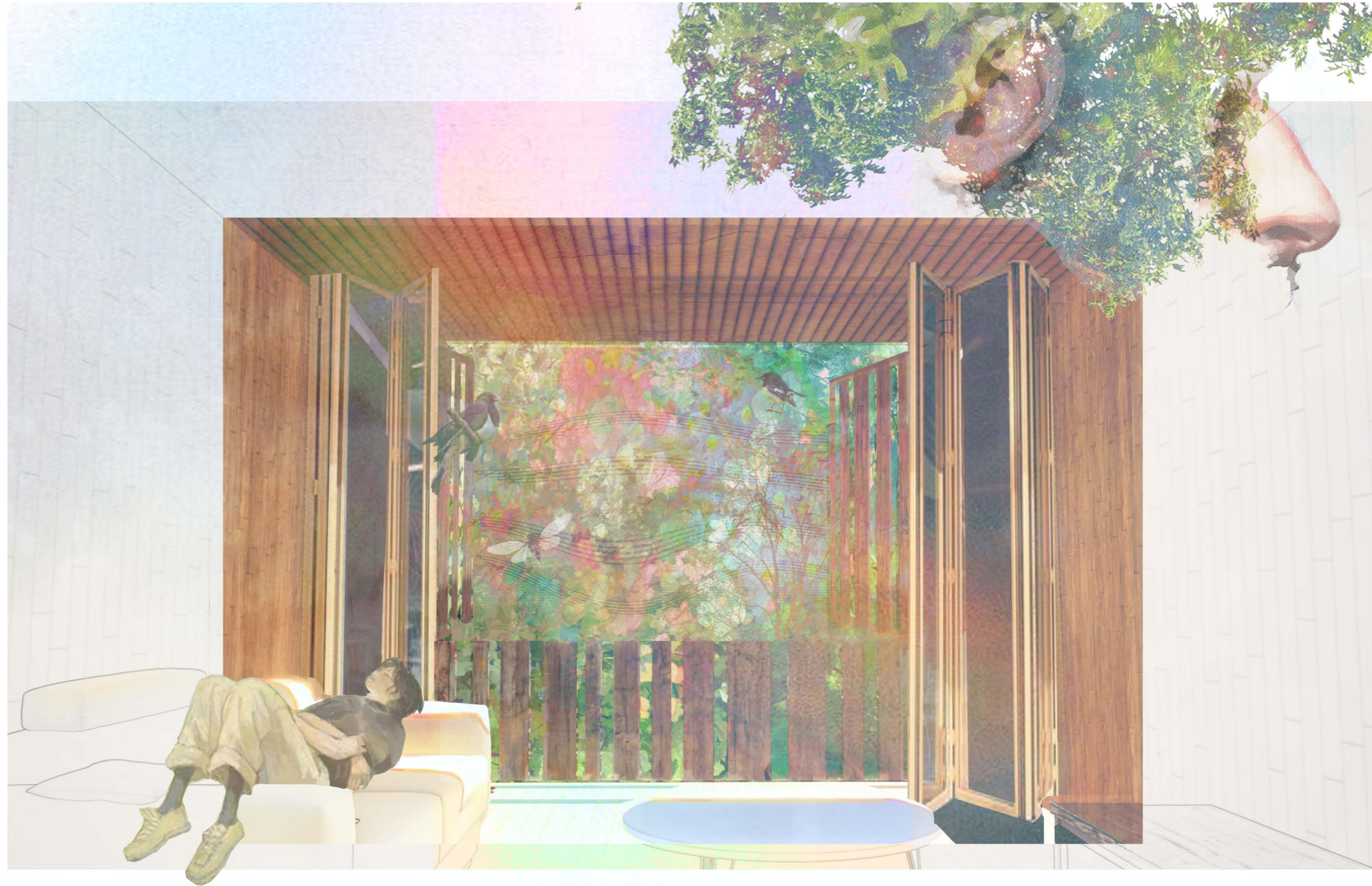


Figure 56. Sensory “box” visualization.



Figure 57. Axonometric drawing of the sensory "box", facade and glass panel closed.



Figure 58. Sound sensory mapping of one of the apartment.

Facing the north side of the site are living rooms with balconies. In these spaces the sound of the lively community can be heard as it is closer to the local cafés, herbal gardens and sensory gardens which can be used by the community. Therefore, the design has two different aspects that capture different sounds and moods, with one being lively and the other being calm and tranquil. The main walkway consisting of stones and seashells creates a resonating crunch with each step taken. There is sound of movement and flow, indicating livelihood to those who perceive the sound. It creates a sense of a present and alive community and a sense of belonging.

The sound of nature is further implemented into the project in the sensory garden area. In the space where the residential and communal building are separated, is the sensory garden with aromatic plants.

The garden can be a space for small animals and insects to stay, adding to the sound of nature as insects such as crickets chirp. In this space, timber structures are also incorporated which visually mimics the shape of trees.



Figure 59. Visualization of the view towards sensory garden.

These structures are built from joining layers of timber in different horizontal directions. The structures can provide spaces for the local animals to use, such as insects and birds for resting, nesting, and eating. As the animals use this space, they will add sensory elements such as sound to the space, such as the singing of native birds, cicadas during summer season, and wings flapping. The corner of the rooftop facing towards the forest also has a similar space, containing built-in plant pots. The animals can utilise this space to engage with the flora planted.

The sense of sound is also important in providing guidance and direction for sight-impaired users. Bakir et al. (2022) stated that sight-impaired participants found sound as a good factor of navigation as they use returning sounds to give themselves information about the surrounding environment, as the spatial organization could be recognised from different sounds and smells that came from different spaces resulting from unique activities that happened in them.

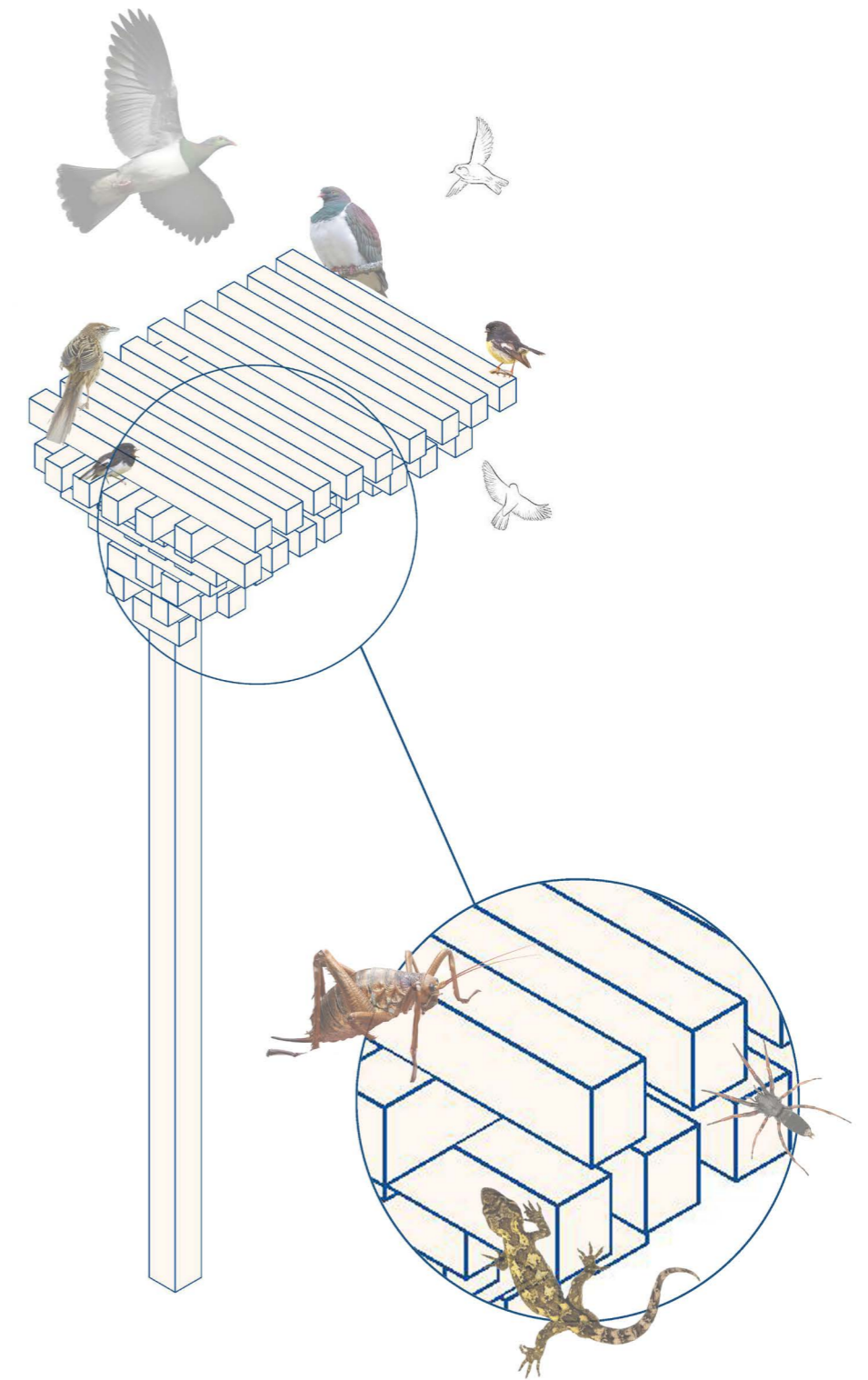


Figure 60. Close view of the tree structure interacting with wildlife.

