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Nest for the Future

Exploring housing design to improve the living conditions of impoverished children in flood-prone area of Sylhet city, Bangladesh

Graduation Booklet *of*
MSc 4 - Global Housing Architecture of Transition in the Bengladesh Delta

GLOBAL HOUSING

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Research plan was produced within
MSc Architecture track at TU Delft.

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Figure1. Bangladeshi children on the streets
(Children on the edge, n.d.)

Around the world, children are more likely to live in poverty than adults.

They are also more vulnerable to its effects (UNICEF)

“How can housing design improve the living conditions of impoverished children in flood-prone areas of Sylhet city?”

01. *Research Plan*

Introduction

Bangladesh is one of the most dynamic countries in South Asia. According to the World Bank, its annual GDP growth rate reached 7.1% in 2022, experiencing rapid urbanization and growth (World Bank, 2022). With an annual population growth rate of 1.7%, Bangladesh's urban population is growing even faster, and it is predicted that by 2025, more than 50% of the population will reside in urban areas (ESCAP, 2007). However, as more people migrate to cities, the capacity of urban areas has been exceeded, leading to the formation of slums

1-1. Slums are growing

Like other developing countries, rapid urbanization in Bangladesh is attributed to migration in search of employment. As finding jobs is a top priority for migrants, they continue to migrate to cities in search of hope despite poor living conditions, accelerating urbanization (Correa, 1989). Another factor is the climatic conditions of Bangladesh. Every year, floods create hundreds of thousands of climate migrants. In 2019, more than 4 million climate migrants were generated due to cyclones and floods, and this is expected to worsen, reaching up to 12 million in the near future (IDMC, 2021). A significant number of these migrants have moved to urban areas, accelerating urban migration (Rana et al, 2021).

This rapid influx of people into cities has led to the formation of slums, where many migrants find themselves in extremely poor living conditions. Despite this situation, the Bangladeshi government has underestimated the current state. When the slum population is estimated based on standard housing-related criteria used by the UN for the Millennium Development Goals (MDGs), approximately 13.34 million people live in slums in Bangladesh. This is six times the figure announced by the government in 2014. The government's underestimation of this slum phenomenon has led to insufficient budget allocations, worsening the slum situation (Joseph et al, 2019).

1-2. Urban poverty and children

Children are the most vulnerable to poverty. As mentioned above, children who have migrated from rural to urban areas due to urbanization are more likely to experience problems related to poverty, especially when living in slum areas. While it is generally thought that the quality of life in cities is higher than in rural areas, paradoxically, the poorest 20% of children in urban areas live in worse conditions than their rural counterparts (UNICEF, 2018). This indicates how inequality in cities causes children, who should be the focus of urban planning, to be forgotten, leading them to suffer in dense environments and face health risks (Chandy/UNICEF, 2018).

Thus, this research aims to explore the issues children face due to poverty and to examine the housing design that can improve these conditions. Through this, the focus is on improving the lives of impoverished children in Sylhet city.

Figure 2. Street view of slum in Dhaka
(Peter, 2015)

Problem Statement

Around the world, children are more likely to live in poverty than adults. They are also more vulnerable to its effects (UNICEF)

Bangladesh is experiencing rapid urbanization due to migration driven by job opportunities and climate disasters. In 1974, the urban population was 8.8% of the total population, but by 2014, it had exceeded 30%. However, cities have been unable to accommodate the influx of people, resulting in 55% of the population living in urban slums. Dhaka has around 6,000 slum settlements, and in the Sylhet division, 50,000 people live in 1,412 slums (BBS, 2014). In these circumstances, many people suffer from poor living conditions in urban slums.

Sylhet is a large city located in northeastern Bangladesh and is the fifth-largest city in the country. Sylhet has a similar level of slum severity as Dhaka (Joseph et al, 2019). Additionally, 49.8% of the total working population in Sylhet city lives in slums. Residents in these areas live in dense areas with poor housing, suffer from food shortages, have low literacy rates, and are highly vulnerable to crime and delinquency. Due to poverty, they also face difficulties accessing basic infrastructure (Reza et al, 2019).

In this environment, children are the most vulnerable to poverty and its associated problems. This vulnerability is reflected in the high rates of child malnutrition in the Sylhet region. According to the 2014 UNICEF Bangladesh Nutrition Report, Sylhet had the highest rates of malnutrition and stunting, and the situation has worsened every year. Particularly, children from families that migrated from rural to urban areas due to rapid urbanization experience these poverty-related issues more severely while living in slum areas. While it is generally believed that the quality of life in cities is higher than in rural areas, the poorest 20% of children in urban areas have a worse quality of life than rural children. These children are often forgotten in urban planning and suffer from environmental and health risks (Chandy/ UNICEF, 2018).

According to Maslow's hierarchy of needs, basic needs such as food security and safety needs must be met before individuals can pursue higher-level needs, such as self-actualization (Maslow, 1943). However, due to the poverty, children are often deprived of even these essential requirements. Therefore, this study aims to explore ways to improve the lives of poor children in urban areas by presenting urgent issues faced by these children and proposing housing design as solutions.

2-1. Child malnutrition

Currently, two out of three children under the age of five in Bangladesh face food insecurity (UNICEF, 2024). As a result, these children suffer from severe malnutrition and stunted growth. Children in urban slums are considered the most vulnerable group, with 29% of girls and 37% of boys suffering from malnutrition and stunting and wasting rates exceeding 50% for both genders. While education and poverty alleviation are often mentioned as key solutions, existing child health programs have largely excluded urban areas compared to rural regions (Rahman et al, 2021). Particularly, Sylhet city, the study area, has the highest rates of child malnutrition and stunting in the country (UNICEF, 2014). Due to the severity of this issue, addressing food security for poor children is an urgent priority.

2-2. Exposure of children to unsafe living conditions

Slums provide unstable living conditions with

Figure 3. Child in Bangladesh Slum
(UN Photo/Kibae Park.,2010)

poor housing quality. As a result, many slum residents engage in the informal economy, participating in activities such as drug dealing, prostitution, human trafficking, and theft. Children are the most vulnerable to these crimes and, due to their susceptibility to peer pressure and environmental influences, are at risk of falling into criminal activities. Currently, children in slums are frequently exposed to such crimes. (Kamruzzaman et al, 2015). And such dangerous neighborhoods result in limiting children's outdoor physical activities, which negatively impacts their mental and physical well-being. (Hanapi et al, 2016) Therefore, child-centered housing design and neighborhoods are necessary to protect children from crime and ensure their health.

2-3. High density and unsanitary housing enivronment

Children living in slums experience poor housing conditions in high-density environments. These dense housing conditions negatively affect the physical and emotional well-being of the children, and they also face difficulties in their academic performance. The long-term effects of these conditions extend into adulthood (Solari et al, 2012). Additionally, unsanitary housing environments and unplanned waste disposal are particularly dangerous for children with weak immune systems. Such waste and improper sanitation contaminate water and the environment, causing severe harm to these vulnerable children (Reza et al , 2019). Therefore, it is crucial to improve these densely populated poor housing conditions and sanitation. Through housing design, improving children's health and providing them with equal opportunities is of utmost importance.

2-5. Vulnerability to Flooding

Slums where impoverished children live are more vulnerable to flooding, which results in poor sanitation and skin diseases. These issues arise from the structure of flood-prone houses and the surrounding environment (Braun et al, 2019). In Sylhet, as mentioned earlier, frequent floods exacerbate the situation when solid waste blocks drainage systems. (Pervin et al, 2019) Therefore, addressing the issue of flooding is essential to improve children's nutrition and overall well-being.

To resolve these issues, the lives of children and their care-givers must be addressed together. This is because care-givers are closely connected to the children's lives and have a significant impact on them.

According to the Van Leer Foundation, care-givers well-being is the most important factor in caregiving, and care-givers' mental illness has highly negative effects on children's mental and physical health. Therefore, in addressing children's issues, the well-being of caregivers must also be considered (Kumar et al., 2019).

By designing a child-friendly housing block that creates safe environment for children and meets the need of them, housing design can mitigrate these problems. Therefore, this research will analyze the problems faced by impoverished children, exploring solutions that improve their living conditions through housing design.

Figure 4. Children in a Bangladesh slum
(United Nations /Flickr, n.d.)

Figure 5. Bangladeshi child is drinking contaminated water in slum area
(WaterIntegrityBlog, n.d.)

Research Question

Main Question

Sub3.2

"How can housing design improve the living conditions of impoverished children in flood-prone areas of Sylhet city?"

Sub3.1 *Sub3.3*

Sub Question

3-1. Sub question about the lives of impoverished children and their caregivers

What are the most urgent challenges faced by poor children and their caregivers, what are the causes of these issues, and are there any successful cases of addressing them?

3-2. Sub question about housing design

What spatial issues do impoverished children and their care-giver face, and how can housing design contribute to child-friendly neighborhood?

How can housing design address food security and income issues?

3-3. Sub question about flood-resistant design

How can the housing design respond to flooding issue?

