

# Biophilic Urban Childhood

A Healthy Childhood with Biophilic City Model under Urban  
Densification in Post-war Neighbourhood, Zuidwijk

Chingfang Wang 5022444  
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Master Thesis: Biophilic Urban Childhood  
A Healthy Childhood with Biophilic City Model under Urban Densification in Post-war Neighbourhood, Zuidwijk

Chingfang Wang | 5022444  
lindawcf@gmail.com

Design of the Urban Fabrics  
Department of Urbanism  
Faculty of Architecture  
Delft University of Technology

Delft, January 2022

1st supervisor: Prof.dr.ir. M.J. van Dorst [M.J.vanDorst@tudelft.nl](mailto:M.J.vanDorst@tudelft.nl)  
2nd supervisor: Robbert Jan van der Veen [R.J.vanderVeen@tudelft.nl](mailto:R.J.vanderVeen@tudelft.nl)

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# Abstract

In the first two decades of the 21st century, urbanisation along with the virtualized social and educational methods, childhood today is increasingly becoming an indoor experience. Under urban densification, a high percentage of childhood is lacking outdoor activities, especially when nature is not accessible enough in the city. The range of the space where children are free to reach and explore the environment is decreasing with the exclusion of consideration of the need for children in urban planning and design. Growing up with little connection to nature is not only negative for mental/physical well-being, but helps create a society that forgets the biophilic needs of humans and ends up building a natureless environment and lifestyle. The research method is to review existing studies about the impact of urban densification on healthy childhood; and how the biophilic city model can contribute to enhancing childhood development. The research is aiming to conclude effective methods for planners and designers to create a city where children can develop a healthy childhood in an urban environment with abundant natural experience.

## Keywords

Healthy Childhood, Urban Densification, Biophilic City, Child-Friendly City, Post-war Neighbourhood, Zuidwijk



# 1. Introduction

1.1 Overview

1.2 Research Outline

1.3 Motivation

1.4 Problem Field

1.5 Problem Statement

# 1.1 Overview

The research will consist of three main sections, research development, methods, and conclusion. The first section consists of the foundation of the research from motivation to problem statement with research questions as a conclusion to form the conceptual and theoretical framework. In the next section, the methods of the research will be addressed with proposed approaches and outcomes. The last section will be a conclusion with the summary of this chapter, ethical paragraphs, and the limitation of the research.

# 1.2 Research Outline

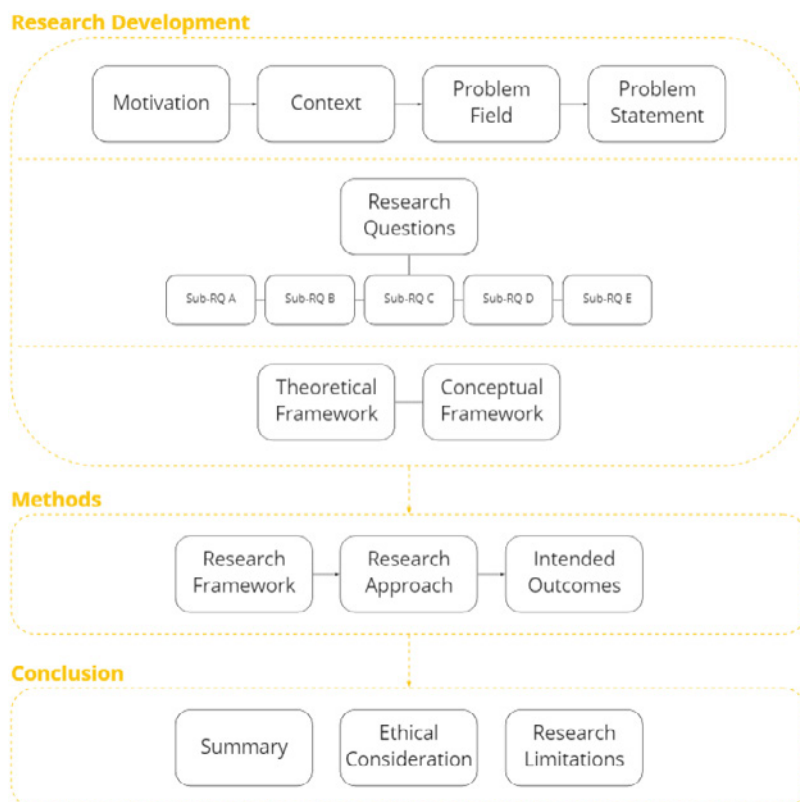


Fig. 1.1 Research Outline. Source: Author

## 1.3 Motivation

“We need to allow children to develop their biophilia, their love for the Earth, before we ask them to save it. The more personal a child’s experience with nature, the more environmentally concerned and active children are likely to become.”

- Randy White, Fresno Pacific University

The motivation of this project can be related to my personal experience from childhood. I was raised in a suburban area with the daily nature play on the family farm. Since I was 7, we moved to the city centre to be closer to my parent’s work. Thus, I started to have friends from different upbringing backgrounds in the class. Throughout the years, including college life, I notice some different patterns of characteristics and health problems are very much related to the amount of exposure to nature during childhood.

Speaking of health problems, I noticed that people who are having more allergic problems usually grew up in a more strictly managed play space, mainly indoor environment. Without enough exposure to different kinds of bacteria, the body will be more sensitive to the surroundings, which results in a relatively vulnerable health condition.

Another observation of my personal experience is the appreciation of nature. Some people feel absolutely fine for wasting food; some feel dirty when they were asked to do gardening work with the exposure to touching the soil and some insects. From my observation and discussions with these people, I came to a conclusion as follows. People who grew up in the city or have less engagement experiences with nature tend to have less appreciation of nature or feel distanced from nature.

Biophilia, “The innately emotional affiliation of human beings to other living organisms. Innate means hereditary and hence part of ultimate human nature.”, defined by E.O. Wilson in 1984. The hypothesis of the previous paragraphs were proved through the study of biophilic cities in my graduation project in bachelor degree. The concept of biophilic cities contributes to human society in many aspects. As children are the future citizens of the world, it is crucial to ensure their connection to nature before expecting them to lead the world to a more sustainable and healthy society in the future.





Photo of Zuidwijk Source: Author

## 1.4 Problem Fields

### Problem Fields

The problem fields can be seen from three main domains, the trend, the process, and the context. Combining the three components, we can address the problem statement more clearly and lead to a clearer research structure. Following paragraphs will be elaborating the three domains of the problem fields.

### The Trend - Unhealthy Childhood

Unhealthy childhood by lacking outdoor and natural experience is an ongoing trend especially in urban environments. Plus the advances of technology, it is happening everywhere.

### The Process - Urban Densification

Urban densification is a facilitator that makes the unhealthy trend even more severe to the vulnerable, yet crucial group of people to the future, children.

### The context - Post-war Neighbourhood, Zuidwijk

The research is focusing on the post-war neighbourhood, Zuidwijk, which has a low performance on social and natural engagement in the neighbourhood.

### Problem Field

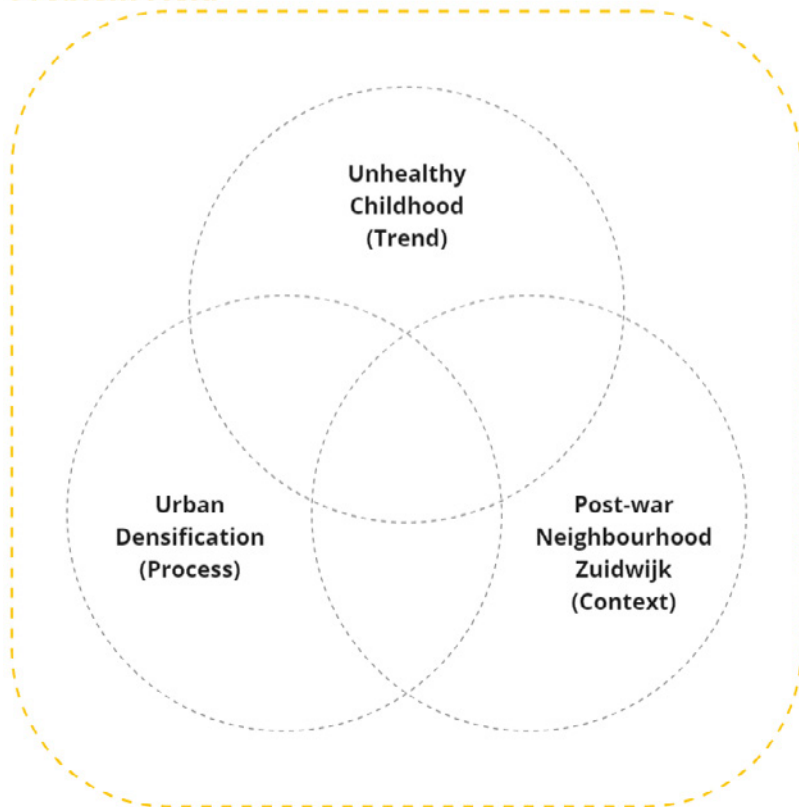


Fig. 1.2 Problem Field. Source: Author

# 1.5 Problem Statement

## Problem Statement

We know from Randy White, the Executive Director of the Center for Community Transformation at Fresno Pacific University, that if we want to create a better society that values sustainability and the environment, we need to ensure the presence of biophilia is present in childhood development. Unfortunately, children that live in the densifying urban environment are facing the unhealthy trend of disconnection to nature. They are the vulnerable group in the community but also the representation of the future society. If we want to achieve a healthier society in the future, we need to thrive to find solutions for creating better cities for children to grow up in.

The cities today are facing the problematic trend of unhealthy childhood development due to the decreasing outdoor physical activities and the experience with nature. The trend is even being facilitated with the continuous urban densification, which is intensifying the tension between the demand of space and the space for nature. Looking at the densified and densifying urban fabrics, the needs and consideration of children are less seen in the developing process.

Under the context of the city of Rotterdam, the city was scored as the worst in terms of child-friendliness compared to all the other Dutch cities. (Lefaivre, 2007) In reaction to this issue, the municipality of Rotterdam has been publishing and executing projects that improves the living quality for children to keep or attract families with children to live in Rotterdam. However, with the changing demand and interest of families and children, some projects are in need of new directions to continue ensuring child-friendliness in the city. (See Chapter 2)

Within the city of Rotterdam, the post-war neighbourhood, Zuidwijk, was the pilot neighbourhood that was created with the vision of connecting the residents together with more public space in the neighbourhood. However, it is now lacking social cohesion with its presence of public green spaces. Zuidwijk is also one of the most populated neighbourhoods in Rotterdam, with a higher percentage of young children. (See Fig. 1.3) Thus, there is a gap between the demand for a child-friendly environment and the supply that the current context of Zuidwijk can support.

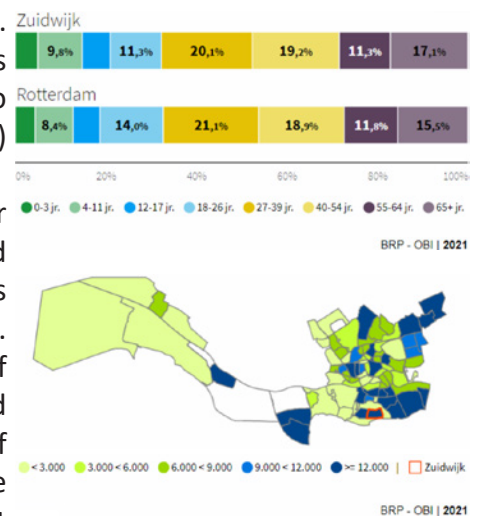


Fig. 1.3 Zuidwijk Population. Source: Gemeente Rotterdam



## **2. Methodology**

2.1 Conceptual Framework

2.2 Research Aim

2.3 Research Question

2.4 Analytical Framework

2.5 Methods

2.6 Research Approach

2.7 Intended Outcomes

## 2.1 Conceptual Framework

The main concept of this thesis is to achieve Biophilic Urban Childhood, which can be constructed with three main domains as stated in the conceptual framework below.

The densification as the ongoing process with the focus on governance of the regeneration of dense neighbourhood and spatial typology analysis. Healthy childhood as a condition to achieve. It can be achieved with six main qualities of child-friendly design. (Krisiak N., 2020) The biophilic city as a model to form specific principles and methods to achieve the condition of healthy childhood in the process of urban densification.

The conceptual framework forms the vision of enhancing the condition of healthy childhood with the model of biophilic city under the process of urban densification.

The vision of Biophilic Urban Childhood is also aiming to contribute to a more sustainable society with environmental, social, and economic benefits.

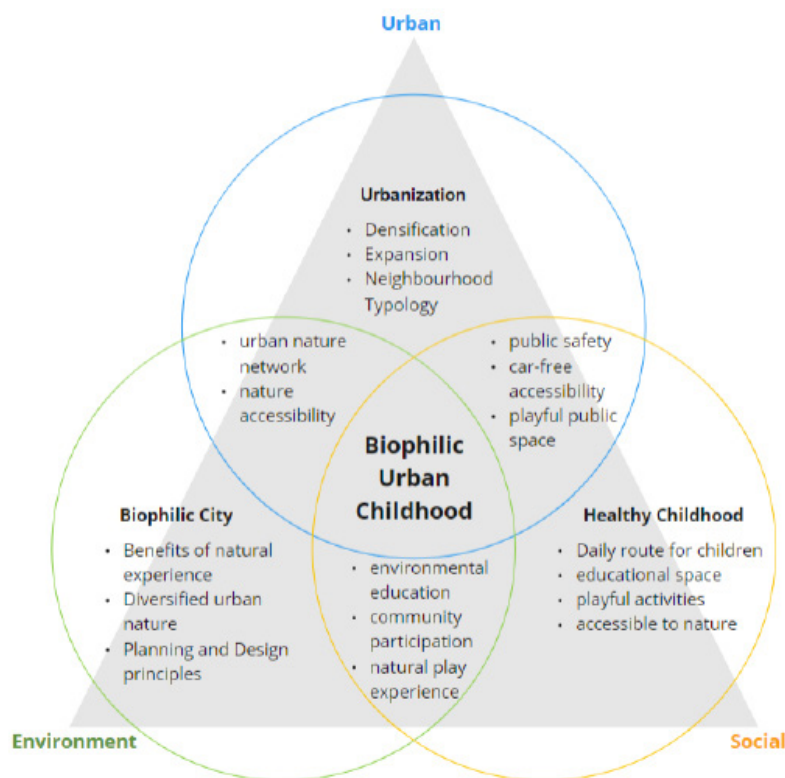


Fig. 2.1 Conceptual Framework. Source: Author

## 2.2 Research Aim

### Research Aim

The research aim is to provide a method of city planning and urban design, concluding from the literature review and case study. The method is aiming to create cities where children can have an abundant natural experience while growing up in an urban environment.

Looking at the existing planning and design process, we seldom see the needs of children to be considered or have their voice be heard in the decision making. With community-based and children-inclusive strategies, the project is aiming to create an urban environment that provides children enough natural experience and the inclusive system to make the healthy childhood a priority of the society to maintain and enhance.

By reconnecting urban upbringing to nature, we are introducing a healthier lifestyle to the citizens of the future.

**Define** the evidence based solutions for the unhealthy childhood.

**Reveal** the tension between the densifying city and the space for nature.

**Assess** the current context for focus area and possible location for interventions.

## 2.3 Research Question

### Research Questions

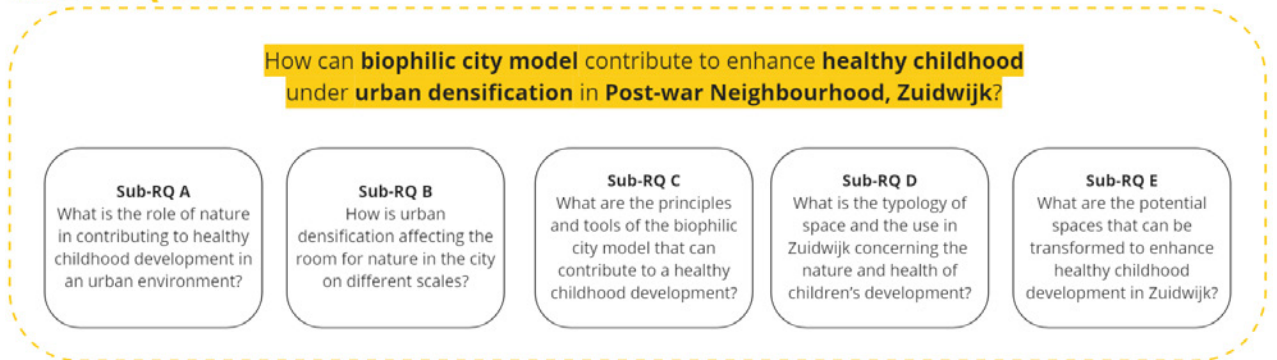


Fig. 2.2 Research Questions. Source: Author

Concluding from the problem statement and research aim, the research question is formed as "How can biophilic city model contribute to enhancing healthy childhood under urban densification in Post-war Neighbourhood, Zuidwijk?" Which is going to be answered with the following five sub research questions.

#### **Sub research question A**

What is the role of nature in contributing to healthy childhood development in an urban environment?

#### **Sub research question B**

How is urban densification affecting the room for nature in the city on different scales?

#### **Sub research question C**

What are the principles and tools of the biophilic city model that can contribute to a healthy childhood development?

#### **Sub research question D**

What is the typology of space and the use in Zuidwijk concerning the nature and health of children's development?

#### **Sub research question E**

What are the potential spaces that can be transformed to enhance healthy childhood development in Zuidwijk?

## 2.4 Analytical Framework

Research Background

### Motivation/Phenomenon

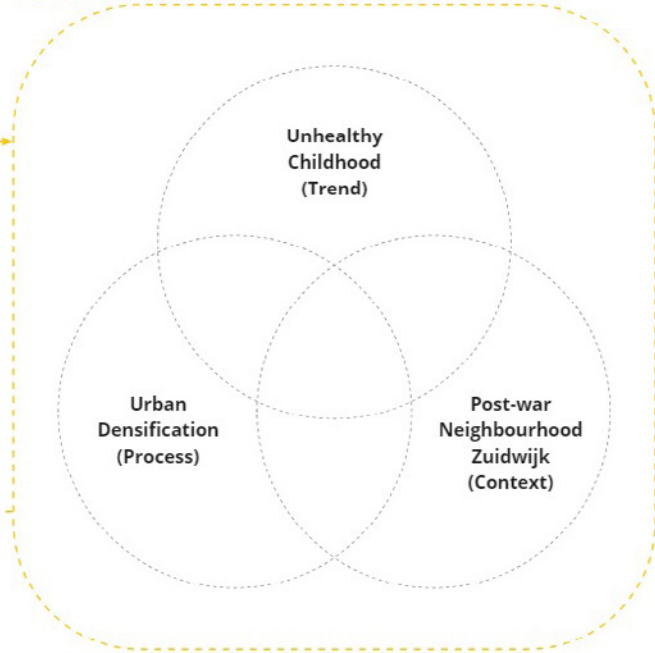
"We need to allow children to develop their biophilia, their love for the Earth, before we ask them to save it. The more personal children's experience with nature, the more environmentally concerned and active children are likely to become"

Randy White,  
Children's Space Designer

### Problem Statement

Over the past few decades, along with the virtualized social and educational methods, childhood in modern days is increasingly becoming an indoor experience. Especially in urban settings, a high percentage of childhood is lacking outdoor activities, especially when nature is not accessible enough in the city. Growing up with little connection to nature is not only negative for mental/physical well-being, but help creates a society that forgets the biophilic needs of human and ends up building a nature-less environment and lifestyle.

### Problem Field



Vision / Goals

### Research Questions

How can **biophilic city model** contribute to enhance **healthy childhood** under **urban densification** in **Post-war Neighbourhood, Zuidwijk?**

- Sub-RQ A**  
What is the role of nature in contributing to healthy childhood development in an urban environment?
- Sub-RQ B**  
How is urban densification affecting the room for nature in the city on different scales?
- Sub-RQ C**  
What are the principles and tools of the biophilic city model that can contribute to a healthy childhood development?
- Sub-RQ D**  
What is the typology of space and the use in Zuidwijk concerning the nature and health of children's development?
- Sub-RQ E**  
What are the potential spaces that can be transformed to enhance healthy childhood development in Zuidwijk?

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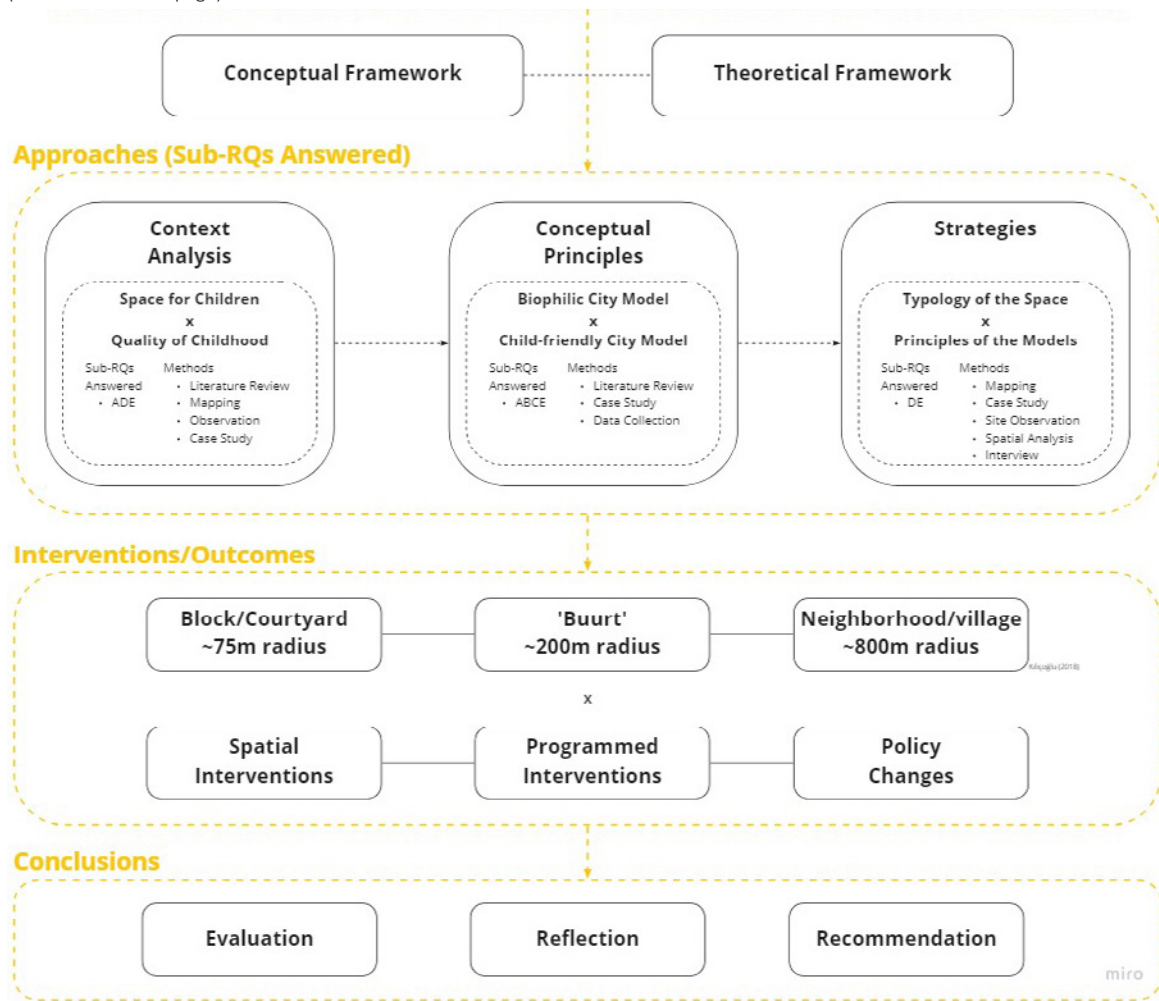


Fig. 2.3 Analytical Framework. Source: Author

## 2.5 Methods

Establishing the overall framework of the research, the next section in the methodology is to find tools and methods to realise every step of the research. This section will be explaining the methods that are useful and effective to answer the research questions, and how it will be used in the research.

### Literature Review

(Answering the Sub-Question ABC)



The method of literature review will mainly be conducted in the early stage of the research. The purpose is to establish the foundation of the research. It is used to understand and reveal the issue and the gap between known knowledge and the opportunity of research or experimental design of this research. Concluding from the literature review, some of the principles can be revealed to further guide the planning and design stage of the research.

### Case Study

(Answering the Sub-Question ABC)



This project will be focusing on two types of case studies: the child-friendly design and the biophilic city planning and design. The case study will be emphasizing on how the projects measure and identify the context, and how they develop the strategies to reflect on those problems.

### Data Collection

(Answering the Sub-Question BE)



The method of data collection can be done with statistic review or historical study from the published reports and statistic materials. It is essential to collect enough data to understand the context and the problem with an evidence based background.

## **Mapping**

(Answering the Sub-Question BDE)

With the information that is gathered from other methods, the data will be mapped with different layers to show the spatial relation between each material. By mapping and overlapping the information, we can reveal the problems with spatial perspective, and see the potential solution while understanding the interrelation.



## **Site Observation**

(Answering the Sub-Question DE)

Site observing is the method that collects first-hand data from visiting the site and observing the critical aspect for the project. For this project, the main focuses will be the children's activities and the use of the public space in the neighbourhood, and the connection to the natural or outdoor amenities that are located around the neighbourhood.



## **Spatial Analysis**

(Answering the Sub-Question BDE)

With the materials gathered from the site observation and the base context maps from mapping data, spatial analysis can be done for different purposes in order to reveal the problem and potentials, and become the bridge to the decision making in the design process.



## 2.6 Research Approach

The research approach is aiming to answer the sub research questions to solve the overall research question. According to Kılıçoğlu's research in 2018, the approaches will be focused on three main scales of space for children, and different domains and quality of childhood development.

The approaches can be separated in three steps. The content analysis will be studied in two aspects, the space for children and the quality of childhood. The conceptual principles will focus on concluding and extracting the principles of biophilic city model and child-friendly city model with literature review and case study. The last step, strategies forming, will be formed with the previous two steps, the typology of the space and the principles of the models.

block / courtyard ~75m radius	'buurt' ~200m radius	neighb. / village ~800m radius
<b>play</b>	<b>play</b>	<b>play</b>
<ul style="list-style-type: none"> <li>- swing &amp; slide</li> <li>- functional (motor) play</li> <li>- fantasy play</li> <li>- imitation play</li> </ul>	<ul style="list-style-type: none"> <li>- functional (motor) play</li> <li>- fantasy play</li> <li>- exploration, emplaced knowledge</li> <li>- (informal) sports</li> </ul>	<ul style="list-style-type: none"> <li>- exploration, formal knowledge</li> <li>- functional (motor) play (competitive) sports</li> </ul>
<b>social</b>	<b>social</b>	<b>social</b>
<ul style="list-style-type: none"> <li>- semi-public enclosed space</li> <li>- front door for neighbours</li> <li>- high inter-visibility public-private</li> <li>- audible connection public-private</li> <li>- co-ownership with residents</li> <li>- "furnishing for togetherness"</li> <li>- diverse housing typologies</li> </ul>	<ul style="list-style-type: none"> <li>- small (play) square or 'meent'</li> <li>- front door for visitors</li> <li>- some inter-visibility public-private</li> <li>- local legends, emplaced knowledge</li> <li>- co-maintenance with municipality</li> <li>- corner store, icecream van</li> <li>- mixed-use with small workshops</li> </ul>	<ul style="list-style-type: none"> <li>- (market) square as "totem pole"</li> <li>- community center, library, theater</li> <li>- clear boundary public / private</li> <li>- participation of children in civic life</li> <li>- organized clean-up activity</li> <li>- shopping street with local trades</li> <li>- diverse urban landscape</li> </ul>
<b>space</b>	<b>space</b>	<b>space</b>
<ul style="list-style-type: none"> <li>- play space at least 300m<sup>2</sup></li> <li>- at least 1.5m wide</li> <li>- adequate light entrance</li> <li>- multi-chambered</li> <li>- high visual depth</li> <li>- places to hide</li> <li>- (bridged) height differences</li> <li>- place to gaze at the sky</li> </ul>	<ul style="list-style-type: none"> <li>- pluriformity of 'play stretches'</li> <li>- shared space or wide sidewalks</li> <li>- minimized through traffic</li> <li>- unprogrammed spaces</li> <li>- sport pitch for 2-8 players</li> <li>- spaces to meet friends</li> <li>- vantage point(s)</li> <li>- access to public transport</li> </ul>	<ul style="list-style-type: none"> <li>- network of play stretches &amp; spots</li> <li>- separation of traffic by speed</li> <li>- safe pedestrian crossings</li> <li>- open school yards</li> <li>- space for organized group activities</li> <li>- isolated spaces for privacy</li> <li>- spaces for teens, adolescents</li> <li>- extensive cycle network</li> </ul>
<b>nature</b>	<b>nature</b>	<b>nature</b>
<ul style="list-style-type: none"> <li>- non-toxic plants, ground cover, shrubs, vines, climbable trees</li> <li>- fauna: insects, worms, spiders, birds, bats, cats, dogs, chickens</li> <li>- spice / vegetable garden</li> <li>- greenhouse</li> <li>- water source</li> <li>- fire pit</li> </ul>	<ul style="list-style-type: none"> <li>- diverse micro-climates</li> <li>- diverse plants at eye level children</li> <li>- fauna: fish, amphibians, squirrels</li> <li>- allotment gardens</li> <li>- collecting flowers, berries, nuts</li> <li>- play or fish in ditches, ponds</li> <li>- trees to climb, build tree huts in place to let the dog off the leash</li> </ul>	<ul style="list-style-type: none"> <li>- access to natural environments</li> <li>- diverse environments to explore: forests, fields, dunes, lakes, streams</li> <li>- fauna, farm animals, mammals in natural habitat, meadow birds</li> <li>- experience transhumance</li> <li>- farmers market</li> <li>- petting zoo</li> </ul>
<b>material</b>	<b>material</b>	<b>material</b>
<ul style="list-style-type: none"> <li>- yard: grass, sand, earth, wood chip</li> <li>- path: compacted gravel, stone</li> <li>- play material: sand, clay, pebbles</li> <li>- twigs, cones, leaves, nuts, shells re using household 'waste'</li> <li>- shared storage shed</li> </ul>	<ul style="list-style-type: none"> <li>- squares: mix of hard &amp; soft material</li> <li>- bike paths: asphalt, concrete</li> <li>- sidewalk detailing: stoops, alcoves, stairs, canopies, corners</li> <li>- storage box at play squares / streets</li> <li>- collecting 'waste': paper, glass jars</li> <li>- 'free little library'</li> </ul>	<ul style="list-style-type: none"> <li>- squares: (natural) stone, brick</li> <li>- street &amp; bike path: asphalt</li> <li>- toy library or sharing group</li> <li>- geocaches</li> <li>- children's street market</li> </ul>

Fig. 2.4 Socio-spatial scales of childhood. Source: İhsan D. Kılıçoğlu (2018)

### Approaches (Sub-RQs Answered)

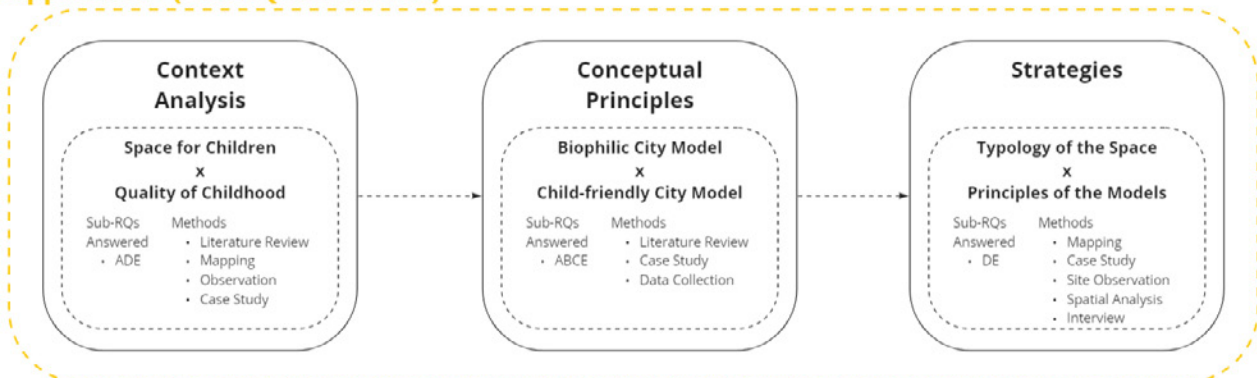


Fig. 2.5 Research Approaches. Source: Author

## 2.7 Intended Outcomes

The intended outcome of this thesis is to provide a spatial transformation method and urban design proposals to promote and test strategies that transform the city with nature into a healthier environment for children to live in.