Another design used to engage with the sound is having water channels throughout the design. A study by academics Maria Radsten-Ekman, Osten Axelsson, and Mats E Nilsson (2013) showed that the pleasant and soothing sound of flowing water can create positive emotional responses and block out road traffic noise, making this strategy valuable. Using water collection from the roof during rainy conditions will unlock the sound of water flowing through the pipes. These pipes will be closed in user-heavy spaces, and semi-open to produce open sound when they are placed on the exterior walls right down to the water channels on ground. Therefore, on rainy days the flowing of the water will produce the calm, pleasant sound of a flowing river. In addition, the middle of the roof on the rooftop has a square cutout, opening up a view towards the sky. On rainy days, some of the rainwater collected from the roof will splash against the bench underneath, creating a mini waterfall which is then collected on the floor. This waterfall creates a sound of flowing water aimed to form a sense of calmness and tranquillity. Finally, the idea around the use of rain chain was considered, as it is a functional design element which adds an exposed flow of water producing sound.

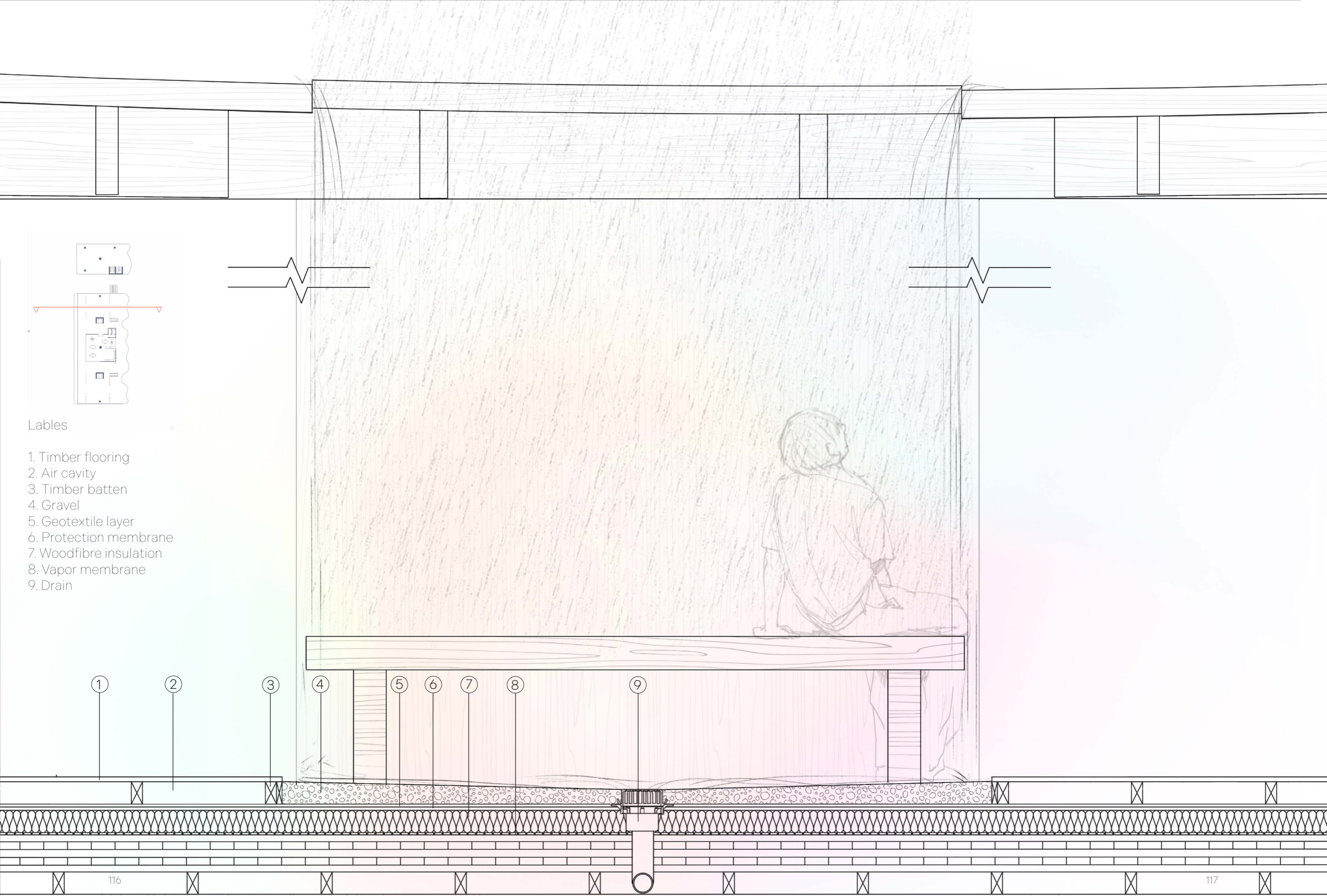
Considering the sensory theoretical framework, these sound design elements can elicit vivid sensations in users. The use of garden spaces and structures, rooms that utilise the forest nearby and materials that maximise the sound, help the building to engage with the surrounding ecological world, integrating their natural sound of birds and insects' songs, and rustling of the trees. The sounds are then perceived by the users and sensation is formed as the users listen to the vibrant sound of nature, leading to a richer experience.



Figure 61. Water channel throughout the main walkway.



Figure 62. Rooftop on a rainy day, showing the roof cutout creating a waterfall.



Lables

- 1. Timber flooring
- 2. Air cavity
- 3. Timber batten
- 4. Gravel
- 5. Geotextile layer
- 6. Protection membrane
- 7. Woodfibre insulation
- 8. Vapor membrane
- 9. Drain

Figure 63. Rooftop flooring details.



Figure 64. Sensory garden on a rainy day, showing rain chains and water channel.



Figure 65. Close up view of the rain chain and water channel.

Smell

Like the sense of sound, the site was already rich with the sensory element as it is connected to the scent of dense native flora immediate to the site. Not only that, during the site visit I also observed a strong smell of coffee from nearby cafes. With such pleasant scents being present throughout the site, I thought it would be a great opportunity to incorporate them into the design. In the design, there are sensory spaces towards the communal north-east side and south-west side full of rich native bushes and trees. The sensory rooms mentioned above facing the green side were developed to allow users to form an experiential connection, a bond with the forest to engage with its sensory elements, including the smell of the soil, woods and greenery. On the other side facing the north-east, sensory balconies were developed allowing users to have an open space that directly views the cafes and sensory gardens, evoking the smell of coffee, bakery, and food from the nearby café, as well as the aromatic and edible plants that are placed on the balconies and the sensory garden. From my visit to the site, the scent of the food and coffee were not overwhelming, and they were pleasantly blended with the scent of nature that was present all throughout the site. Also, Franco, Shanahan and Fuller (2017) stated that many natural odours are commonly found to be pleasant, therefore it gives good reasons to believe that the types of odours implemented in the project will result in pleasant experience to the users.