Children living in poverty have often been excluded from city planning, and as mentioned earlier, they are affected by various issues such as malnutrition, exposure to crime, and poor housing conditions (Chandy/UNICEF, 2018).

This research seeks to explore these fundamental questions to understand the problems children face, and how these issues can be improved. Additionally, by analyzing the spatial issues, the research will investigate how housing design can contribute to problem-solving. Lastly, this research will explore spatial strategies that meet the needs of caregivers who are closest to impoverished children and promote interactions among the children, with the aim of addressing their problems.

Through this process, the ultimate goal of the research is to improve the lives and health of these children and, in turn, enhance the lives of their families.

Figure 6. Slum life in Chattogram
*(*Jalal Uddin Rumi, 2019)

Hypothesis

This chapter will examine the hypotheses formulated to explore housing designs focused on improving the lives of impoverished children in Sylhet city.

4-1. Improving children's physiological needs will have a positive impact on their development.

According to Maslow's Hierarchy of Needs, human needs are hierarchical, and lower-level needs for safety and food security must be met before pursuing higher-level needs such as self-actualization (Maslow, 1943). However, poor urban children in Bangladesh are currently exposed to malnutrition and dangerous environment . Therefore, this hypothesis suggests that by improving these conditions through housing design, children's lower-level needs can be met, which will positively influence their development.

4-2. Improving life quality of caregivers will have a positive impact on the children.

This hypothesis predicts that if these care-givers are provided an improved living environment that allows them to work more easily at home, they would have more time to interact with their children, which is expected to positively impact the children's health and emotional well-being. Additionally, improving caregivers' well-being through better life quality is expected to enhance their mental health, which in turn is predicted to improve the physical and mental health of their children.

4-3. The more spaces there are for interaction between children and caregivers, the safer the neighborhood will become.

This hypothesis predicts that if caregivers can easily watch over their children while working or cooking, they will be able to pay more attention to the children's safety. Therefore, the more spaces that allow caregivers to interact with their children, the more safety is expected to improve.

4-4. Child-centered housing will revitalize the local community.

This hypothesis predicts that in child-centered housing design, interactions among neighbors through their children will increase, thereby revitalizing the community. It is expected that this will lead to active information sharing among care-givers, as well as child-centered community activities such as shared childcare. These interactions are expected to make the community safe and vibrant.

4-5. Urban farming is expected to have a positive impact on children's health.

This hypothesis suggests that housing design integrated with urban farming will alleviate malnutrition among impoverished urban children through food production and improve their mental health by enhancing the surrounding environment.

4-6. Flood-resistant house will have a positive impact on children's health conditions.

Slum houses are highly vulnerable to flooding, which leads to significant financial and sanitation-related damage during flood events (Braun et al, 2011). Additionally, the impoverished population suffers great losses during floods, worsening the nutritional status of children (Goudet et al, 2011). This hypothesis suggests that providing flood-resistant housing structures to these communities would mitigate the financial and sanitation-related damages caused by flooding, thereby positively impacting children's health.

Figure 7. Hope in the Slums
(Shumon Ahmed/ABC NEWS, 2011)

Goal / Aim

Main goal

The main goal of the 'Nest for the Future' project is to improve the quality of life of Impoverished children in Syhlet city.

Research Aim

To achieve this goal, the research aims of the project are:

Understanding of the problems faced by children and caregivers

Insights on child-centered housing design and neighborhoods

Understanding of housing design that address food security issue

Understanding of housing design that respond to flood problems

A detailed design approach to offer practical solutions for poor children's problem

Through these research aims, the goal is to design child-centered housing that meets the needs of caregivers and improves the lives of children.

Figure 8. Child and care-giver
(UNICEF Bangladesh, n.d.)

Literature Review

This research aims to improve the living conditions of impoverished children through the housing design. Although many papers have addressed the lives of poor children and proposed solutions, there is a lack of research that provides spatial solutions to the problems. Furthermore, the serious issue of child malnutrition and safety in the slum area has often been addressed through policy and education, rather than more direct interventions. Therefore, this study seeks to address these issues more directly.

Various literature and cases were reviewed during the research planning phase. This allowed for identifying and analyzing the different issues faced by impoverished children. In this chapter, the literature reviewed during the overall process will be discussed.

4-1. Maslow's Hierarchy of Needs

Maslow's (1943) hierarchy of needs pyramid categorizes human needs into five levels and establishes their interrelationship. These five needs include physiological needs, safety needs, love and belonging needs, esteem needs, and self-actualization needs. Pursuit of higher-level needs only begins when the lower-level needs, such as physiological and safety needs, are satisfied. This theory highlights the importance of fulfilling children's basic deficiency needs to support their growth

Noltemeyer et al (2012) examined the impact of deficiencies in Maslow's hierarchy of needs on the academic abilities of children in the United States. The study found that children from low-income backgrounds often faced challenges in fulfilling their basic needs, which adversely affected their reading skills. This literature emphasizes the importance of satisfying lower-level needs to support children's healthy development.

Nasir et al (2021) describe the severe challenges faced by impoverished children on the streets of Pakistan, who are deprived of basic deficiency needs as outlined in Maslow's hierarchy, thus living under constant threats to their survival. The study emphasizes the urgent need to address these fundamental needs to support children's growth. This literature highlights the critical importance of fulfilling the deficiency needs of impoverished children.

4-2. Rapid urbanization and the formation of slums

In the introduction of Correa's (1989) book, the causes of rapid urbanization in Mumbai and migration in the third world are discussed. The author notes that people migrate from rural areas to cities in search of work. Since housing quality is not their priority, they live in poor conditions for the sake of opportunity and hope. This literature provides insights into the reasons behind urbanization.

Rana et al (2021) discuss in their research the acceleration of urbanization in Bangladesh due to climate disasters. Each year, hundreds of thousands of climate refugees are created, and this number is expected to reach 12 million in the near future. The migration typically occurs from rural to urban areas, further accelerating urbanization.

4-3. The lives of impovevrished children

- Nutrition problem

UNICEF's (2014) Bangladesh Nutrition Analysis Report discusses the nutritional status of Bangladeshi children. It reveals that Sylhet has the highest levels of child malnutrition and stunting in the country.

Fink et al (2014) compare in their paper the health conditions of children living in slum areas in developing countries worldwide. The authors conclude that poor urban children have no health advantage compared to rural children.

Fakir et al (2015) study malnutrition in urban slums in Bangladesh. The results show that child malnutrition is not significantly influenced by household assets but decreases as household income increases. Additionally, parental health education was found to improve children's nutritional status

Rahman et al (2021) study the nutritional status of children in Dhaka's slums. According to this literature, 29% of girls and 37% of boys in urban slums suffer from malnutrition and stunted growth, while the prevalence of wasting exceeds 50% for both genders. The study also notes that despite these issues, policies for poor urban children are lacking compared to those for rural areas..

- Safety issue

Ahmed et al (2014) study in their research the crime situation and its causes in Dhaka's informal settlements. These settlements are often breeding grounds for crime, including prostitution, drugs, and violent crimes. Over 90% of slum residents have experienced such violence, highlighting the severity of the situation.

Kamruzzaman et al (2014) investigate in their research the lives of children in Dhaka slums and the causes of their involvement in crime. The study suggests that peer influence significantly affects them, and without environmental improvements, they may progress into adult crime.

- Living condition

Reza et al (2019) describe in their paper the slum conditions and sanitation issues in Sylhet, Bangladesh. The literature states that 50% of workers in Sylhet live in slums, facing extremely poor housing and sanitation. In these slums, solid waste is left on the streets, water is contaminated, and various diseases spread, highlighting the vulnerability of residents' health. In addition, the literature mentions that children with weakened immune systems are suffering from waterborne diseases due to these unsanitary conditions

Sherf-Ul-Alam et al. (2022) conducted a survey of 200 households in the slum area in Sylhet, revealing the current living conditions of Sylhet's slum dwellers and identifying spaces in need of improvement. The study reported issues such as overpopulation, drainage and sanitation problems, lack of access to safe drinking water, unhealthy living conditions, and challenges related to kitchen spaces for cooking. Furthermore, the study emphasized the need for raising family awareness for the education of children.

- Flooding Issue

Braun et al (2011) conducted a study on the vulnerability of Dhaka slums to flooding. The study noted that buildings in slums are constructed with flood-prone materials rather than concrete, making them highly susceptible to flood damage. It also highlighted issues such as sanitation and malnutrition during floods. Through this literature, the vulnerability of slums to flooding was clearly recognized.

Goudet et al (2011) investigated the nutritional status of children in Dhaka slums during flood periods. The study found that due to a lack of flood response capabilities, chi ldren in slums experience higher rates of malnutrition during flood seasons.

Pervin et al (2019) analyzed the flooding situa-

tion in Sylhet and emphasized that, to address this issue, infrastructure improvements are needed along with proper waste management to prevent solid waste from blocking drainage systems.

4-4. Convention on the rights of the child

The United Nations (1989) reached an agreement on the universal rights of children through the Convention on the Rights of the Child, defining children and asserting their various rights. Among these, rights to food and safety are notably lacking for many children in Bangladesh, highlighting the need for improvements in these situations.