The interventions will be focused on different scales of radius, which is accessible for different age groups of children. (Kılıçoğlu, 2018) The types of interventions will be formed in three main categories as Spatial Interventions, Programmed Interventions, and Policy Changes.

Combining the scale of the scope and the types of interventions, the research is aiming to develop a toolbox of transformation methods to a healthy urban environment for childhood development. In addition to the toolbox, different strategies will be tested with the context of the targeted neighbourhood in Rotterdam South to produce site-specific design proposals.

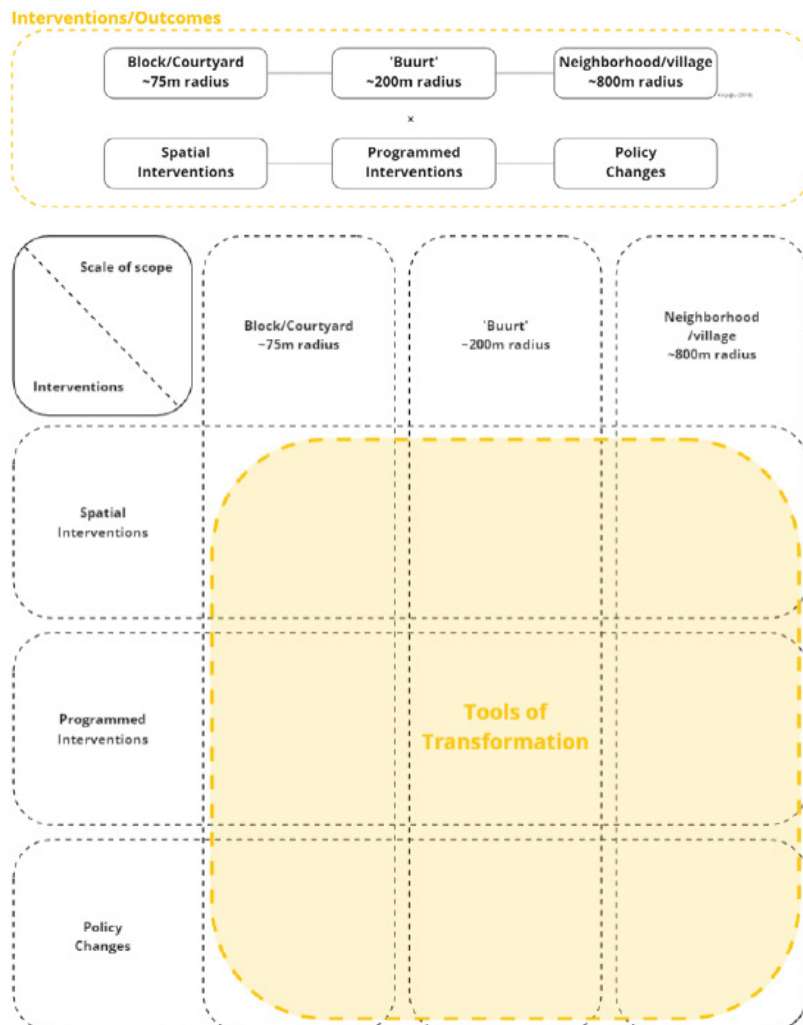


Fig. 2.6 Intended Outcome Diagram. Source: Author





### **3. Theoretical Chapter**

- 3.1 The trend of Unhealthy Childhood
- 3.2 The Post-war Neighbourhood - Zuidwijk
- 3.3 Biophilic & Child-friendly City
- 3.4 Governance & Policy
- 3.5 Conclusion & Principles

## 3.1 The trend of Unhealthy Childhood

### **Natureless Childhood**

Since the first two decades of the 21st century, along with the virtualized social and educational methods, childhood in modern days is increasingly becoming an indoor experience. Studies show that this trend is providing negative impacts on the health of children. “The decreasing outdoor & physical activities in school dramatically raised life-threatening childhood obesity with growing evidence that links physical exercise and experience in nature to mental acuity and concentration.” (Munter et al, 2004). Lacking time spent in outdoor spaces, children are prone to having insufficient nature experience, which is another critical factor to unhealthy childhood. As Louv stated in his book, *Last Child in the Woods*, “Nature-Deficit Disorder can change human behaviour in cities and its design, according to studies that show a relationship between the absence, or inaccessibility, of open space with high crime rates, depression, and other urban maladies.” (Louv, 2005)

The trend of unhealthy childhood has been facilitated even more with the process of urban densification. Children living in the densifying area can access a smaller range of space. (Fetto, 2002) They have lower freedom to play in outdoor public space. (L. Karsten, 2005) With the growing tension of the demand of space, formal and informal regulations are formed, which have been restricting the freedom of mobility for children, (Hillman & Adams, 1992) “As open space shrinks, overuse increases. The disappearance of accessible open space escalates the pressure on those few natural places that remain. Meanwhile, the regulatory message is clear: islands of nature are to be seen, not touched.” (Louv, 2005)

This unhealthy trend and densifying process can also be found in the Dutch context. “Comparing children’s play in the Netherlands in the 1950s and 1960s to child’s play in the first years of the 21st century, children today play outside less often and for briefer periods; they have a more restricted home range and have fewer, less diverse playmates.” (Karsten, 2005) According to a survey of students from seven Dutch secondary schools by Jana Verboom-Vasiljev, the love of nature is not a main value in many of the family. “About 75% of pupils thought there was only ‘a bit of interest’ for nature at home, and 11% said there was none. More than half never go to nature



reserves and parks, zoos or botanical gardens.” With the spatial factor, the urban environment is providing insufficient nature experience. Adding the social aspect of the parenthood of generation that is lacking in the love of nature, it is becoming harder for children who are growing up in the city to develop their innate affiliation to nature.

### **Unfriendly Urban Environment for Children**

The rapid trend of urbanization is contributing to the form of unfriendly urban environment to the children living in it. This trend is also increasing the urban challenge of growing towards an unsustainable future. In 2015, more than half of the population in the world, which is around 4 billions of people, lived in the cities. By 2030, the city population is expected to reach another billion people, which means the cities will contain 60 percent of the population in the world. (UNICEF, 2018) With the growing needs of accommodation in the cities, the urban expansion will increase the fragmentation of the built environment. The urban form can become less compact with less public space and centrality of the agglomeration. In various aspects, the expansion is contributing to many environmental, social, and economic issues. For children, according to Pieterse’s study of child-friendly cities in the case of Wroclaw in Poland, the outflow of families from the city center is causing the safety problem for children due to the increase of traveling distance to the school. (Pieterse, 2012) Another example of the impact of urbanization can be seen in Belfast, Ireland from a proposal of ARUP. It shows that the city is not only growing, but growing less hospitable for children and their families. Children are the future of our society, while they have been increasingly neglected from the decision of the urban planning process, which results in an environment that limits the freedoms of children to expose to different experiences in order to develop their lifelong health and essential skills. (ARUP, 2020)

As the urban environment becomes the context of where most children live, a better way of shaping urbanization for children is not only essential to support children’s needs, but also creating a better urban system as homes for the future generation. According to a report from unicef in 2018, we need to understand the vulnerabilities of children in urban settings (see Fig. 3.1) to offer them a healthier urban

and better future. (UNICEF, 2018) From the diagram, we can see that there are four categories of vulnerabilities of urban childhood. In the built environment category, it's mainly about the accessibility of children and their family to the urban services. The other three categories are focusing on the concern of children's health, protection and participation.

In terms of the design of the urban fabrics, reports are showing that the neighbourhoods and street design is crucial on the impact of the health of childhood development. Numbers of challenges on the street level are causing a health crisis on a global level. According to the research from the National Association of City Transportation Officials (NACTO), four crucial issues were highlighted as follows. Firstly, the road traffic crashes issue shows that globally, 500 children die each day from it, which is the top cause of death for people ages 5 to 29. The second topic is the ambient air pollution. Around 127,000 children under age of five die from air pollution worldwide. The third and the last issues are the mental health stresses and lack of physical activity. The exposure to noise pollution can lead to concentration problems, high stress level, and cognitive function reduction. With the facilitation of urbanisation, 81 percent of adolescents are insufficiently active in physical activities.

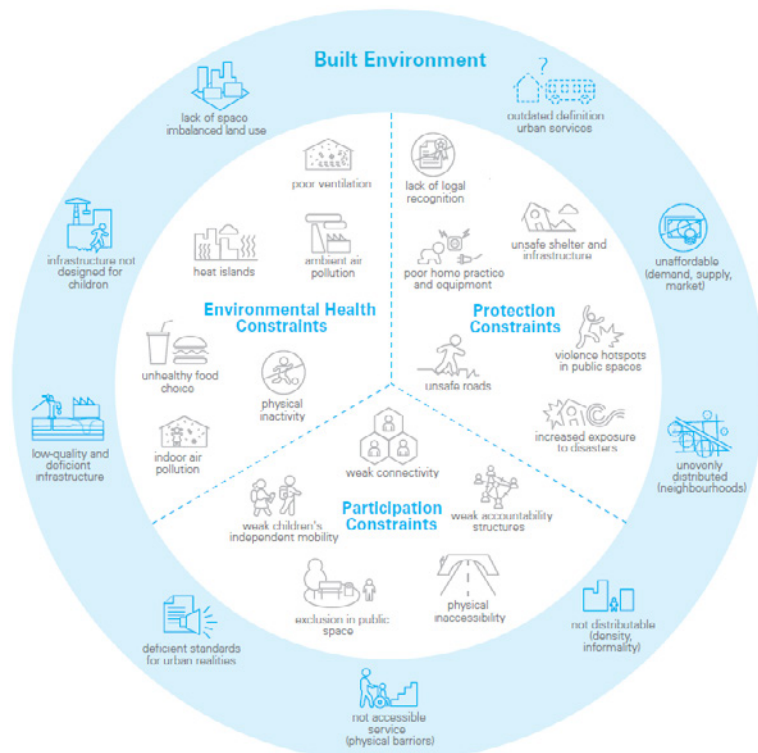


Fig. 3.1 Taxonomy of children's vulnerabilities related to the built environment. Source: unicef, 2018

## 3.2 The Post-war Neighbourhood - Zuidwijk

### Background of Post-war Neighbourhood

The origin of the post-war neighbourhoods can be dated back to the 1950s when the gap between population growth and the slow operating architecture market was increasing in the first few years of the post-war periods. Due to the lack of architectural materials from the insufficient infrastructure of the architectural profession, and the fall of the capitalism market, the housing production is starting very slow in the first few years. (Ouwehand, 2018) The trend of the growing gap of housing demand and the difficulties of producing sufficient accommodation from the free market is causing the first bloom of the post-war neighbourhoods. Since 1948, the government has started to intervene in the imbalance of demand and supply issues. The policy of stimulating housing production started to influence the market. The form of the housing was mainly produced for social rental purposes. (Ouwehand, 2018)

### Structure of Zuidwijk

From the book 'De stad der toekomst, de toekomst der stad' (The City of the Future, the Future of the City) by Alexander Bos and Willem van Tijen, where they proposed a concept of 'connecting the neighborhood and community' for the city development based on their study during the war in Zuidwijk. (Van Wijk, 2019) The book was published with the study group, Studiegroep-Bos (Study Group Bos), in 1946 with the purpose of answering how to rebuild and develop the city of Rotterdam after the bomb in May, 1940. The planning of Zuidwijk was based on the vision of 'co-living in the city,' which was mainly related to the concept that was proposed from the Study Group Bos. Zuidwijk was also the first neighbourhood that was developed with this concept, which makes Zuidwijk a pioneer post-war neighbourhood. (Ouwehand, 2018; Van Wijk, 2019)

The Study Group was studying the concept of neighbourhood. Based on the historical and social references, they have proposed that the idea of neighbourhood is formed with different scales of urban components including the connection in between each element. (See Fig. 3.2) The lower schemes of Figure 02 are the concept that was proposed for post-war neighbourhoods. The concept of neighbourhood can be explained with the structure of the city as concentric circles.

Every circle represents different scales of components, such as, house, neighbourhood, district, and city whole. They are all related to each other and they all have different meanings on individuals and different scales of communities. They later pointed out that the intention of this scheme is not to divide the city into isolated provincial towns, but to bring residents into contact with the larger community and the city as a whole. (Ouweland, 2018)

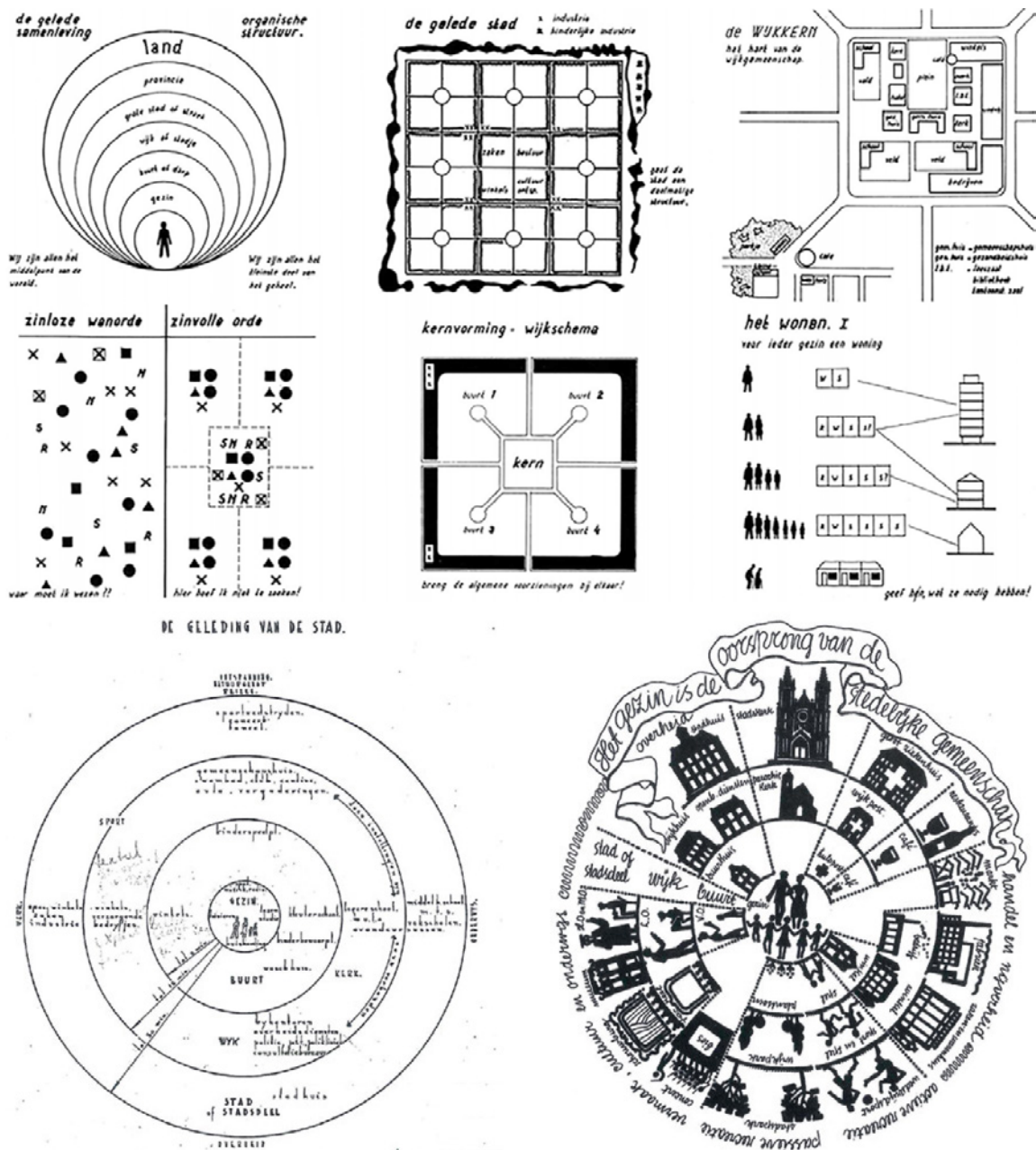


Fig. 3.2 The Articulation of the City. Source: Ouweland, 2018

## Nature in Zuidwijk

Speaking of nature in Zuidwijk, the design of public green from the post-war neighbourhood concept is clear to be seen in the structure. However, most of the 'public' green is no longer being publicly used, but becoming 'anonymous' green lands that are not recognised nor attached by the residents. The urban green was redefined in the new concept of post-war neighbourhoods which can be articulated with hierarchical layers as; the residential green, the block green, the neighbourhood green (het buurtgroen), district green (het wijkgroen), and the city green (het stadsdeelgroen). (Merriënboer, 2011) The public green concept was clearly implemented in Zuidwijk. It was the first time where most of the people could have the opportunity to live in a wide residential area with greens and shadows. (Van Wijk, 2019)

There are two characters of public green in the post-war neighbourhood, the public frontyard, and the courtyards. On the one hand, the public front gardens were introduced under the influence of Scandinavian urban planning and architecture. The main purpose of the public front gardens was to create a more architectural unity along the facades. The idea was started from the urban planner, the architect, and the landscape architect in pursuit of unity between residential blocks and outdoor space. However, more and more of these spaces that were originally designed for pedestrians and greens were occupied by cars with the trend of increasing ownership of vehicles. (Merriënboer, 2011; Van Wijk, 2019) The second character is the 'binnentuinen' (courtyard), which was already well known by the public before World War II. The idea of these courtyards was for the public use in rental residential housings that are usually three to four stories high. The courtyard has an important meaning of connecting the block socially and spatially. Compared to the pre-war housing complex that divided the inner courtyards into cluttered private gardens, the new communal courtyard was referred to as the 'outdoor living space' in the post-war years. Unfortunately, part of the courtyards were quickly sacrificed for the increased car ownership in the 1960s and 1970s. (Merriënboer, 2011) The image of the public green then becomes children playing beside the parking lots where the gardens became a green for viewing instead of using.

## **What are the possibilities to transform?**

Situations have changed a lot since the 1950s, thus the accommodation capacity and living quality of post-war neighbourhoods are no longer sufficient for the requirement and demand of the society today. Including Zuidwijk, many post-war neighbourhoods are facing large-scale regeneration processes. (Van Wijk, 2019) According to Van Wijk's interviews with the residents in Zuidwijk, the public spaces are losing its public function to the neighbourhood. Except for serving as circulation purpose, residents are not using the public space often thus have nearly zero sense of responsibility to it. Children are rarely using the courtyards due to the weather condition and the social restrictions from their family or cultural backgrounds. Most of the time in a year, the courtyards are anonymous, no one feels responsible to it nor feeling the sense of belongings in their living environment. (Van Wijk, 2019) It is clear that there is a great gap between the origin purpose of these public spaces and how they are now as anonymous spaces. The gap brings the weakness of the post-war neighbourhood but also shows the opportunity for interventions to kick in.

With the different scale of public green in the city, children are able to access to a certain range of distance within different age groups. (Kılıçoğlu, 2018) Each scale serves different functions to the children's everyday life. (See Fig. 3.3) Compared to the public green hierarchical layers, it would be the scales from the residential green to the district green. The transformation therefore should be targeted on the relation of the spaces and the children within these scales.

block / courtyard ~75m radius	'buurt' ~200m radius	neighb. / village ~800m radius
<b>play</b> - swing & slide - functional (motor) play - fantasy play - imitation play	<b>play</b> - functional (motor) play - fantasy play - exploration, emplaced knowledge - (informal) sports	<b>play</b> - exploration, formal knowledge - functional (motor) play - (competitive) sports
<b>social</b> - semi-public enclosed space - 'front door' for neighbours - high inter-visibility public-private - audible connection public-private - co-ownership with residents - "furnishing for togetherness" - diverse housing typologies	<b>social</b> - small (play) square or 'meent' - front door for visitors - some inter-visibility public-private - local legends, emplaced knowledge - co-maintenance with municipality - corner store, icecream van - mixed-use with small workshops	<b>social</b> - (market) square as "totem pole" - community center, library, theater - clear boundary public / private - participation of children in civic life - organized clean-up activity - shopping street with local trades - diverse urban landscape
<b>space</b> - play space at least 300m <sup>2</sup> - at least 15m wide - adequate light entrance - multi-chambered - high visual depth - places to hide - (bridged) height differences - place to gaze at the sky	<b>space</b> - pluriformity of 'play stretches' - shared space or wide sidewalks - minimized through traffic - unprogrammed spaces - sport pitch for 2-8 players - spaces to meet friends - vantage point(s) - access to public transport	<b>space</b> - network of play stretches & spots - separation of traffic by speed - safe pedestrian crossings - open school yards - space for organized group activities - isolated spaces for privacy - spaces for teens, adolescents - extensive cycle network
<b>nature</b> - non-toxic plants: ground cover, shrubs, vines, climbable trees - fauna: insects, worms, spiders, birds, bats, cats, dogs, chickens - spice / vegetable garden - greenhouse - water source - fire pit	<b>nature</b> - diverse micro-climates - diverse plants at eye level children - fauna: fish, amphibians, squirrels - allotment gardens - collecting flowers, berries, nuts - play or fish in ditches, ponds - trees to climb, build tree huts in - place to let the dog off the leash	<b>nature</b> - access to natural environments - diverse environments to explore; forrests, fields, dunes, lakes, streams - fauna: farm animals, mammals in natural habitat, meadow birds - experience transhumance - farmers market - petting zoo
<b>material</b> - yard: grass, sand, earth, wood chip - path: compacted gravel, stone  - play material; sand, clay, pebbles twigs, cones, leaves, nuts, shells - re-using household 'waste' - shared storage shed	<b>material</b> - squares: mix of hard & soft material - bike paths: asphalt, concrete  - sidewalk detailing : stoops, alcoves, stairs, canopies, corners - storage box at play squares / streets - collecting 'waste': paper, glass jars - 'free little library'	<b>material</b> - squares: (natural) stone, brick - street & bike path: asphalt  - toy library or sharing group - geocaches - children's street market

Fig. 3.3 Socio-spatial scales of childhood. Source: İhsan D. Kılıçoğlu (2018)

### 3.3 Biophilic & Child-friendly City

Concerning the increasing threat of unhealthy childhood development under the rapid urbanization process, and the opportunities that are brought by the anonymous public green in the post-war neighbourhoods, the city should thrive for providing a better quality of urban nature to take care of our future generation. In this section, we will be looking at the concept of Biophilic City and Child-friendly City to see what are the possibilities that could be the new future of a healthy Zuidwijk.

#### **Biophilic City**

What are biophilic Cities? 'Biophilia' was defined by E. O. Wilson, American biologist, in 1984 as 'The innately emotional affiliation of human beings to other living organisms. Innate means hereditary and hence part of ultimate human nature.' Except for the innate demand to connect to nature, many researches have proved that urban nature, in many forms, can help to foster social relationships and networks, and even build friendships that in turn yield significant health benefits and contribute to emotional resilience. (Beatley, 2016) According to the Biophilic Cities Pledge that was proposed by Timothy Beatley, a biophilic city is in spatial, social, organisational aspects, a nature abundant city that citizens are well developed with their biophilia in their everyday life. (See Fig. 3.4, 3.5) However, the city and society we have been building today are disconnecting children from nature, which leads to the result that children growing up in the city today, often feel a fear of nature, and a fear of the outside world. (Louv, 2005)

To implement nature into the urban environment, we need to understand the natural experiences existing in our environment in different forms. The Nature Pyramid shows us that nature experience happens on different scales with various frequency, duration, and intensity of immersion. (See Fig. 3.6)



### What Are Biophilic Cities?

- a city of abundant nature
- where citizens have rich daily contact with the natural environment
- where citizens have nature nearby
- where larger natural areas and deeper nature experiences are an easy walk, bike or transit ride away
- where the urban environment allows for and fosters connections with diverse flora, fauna, and fungi
- where citizens spend extensive time outside, learning about, enjoying and participating in the natural world
- where leaders and elected officials place nature at the heart of their decision making
- where every major planning and development decision is judged by the extent to which nature is restored and connections with the natural environment enhanced

Fig. 3.4 Biophilic Cities Pledge. Source: Beatley, 2016

### Principle of Biophilic Design

1. Biophilic design requires repeated and sustained engagement with nature.
2. Biophilic design focuses on human adaptations to the natural world that over evolutionary time have advanced people's health, fitness and wellbeing.
3. Biophilic design encourages an emotional attachment to particular settings and places.
4. Biophilic design promotes positive interactions between people and nature that encourage an expanded sense of relationship and responsibility for the human and natural communities.
5. Biophilic design encourages mutual reinforcing, interconnected, and integrated architectural solutions.

Fig. 3.5 Biophilic Design Principle. Source: Kellert, 2015



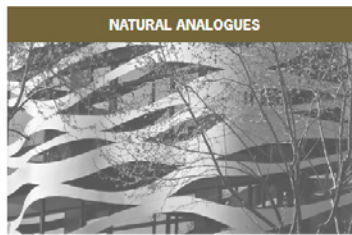
Fig. 3.6 The Nature Pyramid. Source: Singapore National Parks Board

How do we approach developing biophilia in the city? According to the Yale professor Stephen Kellert, there are five main principles of biophilic design. (See Fig. 05) In summary, the principles are aiming to sustain and encourage human interaction and emotional attachment to nature, in order to create a community that has positive relationships and a sense of responsibilities with nature. Kellert also proposed an attribute of biophilic design that includes three types of nature experience design elements. The elements also represent the multisensory aspect of nature experience in biophilic design. The first section is 'direct experience of nature' which includes commonly known natural elements such as, lights, air, water, plants, animals, weather, natural landscapes, and ecosystems. The second section is 'indirect experience of nature' which are elements that use natural materials to provoke the connection to nature in a built environment or using man-made materials or structure to imitate the nature patterns. The last one is 'experience of space and place' which relates the broader environmental psychology aspects. This section includes prospect and refuge, organized complexity, integration of parts to wholes, transitional spaces, cultural attachment to place, etc. (Kellert and Calabrese, 2015) To elaborate the ideas from those three types of design elements, Terrapin Bright Green LLC. has developed a report proposing arguments about 14 patterns of biophilic design. (See Fig. 3.7) These patterns provide practical design ideas to achieve the intention to implement biophilia indesign.



NATURE IN THE SPACE

1. **Visual Connection with Nature**  
A view to elements of nature, living systems and natural processes.
2. **Non-Visual Connection with Nature**  
Auditory, haptic, olfactory, or gustatory stimuli that engender a deliberate and positive reference to nature, living systems or natural processes.
3. **Non-Rhythmic Sensory Stimuli**  
Stochastic and ephemeral connections with nature that may be analyzed statistically but may not be predicted precisely.
4. **Thermal & Airflow Variability**  
Subtle changes in air temperature, relative humidity, airflow across the skin, and surface temperatures that mimic natural environments.
5. **Presence of Water**  
A condition that enhances the experience of a place through the seeing, hearing or touching of water.
6. **Dynamic & Diffuse Light**  
Leveraging varying intensities of light and shadow that change over time to create conditions that occur in nature.
7. **Connection with Natural Systems**  
Awareness of natural processes, especially seasonal and temporal changes characteristic of a healthy ecosystem.



NATURAL ANALOGUES

8. **Biomorphic Forms & Patterns**  
Symbolic references to contoured, patterned, textured or numerical arrangements that persist in nature.
9. **Material Connection with Nature**  
Material and elements from nature that, through minimal processing, reflect the local ecology or geology to create a distinct sense of place.
10. **Complexity & Order**  
Rich sensory information that adheres to a spatial hierarchy similar to those encountered in nature.



NATURE OF THE SPACE

11. **Prospect**  
An unimpeded view over a distance for surveillance and planning.
12. **Refuge**  
A place for withdrawal, from environmental conditions or the main flow of activity, in which the individual is protected from behind and overhead.
13. **Mystery**  
The promise of more information achieved through partially obscured views or other sensory devices that entice the individual to travel deeper into the environment.
14. **Risk/Peril**  
An identifiable threat coupled with a reliable safeguard.

Fig. 3.7 14 Patterns of Biophilic Design. Source: Terrapin Bright Green LLC., 2014

## Child-friendly City

A child-friendly city was defined by the United Nations Children's Fund (UNICEF) as follows, 'A child-friendly city is a city, town, community or any system of local governance committed to fulfilling child rights as articulated in the Convention on the Rights of the Child. It is a city or community where the voices, needs, priorities and rights of children are an integral part of public policies, programmes and decisions. Thus, a child-friendly city is a city that is fit for all.' In their Handbook of Child Friendly Cities and Communities, they stated four guiding principles to achieve child-friendly cities on a global level. Those principles are as follows,

1. Non-discrimination on children of any conditions.
2. Best interests of the child: primary consideration in all actions concerning children.
3. The inherent right to life, survival and healthy development
4. Respect for the views of the child: have the right to voice their opinions and have their opinions considered in decisions that affect them.

Understanding the general concept of child-friendly cities and the principles, as urban planners and designers, we need to consider the spatial condition in relation to this topic and its social aspect. In the report by UNICEF in 2018, *Shaping urbanization for children: a handbook on child-responsive urban planning*, they organized the children activities in a chart based on the urban scales and their correlated functions and accessibility. (See Fig. 3.8) In this figure, we can see the possible space for interventions in multiple scales for different age groups of children and the related urban spaces.

By developing child-friendly cities, we are not only achieving to protect the rights of children and the sustainability pillars, but also creating benefits in many aspects to the whole society. The following figure was proposed by UNICEF to explain the benefits of developing child-friendly cities. The benefits are divided in five areas: Health, Safety, Citizenship, Environmental Sustainability, and Prosperity. (See Fig. 3.9) From a practical case, *Urban Childhoods Belfast City Centre*, by ARUP in Belfast, Ireland, we can see that child-friendly planning and design is not only the purpose, but also the strategy to achieve resilience in the city.