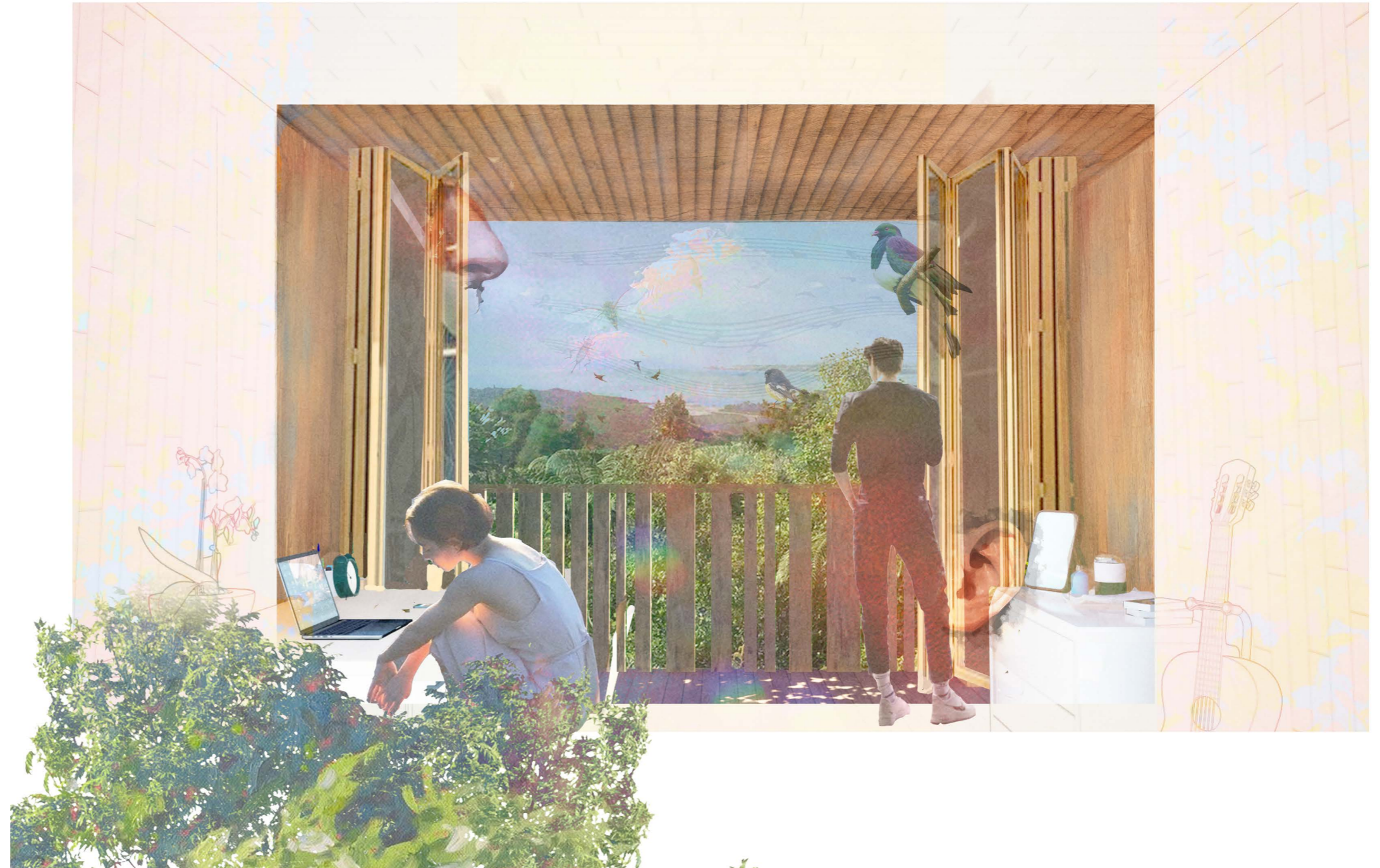
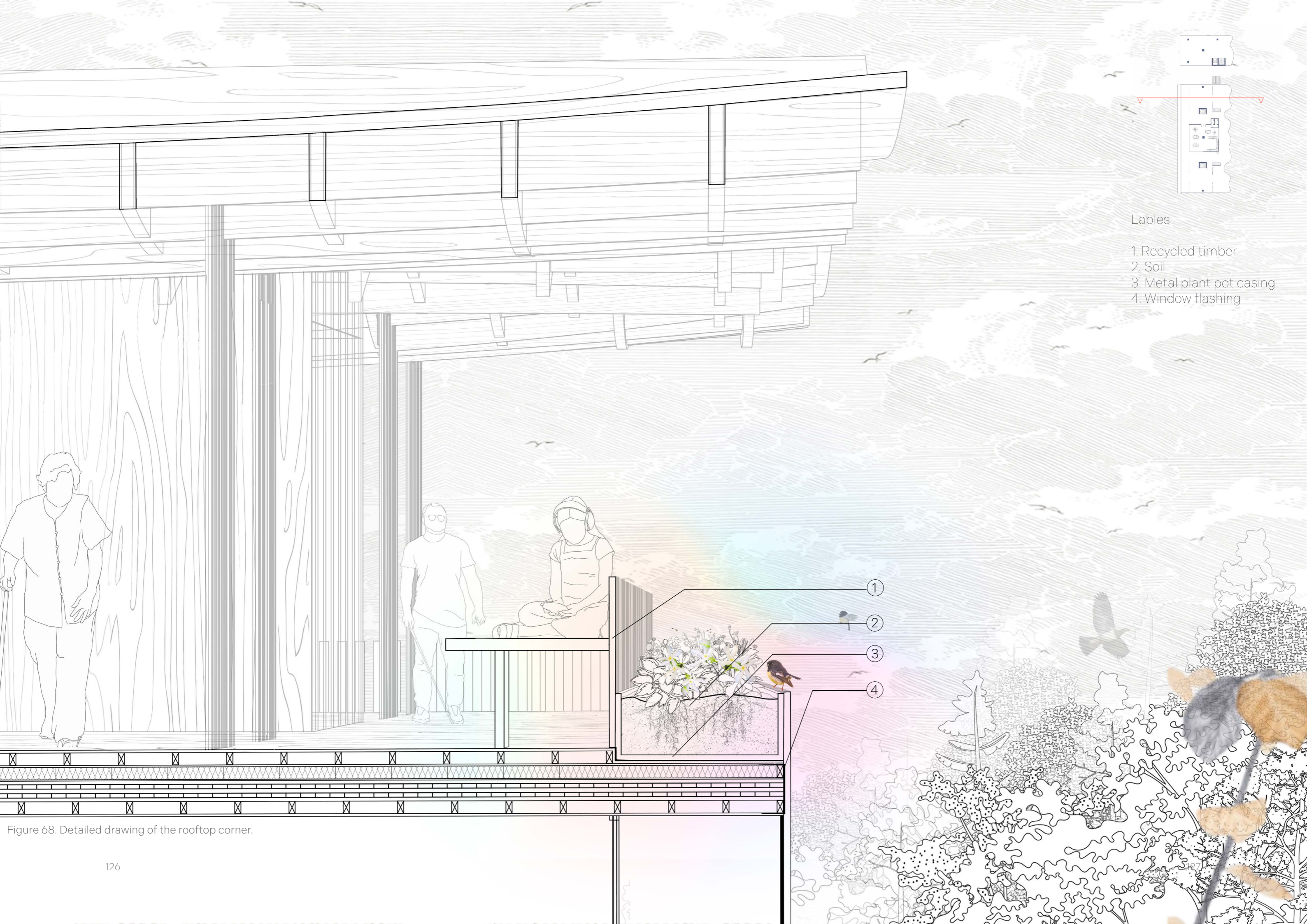


Figure 66. Sensory room (upper floor) visualization.



Figure 67. Rooftop view showing mini-plant pot integrated to edge of the rooftop.



Labels

1. Recycled timber
2. Soil
3. Metal plant pot casing
4. Window flashing

Figure 68. Detailed drawing of the rooftop corner.



Figure 69. Smell sensory mapping of an apartment.

Engagement with the sense of smell can also allow a form of navigation for those who are sight impaired if different scents are used in specific areas, as mentioned by Bakir et al. (2022), through recognising the association of different smells with activities that happen in different spaces. For example, the smell of food and cooking in the rooftop indicates that one is nearby the communal rooftop kitchen, or the vivid scent of an aromatic flower indicates that they are close to the sensory garden. This gives sight-impaired users an easier time navigating through the space by engaging with the senses.

Another design element that engages with the sense of smell is the building's materials. The internal walls are lined with wooden materials which help to mimic the smell of the forest. The involvement of the heavy wooden materials for the walls, also involving doors and doorhandles all produce the smells of the woodlands which mimics the scent of the nearby forest around the site, helping users to engage with the sensory element. Franco, Shanahan and Fuller (2017) stated that scent can have a great impact on a person's emotions by affecting mood, and behaviour. This suggests that incorporation of pleasant odours in the project will lead to a more enriching and enjoyable experience to users through sensory engagement.

The sensory design elements that are discussed here interact with the sense of smell. the incorporated flora in the gardens, and use of nature-based materials for the building's skin, along with the already existing ecological system at the site elicit a rich scent of nature. Users perceive the smell through the body, leading to sensations as smell is a strong sensory element. These design elements are aimed to produce a vivid emotional response, leading to enrichment of experience for users.

Sight

Although the project is mainly focused on engaging with senses other than sight, it does not mean that visual elements are completely neglected. This is because sight is still the main sensory cue for many people, and it is the sense that is often engaged first. Many sight-impaired users still have some level of vision remaining and often use their sight to guide themselves through vivid visual cues, such as high contrasting colours. The school for blind and visually impaired children discussed in Chapter one showed a good example of still incorporating visual elements also for the sight impaired. To have a holistic sensory experience for users, engaging with sight was still necessary.

Sight-based design elements that are incorporated here are related to the use of different natural materials granting the project a visual aesthetic that connects to the dense scape of trees next to the building while giving a warm natural visual. The façade system facing the south-west direction which has an assortment of planks in random widths and shapes mimics the visual randomness of the trees in the nearby forest. The wavy balcony that runs alongside the north-east direction gives a smooth and calming visual sense to people, also inspired by my father's initial drawing. The varied use of natural materials on the doors, door handles, and interior wall linings all contribute to producing a sense of uniqueness for each of the spaces, and surprise to its users, helping them to be visually engaged and stimulated as they discover new types of patterns, materials, and looks for different parts of the building.



Figure 70. View from the street.

Furthermore, the sensory rooms having a full foldable glass side towards the viewing of the trees also engages with the sense of sight, as the viewers have a view towards the native flora and wildlife flying across, with the upper floors and rooftop having a beautiful view of the faraway sea.

These sensory design elements discussed above help users to engage with senses more than just sight by letting their bodies perceive the environment and space closer as they smell the natural, warm scent of the wood and stone materials and herb gardens, touching the rough textures of the wooden internal lining, contrasted with the smoothness of the timber wall guide and doorhandles, hearing the sound of the leaves rustling in the wind and wildlife flapping their wings and chirping, and finally seeing the natural materials that mimic the forest nearby, with a variety of different visuals across each space. These design elements are perceived by users as they interact with the space, forming sensations and bodily experiences. The rich stimuli provided by these sensory design elements are incorporated to provide an enrichment of experience to all users. Through this design, users discover what it means to engage and experience a space more vividly, allowing the space to communicate to its users. This leads people to perceive and observe the world leading to a more beautiful and engaging spatial experience.