4-5. Interaction between caregiver and children

The study by Sharmin et al (2015) found that the majority of women in Dhaka slums work as housemaids, while 30% engage in handcraft work at home to take care of their households. In the case of handcraft work, this is seen as a way to manage both household chores and paid labor simultaneously, resulting in the overlap of home and workplace.

Kumar et al (2019) reported that children's mental health is closely linked to their care-givers' mental health. The study emphasized the importance of parental mental health, as mental illnesses in parents can lead to highly negative outcomes, including mental and physical health issues in their children. Additionally, the study presented solutions by highlighting cases from various countries where parental mental health was improved. This literature helped recognize the importance of not only children's well-being but also the well-being of caregivers.

Win et al (2022) conducted a study on the correlation between the labor of women in slums and child stunting. The study revealed that the more women engage in labor, the more negative the impact on child stunting. However, it also mentioned that when there were multiple caregivers, this negative impact was reduced, highlighting the need for childcare support.

The Van Leer Foundation (2023), through its publications, emphasizes the importance of caregiving and the well-being of caregivers, highlighting the need for action in this area. It also supports these points with various interviews and case studies. This demonstrates that addressing children's issues requires prioritizing the well-being of their parents.

4-6. Children and space

Cunningham et al (2007) proposed children-focused housing design guidelines. This literature discusses various strategies regarding private spaces for children and safe, interactive public space. Through this literature review, the direction of child-centered housing design could be understood.

Solari et al (2012) studied the impact of housing density on children and found that higher housing density negatively affects children's well-being and learning abilities. This highlights the need for quality living spaces designed for children.

Hanapi et al. (2016) investigated the impact of low-cost housing on children. The study found that affordable housing, often surrounded by dangerous environments and neighborhoods, restricts children's outdoor physical activities, which in turn hampers their emotional and physical health. The authors emphasized the need for accessible play spaces for children. This research highlights the importance of providing safe spaces and outdoor activity areas for children's well-being.

McCormick (2017) studied the positive effects of green spaces on children's development and health. The research noted that green spaces help reduce children's stress and promote emotional development. This highlights the importance of incorporating green spaces in architectural design for the well-being of children.

UNICEF (2020) space design guidelines for children provide principles to consider when designing spaces for them. This literature emphasizes the importance of children's participation in the design process. Through this, guidance on methodologies for child-centered space design is provided.

4-7. Neiborhood theory

In her book, Jane Jacobs (1961) introduced the concept of "eyes on the street," which emphasizes the importance of increasing communication among people in public spaces to foster a safer community. This concept illustrates the connection between the design of space, safety, and social interaction, highlighting how active, well-observed streets contribute to a sense of security.

4-8. Food security for urban poor

Taylor (2021) discusses the potential of urban agriculture as a solution to address food shortages among the urban poor. This provided an opportunity to explore possible solutions for tackling food insecurity.

Chowdhury et al (2020) highlighted the importance of rooftop farming for securing food security in Dhaka. The study also examined the current status of rooftop farming and proposed ways to promote its expansion. This research helped identify the potential of applying farming solutions to enhance urban food security.

4-9. Flood- resisting building design

Pötz et al (2014) provide guidelines on architectural solutions and case studies for responding to flooding. These design approaches include various examples such as retaining walls, waterproofing, and floating structures. This helped establish a direction for designing flood-resistant housing.

Therotical Framework

The therotical framework of this study is structured around three main literature-based elements: Maslow's hierarchy of needs, principles of child-centered housing design, and flood-resisting design strategies. Through this approach, the study aims to propose a housing design that addresses the basic needs of impoverished children, offering a safe and healthy environment.

7-1. Maslow's hierarchy of needs

Maslow's (1943) hierarchy of needs emphasizes that fulfilling lower-level needs—such as physiological needs, safety, and belonging—is essential for human development and self-actualization. Noltemeyer et al (2012) explored the impact of need fulfillment on the academic abilities of children in the United States, finding that low-income children suffer academically when their basic need is unmet, highlighting the importance of lower-level needs for children. Similarly, Nasir et al. (2021) discussed the challenges faced by impoverished urban children in Pakistan, who are unable to meet these lower-level needs. Currently, impoverished children in Sylhet also struggle to fulfill these basic needs due to malnutrition, safety concerns. This study, therefore, aims to create a housing environment that meets the foundational needs of impoverished children, including food security, based on Maslow's theory.

7-2. Children-centered housing design

Cunningham et al (2007) suggested that child-friendly housing design should prioritize the safety of both private and public spaces. Solari et al (2011) identified the negative impact of high density housing on children's learning, reinforcing the importance of private space for children, as emphasized by Cunningham et al (2007). Hanapi et al (2016) found that unsafe surroundings in low-cost housing restrict children's outdoor activities, adversely affecting their physical and emotional health. Moreover, McCormick (2017) emphasized that access to green spaces enhances children's well-being, identifying this as a critical aspect of child-centered design. These elements align with Maslow's (1943) hierarchy of needs, highlighting the need to improve children's well-being through children-centered housing design.

7-3. Flood-resisting design strategies

This study explores designs that address Sylhet's vulnerability to flooding. Braun et al (2011) studied the flood vulnerability of Dhaka slum dwellers and highlighted the need for flood-resistant building design as a solution to environmental problems. Additionally, Pötz et al (2014) presented examples and methods of various flood-resistant buildings and provided guidelines for them. Based on these literatures, this study aims to propose a flood-resilient housing design.

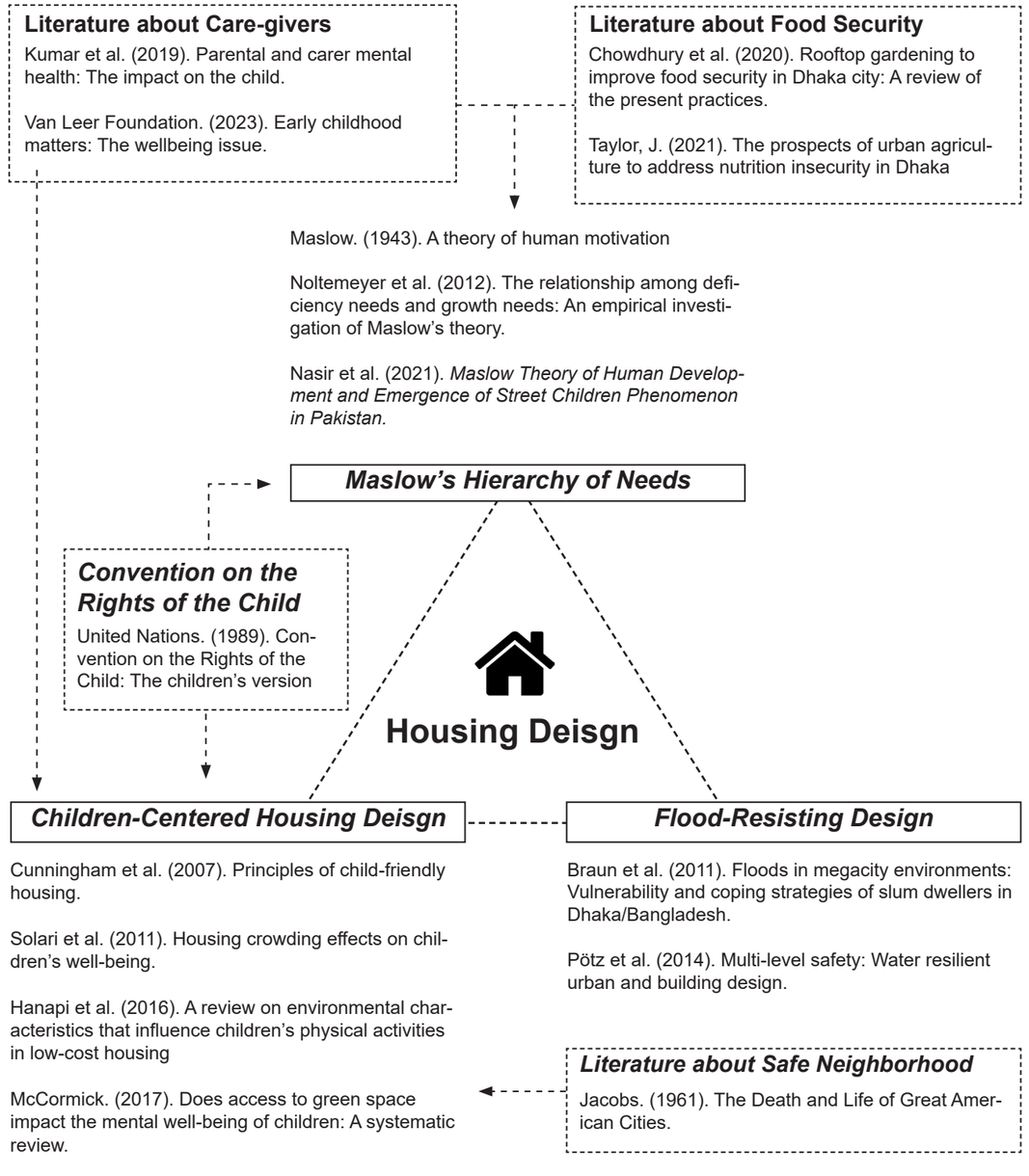
Improving the lives of impoverished urban children requires an integrated approach that considers all of these elements. Through these perspective, this study seeks to provide comprehensive solutions. Based on theoretical framework, the study aims to propose a housing design that enhances the lives of impoverished children in Sylhet, proividing them better opportunities

Definition

Children: The children targeted in this study are defined as individuals under the age of 18, according to the Convention on the Rights of the Child. They are universally entitled to various rights, including well-being, safety, and education. (United Nation, 1989)

Maslow's Hierarchy of Needs: The hierarchy of needs is a concept that divides human needs into five levels and arranges them hierarchically. These five needs include physiological needs, safety needs, love and belonging needs, esteem needs, and self-actualization needs. Pursuit of higher-level needs begins only when the lower-level needs are fulfilled (Maslow, 1943). According to this, street children, who cannot even satisfy basic physiological needs like hunger, are unable to pursue higher-level needs (Nasir et al, 2021).