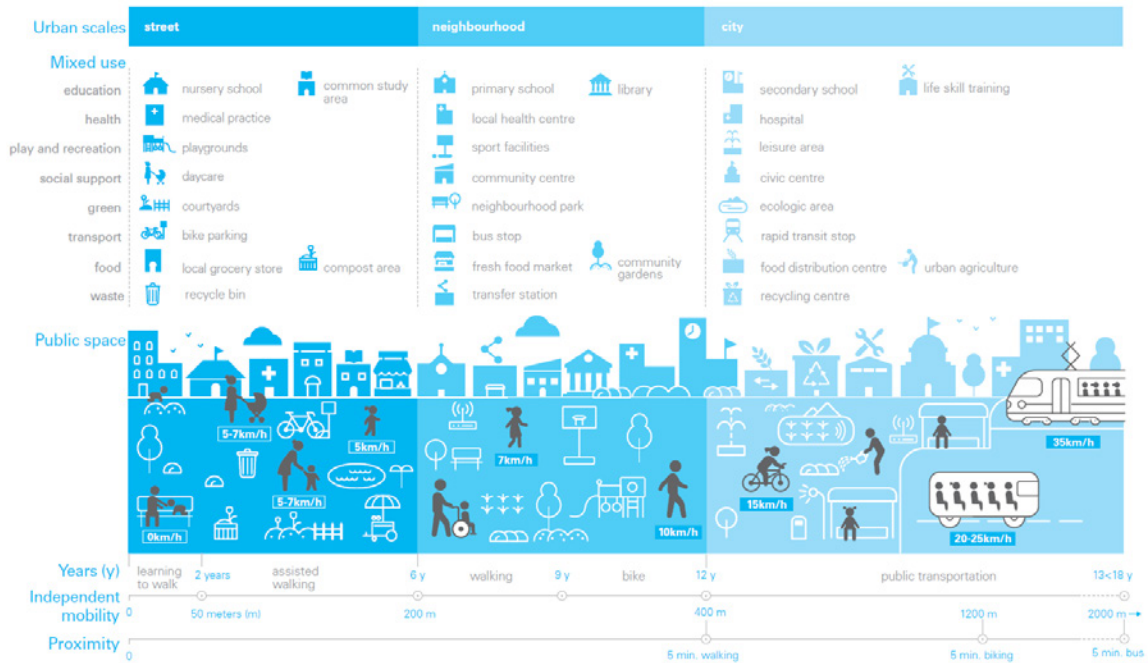


Fig. 3.8 Space and scale of urban childhoods. Source: UNICEF, 2018

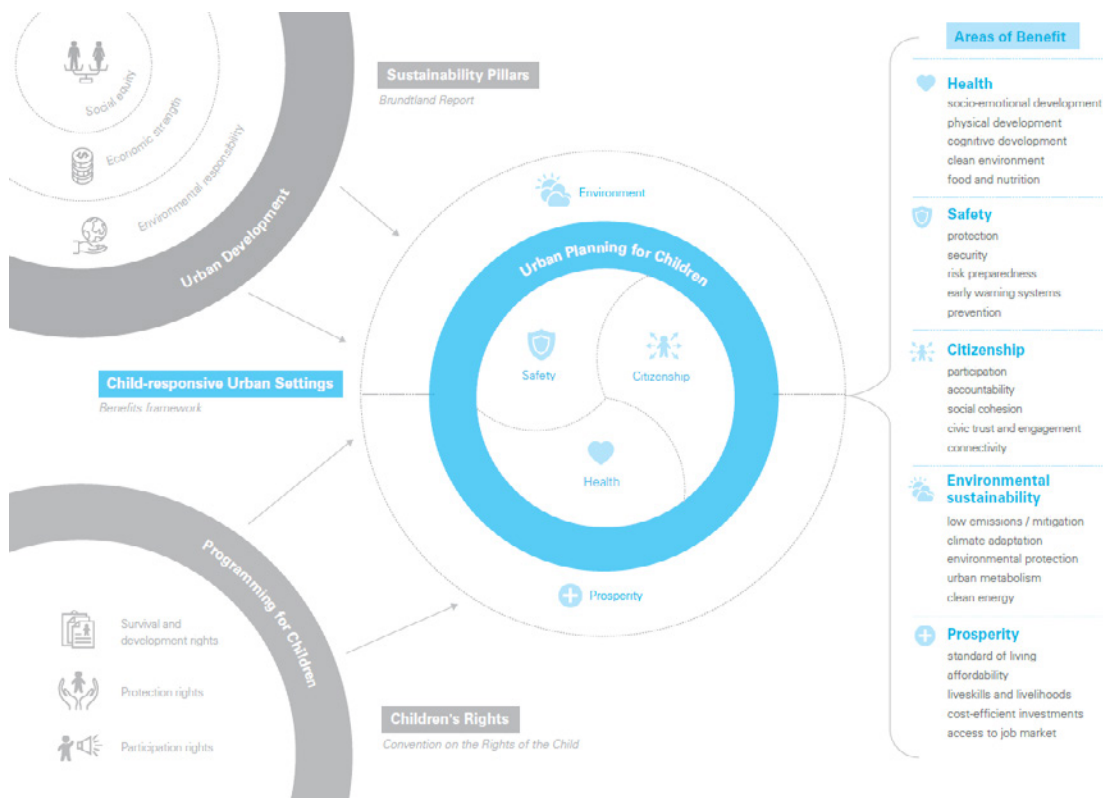


Fig. 3.9 Child-responsiveness and five areas of benefit. Source: UNICEF, 2018

## 3.4 Governance & Policy

Following the trend, the context, and the city models, it is crucial to also look at the current condition and governance of the context to build upon the existing policy or to seek for better adjustment. In this section, we will be looking at some programmes that were published by the municipality of Rotterdam, and are operated by the collaboration of public and private sectors. The city of Rotterdam was once rated as the worst Dutch city in terms of child-friendliness in the early years of 21 century. (Lefaivre, 2007) However, the city of Rotterdam proposed a project, Programme Child Friendly Rotterdam, in 2007, in order to improve its child-friendliness. The programme aims to:

1. Enhance the city as a residential location
2. Keep families in the city
3. Strengthen the economy
4. Improve the quality of life for children from 0 to 18 years

The programme developed an urban planning method, Building Blocks for a Child Friendly Rotterdam, to scan neighbourhoods on their degree of, and potential for, child friendliness. The method consists of four building blocks: Child Friendly Housing, Public Space, Facilities, and Safe traffic routes. In relation to the research, the method suggested minimum space suitable for playing in housing and public space, especially the use of the space between front door and street level (liminal space). It also recommended increasing the nature elements and variation on play areas. For buildings and facilities, it states that shops, sports clubs, and schools are generally highly appreciated by parents and children, which contribute to the liveliness of a neighbourhood with social cohesion. The last building block focuses on encouraging children to explore the city and engage in city life more independently by limiting car speed and access, and locating public amenities at strategic points. (Municipality of Rotterdam, 2010)

Since 2013, the municipality has been developing a playground policy, which today, has created 56 playground associations (speeluinverenigingen) that receive a subsidy from the municipality. (See Fig. 3.10, 3.11) However, they no longer have the obvious strong position in the neighbourhood as before, and the number is declining as well.

The project, Action Program Speeltuin Associations, is aiming to create more spacious and accessible playgrounds, and increase the use intensity, which includes 5 strategies:

1. Open and semi-open playgrounds to be more accessible.
2. The playground as a meeting place for the neighborhood.
3. The multifunction sports and play area.
4. Increasing nature in the playground to create challenging and creative play behaviours.
5. Flexible layout of playgrounds to adjust along the development of the neighbourhood.

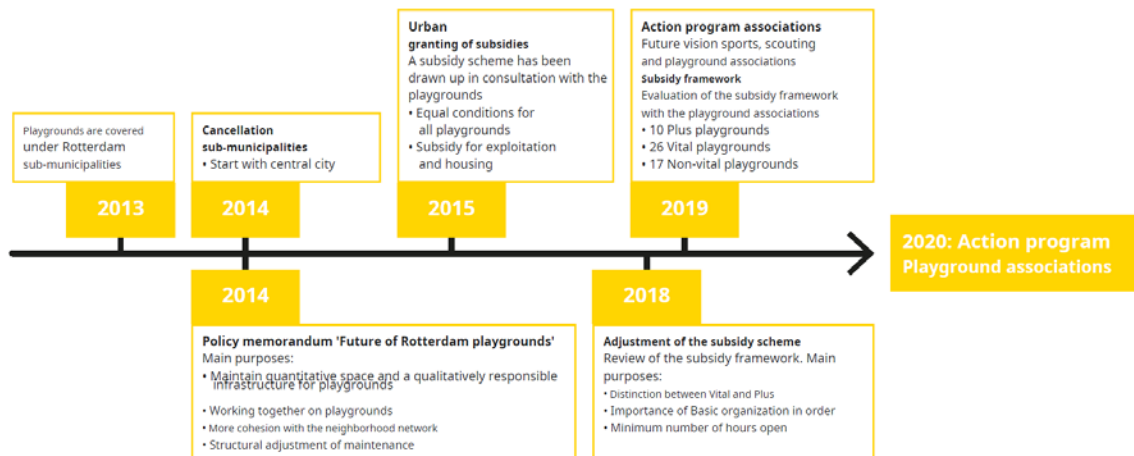


Fig. 3.10 Timeline of Playground Policies. Source: Municipality of Rotterdam, 2020



Fig. 3.11 Location of Playground Associations. Source: Municipality of Rotterdam, 2020

## 3.5 Conclusion

As noted by author Joe L. Frost: 'For the first time in history, the children of entire industrialised nations are losing their natural outdoor grounds for play and forgetting how to engage in free, spontaneous outdoor play. The consequences are profound.' (Forst, 2010) To achieve the sustainable and resilience goals of the future society, we need to thrive to put children in priority with our decision making process.

From the literature review of the trend of unhealthy urban childhood, it is clear that the lack of natural experience is highly crucial to the unhealthy childhood in the urban settings. The current urban development and design process that tends to neglect children's needs are also one of the main reasons that children today can hardly fully develop their potential and stay healthy physically and mentally. With the study of the post-war neighbourhood, Zuidwijk, we can see that the structure of the neighbourhood resulted from a vision to connect people together to the larger community. However, the modern lifestyle of car use has sacrificed the public open space for children or adults to be active in natural outdoor spaces that are right in front of their home. The next section we reviewed the principles and influence of the two city models, Biophilic City and Child-friendly City. As noted by Natalia Krysiak in her report, *Designing Child-Friendly High Density Neighbourhoods*, 'Ultimately, designing child-friendly neighbourhoods will not only provide the best possible developmental outcomes for our youngest citizens, it will also create more inclusive and liveable higher-density neighbourhoods for everyone to enjoy.' (Krysiak, 2020) In the last section we reviewed the related programmes from the municipality to see the past and future direction of child-friendly development. Without a doubt, nature in the city is a key factor and a powerful tool for urban planners and designers to build a better environment and society to make healthy childhood development possible in the urban settings.

The chapter presented the problematic trend of urban childhood and the specified issues and governance projects in the context of Zuidwijk and Rotterdam. Concluding the above, three vision (See Fig. 3.12) were developed with six interrelated tasks:

1. Increase ecological quality & nature experience. (environment)
2. Ensure accessibility for children & families. (urban)
3. Facilitate inclusivity & engagement. (social)



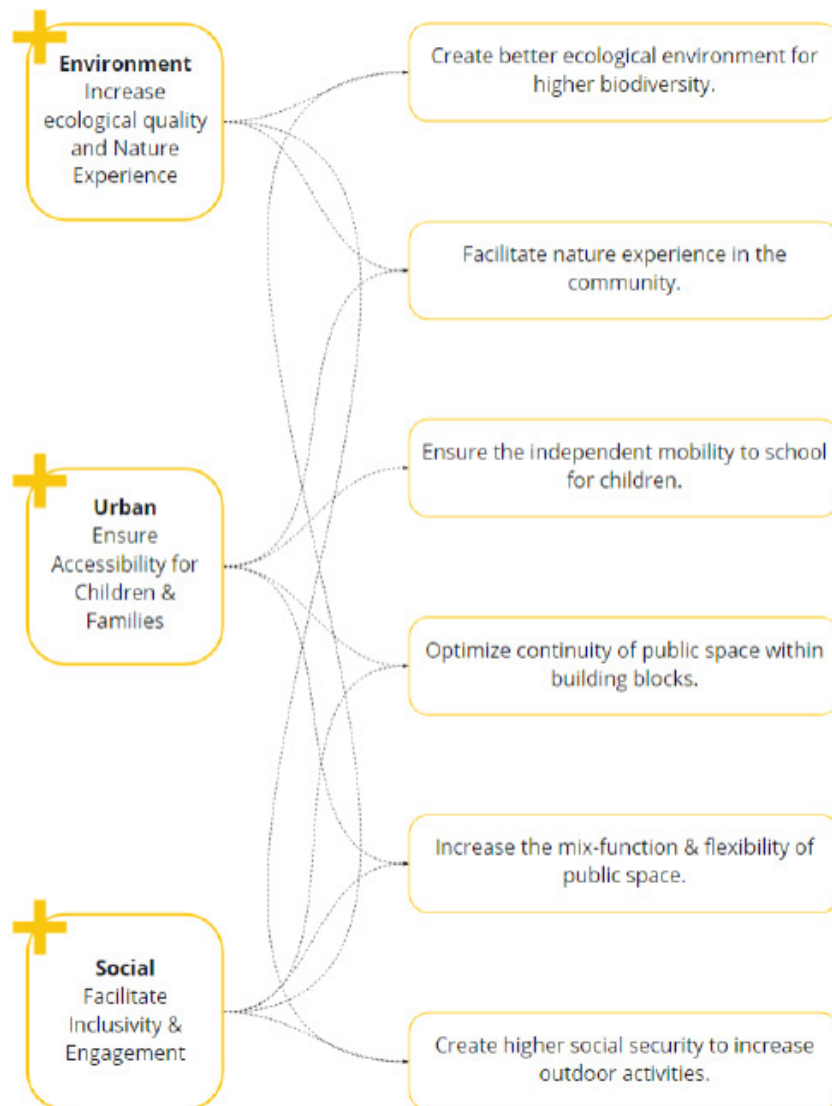
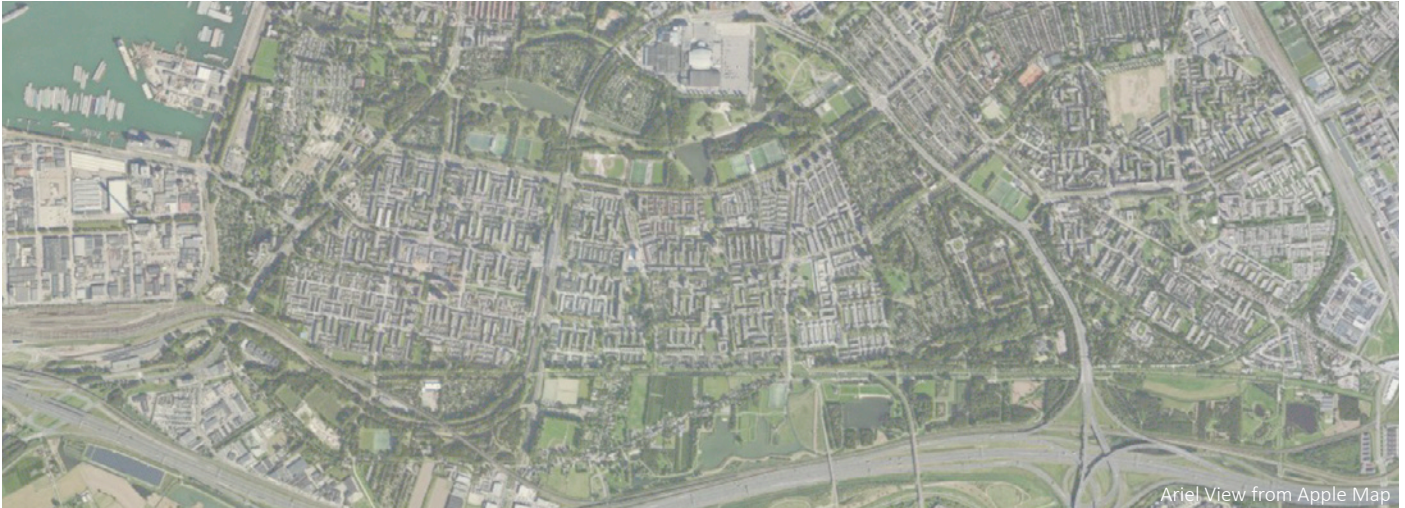


Fig. 3.12 Conclusion. Source: Author





Ariel View from Apple Map

## 4. Context Analysis

4.1 Zuidwijk

4.2 Context Analysis

4.3 Site Observation

## 4.1 Zuidwijk

The context of this research is focused on the post-war neighbourhood, Zuidwijk, as discussed previously. (See chapter 3.) Zuidwijk is one of the highest in population density among all the neighbourhoods in Rotterdam. As children are the main focus of this project, the population of 0-17 years-old children were used here to point out that Zuidwijk, with a 21% of children population, compared to the city of Rotterdam which consists 18.7% of young population, is where this unhealthy childhood phenomenon can be discussed at.



Fig. 4.1 Location of Rotterdam. Source: Apple Maps

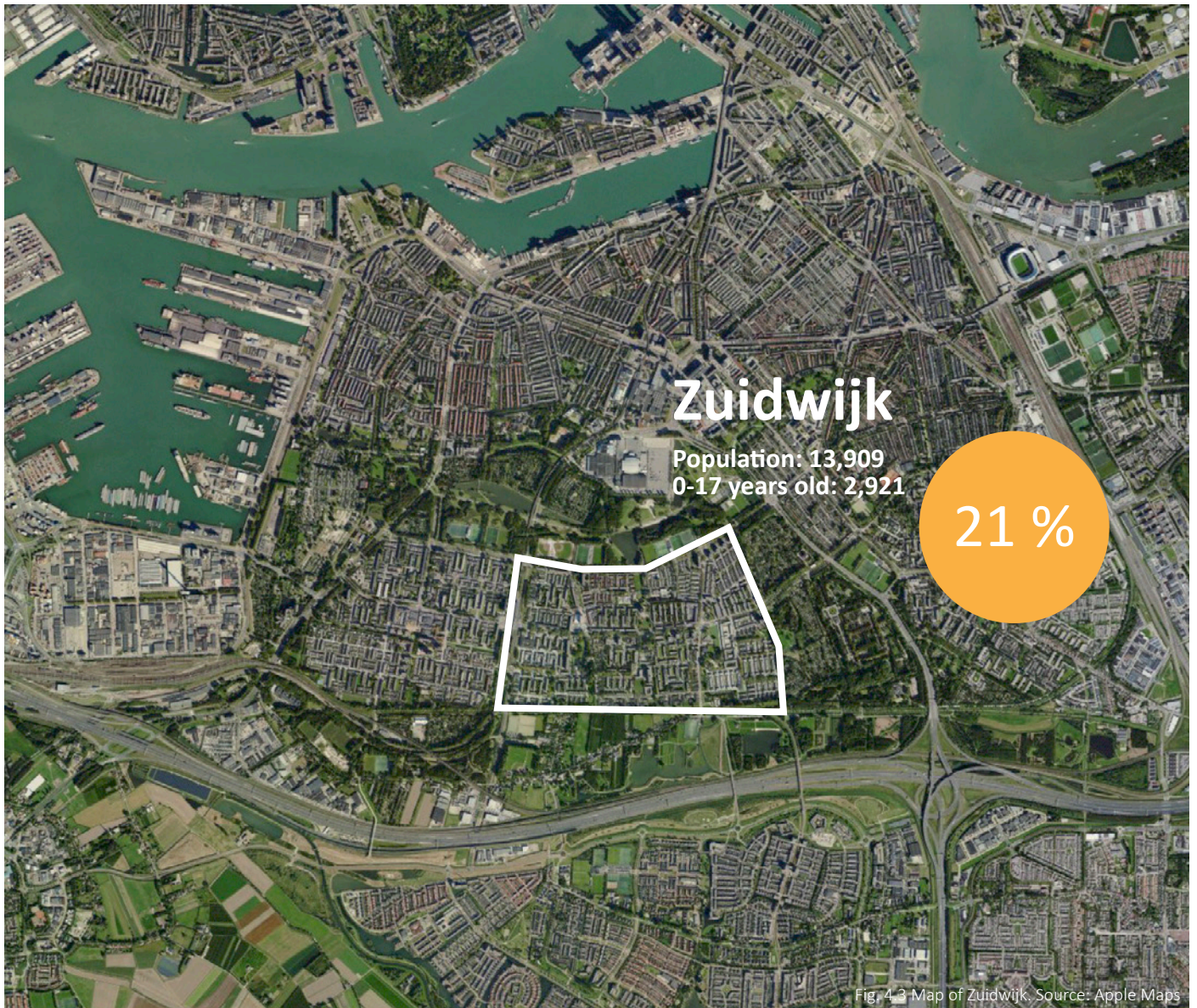


Fig. 4.3 Map of Zuidwijk. Source: Apple Maps

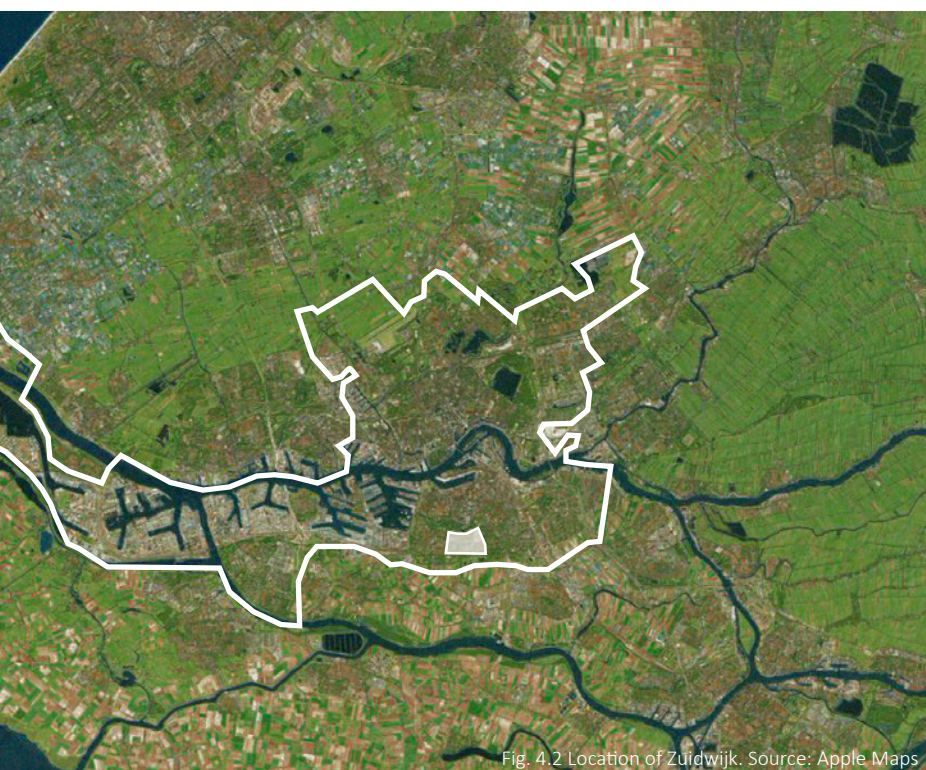
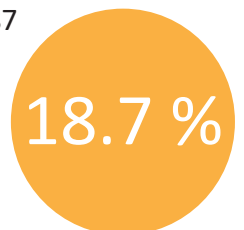


Fig. 4.2 Location of Zuidwijk. Source: Apple Maps

## Rotterdam

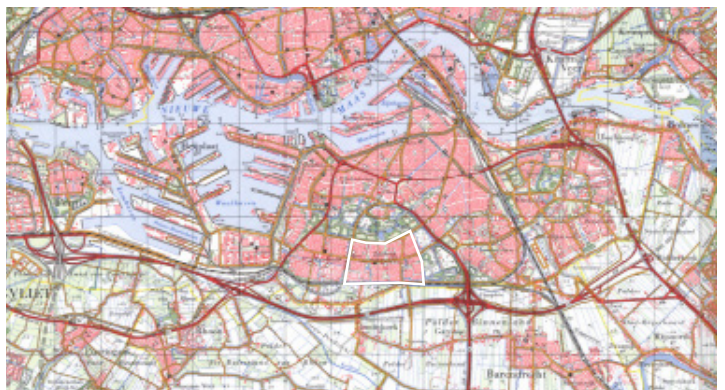
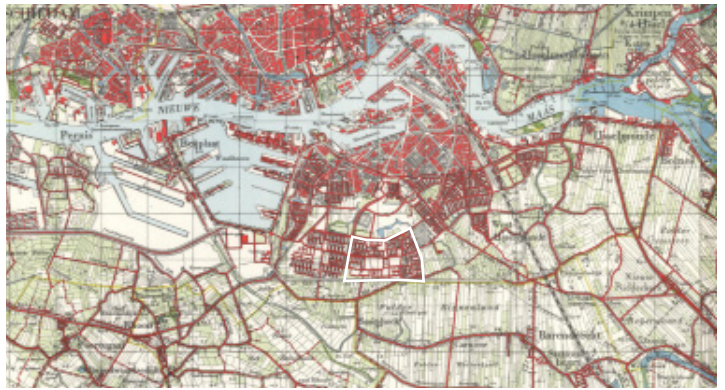
Population: 651,269  
 0-17 years old: 121,787



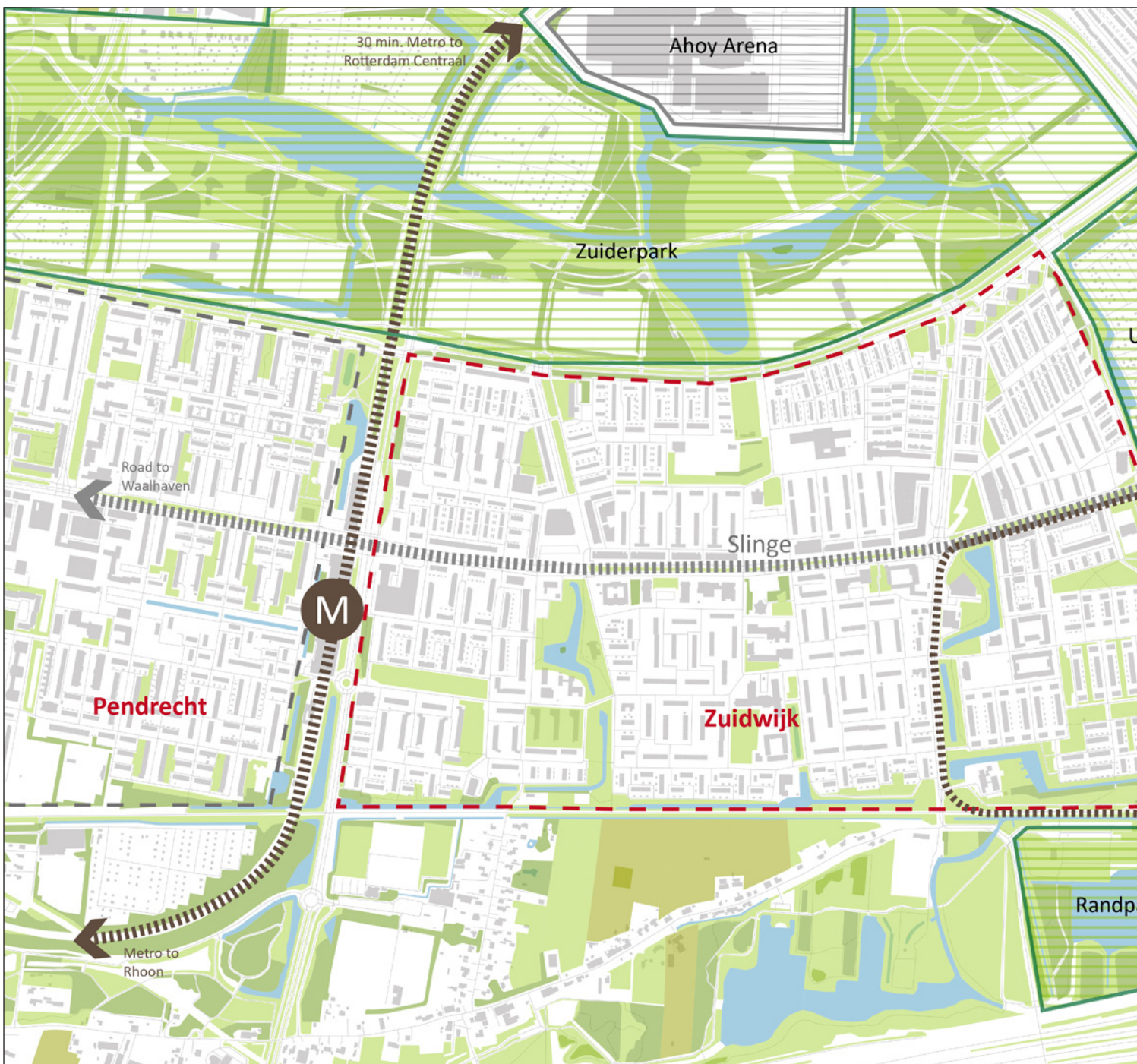
Data Source: Gemeente Rotterdam onderzoek 010

Zuidwijk is a neighbourhood located in the southern part of Rotterdam with well connected public transportation to the city center. From the historical point of view, Zuidwijk has been developed since 1945. Most of the area in Zuidwijk was fully developed around 1980. Until the year of 2000, it was on the edge of the agglomeration of Rotterdam. However, in 2020, we can see that with the development of the southern neighbourhood, Zuidwijk is no longer at the position of the edge of the city. (See Fig. 4.5)

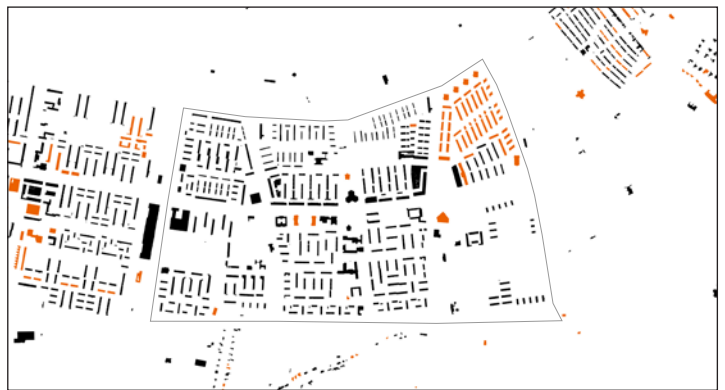
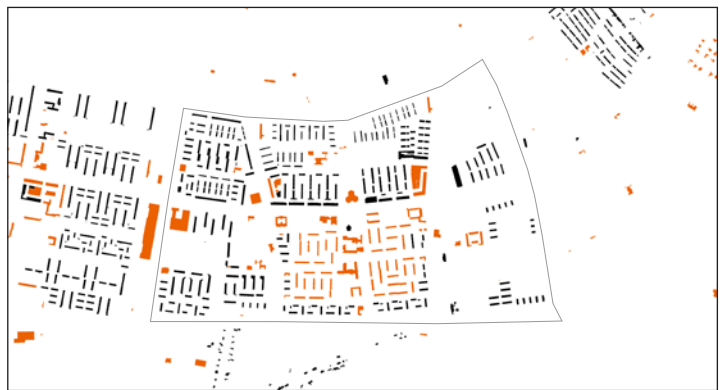
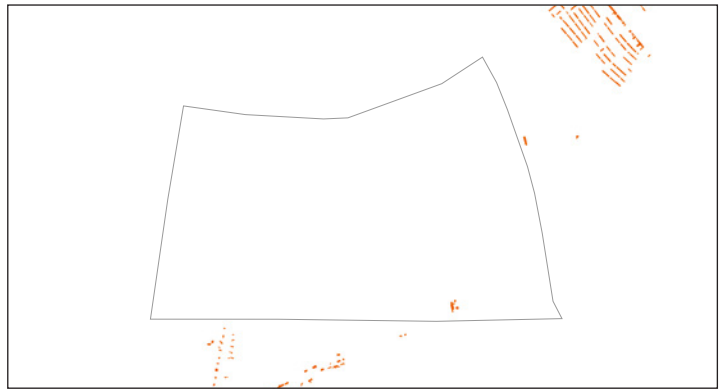




Zooming in to the approximately 1km range of Zuidwijk, we can see that Zuidwijk is surrounded by large area of green areas. However, many of those are hardly accessible for children or even private. The Slinge is the main road in the center of Zuidwijk connecting the neighbourhood to the city center and to the highway. Seeing from the building age, Zuidwijk was mainly constructed during 1945-1985. From 1985 onwards, new types of stamp houses were built on the east side of the neighbourhood. Some small range of reconstruction were also being done in recent years. (See Fig. 4.7)



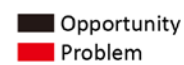




## 4.2 Context Analysis

### Ecological Context

The ecology in the context of Zuidwijk mostly consists of a large area of grassland in between the residential buildings or the courtyard. Two waterfront parks are present in the southern Zuidwijk. The green area in the north is Zuiderpark, which is divided by a 40m wide road to Zuidwijk. On the edge of the park near the neighbourhood were mostly built with sport yards. The green areas in the south are mostly private zones.



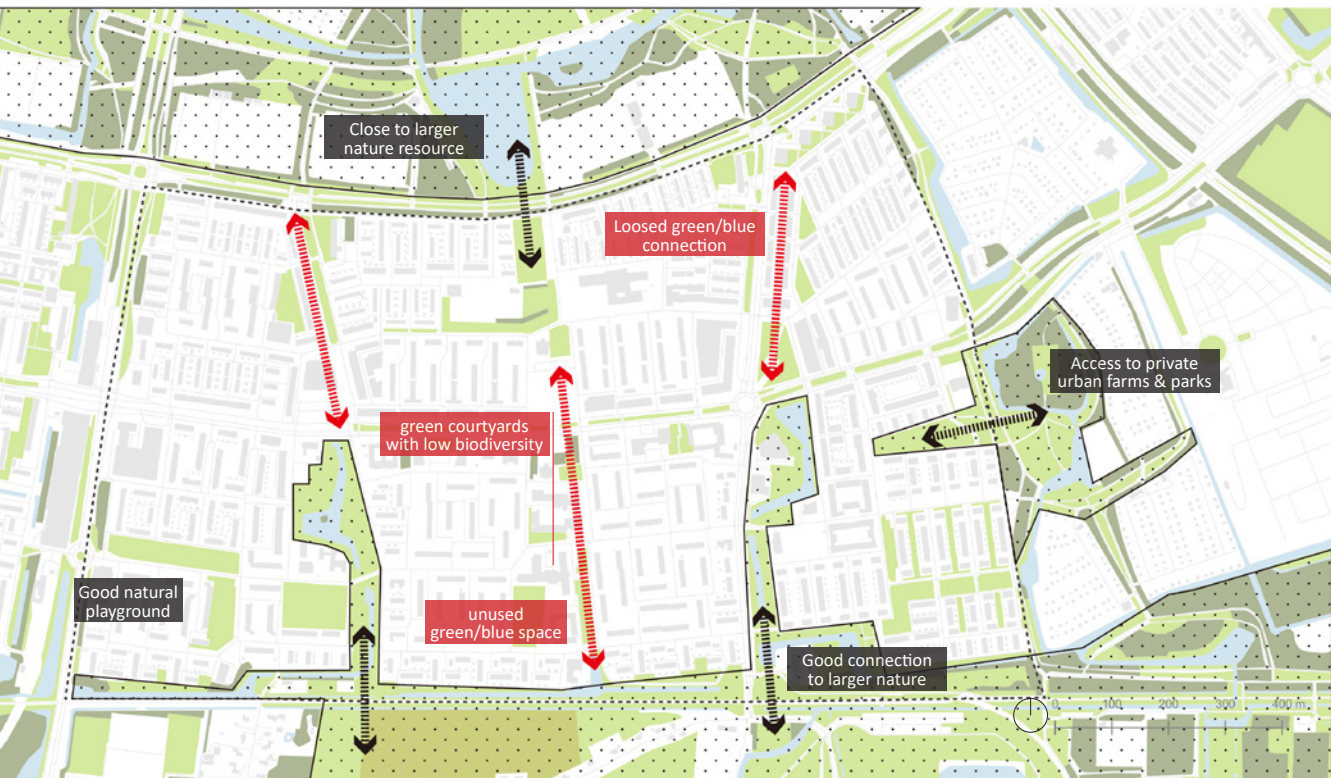
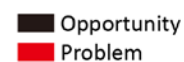


Fig. 4.8 Ecological Context of Zuidwijk. Source: GIS open street data edited by author

## 4.2 Context Analysis

### Infrastructure Context

The public transportation in Zuidwijk is well connected with Metro on the west, tram on the south east, and bus on the Slinge in the middle. Although the public transportation connects the neighbourhood well and the streets within the neighbourhood are accessible by bikes, however, most of the streets are designed for car oriented purposes which a lot of them are occupied on both sides with parking lots.