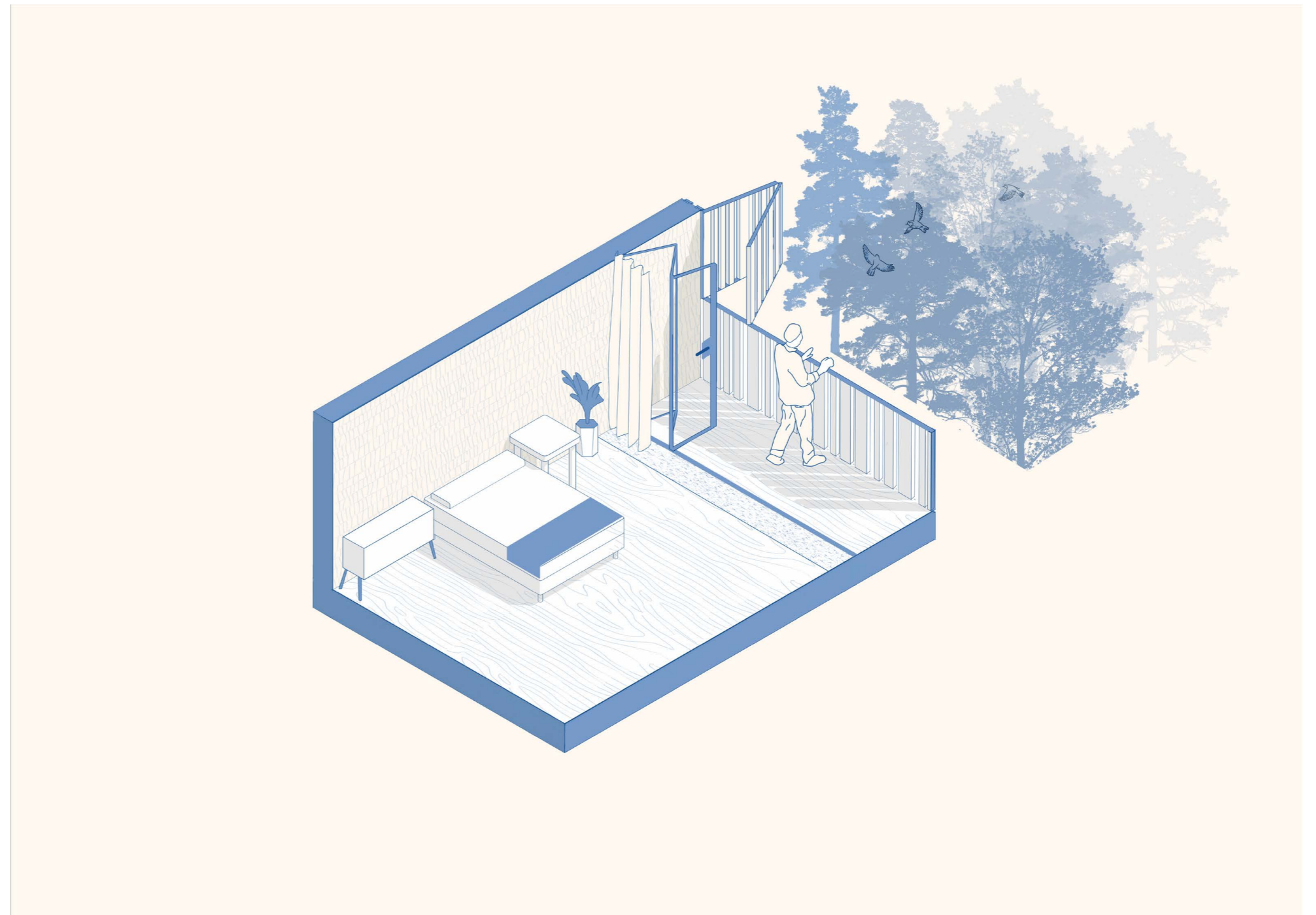


Figure 71. Axonometric diagram of the sensory "box", with facade and glass panel open.

Figure 72. Render of facade side of the building (closed facade).

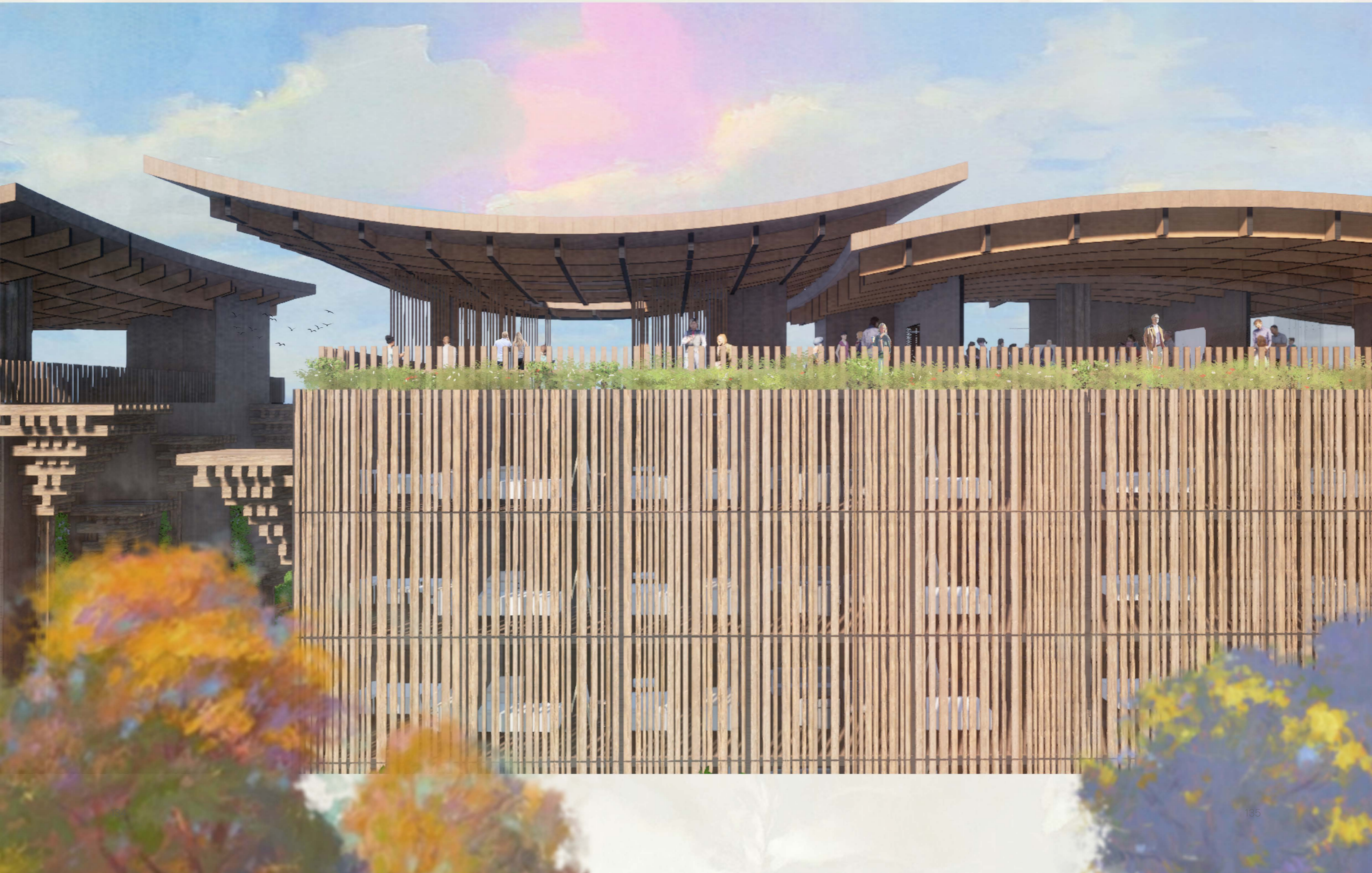


Figure 73. Render of the facade side of the building (open facade).





Figure 74. Clear day roof top visualization.

The roof cutout also provides a sight element along with providing flow of water. Positioning the cutout over the bench, users get to enjoy a view straight towards the sky, also suitable for star-gazing.



Figure 75. Night time roof top visualization.



Figure 76. Night time facade view visualization.

Part Four – Final Design

The final design builds from the design-led explorations discussed thus far to become a sensorial architecture that leads to richer spatial experience for users, a space that communicates and connects with those who occupy. It is composed of a four-storey apartment building, a three-storey community building, and a sensory garden. Timber is used as the main building material for construction.

The multi-storey apartment building holds 24 apartments. There are variations in these apartments ranging from 1-bedroom apartments for single or couple use, and 2-bedroom and 3-bedroom apartments for groups and families. Living rooms face towards the exterior view to the pebble and seashell covered walkway and shops thriving with community activity, filling the living room with community activity's sound and scent. Towards this side of the building, there is a wavy balcony with a smooth timber balustrade that is pleasing to touch. A patch of plant pots are placed in certain parts of the balcony for separation between houses, providing a pleasant aroma along with animals that interact with them. Sensory rooms open radically to the exterior deep view towards the nearby forest and faraway sea. The choice of interior lining materials ensures that sounds such as the chirping of the birds and rustling of the trees heard from the dense nature do not get absorbed by the wall but are instead amplified along with the scent of the forest, giving users a tranquil experience. This was influenced from the case study Audeum, where timber linings were used to maximise the sound echoes in the space. The façade towards the forest side is composed of thin, long timber pieces that are random in thickness, designed to mimic the visual of the dense tree-scape. This façade can open like large windows, and inside is a foldable curtain wall that acts as a barrier between the outside and the inside. This opens a radical view of rich nature, blurring the boundaries between the outside and in.

These sensory designs are aimed at recreating the description of rich sensorial experiences in Pallasmaa's writing. Also, the connection to nature helps to improve the mood for those who are sight impaired (Bakir et al., 2022). This evidence provided a good reason for implementation of the strategy.

As stated in the Site Analysis section, the Titirangi Road produces unwanted traffic noise and smell of petrol. To reduce the road traffic noise from nearby Titirangi Road, brick and stone pavement was placed instead of concrete road. This creates a walkable street, making the space pedestrian-friendly. With the brick and stone pavement, vehicles can still travel through, but much slower, reducing unwanted traffic noise.