Framework Diagram



Methodology

This research aims to improve the living condition of impoverished children and their care-givers by identifying and analyzing their issues, and finding solutions based on child-centered housing design. The most critical aspect of this research is understanding and analyzing the local context and culture to propose practical solutions. Therefore, the research will proceed in four detailed steps.

4-1. Data collection phase: interview, observation, literature review

The most important aspect of research is gaining a practical understanding of the situation. Since this research focuses on impoverished children, it will primarily observe and interview a sample of children between the ages of 5 and 17 from urban slum areas and their care-givers. With the help of local university students, a questionnaire will be created to survey families about their monthly income, health status, and the conditions of their housing that require improvement. In addition, in-depth interviews will be conducted with children and care-givers living in poverty to gather detailed insights into their housing experiences.

Through these methods, the research aims to gain a clearer understanding of the children's experiences with housing. Additionally, photos and videos of the local housing environment will be collected to observe the sanitation, security, and social interactions within the community.

Literature review is one of the most effective ways to provide objective evidence. In this phase, documents published will be compared with the problems identified through fieldwork. Additional information will also be gathered, alongside academic papers and theories related to potential solutions. This will facilitate an objective understanding of the problem and enable the exploration of spatial theories.

4-2. Data analysis: digitalizing, analyaing

Data analysis will be based on the information collected in the first phase. The housing situation in the research area will be digitized to facilitate architectural analysis. Survey data will be charted to identify the issues faced by impoverished children. At the same time, the analysis will consider the solutions identified during the literature review.

4-3. Case studies

The case study phase is intended to validate the findings of the previous phase and explore practical solutions. This phase will involve analyzing actual cases, assessing their effectiveness. The case study will focus on three main themes.

The first will be case studies of housing designed around children and their care-givers. These studies will explore how child-friendly housing is designed and how these spatial configurations can contribute to the well-being of impoverished children in Sylhet city.

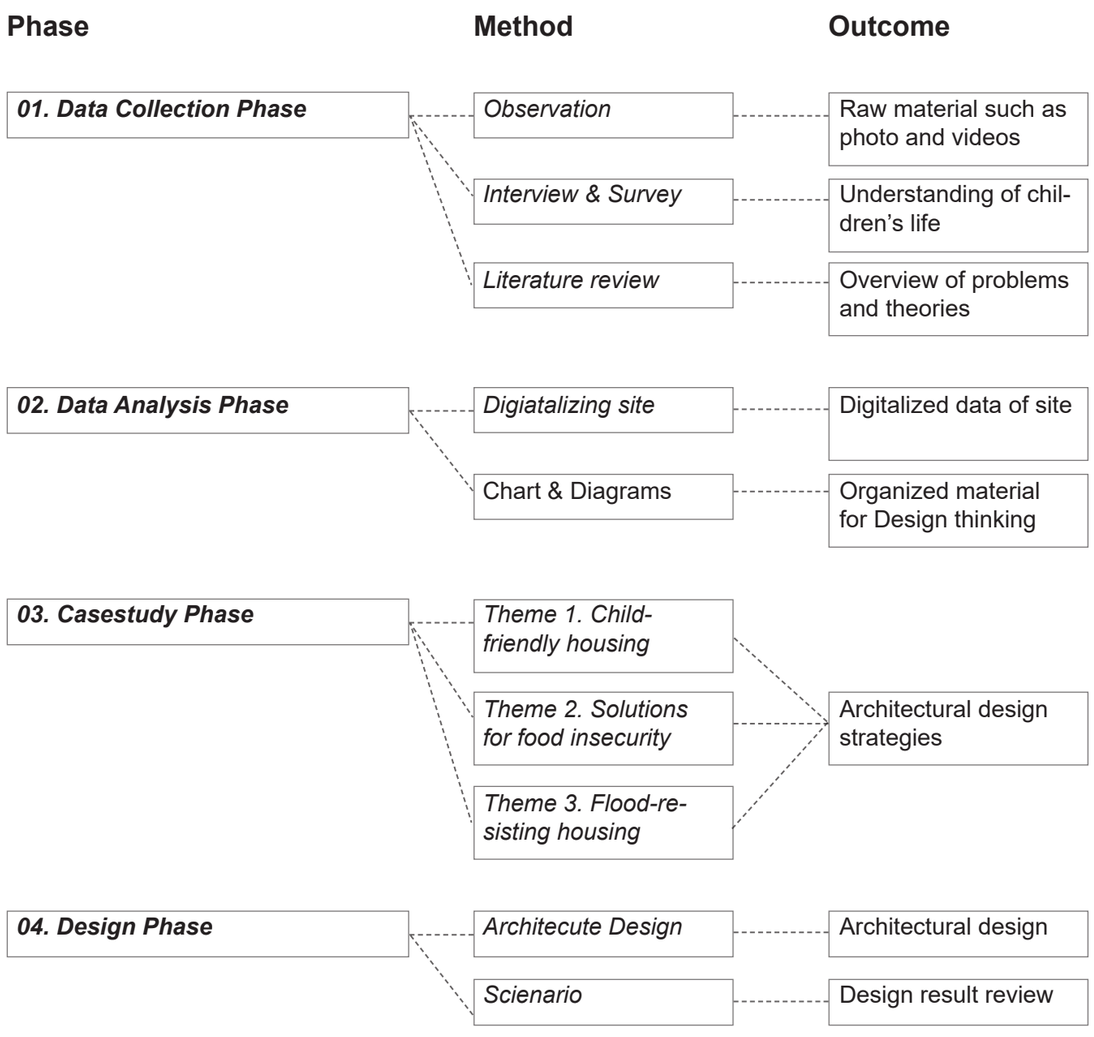
The second theme focuses on solutions to food security issue. Through this case study, successful examples of addressing food security issue in urban slum areas will be researched, as well as cases where these solutions have been integrated with building design. The aim is to explore how such solutions can be incorporated into housing design.

The third theme is housing design that responds to flooding issues. Through research on various housing design strategies that address flooding, this study will explore ways to prevent impoverished children from experiencing a range of health problems caused by floods.

4-4. Design Phase

Based on the directions established through the processes, the design phase will commence.
In this process, scenarios based on the interviews with local children will be developed to strengthen the foundation of the design. The final output will present a design solution that improve the living condition of poor children and their care-givers in a practical way.

Methodolgy Diagram



Research Scheme

Why ?

Problem Statement

Rapid urbanization in Bangladesh has led to an increase in slums. In this context, Impoverished children in syhlet city suffer from the paradox of the city, experiencing low living conditions. As a result, they face numerous challenges in slums, such as food insecurity, dangerous neighborhood, sanitation issue, poor housing quality, and flooding damage, all of which pose serious threats to their physical and mental health.

What ?

Research Goal

The main goal of the 'Nest for the Future' project is **to improve the quality of life of Impoverished children in Syhlet city.**

Aim	*Aim*	*Aim*	*Aim*	*Aim*
Understanding of the problems faced by children and caregivers	Insights on child-centered housing design and neighborhoods	Understanding of housing design that address food security issue	Understanding of housing design that respond to flood problems	Design approach to offer practical solutions for poor urban children's problem

Research Question

How can housing design improve the living conditions of impoverished children in flood-prone area of Sylhet city?

Sub-Question	*Sub-Question*	*Sub-Question*	*Sub-Question*
What are the most urgent challenges faced by poor children and their caregivers, what are the causes of these issues, and are there any successful cases of addressing them?	What spatial issues do impoverished children and their care-giver face, and how can housing design contribute to child-friendly neighborhood?	How can housing design address food security and income issues?	How can the housing design respond to flooding issue?

How ?