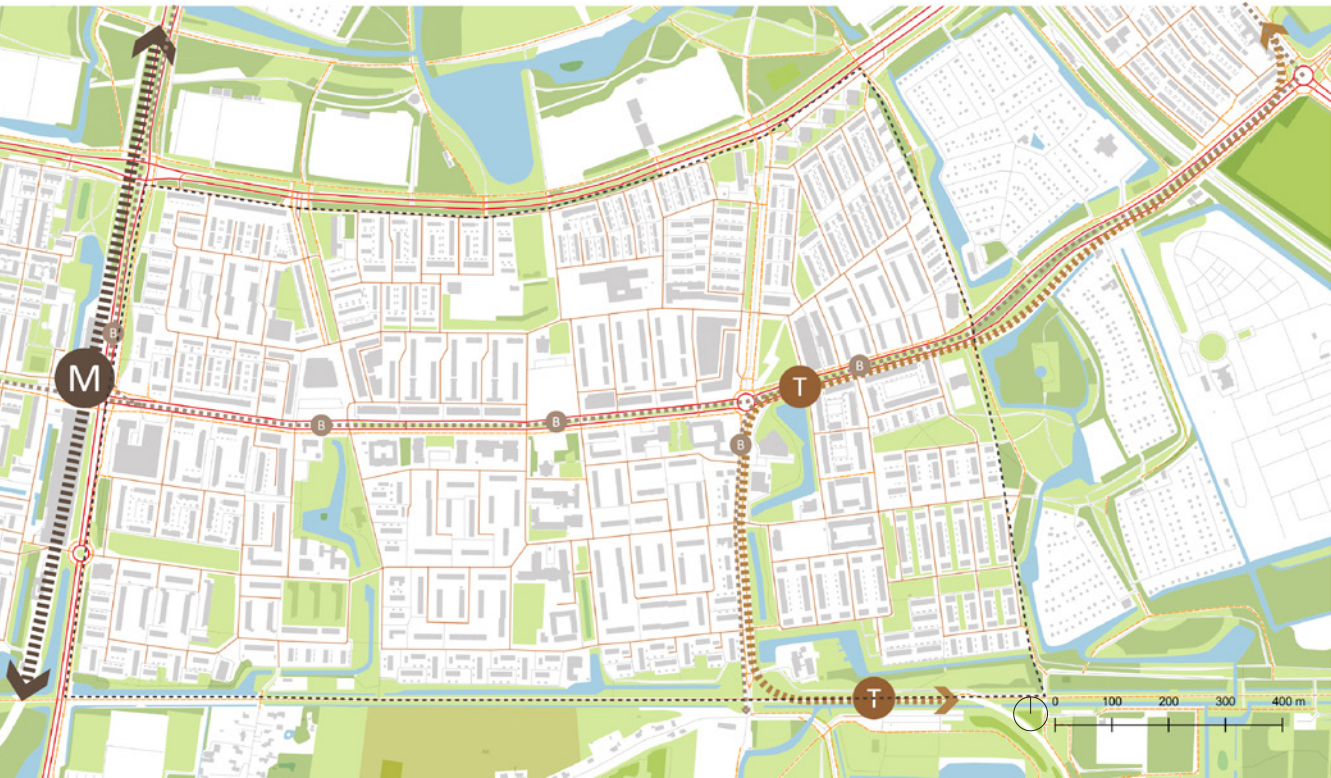


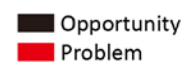
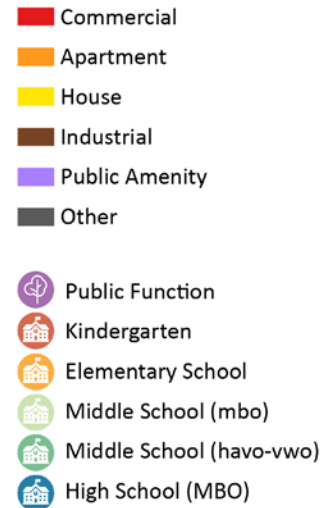
Fig. 4.8 Nature of Zuidwijk. Source: GIS open street data edited by author

## 4.2 Context Analysis

### Social Context

The residential buildings in Zuidwijk mostly consist of 3-4 storey apartments in the center of the neighbourhoods or within the building block. Most of the 1-2 storey houses are located on the edge of the neighbourhood, especially the houses that were built after 1985 on the east side of Zuidwijk. Most of the mixed use buildings with commercial functions are situated in the center. Public amenities are spreaded in the neighbourhood to provide public services.

There is a large park, Zuiderpark, on the northside of Zuidwijk which includes many sport fields on the edge. In Zuidwijk, there are not many sports facilities but there are some parks and play facilities in the neighbourhood. However, the parks and playgrounds are mostly not designed for facilitating nature experiences. Religious buildings, which mostly aside with public space, are spreaded over this neighbourhood that is populated with many immigrant families.



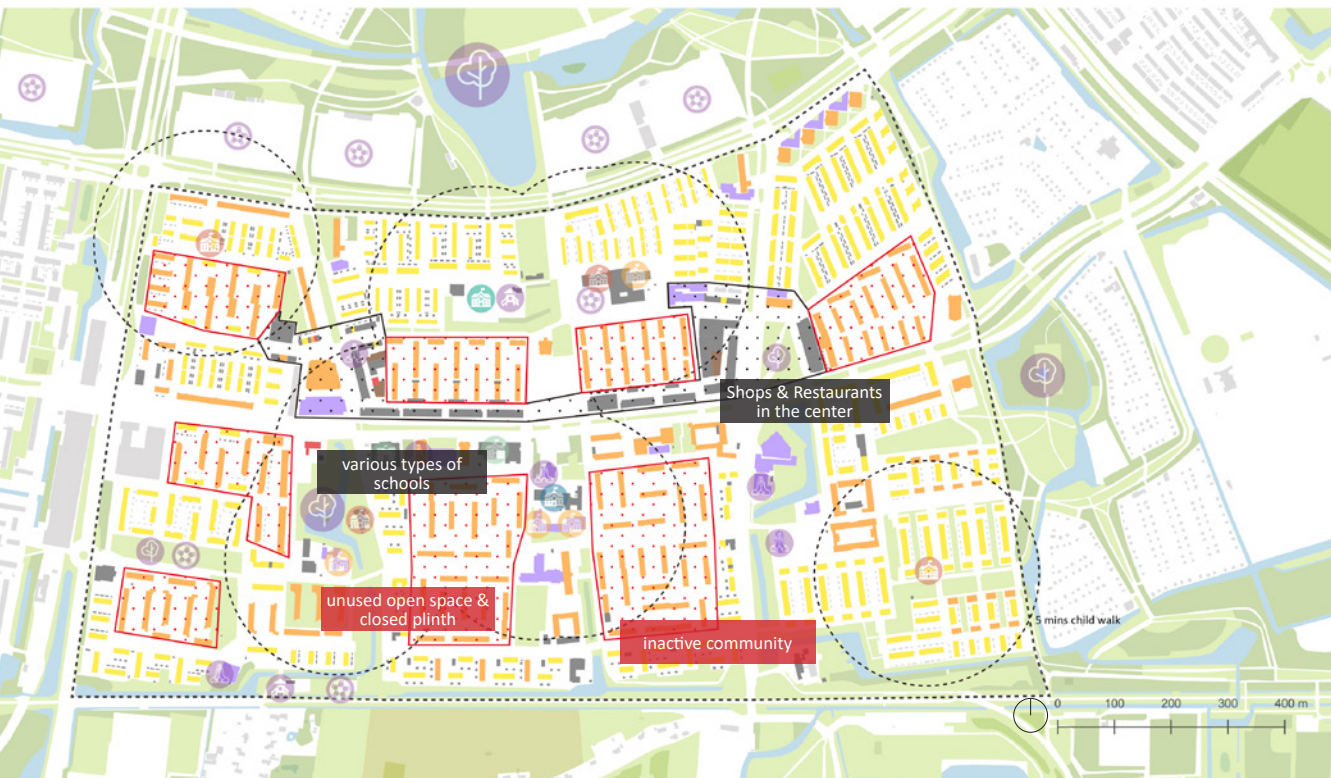
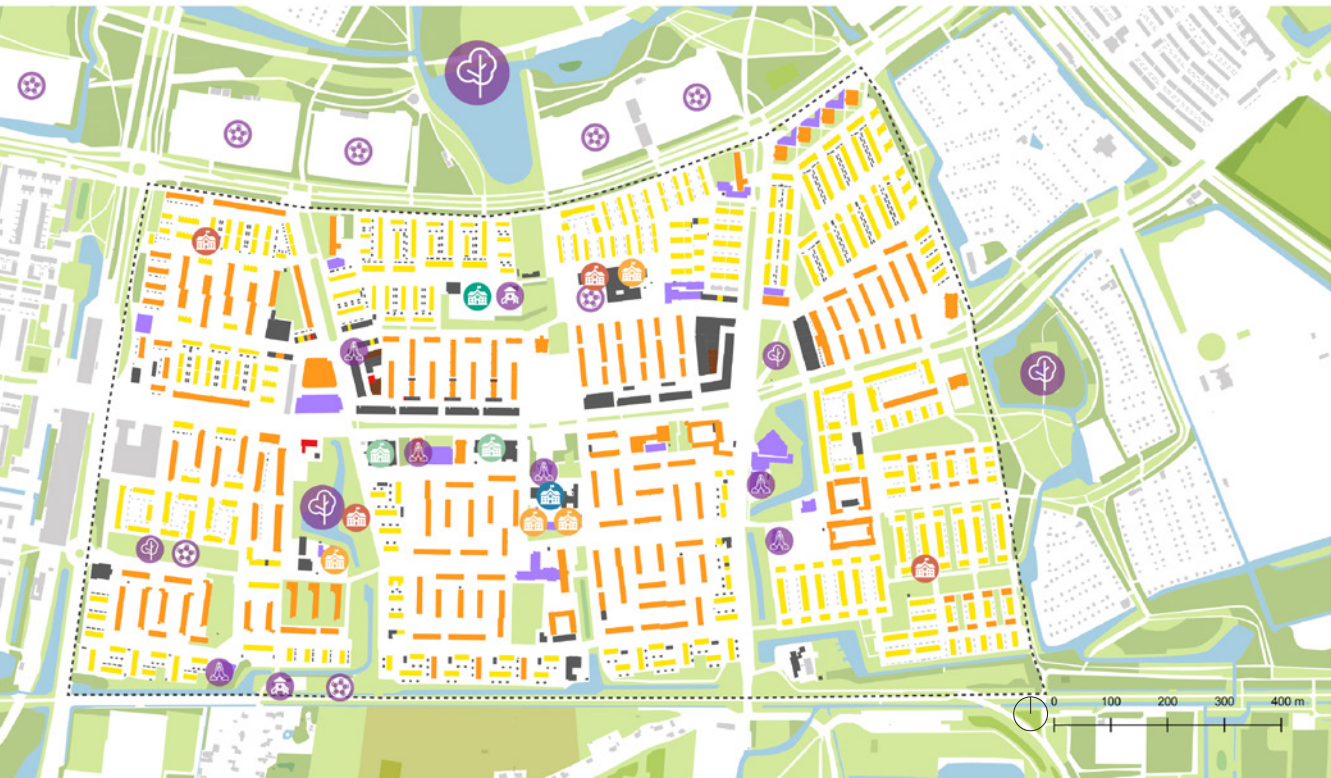
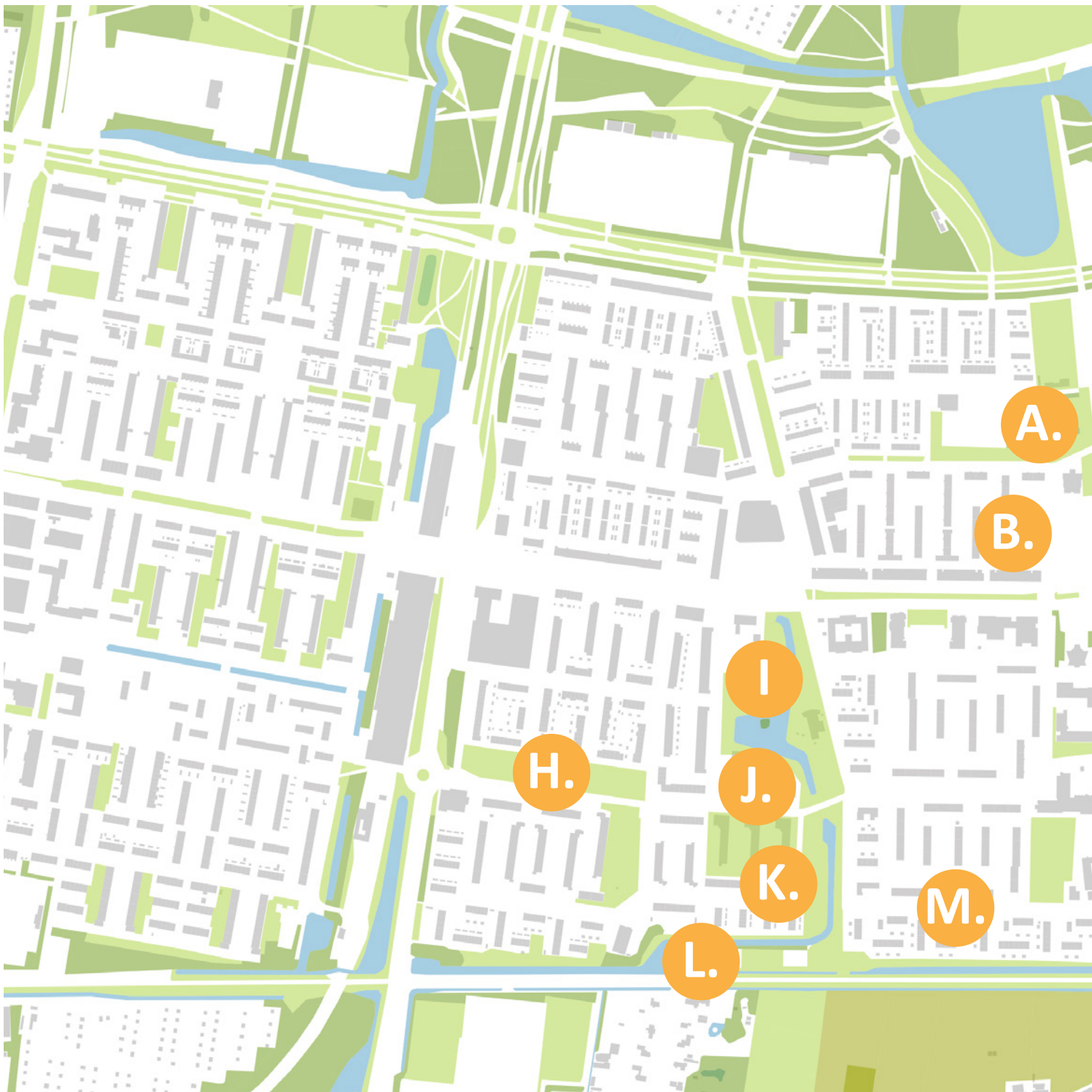


Fig. 4.8 Nature of Zuidwijk. Source: GIS open street data edited by author

## 4.2 Site Analysis

### Site Observation

The first part of the site analysis starts with the site observation of Zuidwijk. The observation is aiming to reveal an impression of child activities and the spatial condition for child use, which later on will be analysed with its spatial quality (naturalness) and using condition (activeness).





Observation Time:  
April 21th Wednesday afternoon 15:00-17:00  
April 24th Saturday afternoon 15:00-16:00



Fig. 4.13 Location of Site Observation. Source: GIS open street data edited by author

## Observation of Space for Children

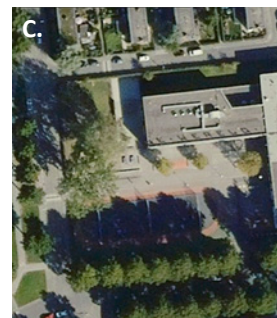
On this page, different types of space are listed with conditions on its naturalness, materials, facilities type, and accessibility. The naturalness and materials shows how much is nature present in the space, while the facilities type can be further studied on how much it stimulates play behaviour, especially the connection with nature.



- Naturalness: ●●○○○
- Materials: tiles, sands, grass, several trees
- Facilities Type: formal play facilities
- Accessibility: 24 hours



- Naturalness: ●●●○○
- Materials: tiles, grass, bushes, trees
- Facilities Type: formal play facilities
- Accessibility: 24 hours



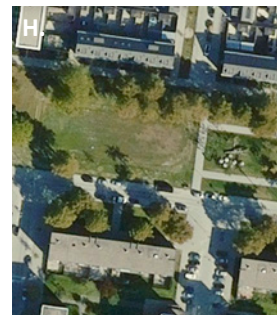
- Naturalness: ●○○○○
- Materials: tiles, several trees
- Facilities Type: formal play facilities
- Accessibility: 9:00 - 22:00



- Naturalness: ●●○○○
- Materials: tiles, sands, grass, several trees
- Facilities Type: formal play facilities
- Accessibility: 24 hours



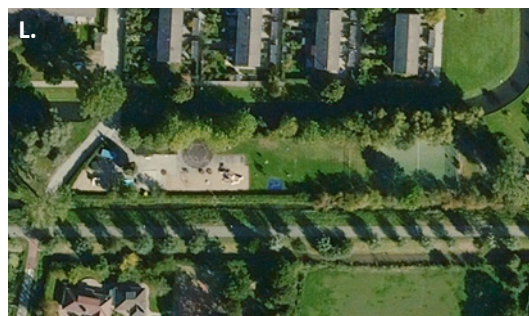
- Naturalness: ●●○○○
- Materials: tiles, grass, several bushes & trees
- Facilities Type: table tennis
- Accessibility: 24 hours



- Naturalness: ●●●○○
- Materials: tiles, grass, several trees
- Facilities Type: mixed facilities
- Accessibility: 24 hours



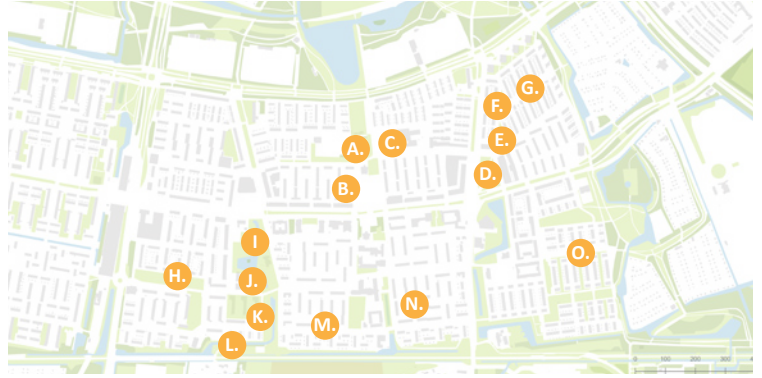
- Naturalness: ●●○○○
- Materials: tiles, grass, several trees
- Facilities Type: formal play facilities
- Accessibility: 24 hours



- Naturalness: ●●○○○
- Materials: tiles, sands, grass, trees
- Facilities Type: formal play facilities, sport court
- Accessibility: 10:30 - 17:30 Tue - Sat



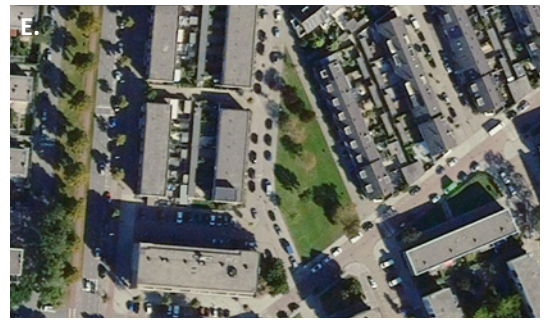
- Naturalness: ●○○○○
- Materials: tiles, grass
- Facilities Type: no facilities
- Accessibility: 24 hours



several trees  
play facilities  
8:00 weekdays



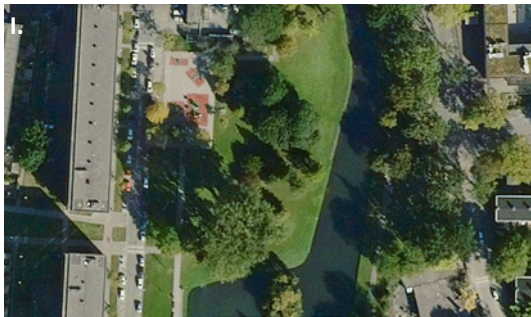
- Naturalness: ●●●●○  
- Materials: tiles, grass, several trees  
- Facilities Type: benches with pavilion  
- Accessibility: 24 hours



- Naturalness: ●●●●○  
- Materials: grass, several trees  
- Facilities Type: no facilities  
- Accessibility: 24 hours



several trees  
function, nature play



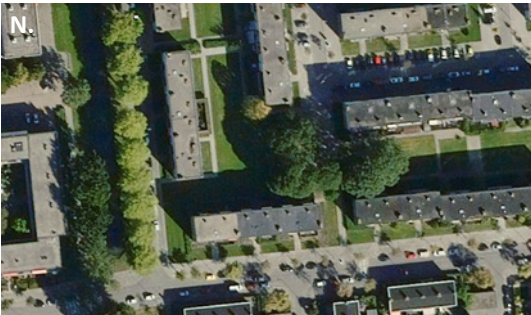
- Naturalness: ●●●●○  
- Materials: tiles, grass, trees  
- Facilities Type: formal play facilities  
- Accessibility: 24 hours



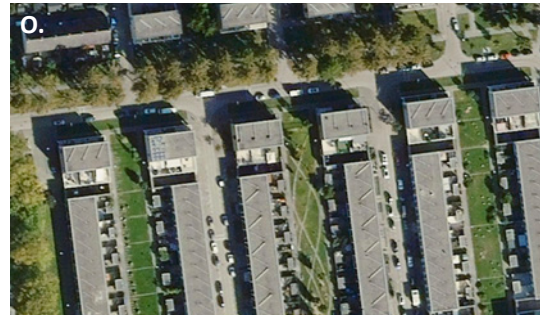
- Naturalness: ○○○○○  
- Materials: tiles, several trees  
- Facilities Type: basketball courts  
- Accessibility: 8:00 - 16:30 weekdays



facilities



- Naturalness: ●●●○○  
- Materials: tiles, grass, trees  
- Facilities Type: formal play facilities  
- Accessibility: 24 hours



- Naturalness: ●●○○○  
- Materials: tiles, grass, several trees  
- Facilities Type: no play facilities  
- Accessibility: private courtyard

Fig. 4.14 Types of Space for children. Source: Apple Maps

## Observation of Children Activities

Following the spatial observation, here we look at the children's activities on each location of different types of space. The activeness shows how intensively the space is being used. The age, amount, and companion shows what types of users are attracted to the space. Lastly, the activities combined with the user information can be studied with its relation to the space condition and design.



- Activeness: ●●○○○
- Age + Amount: 3 of 2-5 years old children
- Companion: with parents
- Activities: walking and chatting



- Activeness: ○○○○○
- Age + Amount: none
- Companion: none
- Activities: none



- Activeness: ●●●●○
- Age + Amount: 15-20 years old children
- Companion: no companions
- Activities: basketball, skateboarding



- Activeness: ●●●●○
- Age + Amount: 5 of 5-7 years old children
- Companion: two adults
- Activities: playing soccer & running



- Activeness: ●●●●○
- Age + Amount: 10 of 7-10 years old children
- Companion: one adult
- Activities: playing table tennis, hide and seek



- Activeness: ●●●●○
- Age + Amount: mixed ages
- Companion: no adults
- Activities: climbing, running



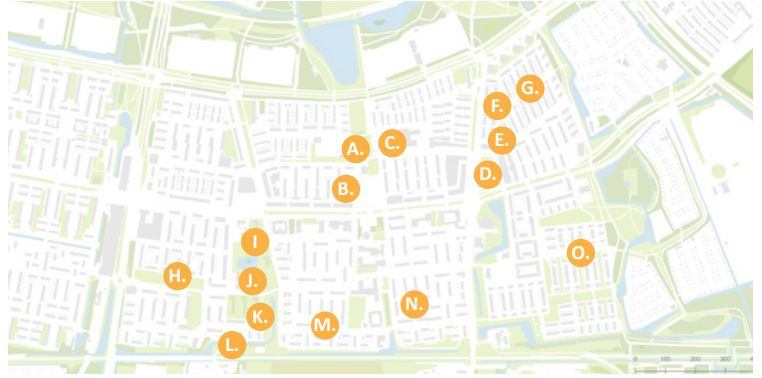
- Activeness: ●●○○○
- Age + Amount: 3 of 7-10 years old children
- Companion: no adults
- Activities: playing skate board



- Activeness: ●●●●○
- Age + Amount: 15 of 5-10 years old children
- Companion: with parents
- Activities: playing facilities



- Activeness: ●○○○○
- Age + Amount: 2 of 7-10 years old children
- Companion: no adults
- Activities: chatting & drinking



15 years old teenagers  
 unions  
 skateboard



- Activeness: ○○○○○  
 - Age + Amount: none  
 - Companion: none  
 - Activities: none



- Activeness: ●●○○○  
 - Age + Amount: 3 of 7-10 years old children  
 - Companion: no adults  
 - Activities: playing soccer



with children & teenagers  
 running, playing basketball



- Activeness: ○○○○○  
 - Age + Amount: none  
 - Companion: none  
 - Activities: none



- Activeness: ●●●○○  
 - Age + Amount: 4 of 5-10 years old children  
 - Companion: with adults from facility  
 - Activities: playing soccer



10 years old children  
 drawing



- Activeness: ●●○○○  
 - Age + Amount: 3 of 5-7 years old children  
 - Companion: no adults  
 - Activities: playing swings, running



- Activeness: ●●●○○  
 - Age + Amount: 7 of 7-10 years old children  
 - Companion: no adults  
 - Activities: playing balls over fences

Fig. 4.15 Types of Children Activities. Source: Author & Google Streetview

## Types of Space for Children

Concluding from the observation of spatial quality and using condition, there are mainly eight types of existing space for children in Zuidwijk. (See Fig. 4.16) Some of these places are designed for children with different purposes, some have the potential of transforming into a space that engages children with nature. On the map we can see that long liminal spaces in front of the apartments usually go together with the large homogeneous courtyards which is not serving its original purpose of connecting people.

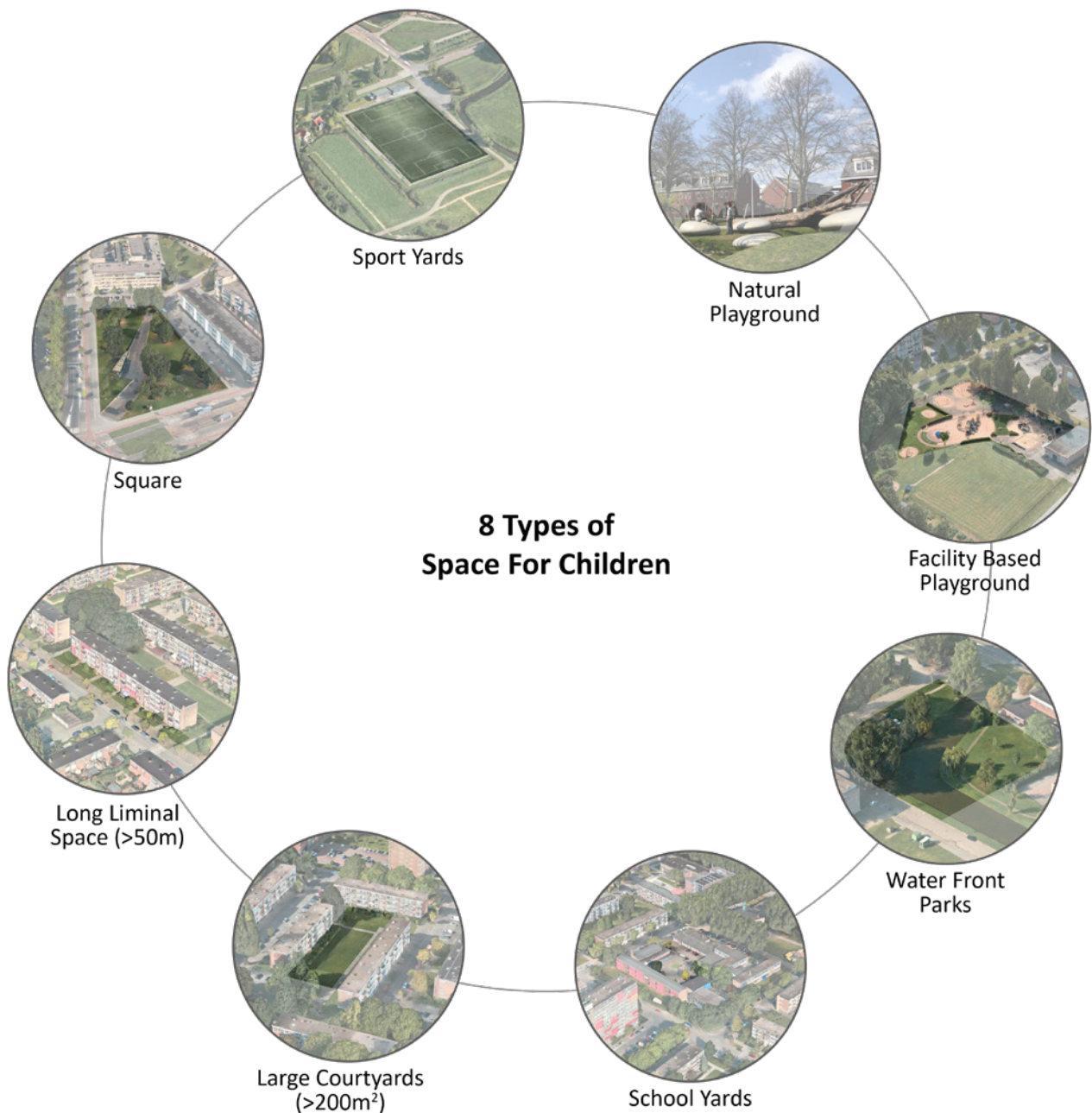


Fig. 4.16 Typology of Space for Children. Source: Author



Fig. 4.17 Map of Typology of Space for Children. Source: GIS open street map edited by author

## Focused Area

Following the overview of different types of spaces, this section compares the spaces with their naturalness and activeness to reveal their quality of engaging children to natural experiences. (See Fig. 4.18) These lower quality spaces are the targeted location to be transformed while spaces with higher quality will also be discussed with possibilities to improve. (See Fig. 4.19)