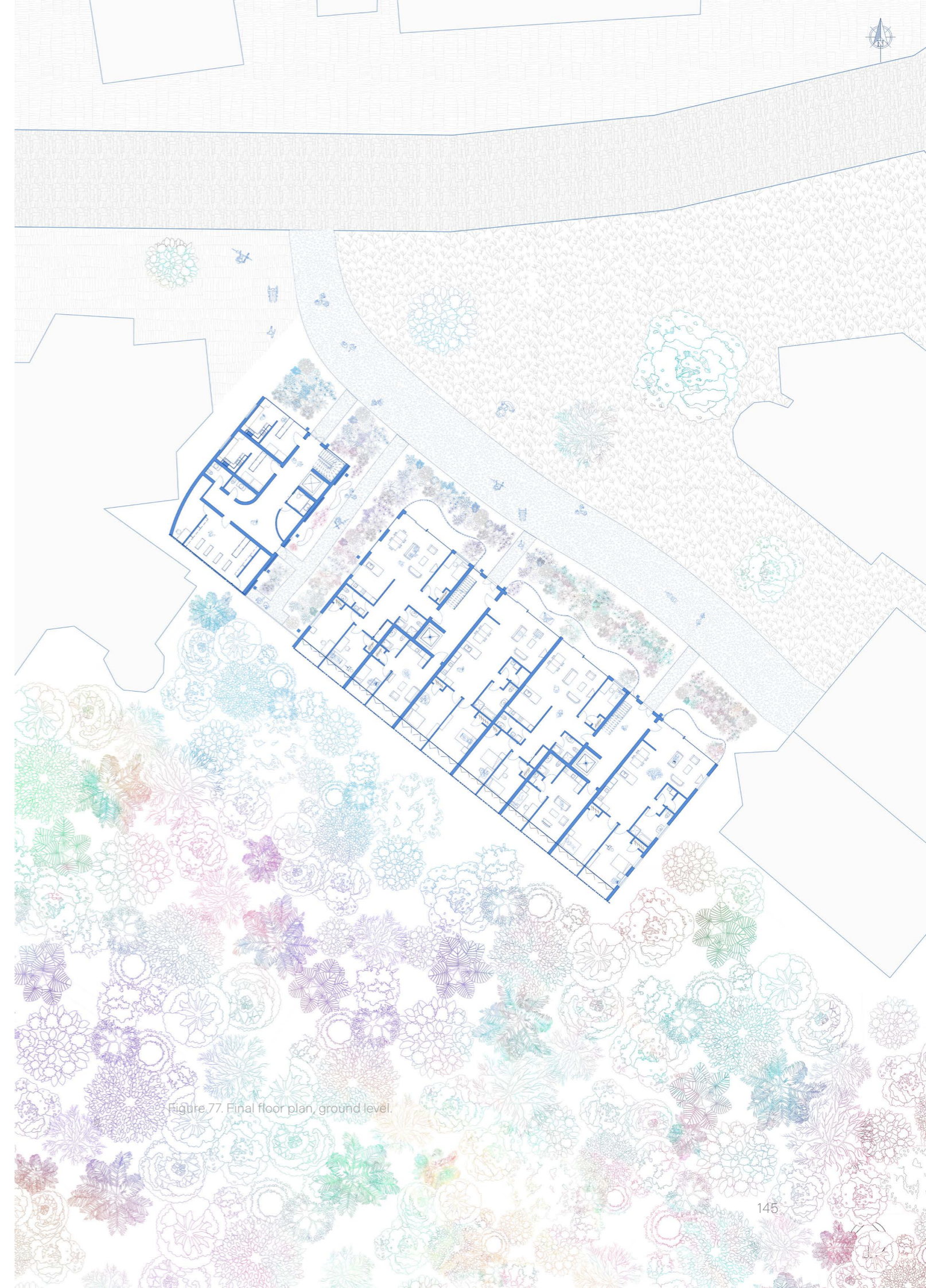


Figure 77. Final floor plan, ground level.



Figure 78. Final floor plan, levels 2 and 3 (community building).

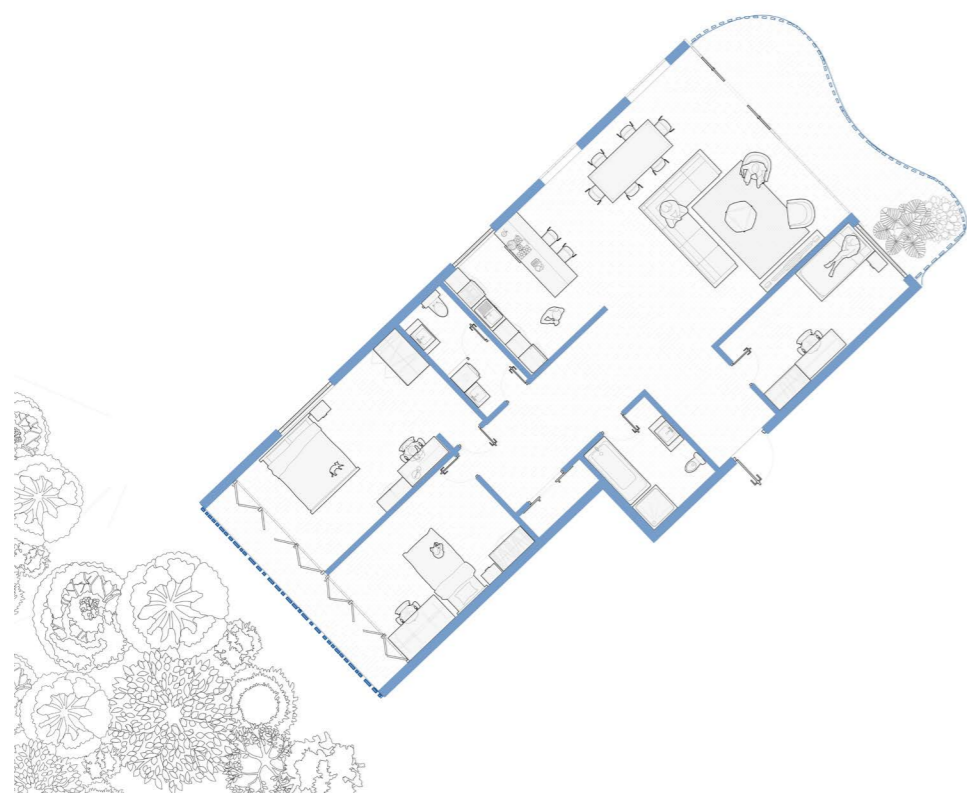


Figure 79. Closer view of an apartment (3-bedroom).

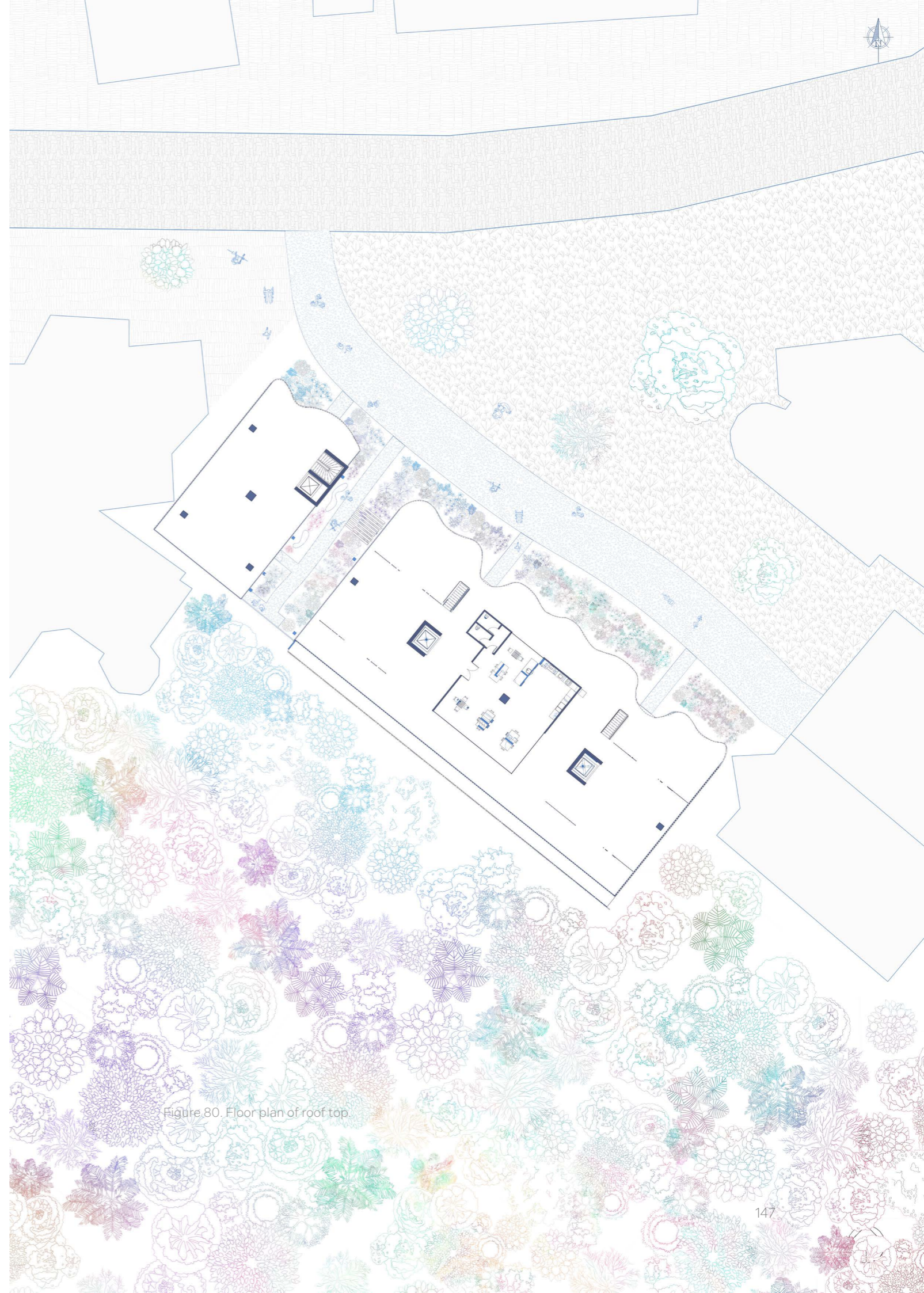
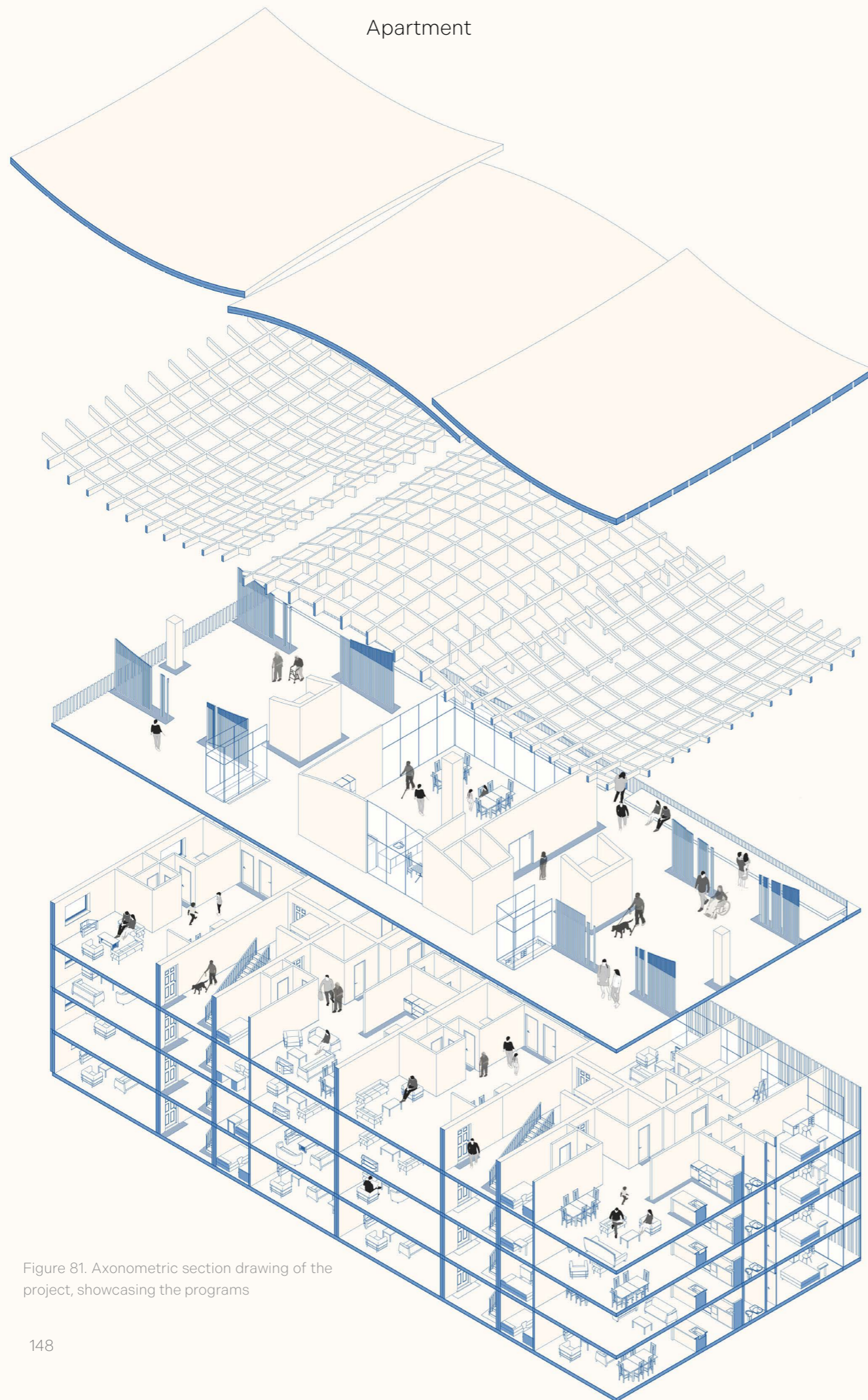