Observation	**Observation**	**Observation**	**Observation**
Interview & Survey	**Interview & Survey**	**Interview & Survey**	
Literature Review	**Literature Review**	**Literature Review**	**Literature Review**
Case Studies	**Case Studies**	**Case Studies**	**Case Studies**

Relevance

Many people believe that urban children enjoy a higher quality of life than their rural counterparts. Paradoxically, impoverished urban children often face more severe living conditions and lower standards of living than rural children. Bangladesh has recently experienced rapid urbanization, with increasing numbers of families migrating from rural areas to cities. As a result, many poor urban children end up living in slums, where they are among the most vulnerable, directly affected by the harsh realities of slum life. These challenges not only impact their childhood but also limit their future opportunities as they grow older.

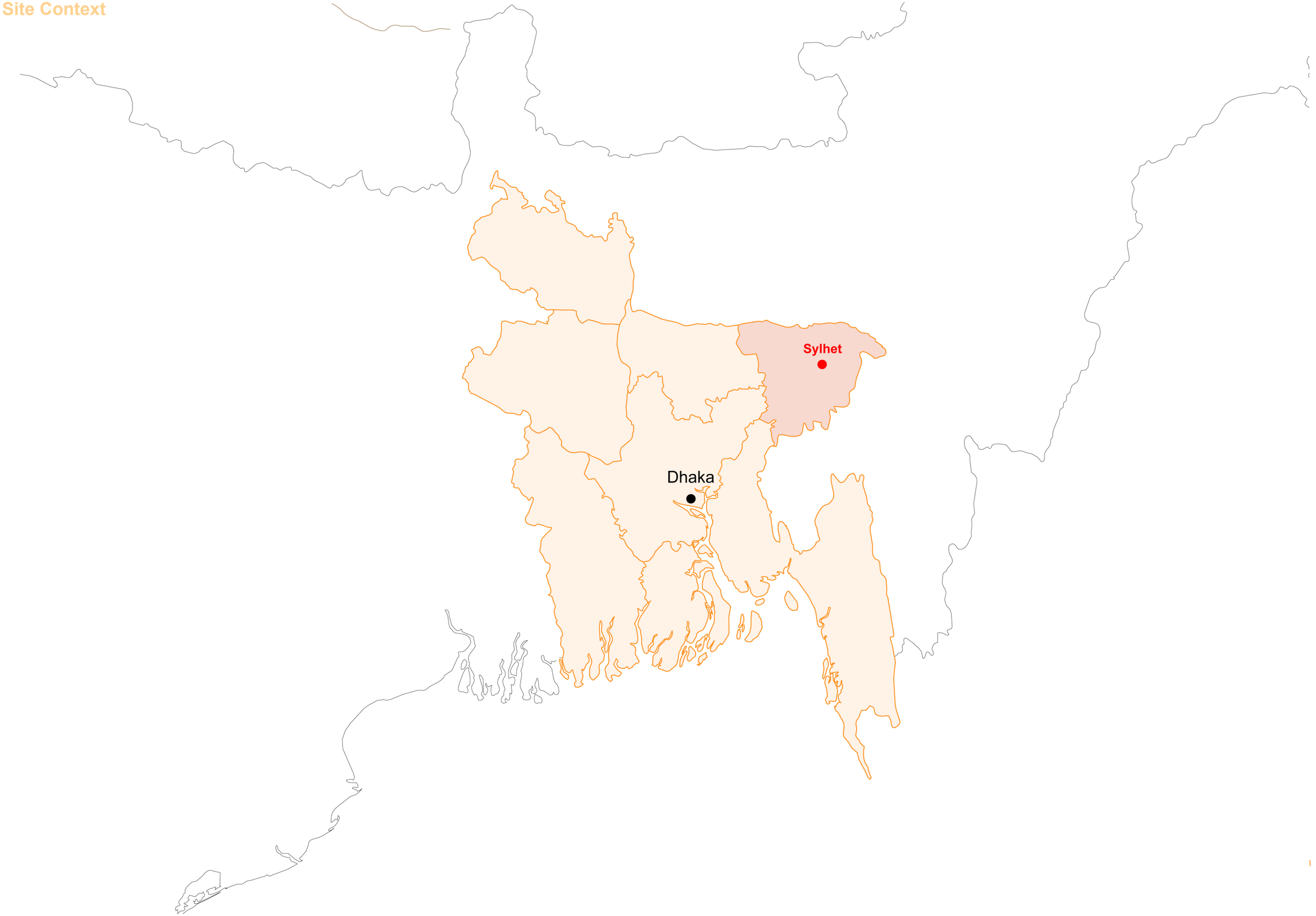
While many studies have addressed these problems from various perspectives, there has been little discussion about solutions, especially architectural ones. Additionally, most research has focused on Dhaka's slums, even though cities like Sylhet face equally severe slum issues. Consequently, children in Sylhet's slums suffer from dangerous living conditions, which have been largely overlooked.

This study prioritizes an architectural approach to solving the problems faced by urban poor children, focusing specifically on Sylhet city, to address the challenges of children living in non-capital city slums. Through the housing design research, the study aims to improve the overall well-being and living conditions of impoverished urban children, while ultimately providing better opportunities for their families. The goal of the research is to meet the need of children and create child-friendly neiborhoods through new housing design.

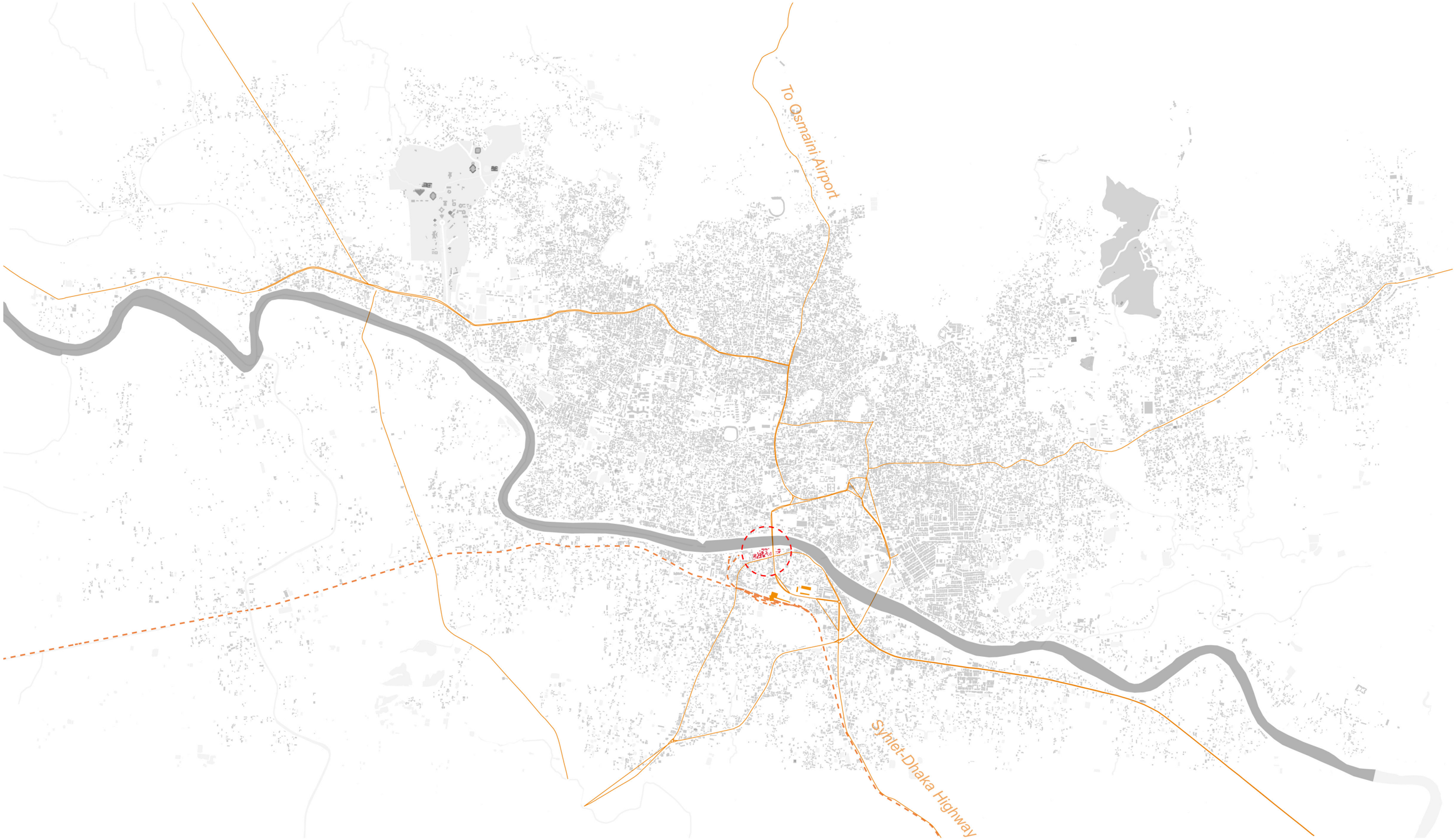
Figure 9. Children playing Cricket (Peter, 2015).