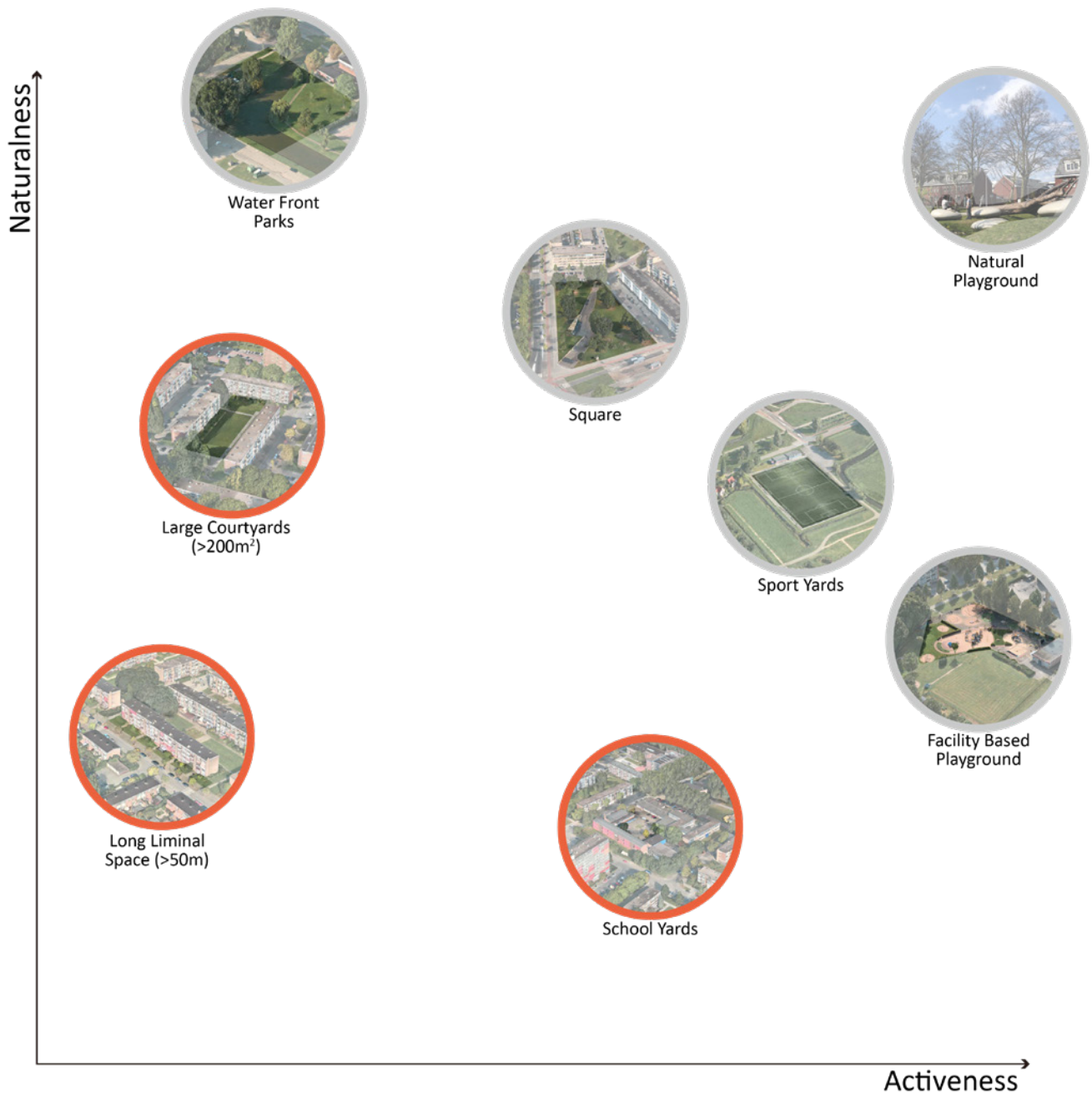
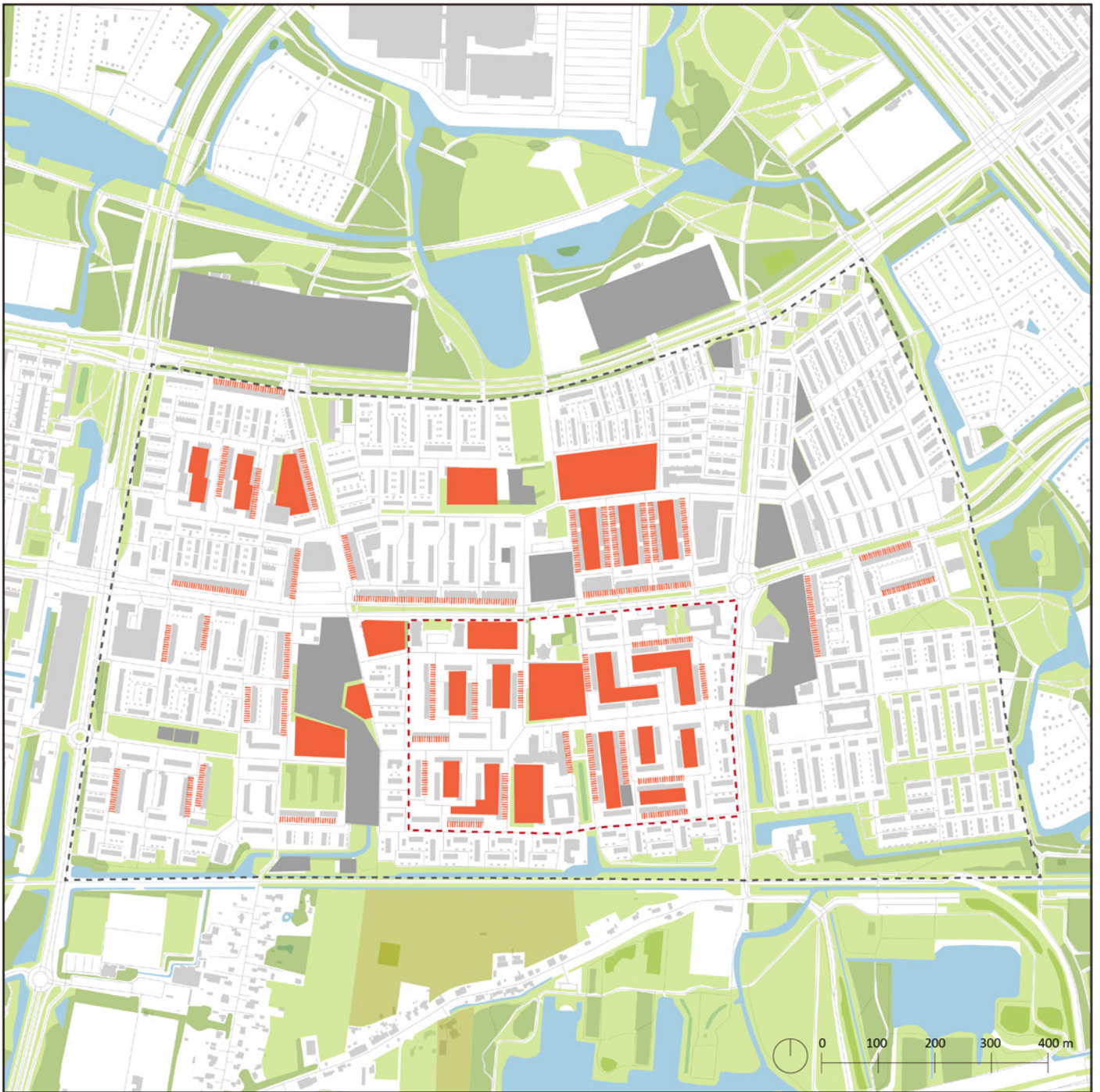


Fig. 4.18 Comparison of Naturalness and Activeness. Source: Author

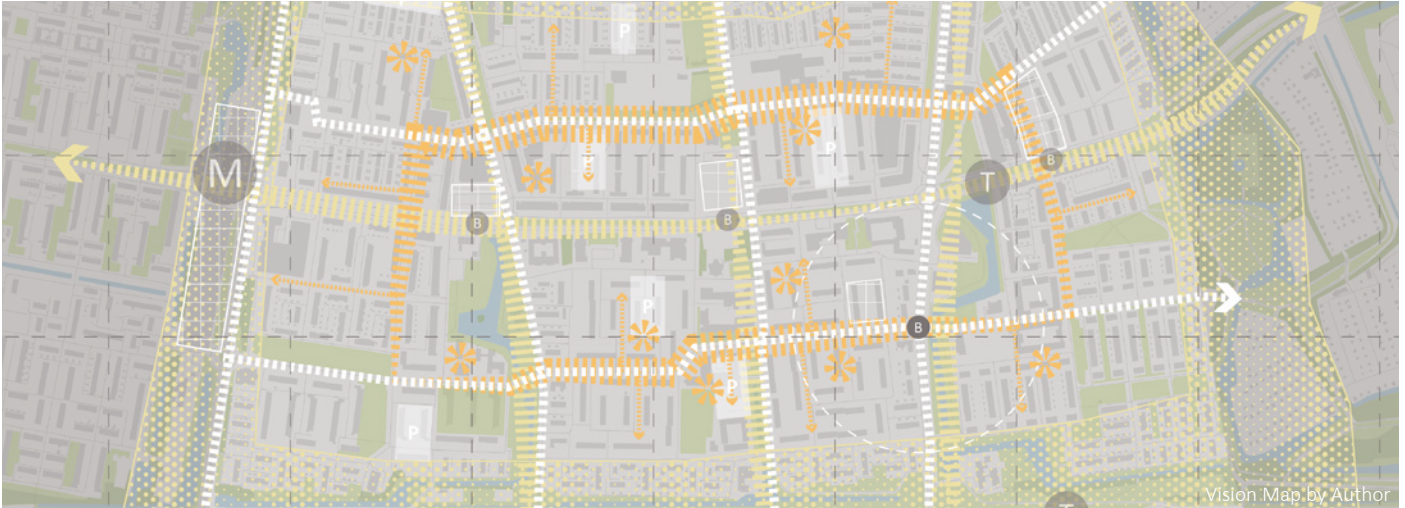




- Higher quality space
- Lower quality space
- Focused area

Fig. 4.19 Map of Focused Area. Source: GIS open street map edited by author





## 5. Vision

- 5.1 Spatial Framework
- 5.2 Vision Layers
- 5.3 Strategic Area

# 5.1 Spatial Framework

## Spatial Layers

The first section of the vision chapter is dedicated to make conceptual framework connected to the space in order to realise the concept under real context. The spatial layers shows the three main context about the space. (See Fig. 5.1)The nature layer contains the environmental issues and lies on the foundational position of the framework. The second layer is the infrastructure context. The infrastructure is built upon natural layer and further support the social activities on the top layer.

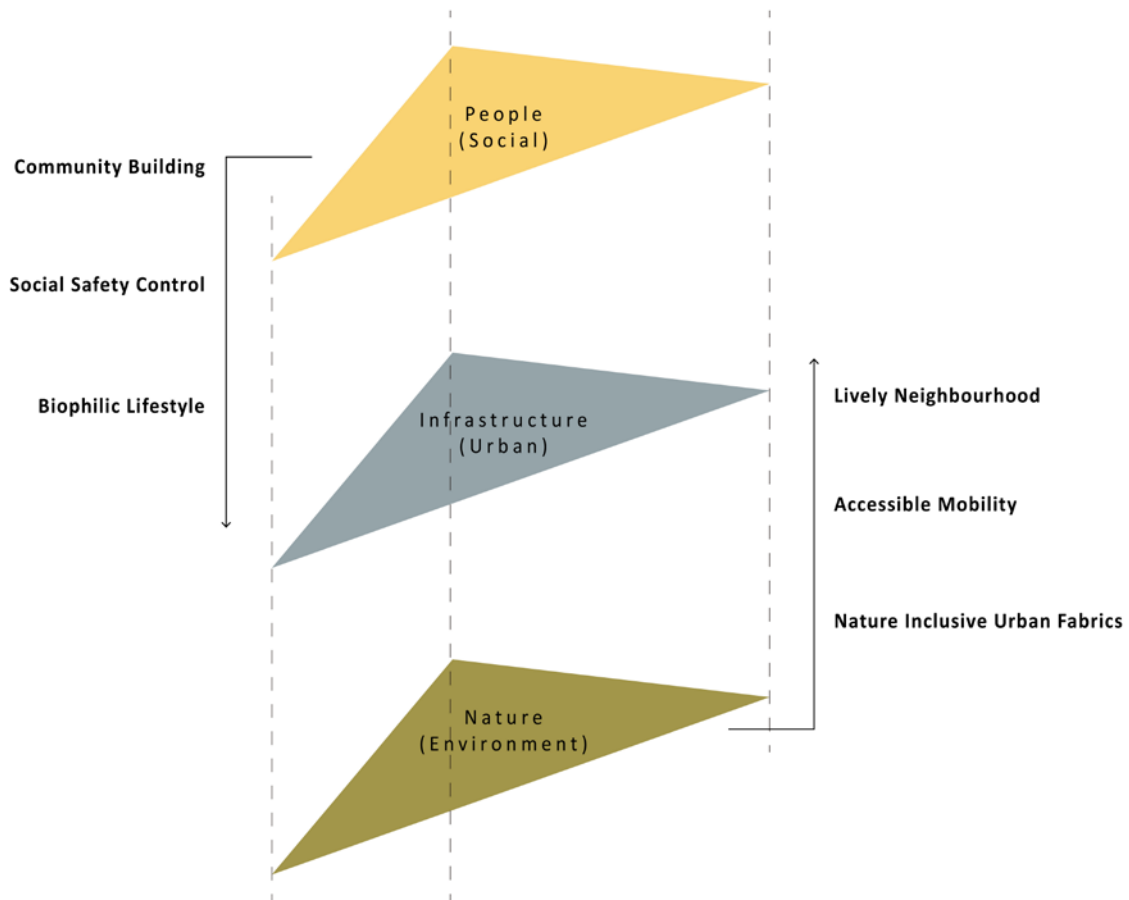


Fig. 5.1 Spatial Layers. Source: Author

## Spatial Framework

Even though the spatial layer has an order in spatial structure, a working city or neighbourhood needs three layers to work with each other. (See Fig. 5.2) They each has several issues and problem to be tackled with, which has the role to facilitate other layers as well. For instance, good accessibility allows high quality nature to be access. As a result, people that are encouraged to live a lifestyle that is close to nature can help facilitate the building of biophilic community.

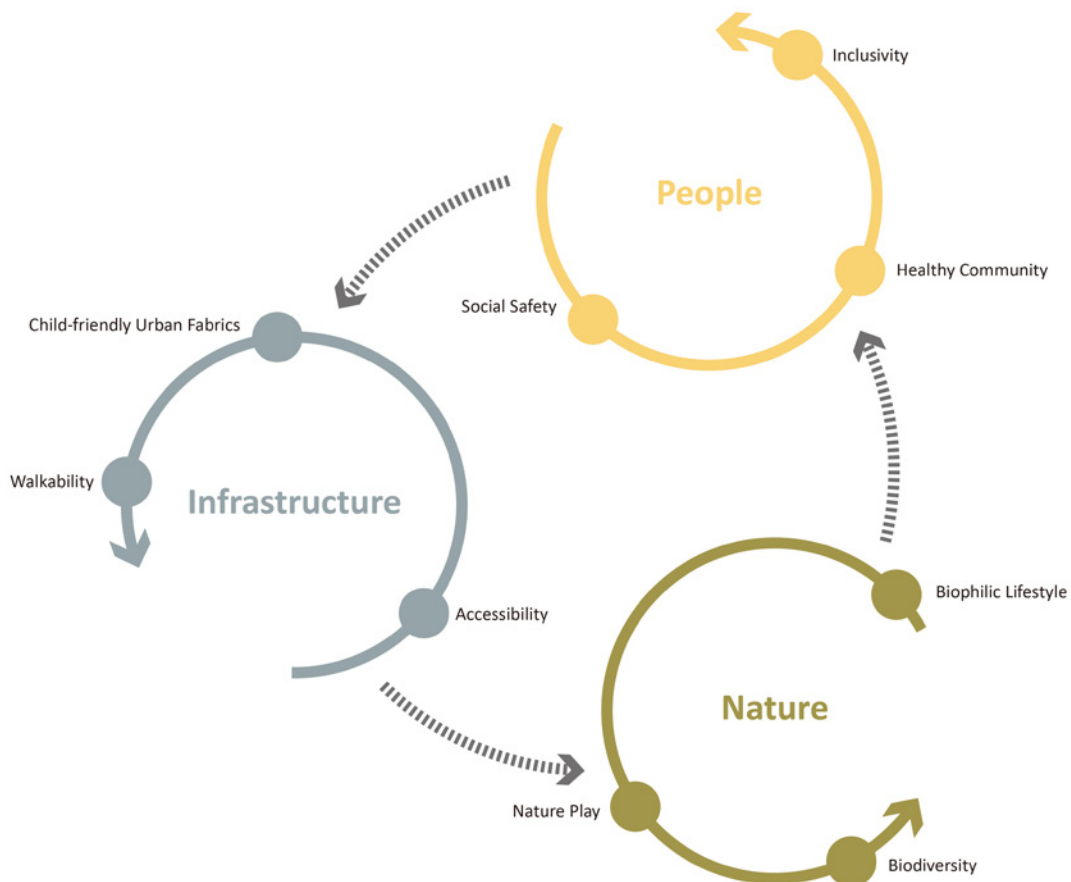


Fig. 5.2 Spatial Framework. Source: Author

## 5.2 Vision Layers

This section will be explaining the vision layers of Zuidwijk towards a neighbourhood that support the development of biophilic urban childhood. The vision is divided into three layers as we discussed in the previous section. It is built under the context analysis of Zuidwijk and the concept of this project. (See Fig. 5.3)

### **Nature Vision**

Increase Ecological Quality and Nature Experience.

The first layer is nature vision that lies as a foundation of the infrastructure and people layers. On the neighbourhood scale, the main goal is to create more nature inclusive spaces on the edge of the neighbourhood to serve as a transitional space to the larger nature structure on the outside. The vision within the edge is to strengthen the missing link on four axis that connects the neighbourhood to the nature.

### **Infrastructure Vision**

Ensure accessibility for children & families.

The next vision is the infrastructure that ensures the accessible nature and support the social activities that lies beyond. The main goal is to create a good biking route within the neighbourhood that connects to all the public transportation points. The bus stop on the south-east side of the neighbourhood is moved to cover more space within the 5 minutes walk for children and families. Around the areas that are harder to get to public transport will be provided with centralised parking space to minimalise the use of car in the living street.

### **People Vision**

Facilitate Inclusivity & Engagement.

The last one is people vision that makes the neighbourhood alive. In this layer, the goal is to create a social inclusive loop within the neighbourhood to create continuous space that facilitate the social engagement. In the area that are covered within the walking distance to schools are focused to create more community space to bond people together.

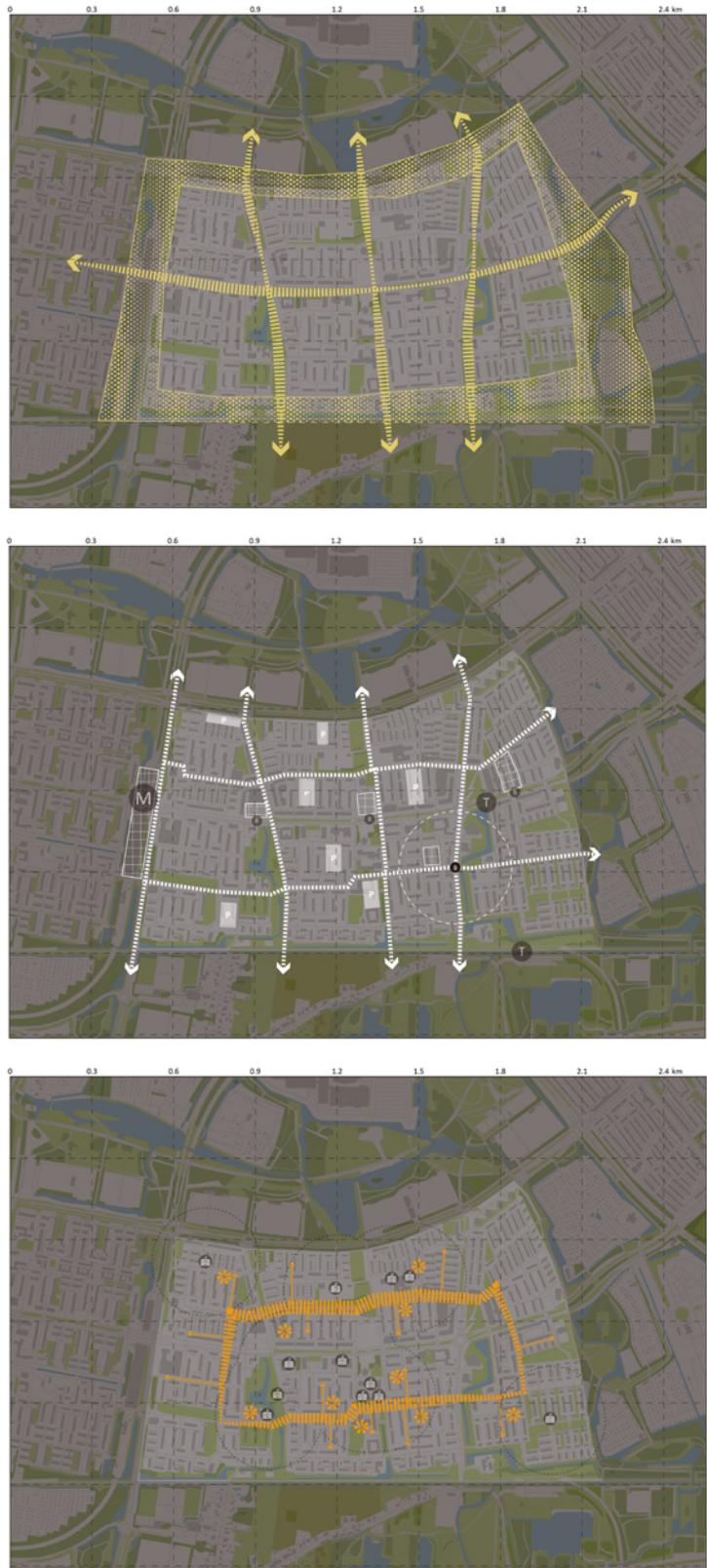
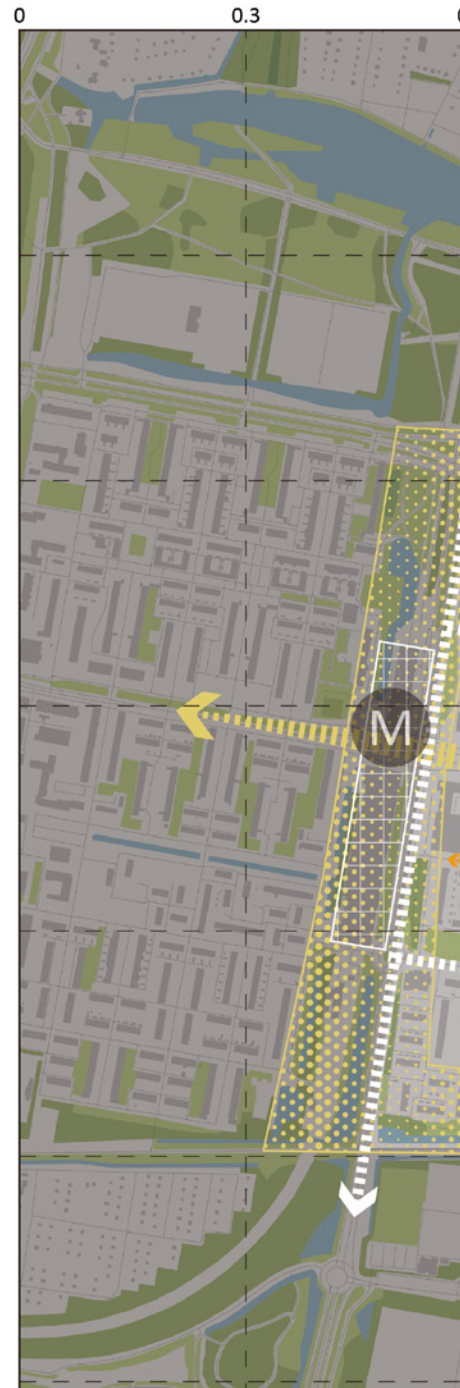


Fig. 5.3 Vision Layers. Source: GIS open street map edited by author

## 5.2 Vision Layers

### Overall Vision

Combining the three layers of the vision, the overall vision is shown on the right. Zuidwijk under this vision is a neighbourhood that has a good accessibility to high quality nature environment. The residents can have small scale nature experience withing the neighbourhood without being disturbed or compromised by the car oriented urban fabrics. Zuidwijk is also a home to everyone. It provides a safe space for diversified activities that are facilitating positive influences in children development and encourage the social engagement of all the residents. By creating a community that has the safe access to nature, Zuidwijk is facilitating the biophilia in childrens' daily life and encourage other residents to live a healthy biophilic lifestyle.





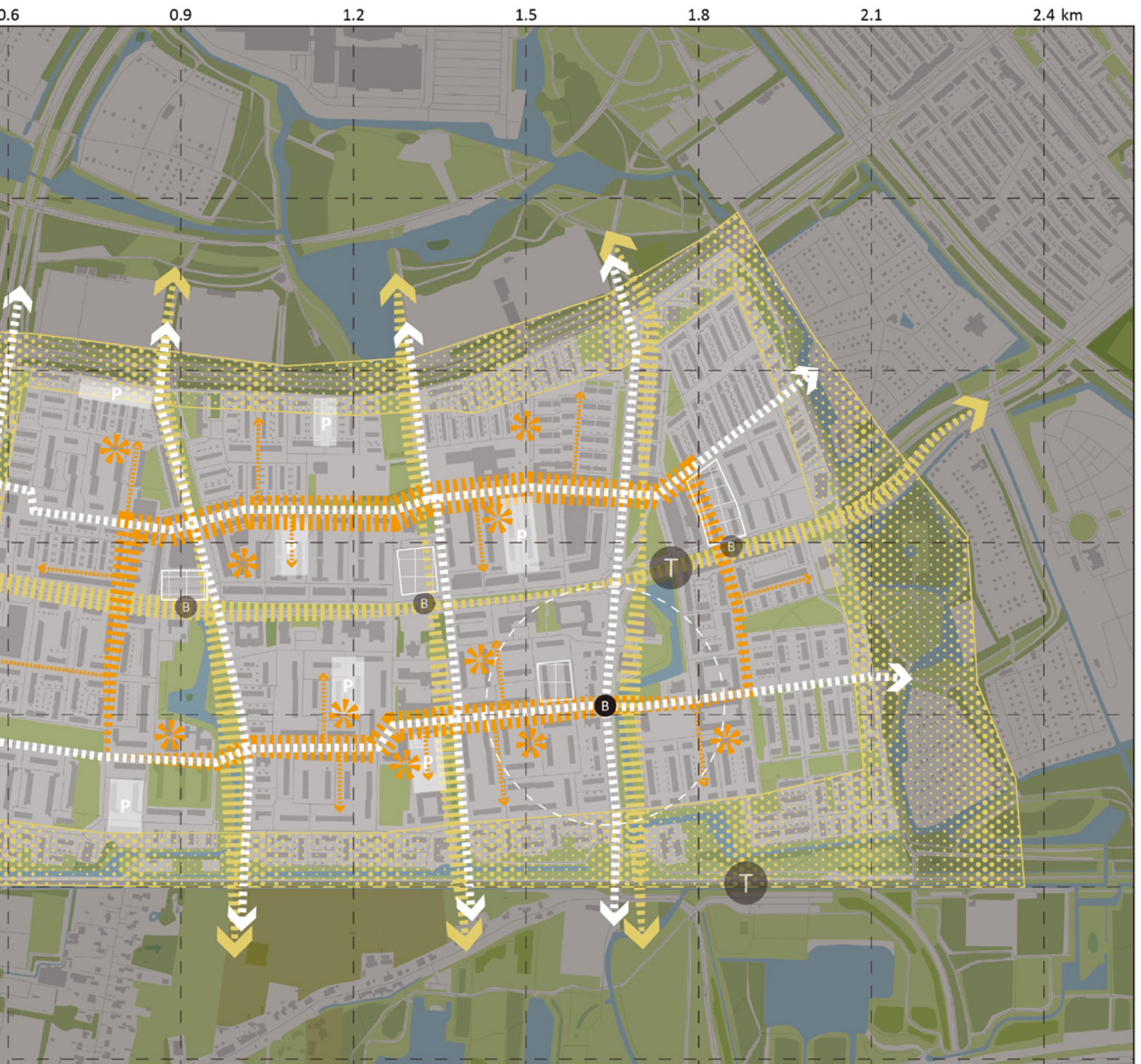


Fig. 5.4 Overall Vision. Source: GIS open street map edited by author

## 5.3 Strategic Area

In this section, we are narrowing down the focus to a strategic area that is based on the result of the context analysis and the vision map. (See Fig. 5.5, 5.6) From the context analysis, the southern center part of the neighbourhood is half outside of the walking distance to public transport and has lower quality of space for children and their activities. From the Vision, the same area also has the most intervention in the neighbourhood and would be able to stand as a leading site for the project to develop further. The existing context of the zoom in strategic area is shown on the right page. (See Fig. 5.7)



Fig. 5.5 Context Analysis Result. Source: GIS open street map edited by author

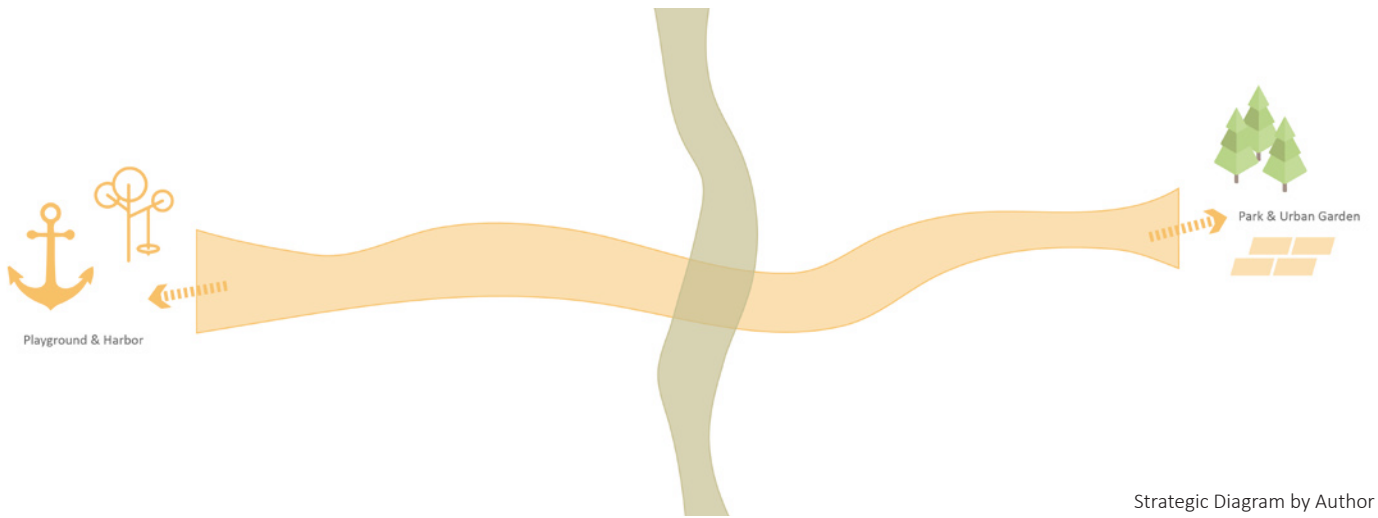


Fig. 5.6 Vision Result. Source: GIS open street map edited by author



Fig. 5.7 Strategic Area. Source: GIS open street map edited by author





Strategic Diagram by Author

## 6. Strategy & Toolbox

6.1 Overview

6.2 Strategic Layer

6.3 Strategic Model

6.4 Building Typology

6.5 Toolbox Matrix

6.6 Toolbox

6.7 Strategic Plan

## 6.1 Overview

The purpose of this chapter is to explain the development of the strategies from vision to design interventions. The overall concept of the strategy development of this project can be seen from the strategic framework on the right. (See Fig. 6.1)

The strategic framework is developed from the nature, infrastructure, and people vision. They each result in a principle that guides the later process to achieve the vision. With the three principles, they each contribute to several strategic models in the next step. Each model leads to four tools of intervention that achieve different purposes of the models. Four tools under each strategic model will form the toolbox that leads to the smaller scale interventions.

Active Hub is a model that focuses on the active mobility of children and the safe space for families with children to use. The tool list contains spaces that encourage children to move and have social interaction in the neighbourhood.

Healthy Avenue is aiming to provide safe and social space for residents to develop a healthy lifestyle. With the tools from this model, it makes social and nature inclusive in people's life in Zuidwijk.

Inclusive Community is a model that aims to create or transform the urban fabric into inclusive spaces to facilitate the social engagement and community building in the neighbourhood. With this purpose, it also contributes to making the public space safer for children and pedestrians to use.

Biophilic Booster is not only aiming to enhance the nature experience and provoke the biophilia in children and other residents but increase the environmental quality higher as well.