Figure 80. Floor plan of roof top.

Apartment



Community Centre

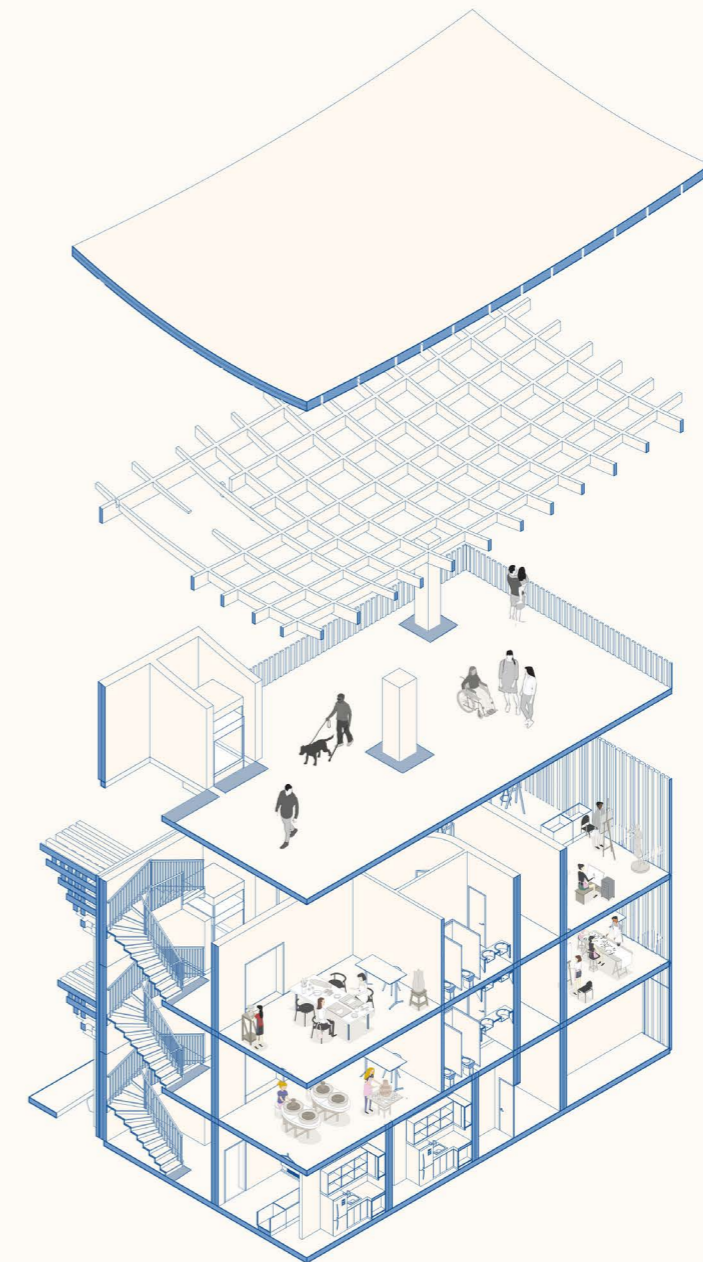


Figure 81. Axonometric section drawing of the project, showcasing the programs



Figure 82. Further view of the project, around the whole site.

Haptic/Touch

Pallasmaa (2005) has described doorhandles as the building's handshake. I wanted to emphasize this hand-to-building connection in the project. To achieve this, connective corridors have haptic rails for tactile wayfaring and engage with the sense of touch giving unique characteristics to each space. A similar effect is achieved through incorporating unique doorhandles, door materials and interior linings, all aimed to achieve an engaging experience of touch and hapticity and provide a memorable handshake from the building to the users. The variation in the wall lining was influenced by the school for the blind case study, where they used different plaster patterns on the walls for the students' navigation.

The communal building has similar design elements to the apartment, such as having tactile design elements such as doorhandles and railings, and rooftop features. The programme for this building consists of art workshops, shared community rooms, and shop space for already existing bakeries and cafes at the site, which are located on the ground floor. The second and third floors both have two large spaces separated by connective corridors. The second floor is used for indoor exercises such as biking and treadmill room for the community, while the third floor is used for painting and sculpting workshops. When they are not in use, these rooms can be used for the community for meetings or working from home. The exercise rooms give the sight impaired users an opportunity to safely exercise without worrying about physical safety or obstacles, as activities such as biking are incredibly difficult for them. The exercise rooms face towards the forest side. This allows users to experience biking, walking/running activities while experiencing the haptic feeling of nature when they open the glass panel and the façade. The art workshop is a great activity for sight impaired users as well as non-sight impaired, as it is something that can be done and enjoyed without sight. This gives an opportunity to build a hobby for sight impaired users. I wanted to incorporate these programmes as my father has issues developing or finding hobbies, due to his disability. Therefore, implementing these programmes which can provide good hobbies for users like my father could grant them more joy in life and empowerment as they experience more in their day-to-day lives.



Figure 83. Collage of haptic/touch sensory design elements.



Figure 84. Render of intended physical 3D floor plan model.

A haptic floorplan model was developed, for users like my father who cannot read drawin floorplans well. A 3D printer was used to print out the plan layout of the design, so that each element of the building could be felt through touch.