02. *Research*

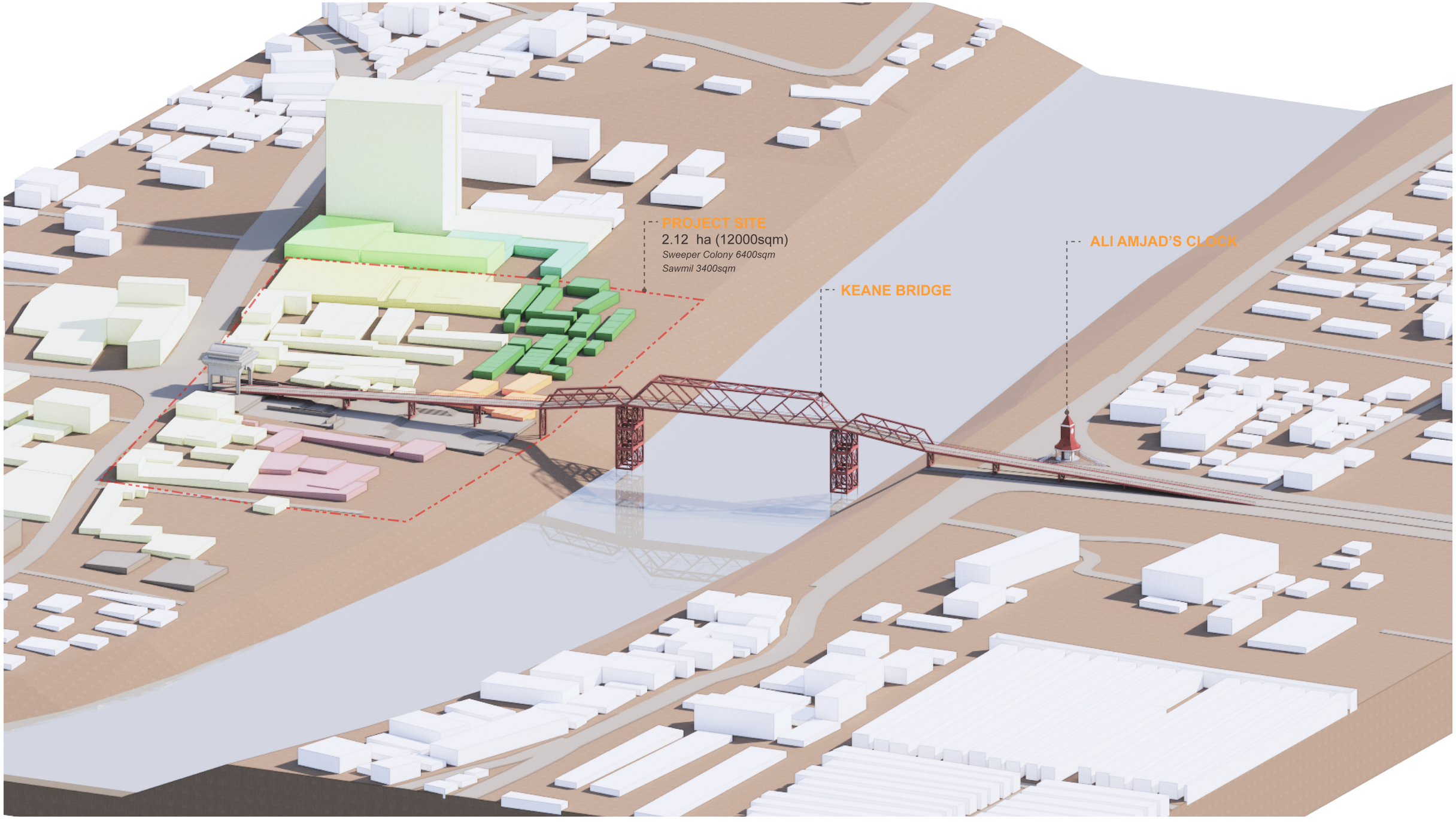
Site Context

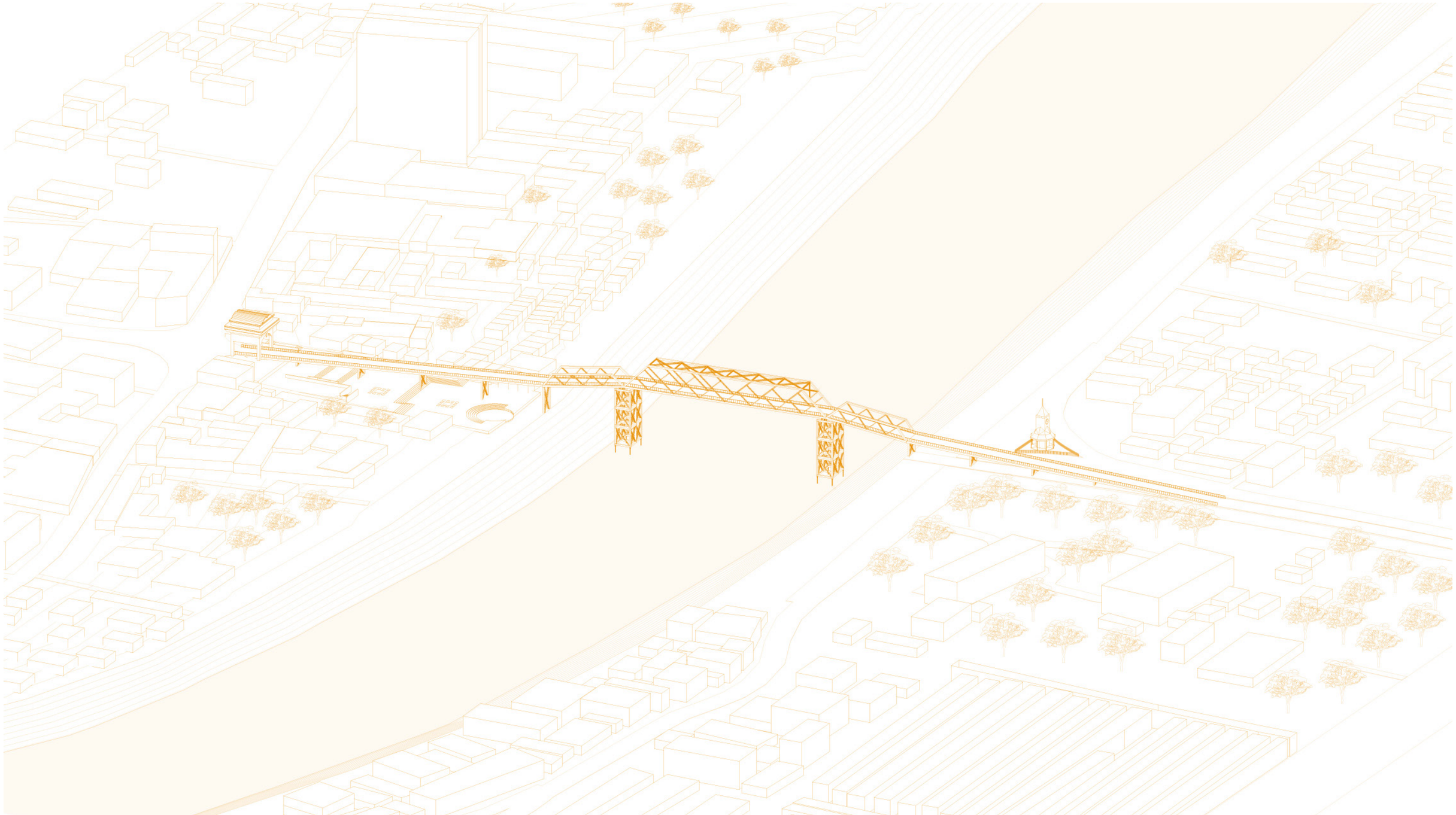


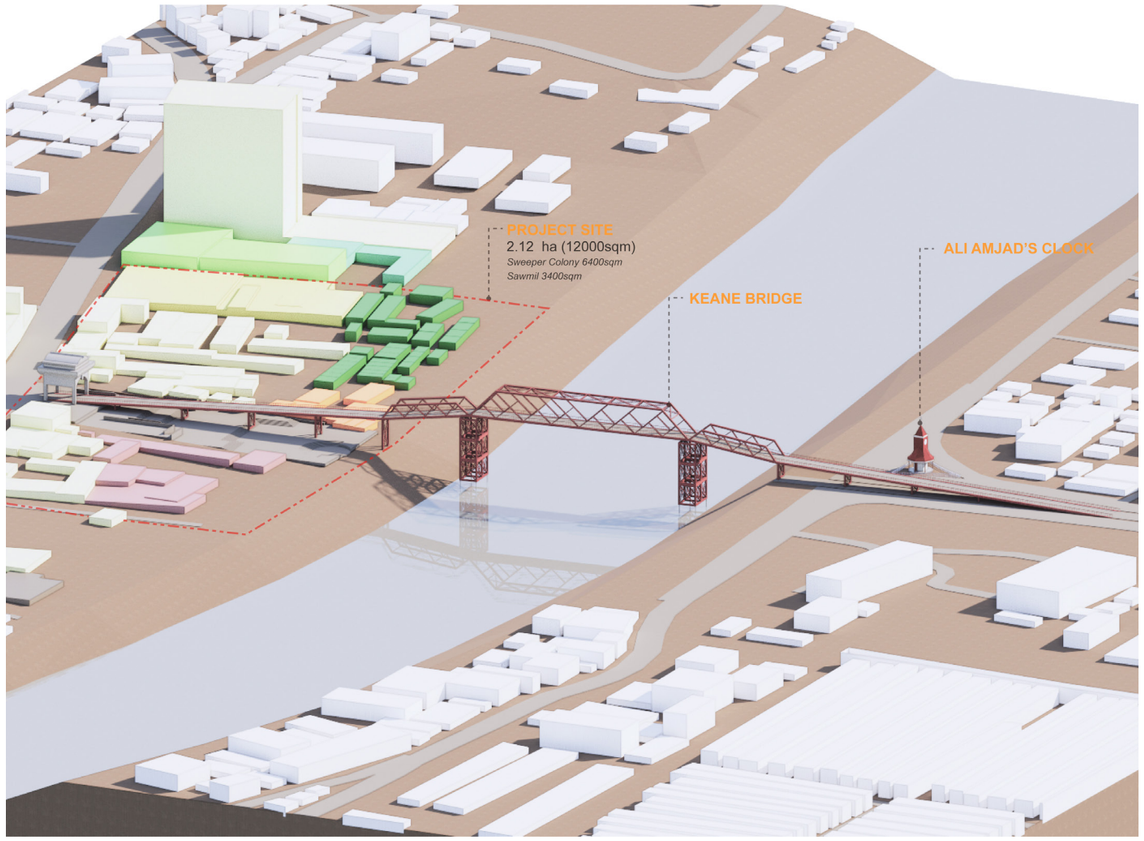
Site Context



Site Context







The Face of Sylhet

The project site is located in the heart of Sylhet and is surrounded by landmarks that represent the region. Therefore, it is crucial to ensure harmony with these landmarks during the development.

Gas and electricity supply map of the project site

Water supply map of the project site

Gas supply line

Electricity supply line

Water supply line

The infrastructure status of the project site

The project site, Sweeper Colony, is a slum settlement that lacks adequate access to clean water, electricity, and gas. Therefore, analyzing and utilizing the existing infrastructure lines is crucial for improving these living conditions.

Through GIS analysis of water, electricity, and gas supply lines within Sylhet city, it was found that there were no significant issues in accessing these infrastructures from the site. Therefore, there will be no major challenges in supplying these infrastructures to new housing complex.

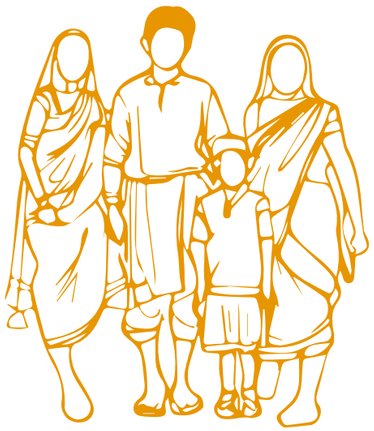
In conclusion, since the existing infrastructure reaches the project site, it can be easily utilized through new residential development. This offers the potential to address various issues faced by residents in the slum area, such as sanitation and water supply challenges.

Site Context

No ownership
Sanitation problem
Limited access to infrastructure

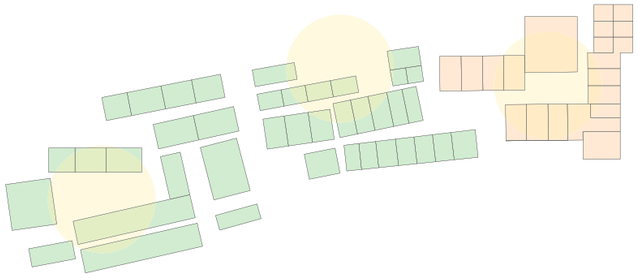