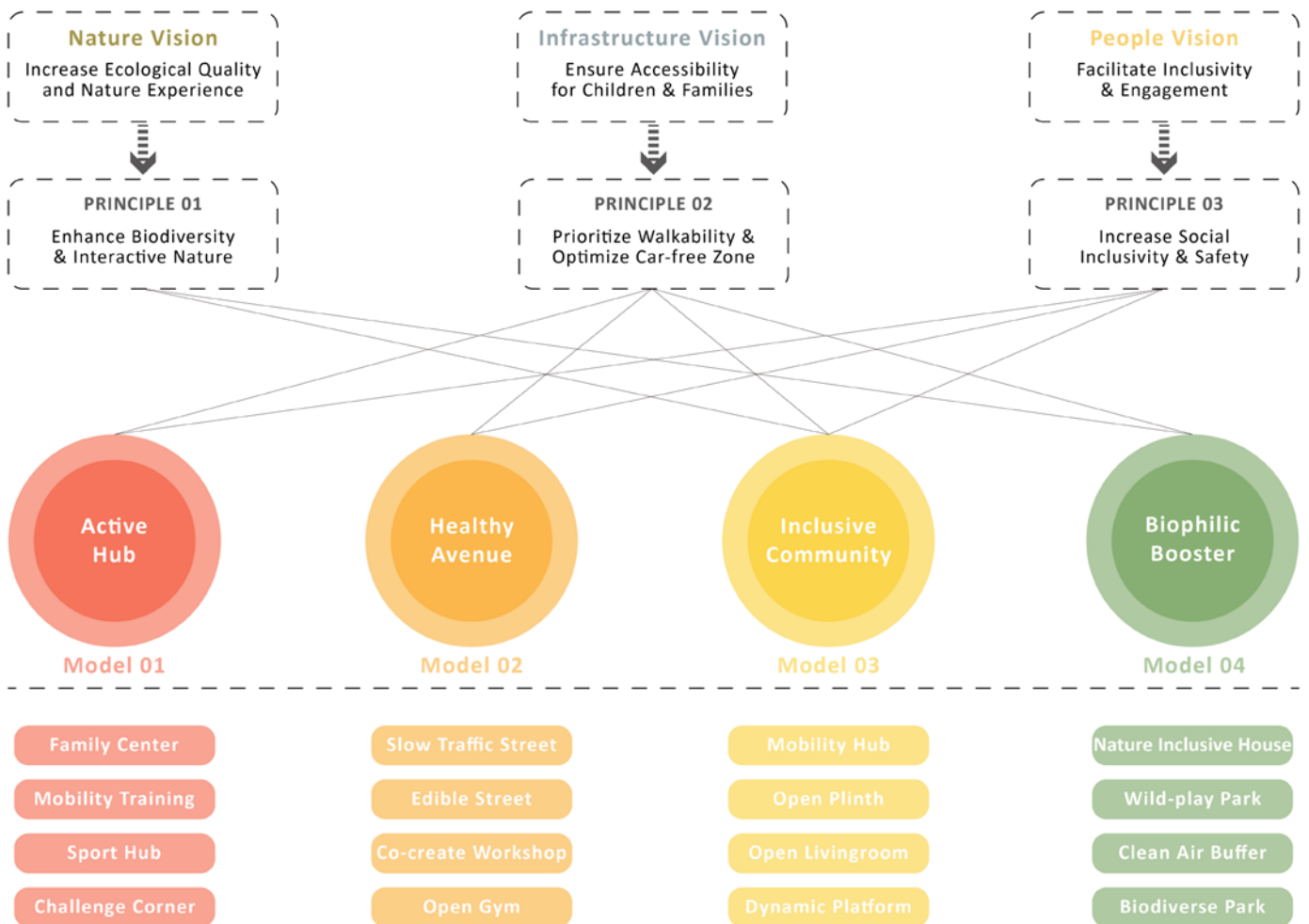


Fig. 6.1 Strategic Framework. Source: Author

## 6.2 Strategic Layer

This section shows the strategic layers that are developed based on the vision map from chapter five. With the focused area, we are able to make the vision down to smaller scale strategies that fits the real context. The diagram below shows the concept of the three layers concept of the strategy. (See Fig. 6.2) Each of the diagram are translated into site specific strategies on the map. (See Fig. 6.3)

First layer is aiming to create good nature connection from west to east and from south to north of the neighbourhood. Different amount of nature and social factors will be placed in different locations. Second layer is aiming to minimise the car-oriented street and public space in the heart of the neighbourhood in order to create car free zone to optimize the walkability and safety. The last layer is to create safe spaces that facilitates the social engagement and community function in the neighbourhood.



Fig. 6.2 Strategic Layer Diagram. Source: Author



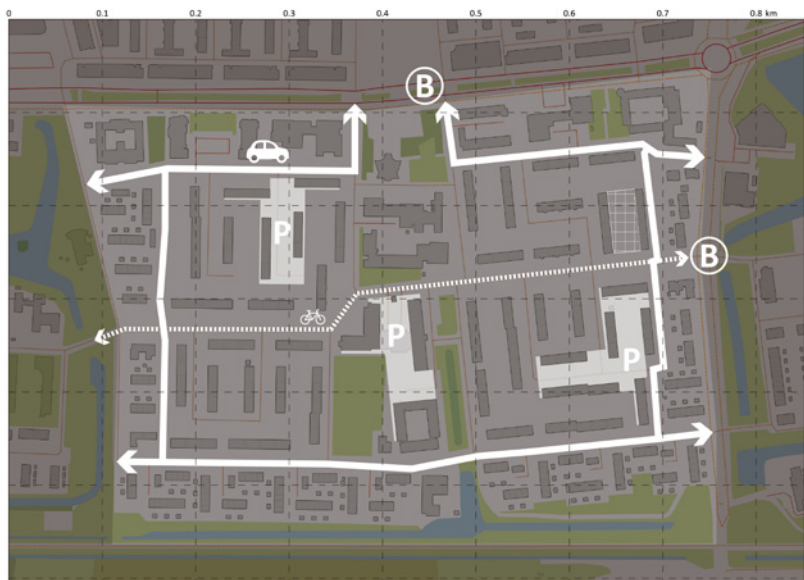


Fig. 6.3 Strategic Layer Map. Source: GIS open street map edited by author

## 6.3 Strategic Model

As discussed in the overview section 6.2, there are four strategic models to guide the following intervention tools and contribute to achieve the overall vision.

Each model has different focus on contributing to child development with different level. Active Hub focuses on the active mobility and social connectedness. Healthy Avenue focuses on the social connectedness and playability. Inclusive Community is focusing on building the sense of ownership with natural and social interventions. The last but not the least, Biophilic Booster is mainly focusing on the access to nature and by engaging children to be playful in the natural environment, it facilitates the building of agency and decision-making skills. (See Fig. 6.5)



Fig. 6.4 Scale of Beneficial Factors for Child Development. Source: Author



**Active Hub**  
Active space for children & physical development.



**Healthy Avenue**  
Safe & social space for healthy lifestyle.



**Inclusive Community**  
Inclusive urban fabrics for community building.



**Biophilic Booster**  
Nature inclusive living environment

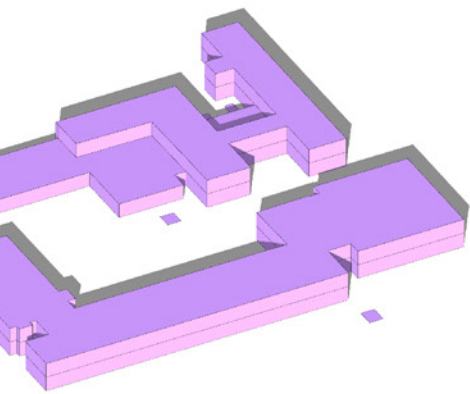
Fig. 6.5 Strategic Model and Child-friendly Scale. Source: Author

## 6.4 Building Typology

In this section, we overviewed the building typology in the area. We conclude with four main types of buildings and it's opportunity and problems.

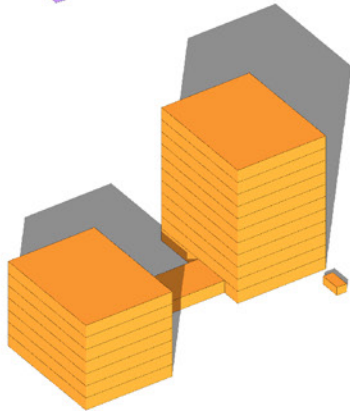
The type A building is wide and irregular buildings that is between two to three storeys tall. They are either public school or church that children would gather often but it is mostly lacking of nature inclusive space. Type B is over five stories residential housings. They accommodate dense population with higher social possibility but are further away from the natural structure. Type C is the typical post-war apartments. They have large open courtyards but with closed plinth and unattractive landscape, it is mostly anonymous to the residents. Type D is the two storeys housing with good access to the nature but the privatised gardens are blocking the ecological path for animals.





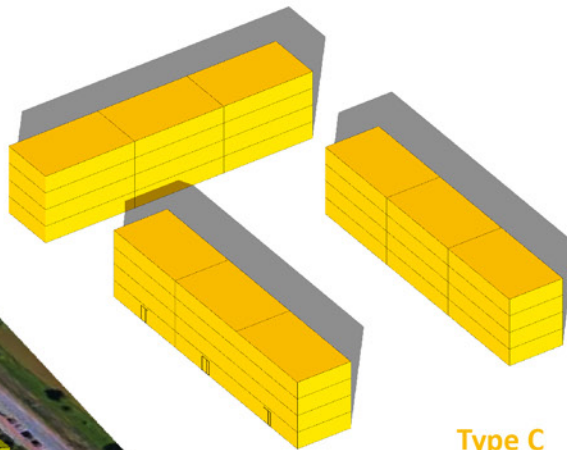
**Type A**  
2-3 Storeys  
Wide and irregular  
Public School / Church

Opportunity: children/parents gathering location  
Problem: unused amenities in weekend, lack of natural elements



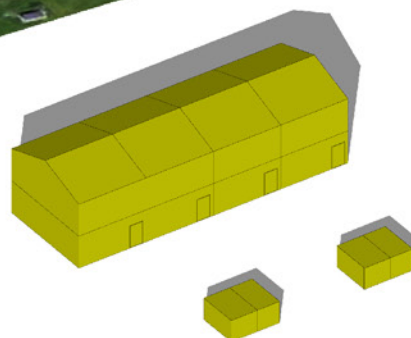
**Type B**  
5+ Storeys  
Tall, mix floors  
Residential

Opportunity: dense population for more social possibility  
Problem: further to presence of nature



**Type C**  
4 Storeys  
Linear, Post-war Structure  
Residential

Opportunity: large open courtyard  
Problem: mostly closed plinth,  
low social activities



**Type D**  
2 Storeys  
4-6 in a row, front&back garden  
Residential

Opportunity: close to green&blue structure  
Problem: highly private outdoor space, high  
density fenced gardens blocking  
animal path

Fig. 6.6 Building Typology. Source: Author

## 6.5 Toolbox Matrix

The toolbox matrix is developed based on the beneficial factors for child development and the 14 patterns of biophilic design. (See Fig. 6.7, 6.8) The Matrix combines these two guidelines to form a matrix that uses the concept of biophilic design to facilitate different qualities in child development.

The matrix creates eighteen possible forms of intervention for later use of developing the tools that are under the four strategic models. (See Fig. 6.9)



Fig. 6.7 Beneficial Factors for Child Development. Source: Krysiak, 2020

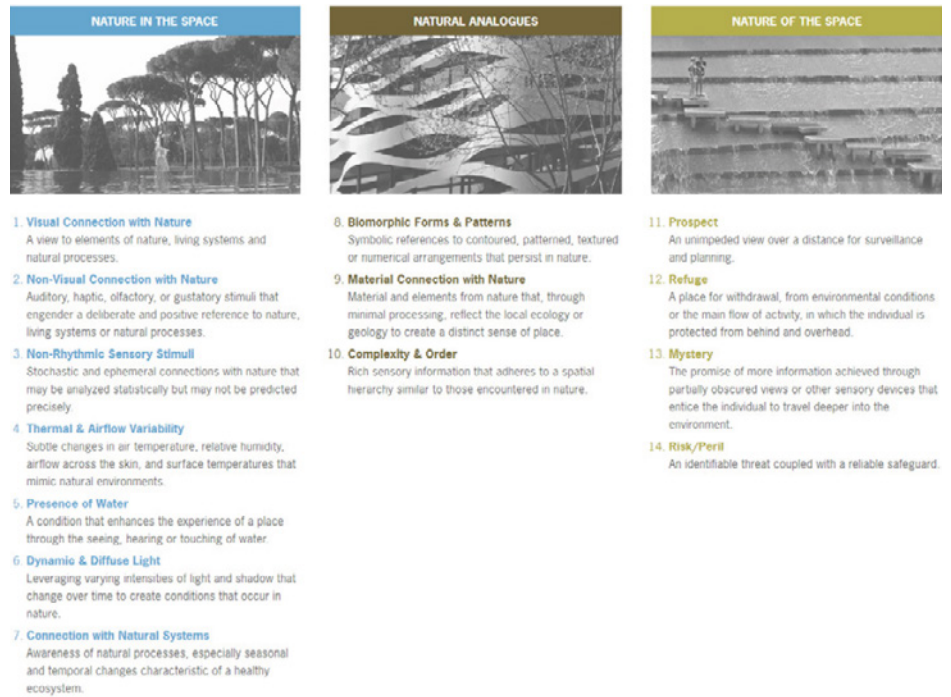


Fig. 6.8 Biophilic Design Pattern. Source: Terrapin Bright Green LLC., 2014

	 <b>Nature in the Space (Direct nature)</b>	 <b>Natural Analogues (Indirect Nature)</b>	 <b>Nature of the Space (Sense of nature)</b>
 <b>Access to Nature</b>	Direct connection with nature. Presence of nature and direct experience with nature that facilitates environment biodiversity and bond with other natural organism.  E.g. insect hotel, diversified plants	The use of natural materials or imitated nature to increase the sense of connection with nature.  E.g. natural building materials	Spaces with abundant natural materials that creates a sense of refuge and mystery.  E.g. walking paths with changing ground level and dense vegetation
 <b>Playability</b>	Playable design that includes water, light dynamics and various sensory to attract children to interact with nature and develop a sense of different texture in nature.  E.g. nature playground with natural elements	Play space with biomorphic pattern that creates multisensory nature with different actions.  E.g. various of simulated natural materials	Natural playground that promotes activities with identifiable threat and reliable safeguard.  E.g. wild play with height difference on shallow water
 <b>Sense of Ownership</b>	Multisensory activities to facilitate connection with natural system and associate individuals into part of the nature.  E.g. gardening and insect keeping	Creative activities with natural materials that encourage strong sense of ownership and association to the nature materials.  E.g. toy workshop with natural materials	Spaces with different types of natural elements to provide protected and identifiable sense of space.  E.g. fort spaces with various natural materials
 <b>Social Connectedness</b>	Social platform with diversified nature presence and activities with nature.  E.g. semi-private liminal garden	Social platforms with biomorphic patterns.  E.g. chatting space with biomorphic patterns on building materials	Covered spaces that provides protected sense for low active social activities.  E.g. resting area with pavilion or lower vegetation in the back
 <b>Active Mobility</b>	Space that promotes active actions with direct natural elements.  E.g. jumping points or balancing training with rocks or wood piles	Complexed sensory in between highly active space that change the visual or other sense of nature while being active.  E.g. biking and skating space with greens in-between	Changing height level to facilitate mobility and provide a sense of prospect.  E.g. climbing facilities to higher platform
 <b>Agency &amp; Decision-Making</b>	Activities to facilitate learning of the knowledge of natural systems.  E.g. guided forage trip	Learning skills to utilize local nature materials.  E.g. guided cooking activities with natural materials	Spaces that provides certain level of mystery and a sense of risk with reliable safety control.  E.g. nature maze with height difference

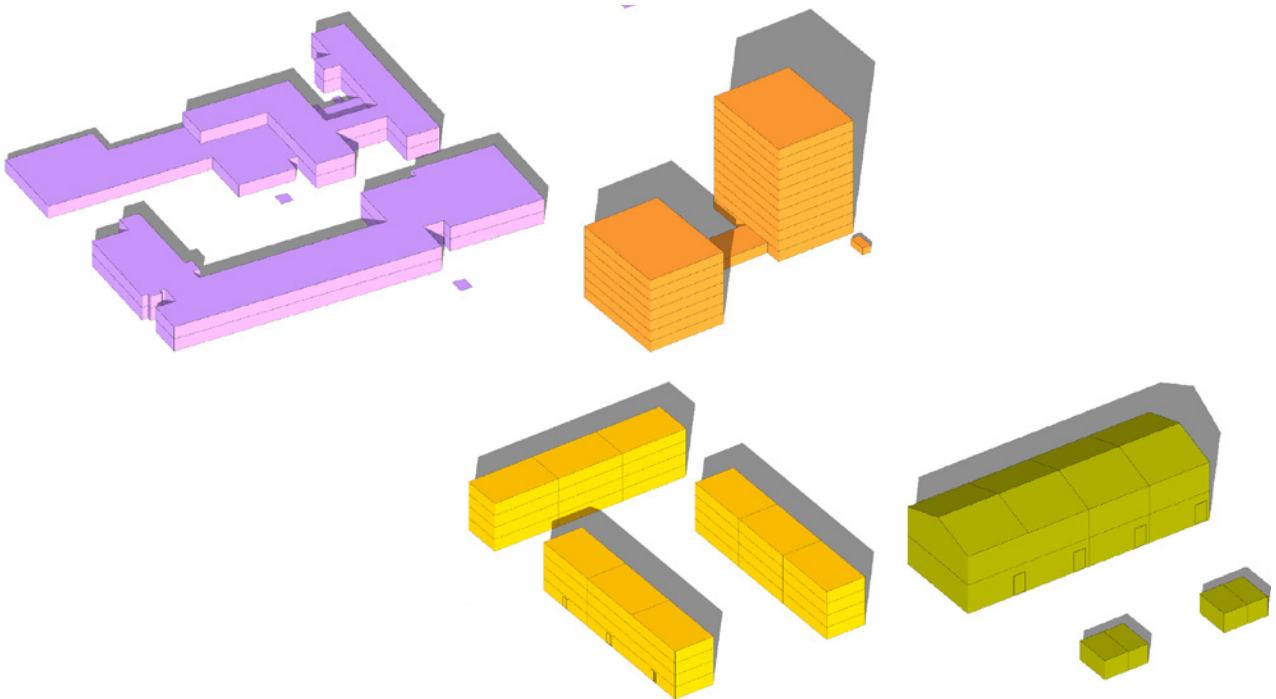
Fig. 6.9 Toolbox Matrix. Source: Author

## 6.6 Toolbox

In this section, the toolbox will be discussed by each model. There are sixteen tools that are created to achieve different focus from each model.

The tools are created with the toolbox matrix which will be presented on the side with the explanation of the tools to show what quality they contribute to the child development.

The Active Hub and Healthy Avenue is mainly focusing on creating public spaces for program interventions to take place. Inclusive Community will be focusing on creating or transforming different urban fabrics to enable safety and social factors. The tools from Biophilic Booster will be focusing on interventions in public space to enhance environmental quality.
















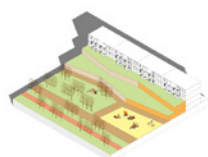
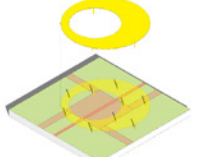
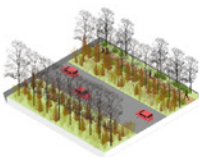
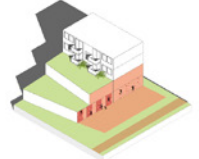
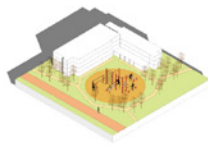
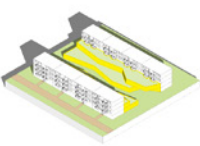
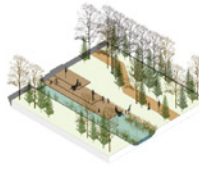
<p>A1</p>  <p>Family Center</p>	<p>H1</p>  <p>Slow Traffic Street</p>	<p>I1</p>  <p>Mobility Hub</p>	<p>B1</p>  <p>Nature Inclusive Housing</p>
<p>A2</p>  <p>Mobility Training Park</p>	<p>H2</p>  <p>Edible Street</p>	<p>I2</p>  <p>Open Plinth</p>	<p>B2</p>  <p>Wild-Play Park</p>
<p>A3</p>  <p>Sport Hub</p>	<p>H3</p>  <p>Co-create Workshop</p>	<p>I3</p>  <p>Open Livingroom</p>	<p>B3</p>  <p>Clean Air Buffer</p>
<p>A4</p>  <p>Challenge Corner</p>	<p>H4</p>  <p>Open Gym</p>	<p>I4</p>  <p>Dynamic Platform</p>	<p>B4</p>  <p>Biodiverse Park</p>

Fig. 6.10 Toolbox. Source: Author

## 6.6 Toolbox

### Family Center



The family center is created to provide safe outdoor space that has good social control and physical boundry on the edge of the space to allow children to be active safely. It is formed with an elevated platform between several buildings and creates a lower part of the courtyards with child-care volunteers as a safe space for children. The uper part of the platform provides functions for parents such as co-wroking space or community cafe where parents can build connection with other parents while having their children being taken care of close to them.

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### Mobility Training Park



The purpose of Mobility Training Park is to allow children to be active and challenged to increase their mobility skills. The park can consist skating, roller skating or biking facilities for them to explore. It creates certain amount of different structure with nature elements in between to provide children the opportunities to experience different sense of space and its various perspective of viewing the nature.

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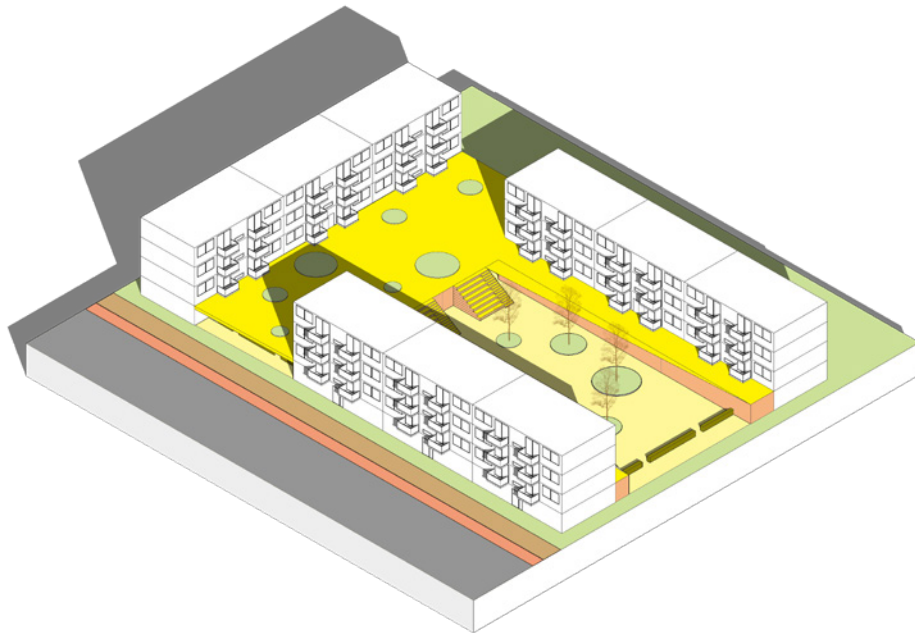


Fig. 6.11 Family Center. Source: Author



Fig. 6.12 Mobility Training Park. Source: Author

## 6.6 Toolbox

### Sport Hub



The sport hub is aiming to facilitate children to be engaged in or form an active community. The sport hub can contain small scale football court or other types of sport facilities that can be integrated into the living block. The sport hub encourage the active mobility and the social connectedness in children development.

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### Challenge Corner



Challenge corner is a tool to utilise the facade of the side of the buildings and encourage the active mobility for children. It is also a social point in the neighbourhood to create opportunities for children to engage in social connections. In challenge corner, climbing elements, ropes, and several other elements can be used to allow children to climb along the wall to encounter various types of materials and at the same time train their skill of decision making.

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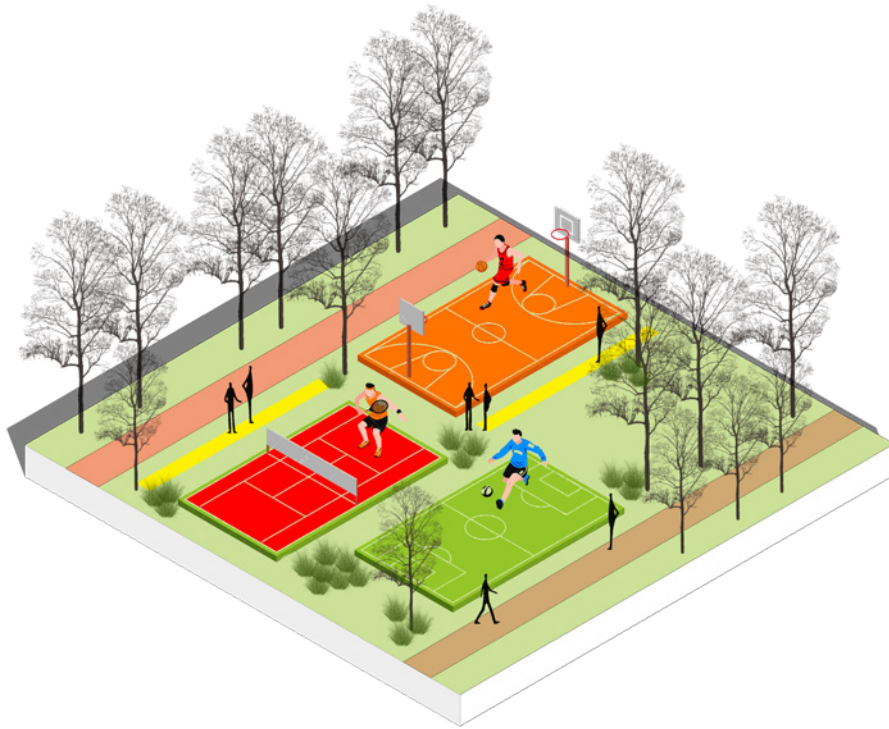


Fig. 6.13 Sport Hub. Source: Author

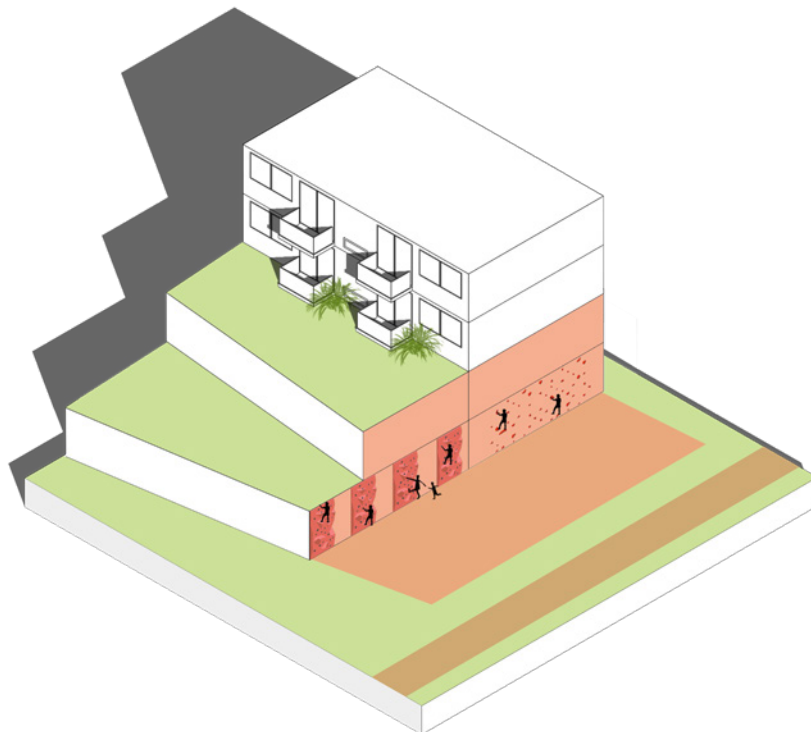


Fig. 6.14 Challenge Corner. Source: Author

## 6.6 Toolbox

### Slow Traffic Street



The existing main road in the strategic area is two lanes car street that is mainly designed for car-oriented use. With the purpose to increase walkability, the main road is transformed into linear green space that only allows slow traffic and preserve other space for more green and social amenities. Furthermore, children can travel between home and school safely with exposure to nature on the way.

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### Edible Street



Edible street is designed to connect the main road into the living blocks with urban gardening amenities for residents to interact with nature. Children who participate in gardening may develop their sense of ownership and knowledge about the natural system.

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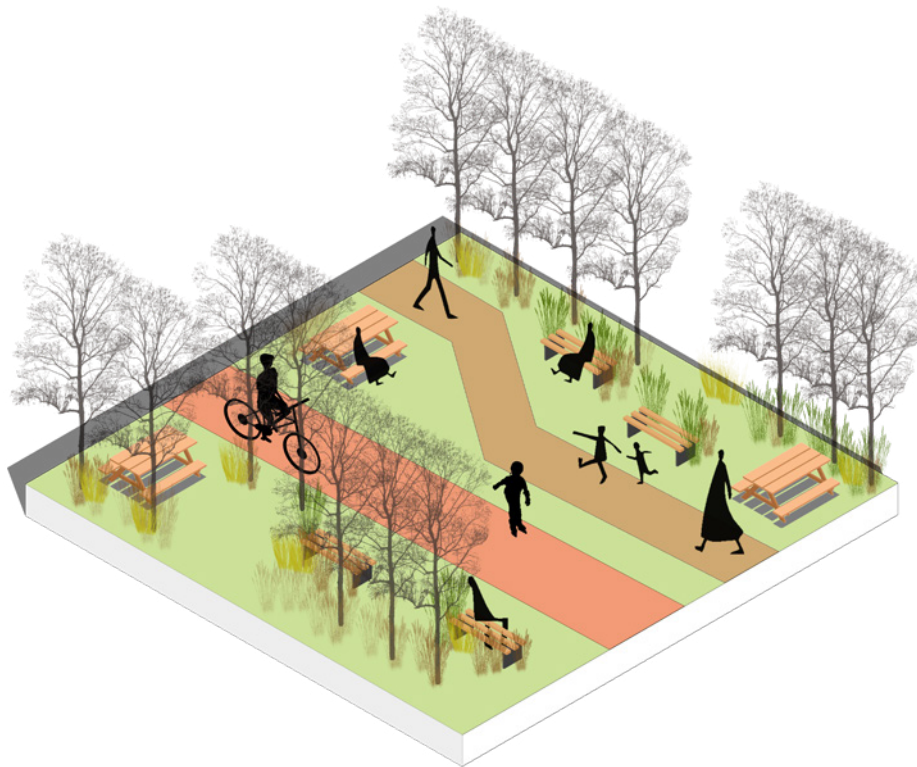


Fig. 6.15 Slow Traffic Street. Source: Author



Fig. 6.16 Edible Street. Source: Author

## 6.6 Toolbox

### Co-create Workshop



Co-create workshop is a space that provide residents to get together to share the tools and do creative works. For children it can be toy workshop where they can be guided to use natural materials to build their own toys. For adults it can be repairing workshop for furniture or for creating new tools for the community or family. The space is also provided with equipments and ourdoor fire place to allow adults to guide children to do forage in the neighbourhood and bring back to create food together.

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### Open Gym



Open gym is mainly targeted for adults and elders to stay active with accessible amenities right around the corner. Children can also use the space as a jungle gym playground with supervision. The ground material would be soft wood to ensure the safety of the users.

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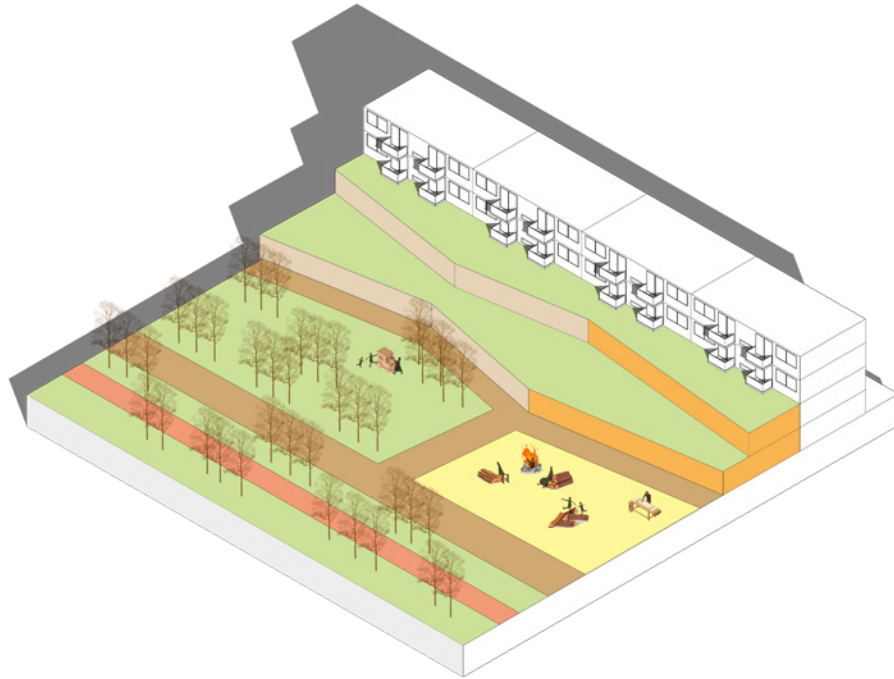


Fig. 6.17 Co-create Workshop. Source: Author

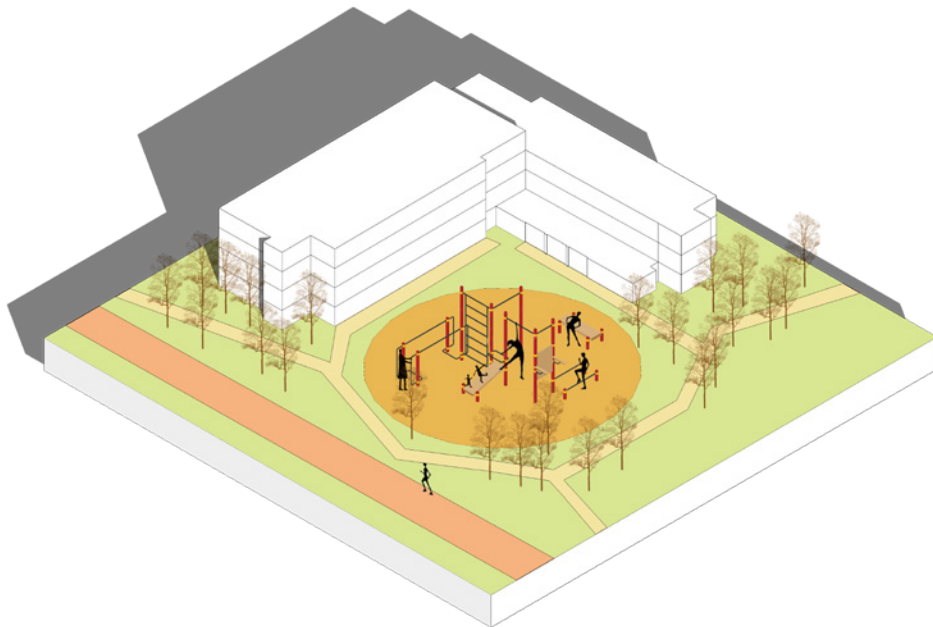


Fig. 6.18 Open Gym. Source: Author

## 6.6 Toolbox

### Mobility Hub



The mobility hub is the main solution to optimise the walkability in the neighbourhood while keepig sufficient amount of parking space. The existing plan is mostly covered with car use roads and the parking spaces are provided along the streets. The mobility hub is created at the area that are less connected to the public transportation stops to allow residents to store their cars when needed.