Sight

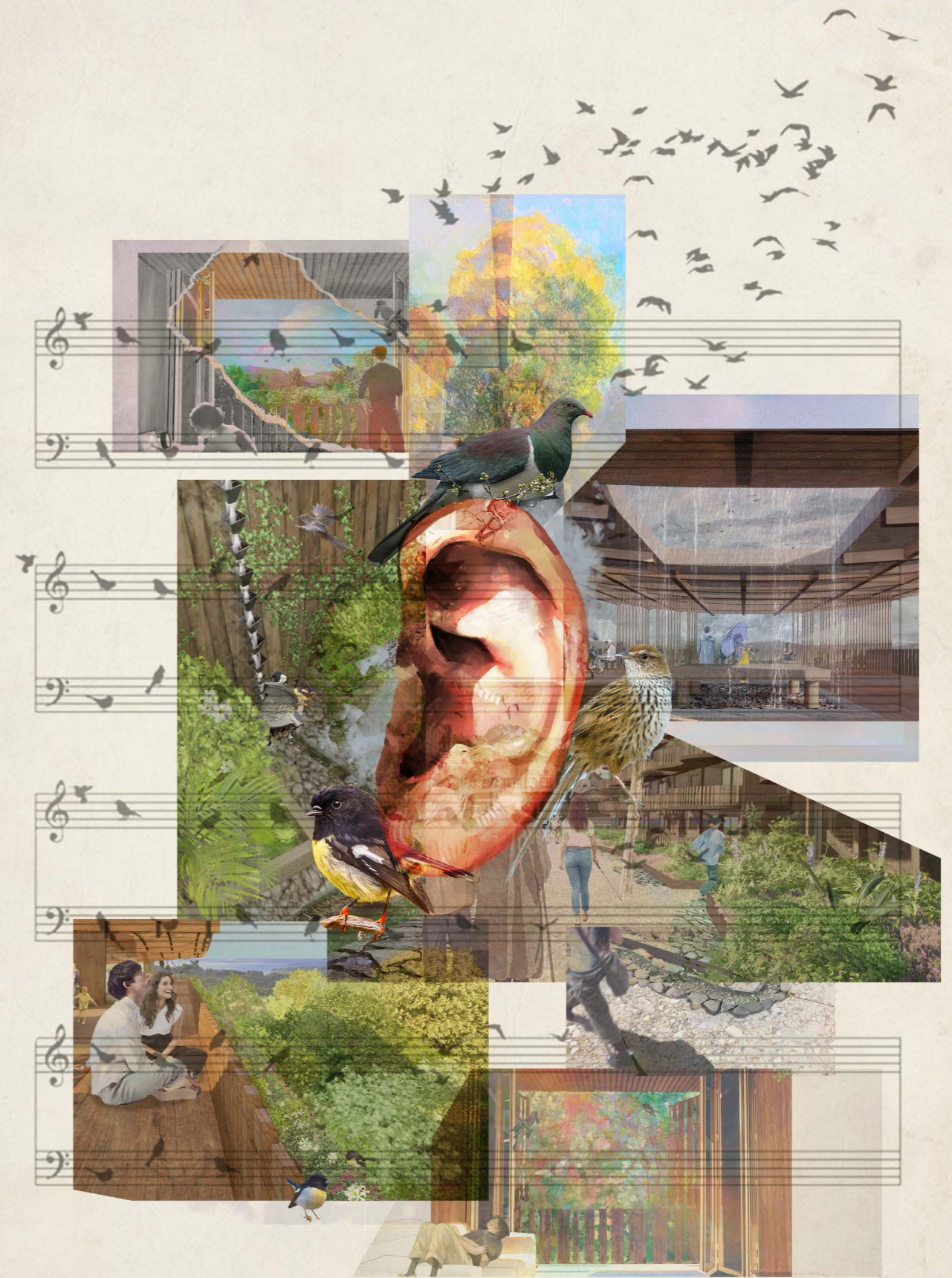
The project mimics the visual qualities of the nearby forest by using sustainable materials that are pleasing to the eye, such as recycled timber, bark, and wooden pieces. A study by academics Yaqi Zhang, Yao Song, and Jing Luo (2023) stated that building materials closer to the natural, original visuals achieve a high level of perceived aesthetics to the viewers. Academic Ifiok E. Mfon (2023) noted that the creative use of natural materials can evoke pleasure and gain users' interest. In addition, the chosen site has a great richness of nature, which adds pleasing aesthetics; as academics Thomas R. Herzog and colleagues (1997) stated, natural elements could lead the users to a state of fascination and emotional positivity.



Figure 85. Collage of sight sensory design elements.

Sound

The rooftop space has a timber deck, with wavy timber balustrades that continue from the elevation below. The large floating roofs, inspired by my father's drawing and subsequent models, lightly protect this roof space while collecting rain to a channel creating water flow around the space. Spence's (2020) writing noted that the sound of running water can result in relief of emotions, which influenced the design. The rooftop contains a community kitchen in the middle and open spaces outside. The floating roofs except the community kitchen has a square cutout in the middle, exposing the view towards the sky. On rainy days, the water flows down the roof into a water channel and any excess drips down to the floor creating a small waterfall. The fallen water is then directed to the water-collecting part of the floor. The collected water creates a stream like a small river. Facing the forest side, there are platforms attached to balustrades that act as benches or meditating platforms. Beyond the balustrade is a small patch of plants for the forest's animals to occupy, forming a sensory engagement with nature.



Smell

Separating these two buildings is the sensory garden, which is filled with aromatic plants and timber tree structures. The plants fill the space with a pleasant aroma. The tree structures, along with the plants provide space for animals to occupy such as birds and insects that will fill the area with their songs and sounds. The sensory garden also contains rain chains which are connected from the rooftop gutters. The chains guide the rain down to the sensory gardens while creating an exposed view of waterflow. It stimulates the sense of sound and smell from the flowing water while being visually captivating. The chains themselves have layers of additional bowl-like structures which hold and collect rainwater for some time, with larger structures at the bottom. This invites the wildlife such as birds to interact and play.

This final design tests strategies and approaches for sensorial space. Rather than purely relying on constructed and human designed elements, the project relies on the surrounding ecology, attempting to blend into it while letting its natural sensorial world seep into the project. Perhaps a significant part of sensory design in architecture is blending both ecological and human worlds together to maximise the engagement with our senses, connecting us with the rich sensorial world of our natural environment.



Figure 86. Collage of smell sensory design elements.



Figure 87. Gateway to the unseen world (Visualization of community centre main door, with haptic doors and door handles).

Figure 88. Ripping into the sensorial world (Sensory visualization of a sensory "box").

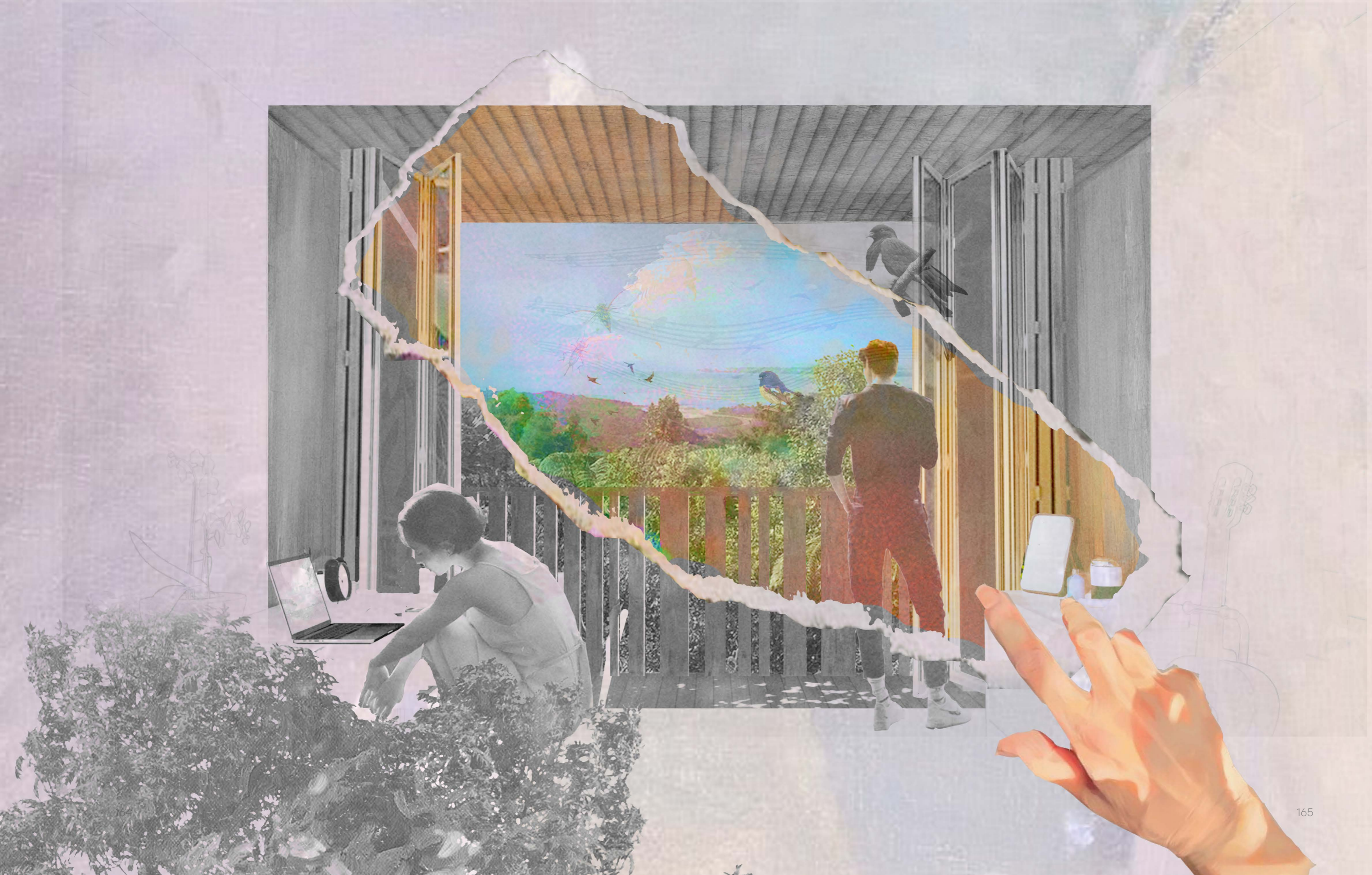




Figure 89. A journey through the unseen world.

Conclusion

Significance & Self reflection

This thesis, being a design-led research project, has asked the question of how incorporation of sensory design can improve spatial experience for all users, including sight impaired people and non-human entities. To combat the over-saturation of optically dominated modern industry, the research engaged with a variety of strategies that were aimed at achieving spatial experience that consider senses other than sight. On a smaller scale, the research has found ways to help my father achieve better navigation and experience his home environment in a richer sense. On a larger scale, it aimed to showcase strategies and benefits of implementing sensory design in architecture to develop spaces that communicate and connect with their users, creating bonds and memories.

To address this research question, I had to first gain an understanding of the context. For this I engaged with critical writings covering the topic of sensory design. Academics such as Juhani Pallasmaa, Charles Spence, and Dina Bakir and colleagues covered a range of context around the topic of sensory design, and designing for sight impaired users. Their writings reminded me of my personal experiences with memorable sensory space which gave me inspirations for what I wanted the design to reproduce. The thesis went over three chapters. The first was around research around critical texts surrounding the topic, along with precedents that incorporate such strategies. The second chapter covered the topic of methodology, explaining the process of design-led research, introducing the theoretical framework, and discussing methods covered in the research. The third and final chapter outlined the design itself, showcasing from the concept design stage to the finals. This chapter highlighted the sensory design strategies incorporated to achieve an answer to the research question.