Muslim Community

Number of Households: 40 Families
Total number: 240 people (120 Children)
Job: Merchant, Business

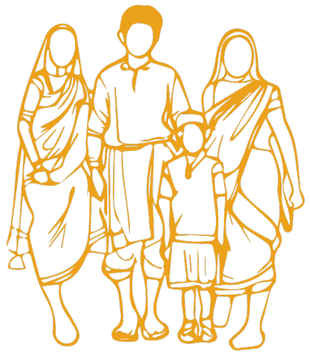


Hindu Community

Number of Households: : 20 Families
Total Number: 120 people (60 Children)
Job: Sweeper



No ownership
Sanitation problem
Limited access to infrastructure



Hindu Community

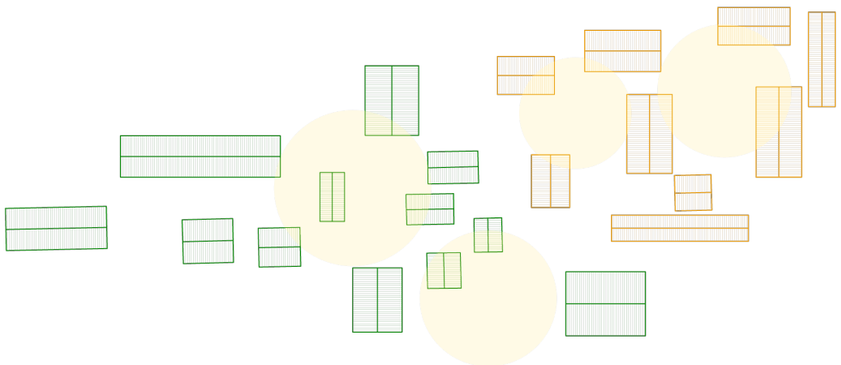
Number of Households: : 20 Families
Total Number: 120 people (60 Children)
Job: Sweeper

Muslim Community

Number of Households: 40 Families
Total number: 240 people (120 Children)
Job: Merchant, Business

Life in the Sweeper Colony

Two communities coexist within the Sweeper Colony, living together harmoniously as neighbors. However, their living conditions face numerous challenges. They lack land ownership, have limited access to basic infrastructure, and are exposed to unsanitary environments. Large families often live in houses with only one or two rooms, enduring cramped and difficult conditions. Despite these hardships, their greatest hope is for their children to have a better future. Therefore, these aspirations should be reflected in the development process.



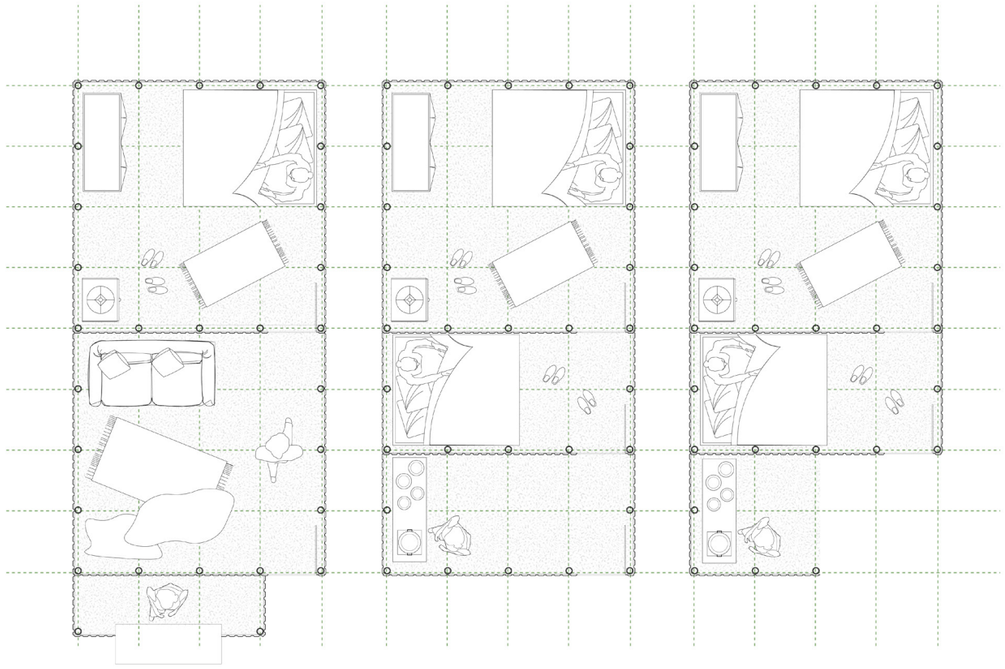
Courtyard culture of the community

The most important cultural aspect of the Sweeper Colony community is their strong bond. This cultural characteristic is reflected in the dwelling layout that forms courtyards. Centered around these shared spaces, residents communicate, help one another, and build a tightly-knit community.