Mobility hub is created with an elevated platform that allows pedestrians to seperated from the car use space. The platform also provide safe space for children to play with neighbours and give car users a good using experience from the rain.

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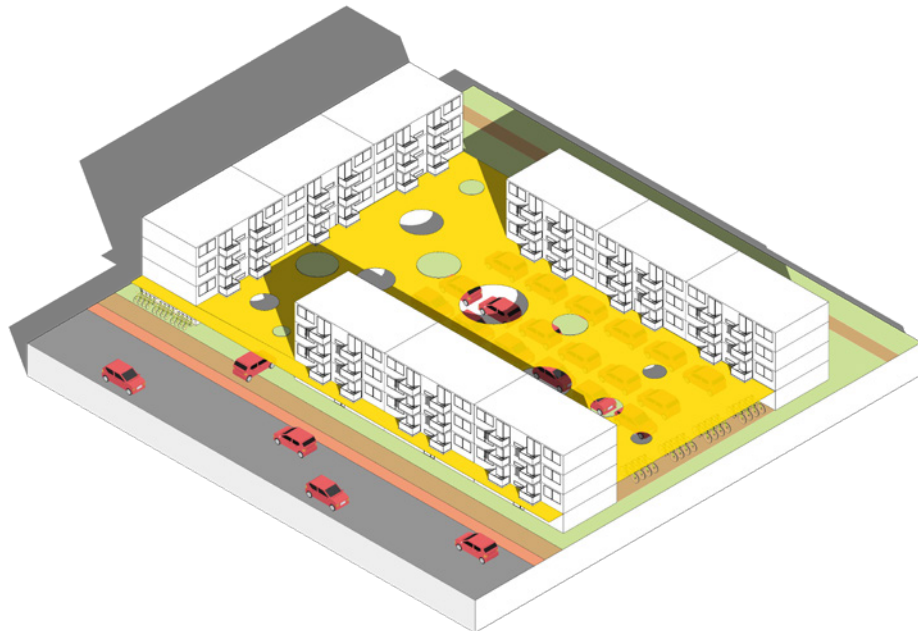


Fig. 6.19 Mobility Hub. Source: Author



Fig. 6.20 Original Parking Space in Centered Area. Source: Author



Fig. 6.21 Location of Mobility Hub. Source: Author

## 6.6 Toolbox

### Open Plinth



One of the problems of the existing post-war buildings is that a lot of them are using the ground floor as storage space. As a result, the plinth is fully closed as private space. The open plinth is aimed to open up the plinth to connect to the street scape and create semi-private space that can facilitate the social connected community.

The open plinth will mainly be transformed on the street facing side. The solution is to move the storage space to the roof with extended elevator or stairs. By doing this, we can open up the closed plinth with more space for residents to connect.

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Fig. 6.22 Map of Open Plinth. Source: Author

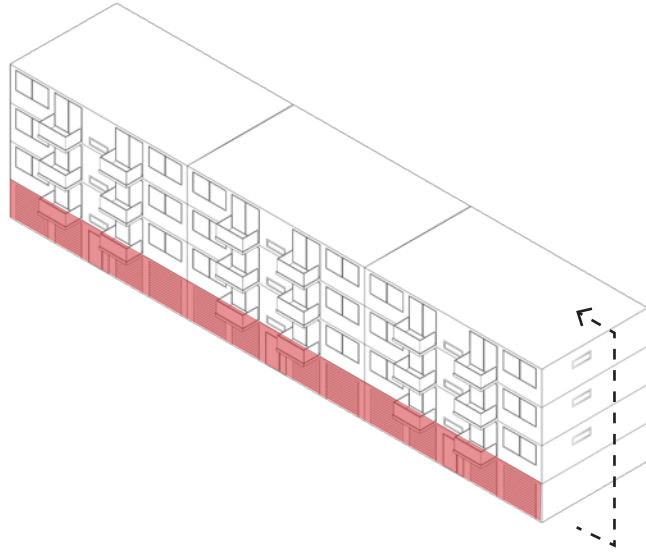


Fig. 6.23 Open Plinth. Source: Author

## 6.6 Toolbox

### Open Livingroom



The open livingroom is created to provide an outdoor space for residents to connect with their neighbours. It is located at the crossing of the main healthy avenues as a node to increase the social opportunity for the neighbourhood.

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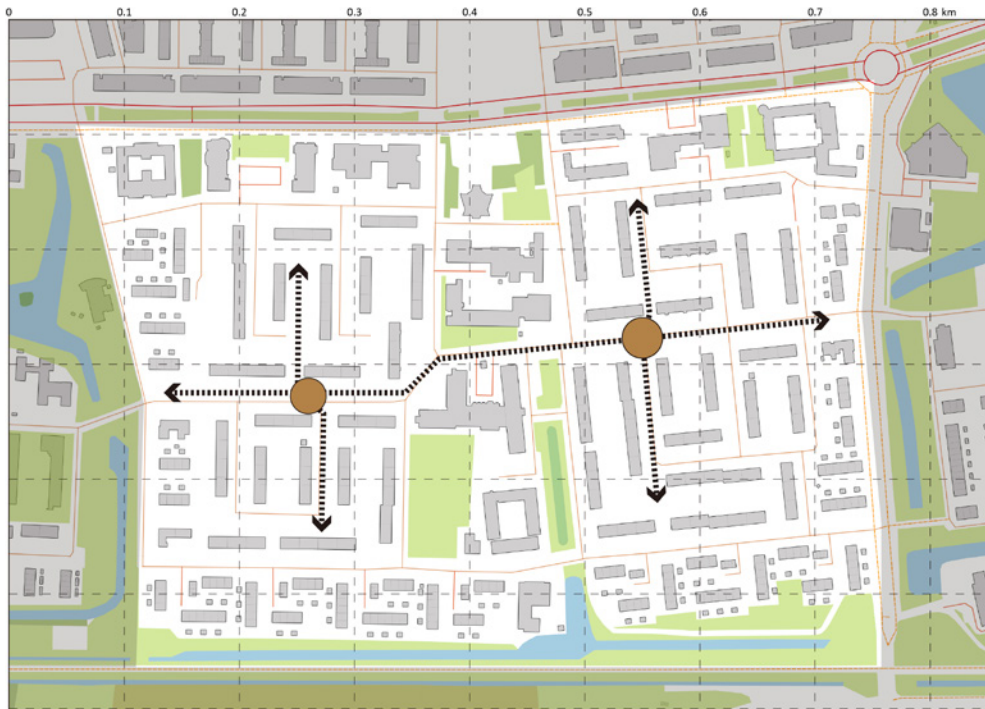


Fig. 6.24 Map of Open Livingroom. Source: Author

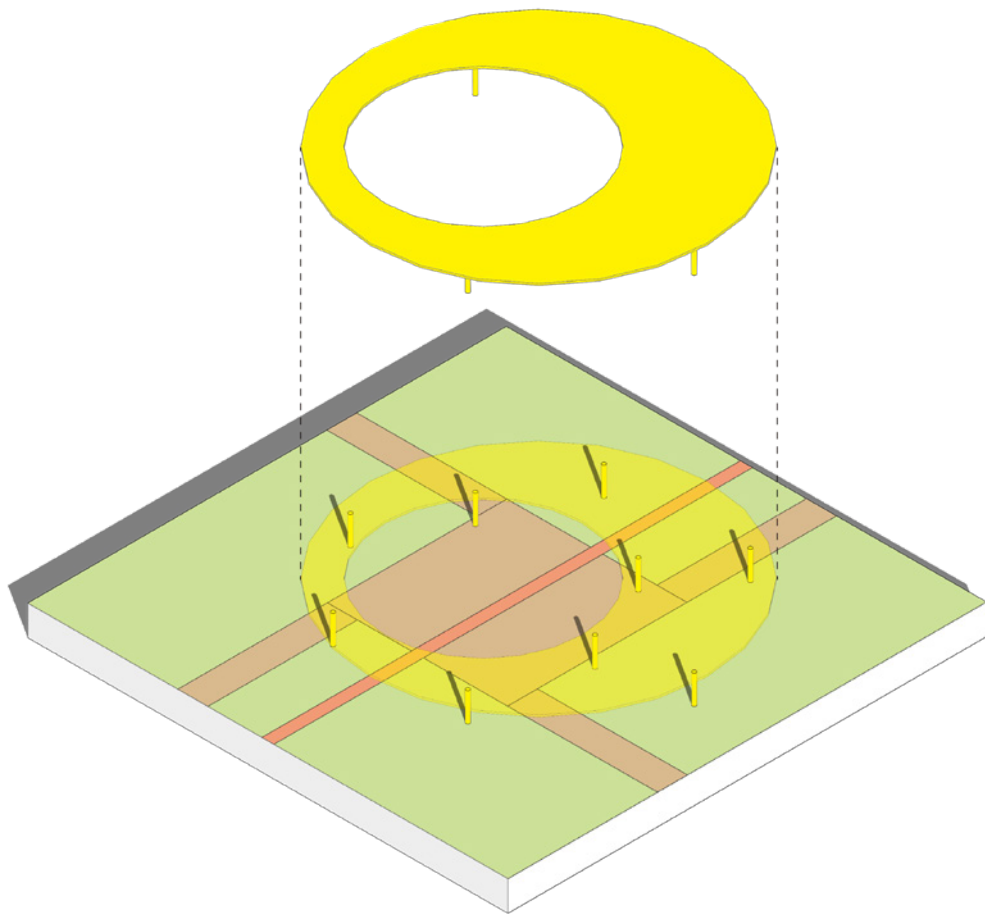


Fig. 6.25 Open Livingroom. Source: Author

## 6.6 Toolbox

### Dynamic Platform



This tool extended the existing post-war buildings to create diversified landscape in the courtyards. It also creates more living space to accommodate denser population.

At the corner of the extended platform, some spaces are preserved to be a sheltered open lobby for the apartments or space that extended from the indoor community functions.

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Fig. 6.26 Map of Dynamic Platform. Source: Author



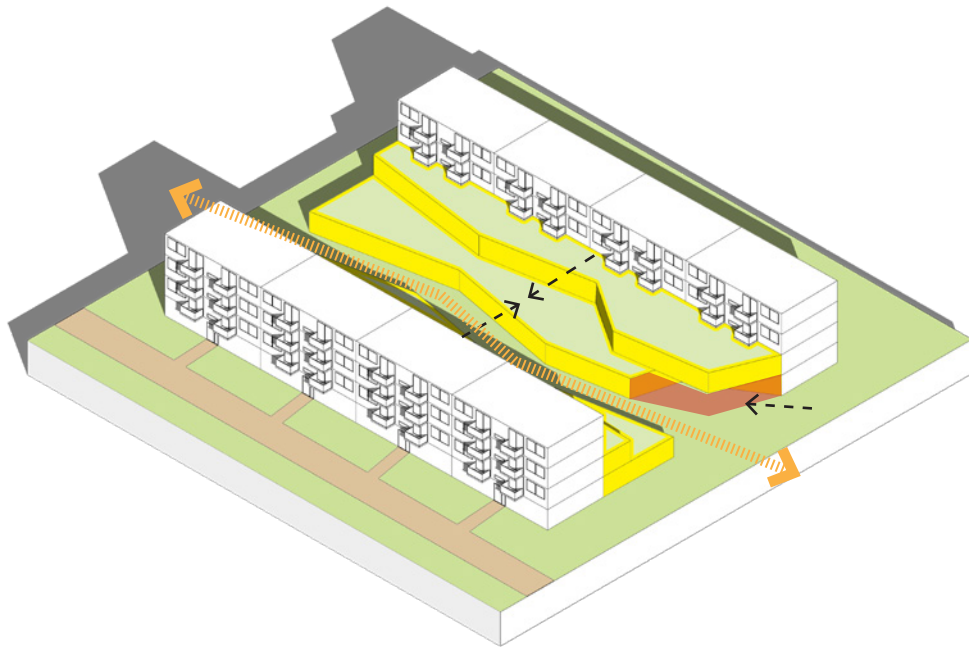


Fig. 6.27 Dynamic Platform. Source: Author

## 6.6 Toolbox

### Nature Inclusive Housing



The existing two-storeys housings are close to the larger nature structure and are provided with a lot of private open space. Since the privatisation of the open space, although this area is greener than other place, the ground is blocked by fences and car use roads.

To increase the ecological quality of this area, this tool creates an elevated path in between the houses and uses diversified vegetation to make the ground under the path as wild as possible to allow animals or insects to pass by.

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### Wild Play Park



The south side of the area is close to the green and blue structure that already has a better environment for natural experience. This tool is to add elements that can facilitate children to play in the wild nature and have immersive experience with nature.

The wild play park can challenge children to make decision on choosing creative ways to use the natural elements in the water or on the grass. They can also develop better mobility skills while playing in between the wood piles and rope webs.

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Fig. 6.28 Nature Inclusive Housing. Source: Author

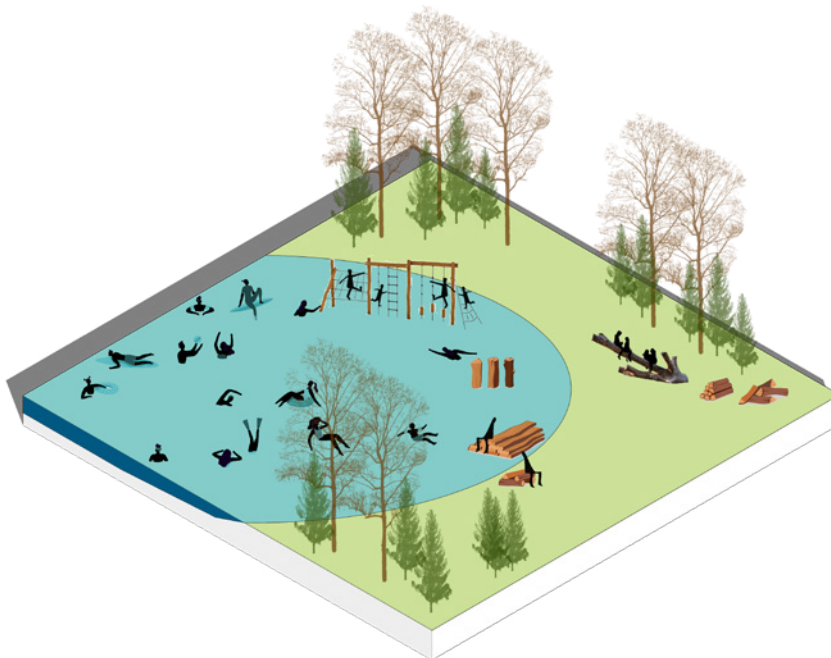


Fig. 6.29 Wild Play Park. Source: Author

## 6.6 Toolbox

### Clean Air Buffer



This tool is created to minimise the diffusion of the car produced air into the living environment. The buffer vegetation also creates a safer space for pedestrians from cars.

The vegetation is focused on the gradually elevated height of the plants, from grasses to bushes, bushes to taller trees. The gradient change of height helps air to be filtered or stay in the car zone.

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### Biodiverse Park



The biodiverse park is a tool that focusing on improving the biodiversity of the space and allow children to have access to high quality natural environment. The tool is mainly situated at the green structure that is connecting to the larger nature structure.

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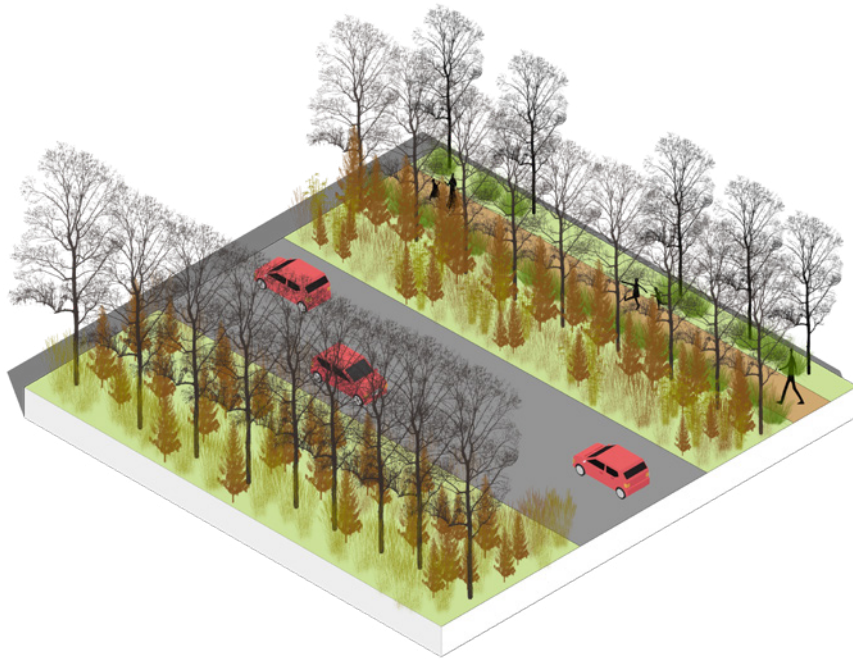


Fig. 6.30 Clean Air Buffer. Source: Author

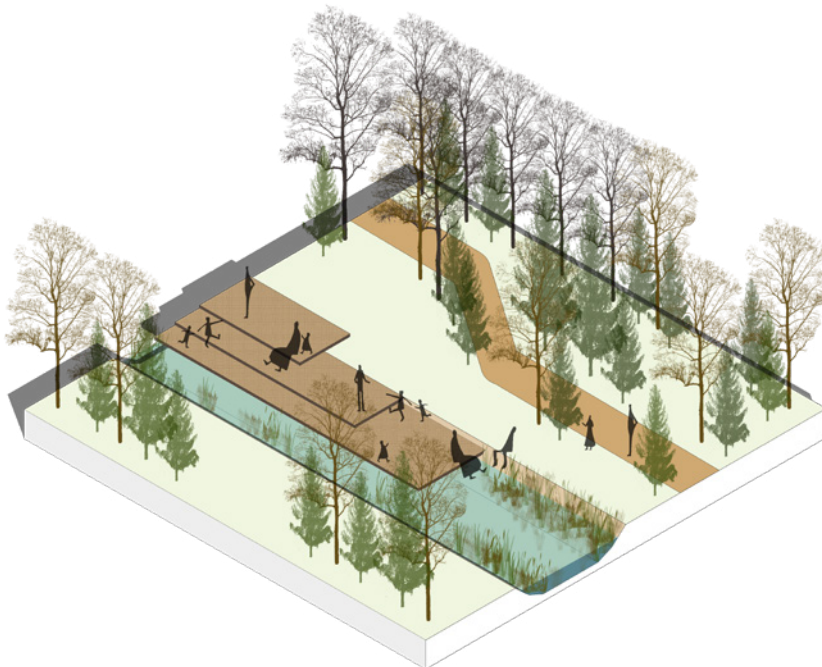


Fig. 6.31 Biodiverse Park. Source: Author

## 6.7 Strategic Plan

To conclude the strategy chapter, we illustrated the connection of the neighbourhood to the larger city structure under this strategic framework. (See Fig. 6.32) Concluding the toolbox discussion, the strategic plan shows how the tools are situated in the neighbourhood to achieve the strategy layers. (See Fig. 6.33)

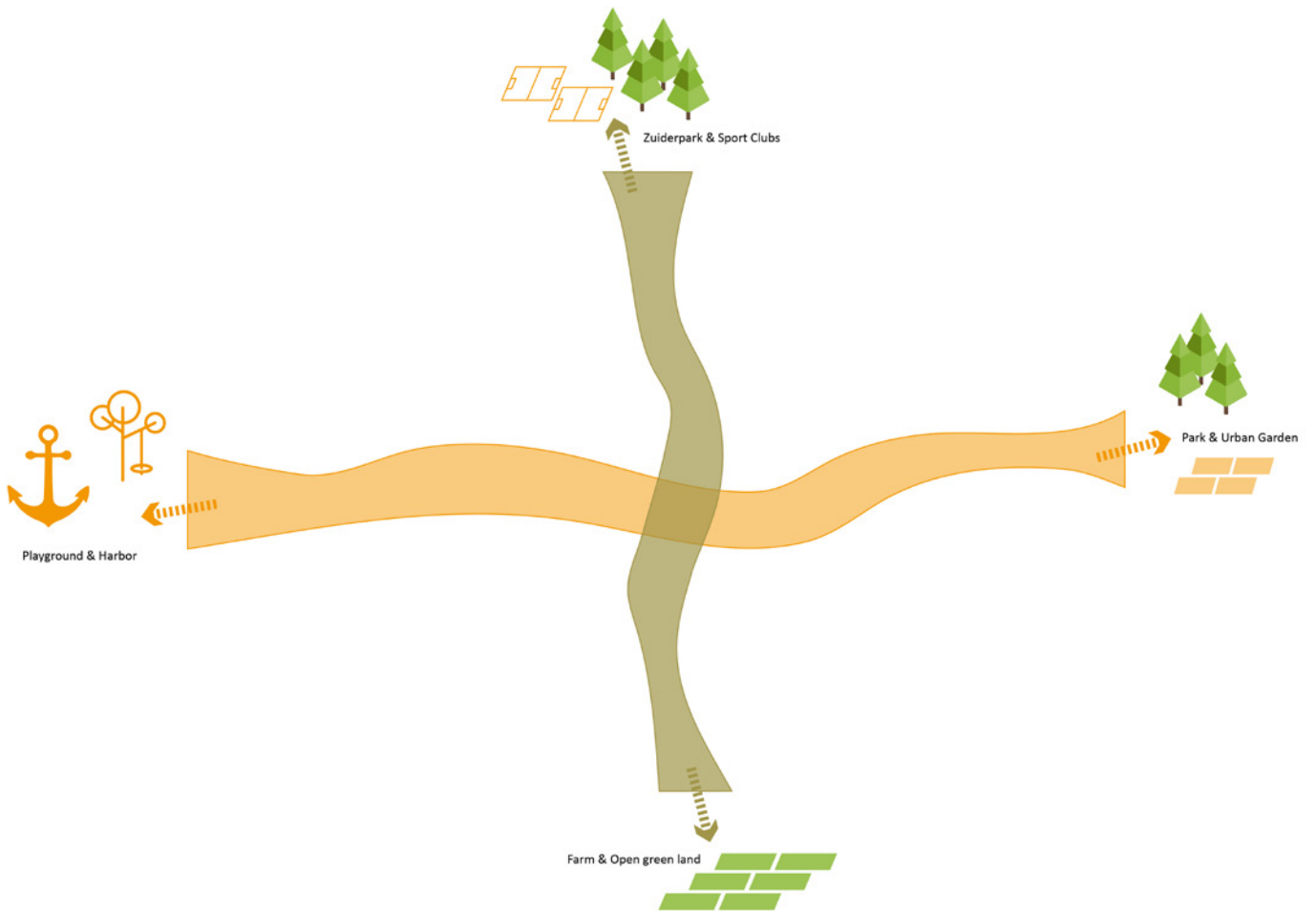


Fig. 6.32 Strategic Diagram. Source: Author

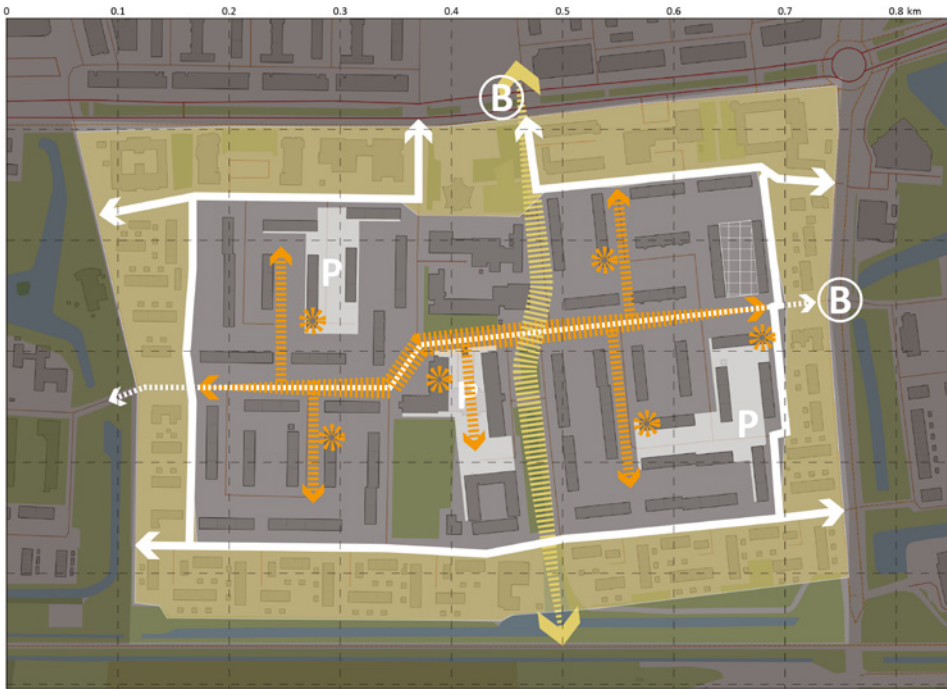


Fig. 6.33 Strategic Plan. Source: Author



## 7. Design Elaboration

7.1 Overview

7.2 Design Intervention



## 7.1 Overview

In this chapter, we will be focusing on the design elaboration from tools into spatial interventions. The overview image shows a general view of how the neighbourhood would look like under the transformation of this project. The next section will discuss the tools and intervention of each strategic model with illustrations.