The theoretical compass has been useful throughout the design process to make decisions on which strategies to implement. It helped to select more impactful strategies in enriching spatial experience. However, the sensory modelling and drawing explored as methods were not as effective, due to the lack of depth in exploring these areas. More physical models with deeper sensory engagement should have been explored to help me experience different intensities of the senses. This would have helped me to make a stronger argument for developing the sensory strategies during the design process.

The significance of sensory design in architecture rests in how it can heighten user experience and phenomenological connection to space, as shown by the research conducted in this research. In architecture, strategies such as orientating floor plans to maximise sunlight and engaging with nearby nature are already widely used, which means that there are aspects of sensory design already being implemented. What is missing is intentionality and a founding methodology focused on the wellbeing and vitality caused by sensorial elements in architecture. By incorporating a clear intent to include sensory design as part of mainstream architecture strategies, professionals will be able to enhance and enrich the user experience of their future projects creating spaces with more inclusion, meaning and connection for a variety of users. The use of sensorial materials such as gravel and a wide variety of wood, and the inclusion of the surrounding landscape and its flora and fauna as part of the design can be simple strategies that can result in the enrichment of space. The theoretical framework and strategies developed in this research can function as a guideline for other professionals to achieve this in future practices.

Reflecting on the research and design process, several areas were successful, particularly the latter parts of the design process. Choosing a site where there are existing rich sensory elements and having a vivid concept of sensory design to start the process helped me to build a clear direction in the design research and give a clear goal and guidance during the concept design process to the developed design. Engaging with my dad to gain an understanding on his perspective and creating an imagery based on it also provided guidance for the design process, as it became the base of the concept design.

There are other approaches for the method and methodology phase of the research that could have been trialled. There could have been a deeper engagement in methods of exploring sensory elements. For example, making devices and artifacts that interact with the sense of smell and sound, such as a blind scent box, or a device that captures rain and records the sound, and more types of tactile explorations. Doing so would have provided a stronger argument and ideas for sensory designs. Also, while the theoretical framework was used as a measuring system for sensory design strategies, it could have been more refined. Currently, it shows how a particular sensory design element provides enrichment of experience in a non-definitive way. It could be changed into a scale or a gradient bar system so that it could be more definitive and clearer in how strongly a certain design element provides sensory engagement. An example would be putting gravel paths and concrete paving on a scale of touch. A gravel path would be on a higher level in the scale/gradient compared to concrete paving, showing a clear and definitive result on which strategy is more enriching. Such a change could have been simpler to use and may have provided a clearer system to measure the sensory design strategies.

Final Words

Our world is sensorial. Through this project, I tried to introduce a strategy that embodies architecture which has a richly haptic sensorial condition. Integrating architecture so that it blends into the ecological world enables multiple benefits as it provides more engaging experience, and a space for the non-human to utilize and thrive in. Such a strategy has the potential to achieve richer experiences and to create spaces of active thriving for not only human but also non-human users.

Through this research, my hope is that architecture can become a regenerative part of the living world, full of experiential qualities and rich with sensory engagement to create positive memories and experience for all users. On a personal level, I hope our living spaces can be more joyful and forgiving for those like my father.

Figure List

All figures are author's own works unless stated otherwise.

Figure 1. Perspective of navigation from my father.

Figure 2. Collage including including Michelangelo's Creation of Adam, from the ceiling of the Sistine Chapel, Rome, 1508-1512, fresco (Italian Renaissance, 2012) by Jemma Rose Baldwin. Accessed 21/02/2025. <https://jemmarosebaldwin.com/2019/08/06/the-eyes-of-the-skin-book-review/>

Figure 3. Ira Keller Fountain, Portland OR by Charles Birnbaum. Accessed 21/20/2025. <https://www.tclf.org/landscapes/ira-keller-fountain>

Figure 4. Library for the blind, by Andra Perenzieto. Accessed 21/02/2025. <https://www.architectural-review.com/buildings/building-for-the-blind>

Figure 5. Kengo Kuma & Associates. Audeum (Audio museum). Seoul, South Korea. Accessed February 18, 2025. <https://kkaa.co.jp/en/project/audeum-audio-museum/>

Figure 6. Kengo Kuma & Associates. Audeum (Audio museum). Seoul, South Korea. Accessed February 18, 2025. <https://kkaa.co.jp/en/project/audeum-audio-museum/>

Figure 7. Dhruvad Shukla. School for blind and visually impaired children. Gandhinagar, India. Accessed February 18, 2025. https://www.archdaily.com/984721/school-for-blind-and-visually-impaired-children-sealab?ad_medium=gallery

Figure 8. The Hudson Valley's Manitoga / The Russel Wright design centre by Vivian Linares. Accessed February 18, 2025. <https://sideofculture.com/2024/09/inspired-by-design-the-hudson-valleys-manitoga-the-russel-wright-design-center/>

Figure 9. William Menking. Manitoga House. Hudson Valley, USA. Accessed February 18, 2025. <https://www.archpaper.com/2018/03/russel-wrights-renovated-manitoga-shines-hand-crafted-details/>

Figure 9. William Menking. Manitoga House. Hudson Valley, USA. Accessed February 18, 2025. <https://www.archpaper.com/2018/03/russel-wrights-renovated-manitoga-shines-hand-crafted-details/>

Figure 11. Titirangi site analysis map.

Figure 12. Site sensory analysis map.

Figure 13. Titirangi Species and ecology, by Te Wao Nui Wa Tiriwa. Accessed February 23, 2025. <https://www.livingintheranges.nz/special-species/>

Figure 14. Titirangi site photographs.

Figure 15. Research design diagram.

Figure 16. Theoretical framework diagram.

Figure 17. Finger gloves by Rebecca Horn. By Rebecca Horn. Accessed February 23, 2025. <https://www.artgallery.nsw.gov.au/collection/works/10.2003/#details>

Figure 18. Pathless woods installation by Anne Patterson. By Anne Patterson. Accessed February 23, 2025. <https://www.annepatterson.com/pathless-woods-1>

Figure 19. Sensorial modelling: Paper haptic exploration.

Figure 20. Sensorial modelling exploring haptic with variety of materials.

Figure 21. Sensorial drawing and collaging of Titirangi site.

Figure 22. Sensorial drawing and collaging of Titirangi site. around the bushes.

Figure 23. Sensorial drawing and collaging of Titirangi.

Figure 24. Drawing of observed sensory elements around the site.

Figure 25. Dad's drawing when he is in a familiar environment.

Figure 26. Dad's drawing when he is in an unfamiliar environment.

Figure 27. Combination of dad's artwork.

Figure 28. Flowing paper models.

Figure 29. Bamboo wall, a tactile exploration.

Figure 30. Tactile wall with greenery.

Figure 31. Paper tactile explorations.

Figure 32. Sensory concept drawing of sound.

Figure 33. Sensory concept drawing of smell.

Figure 34. Sensory concept drawing of touch/haptic.

Figure 35. Collage of programs and sensory design elements.

Figure 36. Form model of building concept.

Figure 37. Early rooftop visualization.

Figure 38. Collages showing living areas (top) and community spaces showing program and tactility (bottom).

Figure 40. Early explorations of floor plans, considering sensory corridor (bottom), and separated apartment layout (top and middle).

Figure 41. Further developed floor plan, incorporating separated apartment layout, sensory spaces towards forest, and sensory garden which separates the two building.

Figure 42. Drawing of the design thus far, showing hints of sensory gardens, roof and balcony design.

Figure 43. Early building visualization.

Figure 44. Street view of the early design.

Figure 45. Sensory experience visualization.

Figure 46. Developed haptic model making, mimicking a surface of door handle.

Figure 47. Door exploration photography.

Figure 48. Compilation of door and door handle designs explored.

Figure 49. Visualization of tactile elements applied in design.

Figure 50. Floor plan showing airflow and sunlight diagram.

Figure 51. Close-up view of door and door handle.

Figure 52. Corridor view visualization.

Figure 53. Corridor view visualization towards outside.

Figure 54. Detailed drawing of corridor.

Figure 55. Close up view of balustrade design.

Figure 56. Sensory box visualization.

Figure 57. Axonometric drawing of the sensory "box", facade and glass panel closed.

Figure 58. Sound sensory mapping of one of the apartment.

Figure 59. Visualization of the view towards sensory garden.

Figure 60. Close view of the tree structure interacting with wildlife.

Figure 61. Water channel throughout the main walkway.

Figure 62. Rooftop on a rainy day, showing the roof cutout creating a waterfall.

Figure 63. Rooftop flooring details.

Figure 64. Sensory garden on a rainy day, showing rain chains and water channel.

Figure 65. Close up view of the rain chain and water channel.

Figure 66. Sensory room (upper floor) visualization.

Figure 67. Rooftop view showing mini-plant pot integrated to edge of the rooftop.

Figure 68. Detailed drawing of the rooftop corner.

Figure 69. Smell sensory mapping of an apartment.

Figure 70. View from the street.

Figure 71. Axonometric diagram of the sensory "box", with facade and glass panel open

Figure 72. Render of facade side of the building (closed facade).

Figure 73. Render of the facade side of the building (open facade).

Figure 74. Clear day roof top visualization.

Figure 75. Night time roof top visualization.

Figure 76. Night time facade view visualization.

Figure 77. Final floor plan, ground level.

Figure 78. Final floor plan, levels 2 and 3 (community building).

Figure 79. Closer view of an apartment (3-bedroom).

Figure 80. Floor plan of roof top.

Figure 81. Axonometric section drawing of the project, showcasing the programs.

Figure 82. Further view of the project, around the whole site.

Figure 83. Collage of haptic/touch sensory design elements.

Figure 84. Render of intended physical 3D floor plan model.

Figure 85. Collage of sight sensory design elements.

Figure 86. Collage of smell sensory design elements.

Figure 87. Gateway to the unseen world (Visualization of community centre main door, with haptic doors and door handles).

Figure 88. Ripping into the sensorial world (Sensory visualization of a sensory "box").

Figure 89. A journey through the unseen world.

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