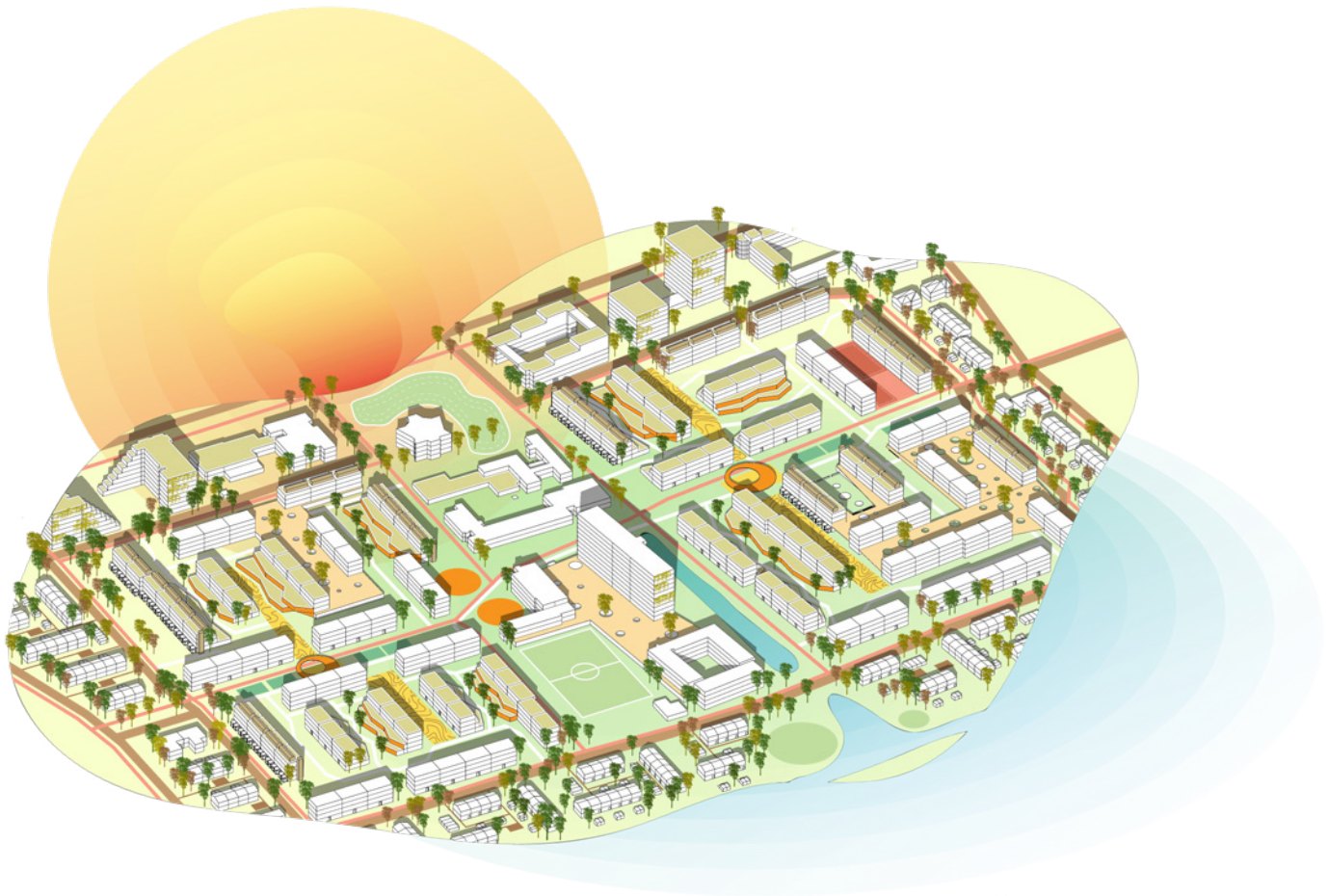


Fig. 7.1 Overview. Source: Author

## 7.2 Design Intervention



**Active Hub**  
Active space for children & physical development.

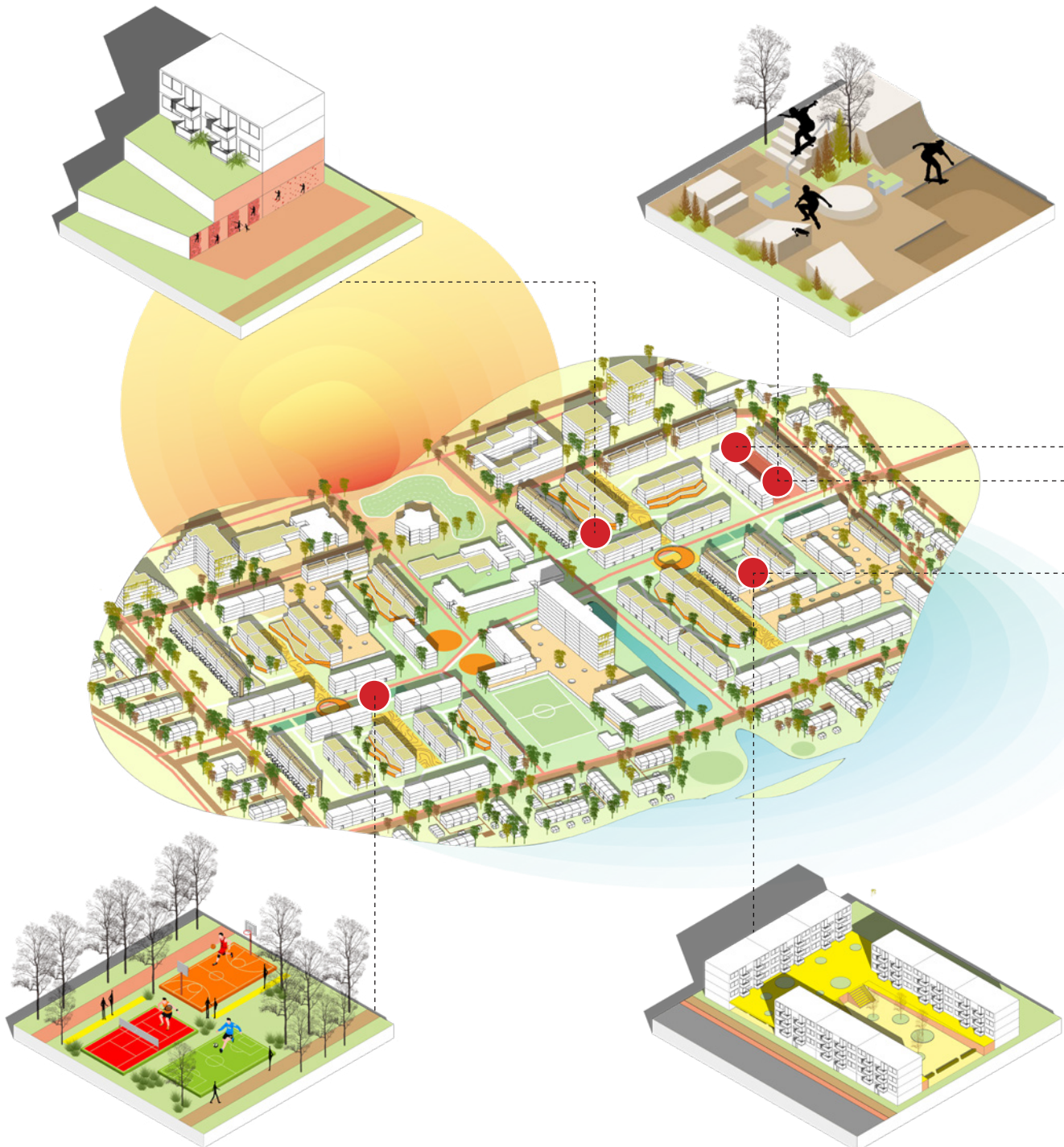


Fig. 7.2 Active Hub Map. Source: Author



Fig. 7.3 Active Hub Illustration. Source: Author

## 7.2 Design Intervention



**Healthy Avenue**  
Safe & social space for healthy lifestyle.

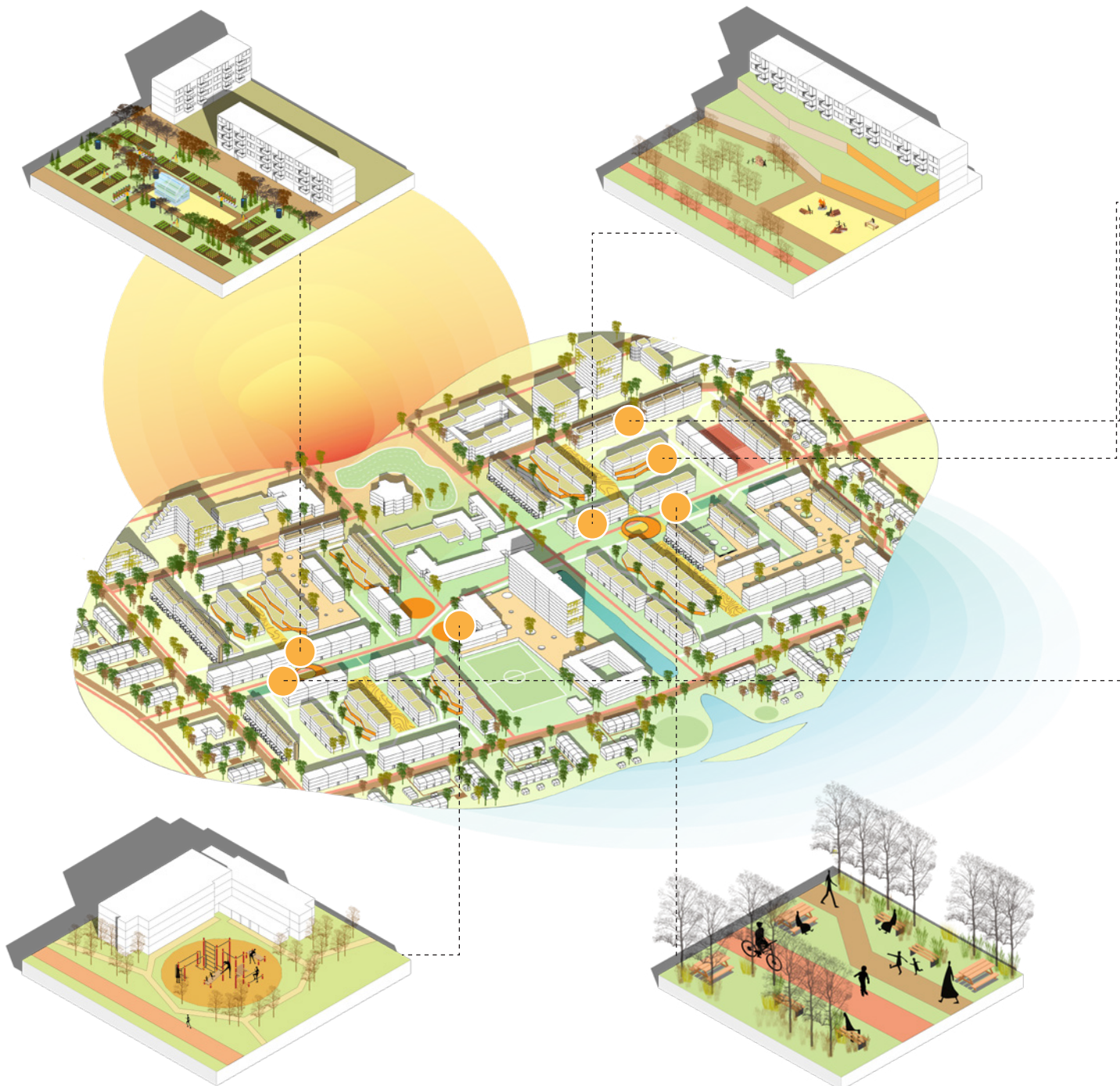


Fig. 7.4 Healthy Avenue Map. Source: Author



Fig. 7.5 Healthy Avenue Illustration. Source: Author

## 7.2 Design Intervention

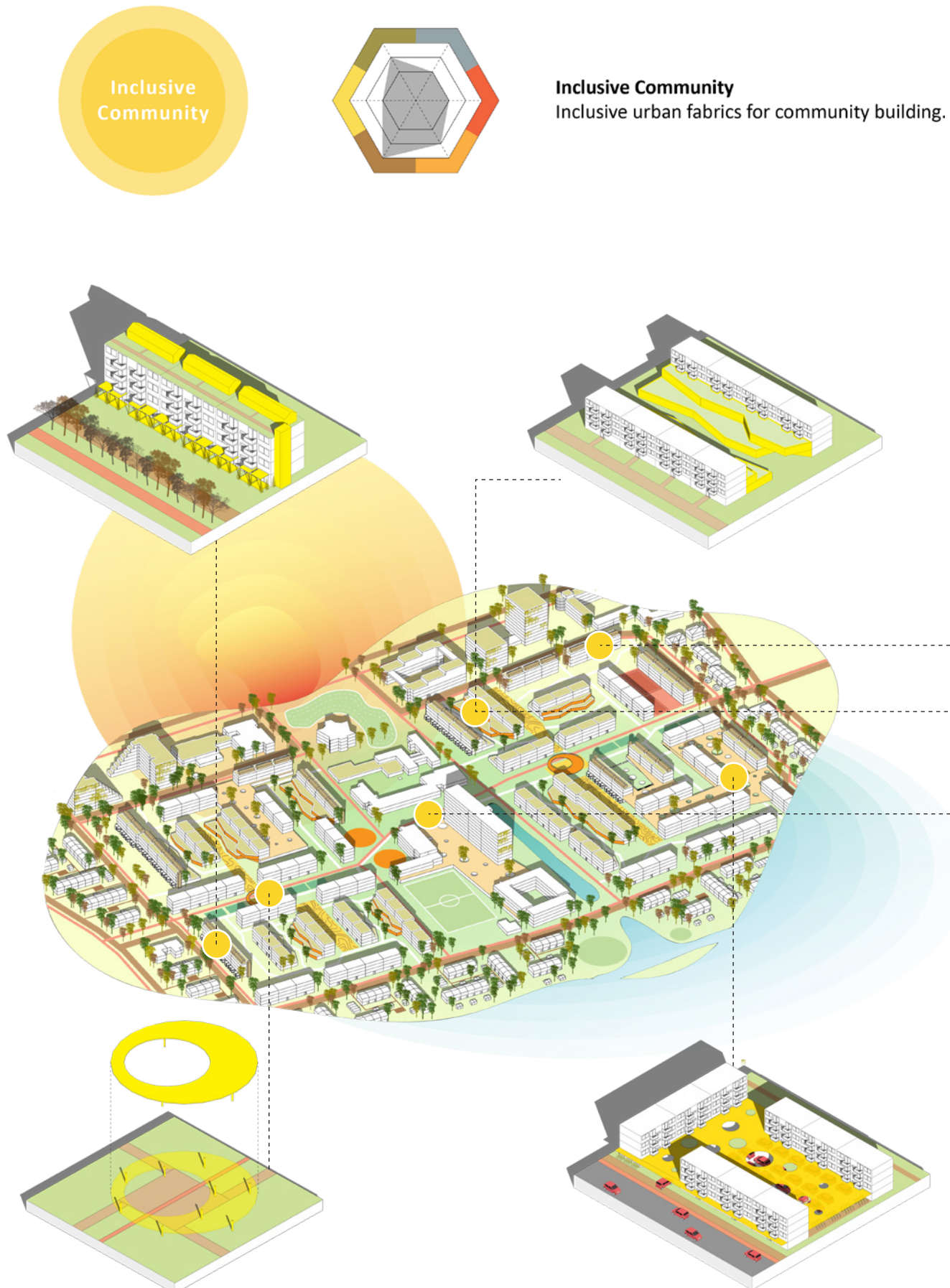


Fig. 7.6 Inclusive Community Map. Source: Author



Fig. 7.7 Inclusive Community Illustration. Source: Author

## 7.2 Design Intervention



Fig. 7.8 Biophilic Booster Map. Source: Author



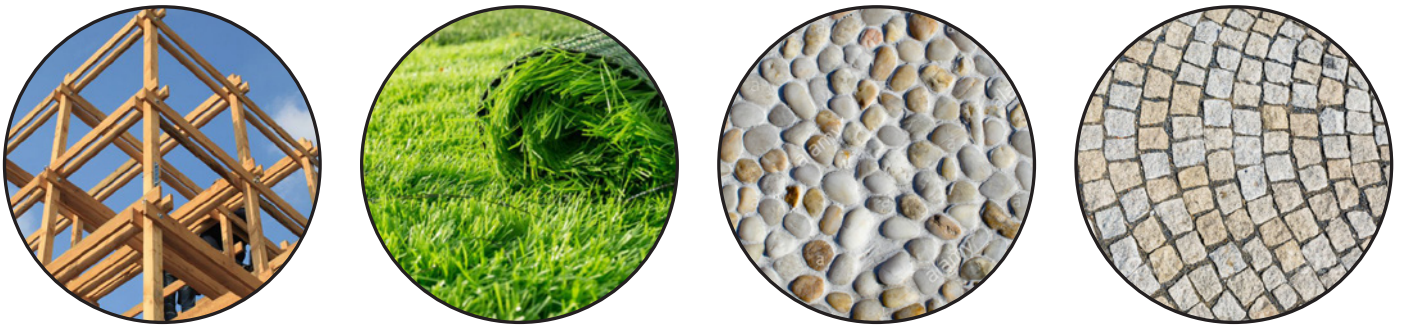


Fig. 7.9 Natural Pavement. Source: Author

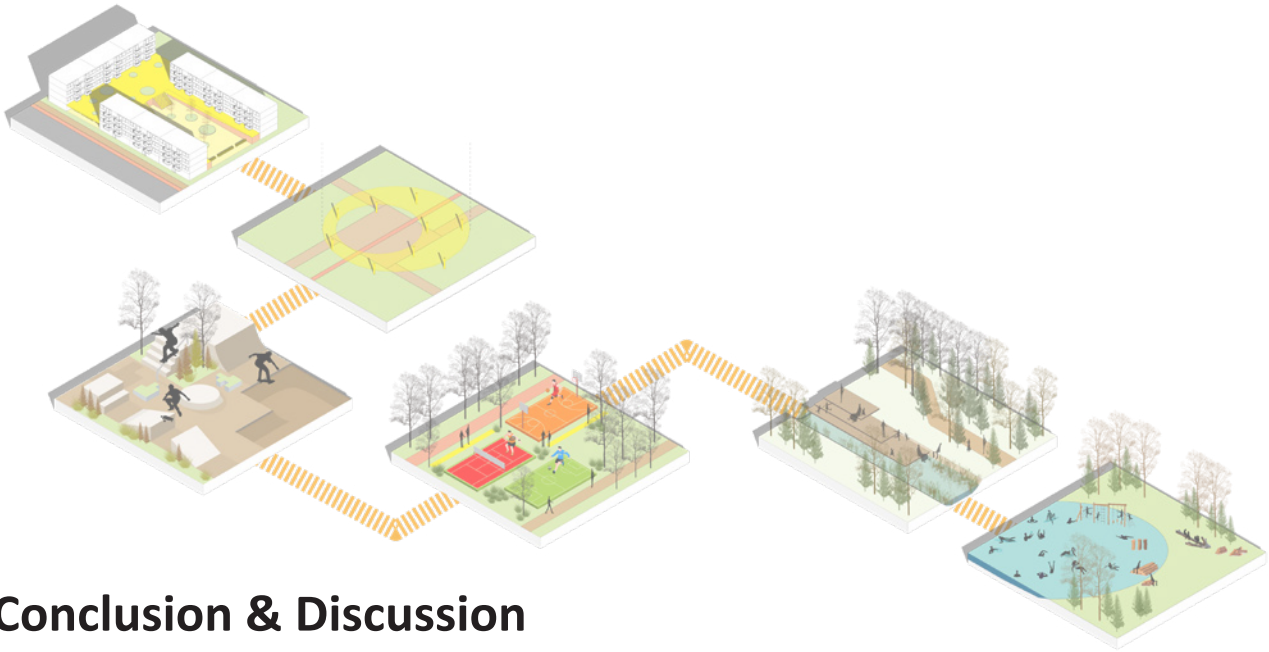


Fig. 7.10 Biophilic Booster Illustration. Source: Author



Fig. 7.11 Layered Vegetation. Source: Author





## 8. Conclusion & Discussion

8.1 Conclusion

8.2 Reflection

## 8.1 Conclusion

The project envision to transform the daily life of children who lives in Zuidwijk into a healthy and lively journey with a lot of eposure to nature experience. While changing the urban fabrics for benefits of children, the project realise the social and natural connection of Zuidwijk to the neighboured systems. This section will be discussing the conclusion with the research qustions.

### **Main Research Question:**

How can biophilic city model contribute to enhancing healthy childhood under urban densification in Post-war Neighbourhood, Zuidwijk?

In this research, we conclude that making a neighbourhood into a environment for biophilic childhood development is not only about creating physical natural environment but also the social aspect of building a community that enable or facilitate the biophilic lifestyle. In which, the residents in the Post-war neighbourhood, Zuidwijk, have low interaction with nature and have a low social sctiveness. Thus, it is the focus of this project to use biophilic design to transsform Zuidwijk into a neighbourhood where children can grow up healthy.

### **SRQ A: Healthy urban childhood with nature?**

What is the role of nature in contributing to healthy childhood development in an urban environment?

Over the last few decades of research, it is clear that the exposure to nature or different types of interaction with nature can have various benefits for children. Being outside with natural environment can help children develop their physical strength and their multisensory skills. A nature abundant urban environment creates higher biodiversity which allows children in the city to have more opportunities to live with other organisms. By implementing and emphasising the nature in childhood, we raise the future generation with better environmental mindset and healthier lifestyle.

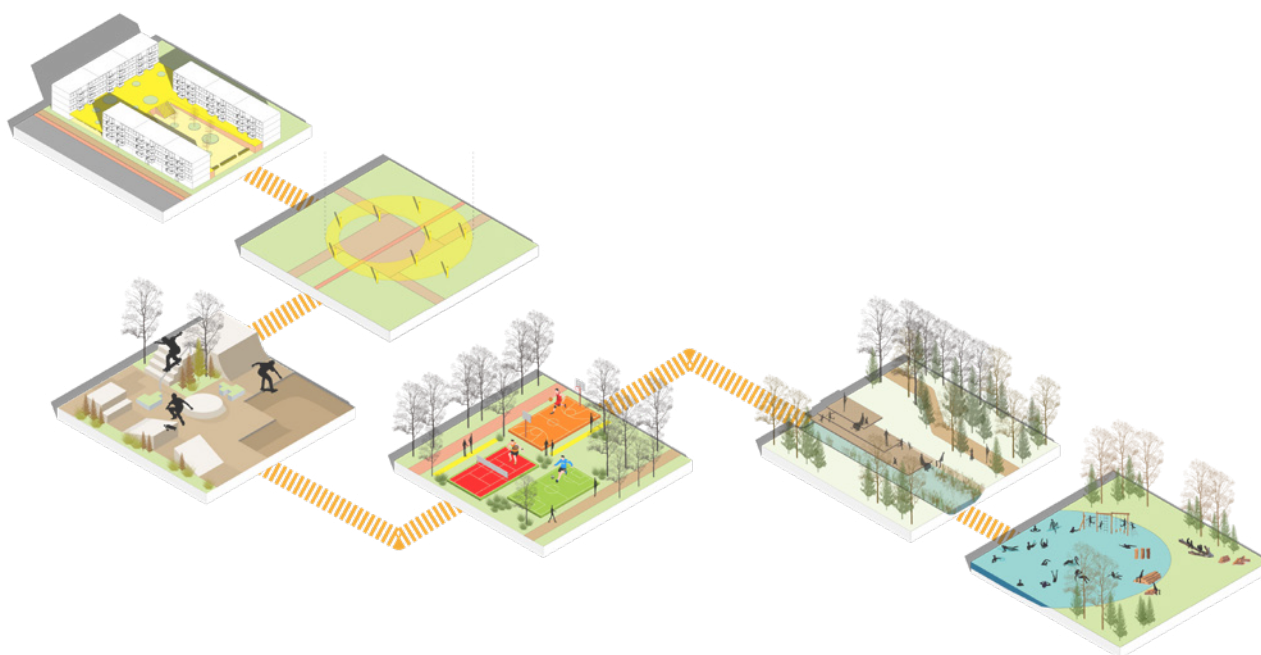
### **SRQ B: Impact for different scale?**

How is urban densification affecting the room for nature in the city on different scales?

On children perspective, the densified urban fabrics not only decrease the presence of nature but also make the living environment more dangerous for children to have enough freedom to explore outside on their own. It is crucial to preserve or provide different ways for children to have the opportunities to explore on their own around their home and the school.

On neighbourhood scale, the streets and a lot of spaces become car oriented structure which makes it hard for parents allow their children to play outside by themselves. Except for environmental aspect, the social aspect of building a supporting community can also facilitate the active and lively lifestyle in a neighbourhood.

As for city scale, expanding without preserving natural environment can lead to the decrease of ecological quality and unhealthy citizens. Except for environmental and social aspect, it is also effecting the economical efficiency and value for a city. Thus, it is critical to preserve enough and continuous space for nature to allow a city to develop sustainably.



**SRQ C: Biophilic or green wash?**

What are the principles and tools of the biophilic city model that can contribute to a healthy childhood development?

The concept of biophilic design is emphasising on the interaction between human and nature, and the various types of nature experiences. The focus is different from greenwashing the city with vegetations. Biophilic experience can be direct or indirect natural experience, various from immersive wilderness hiking to potted plants or an image of nature at home for daily exposure. In order to help children to develop their biophilia, it is also important to create an active community that lives with nature and see nature as essential part of their daily life.

**SRQ D: Toolbox Application?**

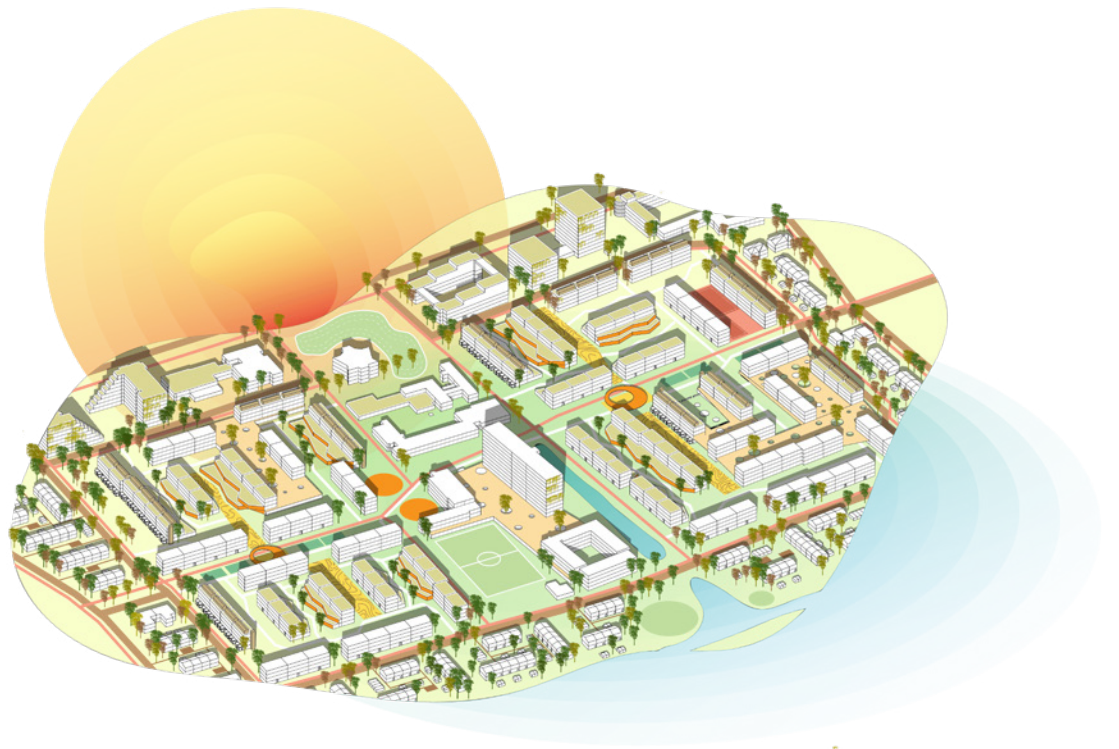
What is the typology of space and the use in Zuidwijk concerning the nature and health of children's development?

The typology of the building and quality of space in Zuidwijk is the base of the toolbox. Additionally, consider the biophilic design pattern and beneficial child development factors, 16 tools are suggested for the post-war neighbourhood to transform. The toolbox can be used in other post-war neighbourhood like Zuidwijk while the design elaboration is a translation of the tools into site-specific conditions.

**SRQ E: Site-specific results?**

What are the potential spaces that can be transformed to enhance healthy childhood development in Zuidwijk?

The interventions of this project are focusing on the Post-war building structure and its courtyards. Along with the transformation of the main street into healthy avenue, they become space for social interaction with natural and playful elements. On the skirt of the neighbourhood we allow cars to have minimum access but also using more vegetation and eco-friendly design on the building area to create better environmental quality.



## 8.2 Reflection

### **Social Relevance**

This project is focusing on the relation between the health of childhood development and the nature experience in urban environments. The research is aiming to form a better physical and social environment for children to grow up healthy. Children are the future of society thus the research is strongly related to increasing the social benefits of the city.

The current planning and city development process is mainly considering the needs of adults. However, the future society will be built with the future citizens, children. Building an urban environment that can provide children with conditions to develop a healthy childhood will help transform the community into a society that values the natural connection to individuals as well as the urban systems.

### **Limitation and Future Research**

The limitation of this research can include the financial and political feasibility. The research was conducted with a hypothetical proposal for a better vision to guide the urban environment. In this case, the emphasis of this research is focusing on the social and environmental quality of the urban systems. However, due to the limited time and resources, the financial and political perspectives were not emphasised during the research.

For future research projects, this research can provide a recommendation for regenerating the post-war neighbourhoods. The analysis and strategic framework can be beneficial for future research that is related to issues such as urban child development or human interaction with nature.

From a financial point of view, future research can be looking into the financial system within and without the neighbourhood or in another area that is facing similar problematic issues. To facilitate social equality and make the solution of this research possible, the economic and financial perspectives will be a crucial input to the whole project. Furthermore, political consideration can be beneficial to help neighbourhoods that have fewer resources or community strength to have an opportunity to transform into a better place to live healthily.



## **Data Collection**

During the analysis part of the research, the original plan was to have on site interviews or questionnaires to gather informations from residence perspective. However, the sensitivity of children privacy and language barrier, it was not very effective to get first hand informations from the residents during site seeing. Moreover, due to the fact that the research was conducted during the severe Covid-19 pandemic, it was even more difficult to grant permission from the residents, especially the families with children or elder members.

In order to still have an input information about the perspective of the residents, this reserch compensated with referencing from the latest research of Zuidwijk that was conducted an overall interview about the living experience and expectation from the residents (Wijk, van V., 2019). Another compensation method was by on site observing of the activity of children and quality of the spaces in the neighbourhood.

## **Scientific Relevance of the Results**

The scientific aspect of this project includes the empirical research of the topic on the impact of nature experience on childhood development and the reflection on spatial conditions of the urban environment. The analysis of the context and the design of the space is based on the scientific research of the literature and theories. In this case, the main source of the research background and references are from the works of Timothy Beatley (Beatley, T., 2017) and Richard Louv (Louv, R., 2005).

The topic of this graduation project is about reflecting the problematic issue of unhealthy childhood in the urban environment with the development and the resultant products of the thesis. The aim to focus on developing methods to transform the urban environment for social, environmental, and economical benefits for the citizens can be related to the sustainable aspect of the study of designing the urban fabrics.

This project is also reflecting on the focus to promote healthy lifestyles by transforming urban fabrics to provide more space for communities and ensure equal access to urban service and amenities. With the topics of child-friendly cities and the vitalization of nature in childhood development, this project

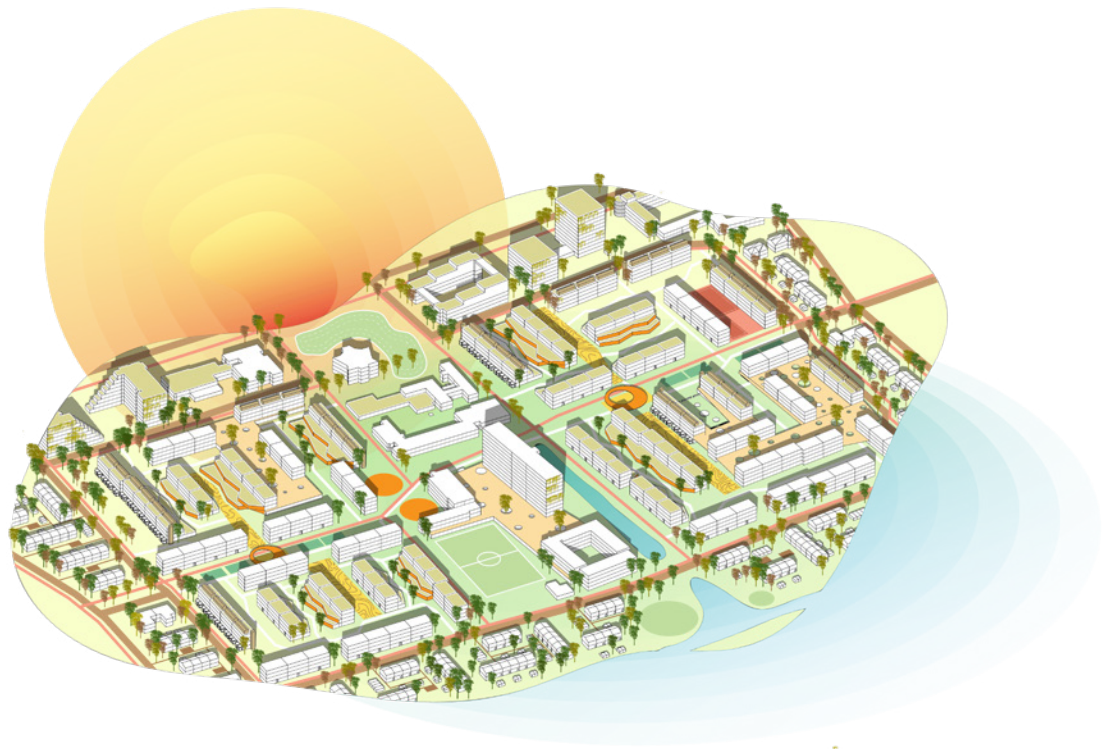
reflects the current trend of critical issues of the next generation to the ongoing discussion of livability in the architectural profession. Livability is also one of the focuses of the studio with the emphasis on how to keep our urban environments suitable to live in, putting people central, contextualized by the physical, geographical characteristics of the urban environments.

The scope of this research is including different scales of analysis and interventions with their interrelated function. This aspect can be related to the challenge of tackling the core urban elements of blocks, streets, buildings, and larger networks. It is also reflecting the multiscale and multidisciplinary perspectives of the study of urbanism.

Overall, the research result reflects the study of urbanism and the society with consideration of the urban fabrics to accommodate healthy lifestyles, pursuing a livable urban environment to achieve the goal of sustainable neighbourhoods for a better future.

### **Ethical Consideration**

The motivation of this research is considering the negative trend on children that are growing up with more mental and physical health problems from early life. In a neighbourhood like Zuidwijk, which was a result of the high demand for residential housing during the post-war periods, the original plan for the neighbourhood is no longer suitable for the current condition. Especially with the ongoing trend of unhealthy urban childhood, there are possibilities in this kind of neighbourhoods to contribute to the future generation with urban environments that facilitate their well-being and healthy lifestyle.



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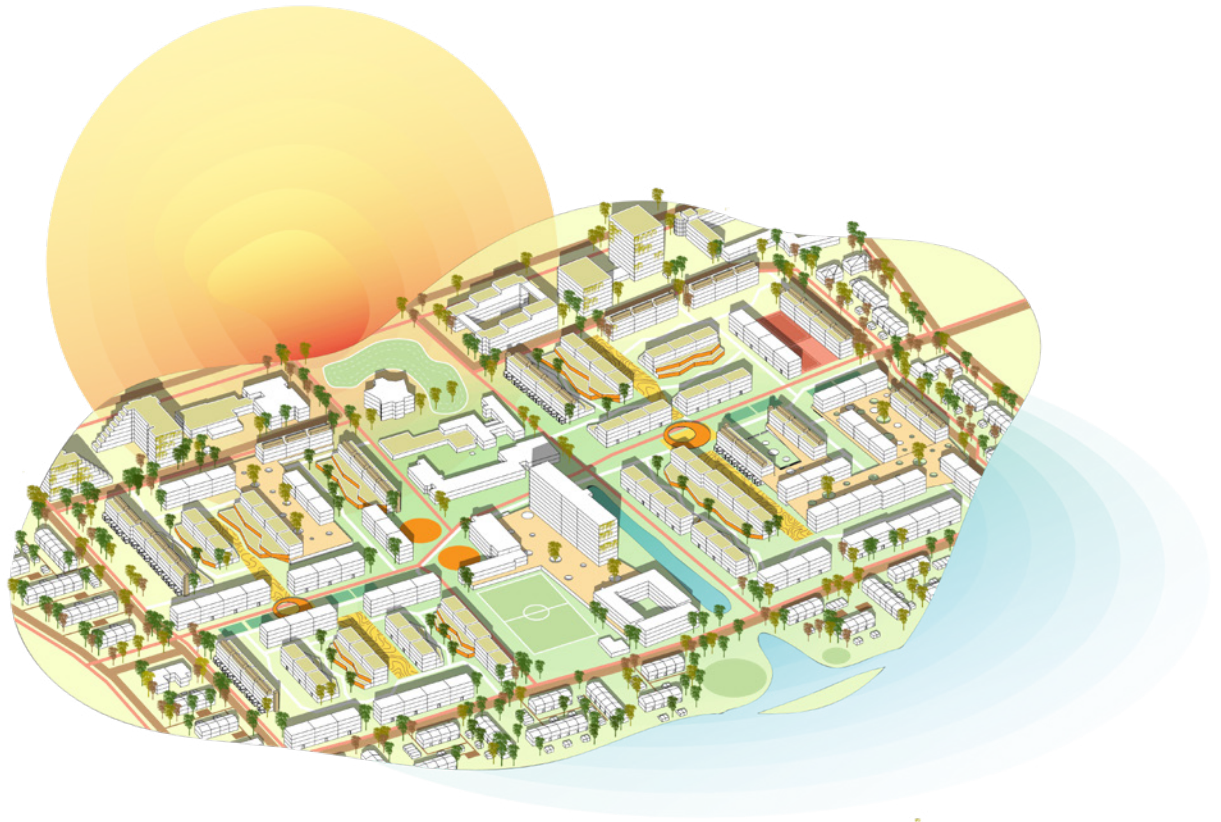
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Chingfang Wang 5022444  
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