Figure 10. Interview at Sweeper Colony
(Hyosik Kim, 2024)

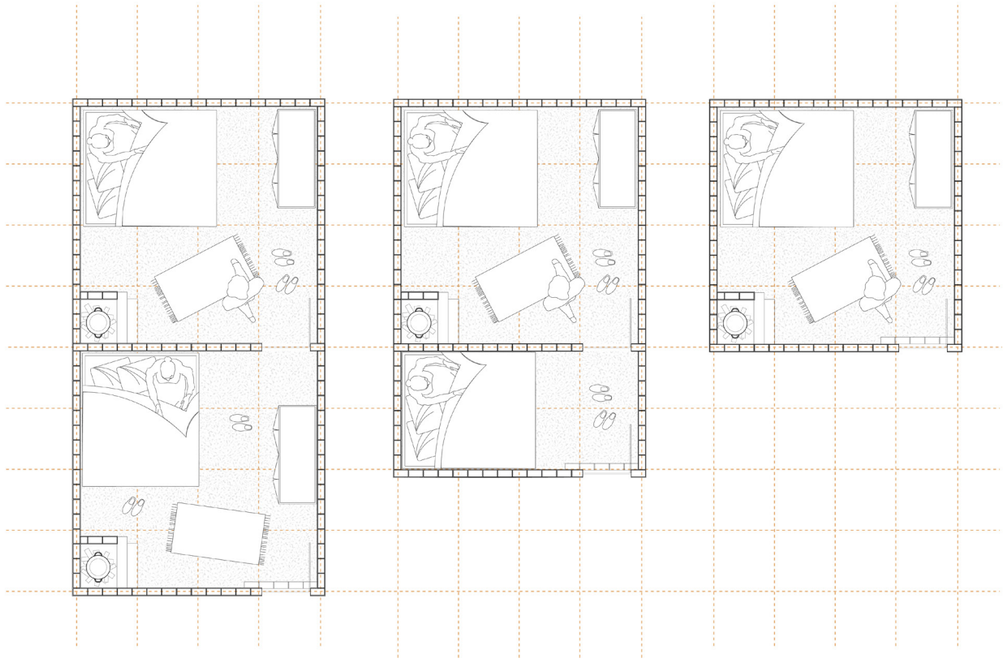
Figure 11. Interview at the Sawmill
(Hyosik Kim, 2024)

Living in overcrowded housing conditions



Muslim Community

The housing of Muslim communities is often built with corrugated metal sheets and bamboo, making it highly vulnerable to flooding. In addition, the densely packed living conditions negatively affect children.

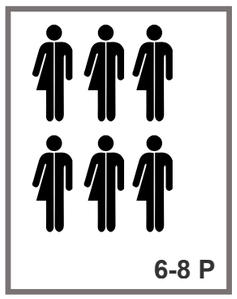


Hindu Community

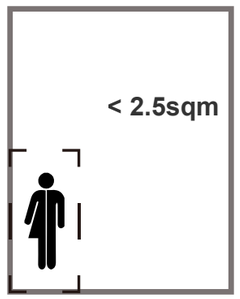
The houses in Hindu communities are built with brick and plaster. They often live in extremely crowded conditions, with up to ten people in one or two rooms, and without access to proper sanitation or a kitchen.

Grid Size 0.9 x 0.9m

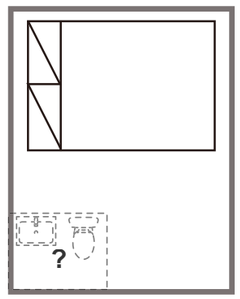
Small Unit



Large Family



Narrow
Individual Space



Limited Access to
Basic Needs

Exposed to
Unsanitary Environment

Decrease in
Academic Ability

Health Problem

Figure 12. Courtyard of the Hindu community
(Hyosik Kim, 2024)

Figure 13. View of the Muslim community
(Hyosik Kim, 2024)

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Interview

Interview Date

DEC 12, 2024

Interview Location

Sweeper Colony (Keane Bridge Area)
Sawmill (Keane Bridge Area)

Interviewer

Hyosik Kim
Kaspar ter Glane
Youri Doorn
Joelle
Mascha
Sadik Akram Rafi (Interpreter)

Interview with Hindu community in Sweeper Colony

2-1.Population

Q1. How many people live in this village, and how many children reside here?

A1. There are 2,500 people and 5,000 children living in this village.

Analysis: The exact number of residents was difficult to determine due to challenges in conducting interviews. Therefore, the number of community residents and households must be estimated based on the count of housing buildings observed in satellite view.

2-2. Means of livelihood

Q2. What do the people of the Hindu community do for their livelihood?

A2. The residents do not have regular jobs; they earn money by cleaning garbage and selling recyclables. Through this, they make an income of 10-12 Tk per kilogram.

Q3. What do the people of the Muslim community do for their livelihood?

A3. Muslim community sustain their livelihood by operating recycling businesses and selling tea. Additionally, they earn income by working at the local fish market connected to their residential area. Their earnings range from 400 to 900 Tk.

Q4. What kind of work do they primarily do during the rainy season?

A4. The residents drive CNGs or rickshaws, earning 400-500 Tk per day.

Analysis: The residents sustain their livelihood on low wages due to the absence of regular sources of income. During the interviews, they emphasized the need for reliable income sources. This highlights the importance of creating jobs and providing commercial spaces through development efforts.

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2-3. Flooding and Earthquake

Q5. How frequently do floods occur, and what kind of damage do they cause?

A5. Floods occur during the rainy season, submerging houses and damaging sanitation systems. Families build small houses on the streets during floods, and children suffer significant hardships as a result.

Q6. What measures do the residents take in their homes to prepare for floods?

A6. They wanted better houses with upper floors, but no one helped them, and due to financial issues, they remain vulnerable to flood damage.

Q7. Do they experience earthqukes?

A7. They do experience earthquakes, but they are minor incidents.

Analysis: The residents suffer significant damage due to floods, which often force children to live on the streets. They hope to live on upper floors to avoid the annual floods, but financial constraints have left their vulnerability to floods unresolved. The residents particularly emphasized the severe impact of the 2004 flood, where water rose to waist height, causing extensive damage. Their experiences highlight the critical need for flood-resistant design.

2-4. The development directions desired by the residents

Q8. What is the most important factor in housing development for them?

A8. Actually, they never think about this; they just want to raise their children in a better way. Education and community space are important to them. However, there is a big problem: the land belongs to the railway, not the community. It is not their land—they only use it. Despite this, they hope for a better future for their children

Q9. Are the residents willing to relocate for a better life? Additionally, if they do relocate, how should the new settlement be developed?

A9. The residents are willing to relocate for a better life. However, they were born on this land and have a strong emotional attachment to it. Therefore, even if they relocate, they hope to preserve their way of life and culture while having access to new income-generating opportunities.

Q10. What is the most important cultural aspect in the lives of the residents?

A10. What matters most to them is staying together, as their community is of utmost importance to them. Therefore, maintaining this way of life is crucial.

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Analysis: The residents were born and raised in the Sweeper Colony and have a deep attachment to their culture and land. Therefore, it is crucial to preserve their close-bond community during the development process. Additionally, the most important element in the residents' lives is the future of their children. As such, prioritizing the well-being of children and striving to provide them with better opportunities for the future should be a key focus in the development process.

Interview with the Sawmill Owner

2-5. About bussiness

Q1. How do sawmill workers sustain their livelihood during the flood season?

A1. They get holidays, and if the floods last for an extended period, the owner helps them.

Q2. What is the water level during the flood?

A2. 80cm above ground level

Q3. Can the wood be used as construction material?

A3. Yes, it can be used, but it is primarily used for making portable houses in rural area

Q4. How much do the workers earn per day?

A4. The workers earn a daily wage of 800-900 Tk.

Q5. What kind of work do they primarily do during the rainy season?

A5. The residents drive CNGs or rickshaws, earning 400-500 Tk per day.

Analysis: The sawmill provides regular employment within the area, but it also faces challenges during floods. Therefore, flood-resisting measures are essential when developing the sawmill area.

Verbal information

- People selling goods on the bridge do so because they cannot afford to pay rent for a proper space.
- The Hindu community has been living here for over 1,000 years.
- The rent for the Sweeper Colony is 3,500 Tk per month.
- The farming area along the riverbank is not managed by the community.

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Sketch Survey

According to UNICEF's Child-Friendly Spaces Design Guidelines, the participation of children in the design process is crucial. Children's involvement in the design process not only inspires designers but also plays a significant role in fostering a sense of responsibility and socialization among children. Additionally, such a process aligns with the principles of the Convention on the Rights of the Child (UNICEF, 2020).

3-1. Involving children in the design process

In this study, a sketch survey was conducted to hear children's opinions and actively involve them in the design process. The research targeted children from the Hindu community in the Sweeper Colony, who were instructed to draw their "dream house."

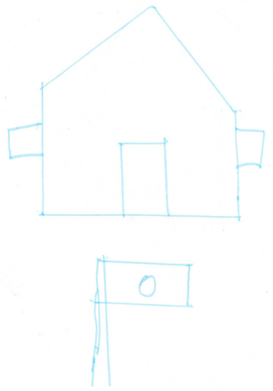
During the sketch survey, children participated enthusiastically, resulting in a total of 13 sketches. While the sketches did not include specific design details, they revealed the general concept of a house. Many of the drawings featured the flag of Bangladesh, reflecting the children's strong attachment to their country and land, as previously mentioned in interviews. Additionally, the common depiction of triangular-roofed houses indicated their desire for homes of better quality than the current slum housing.

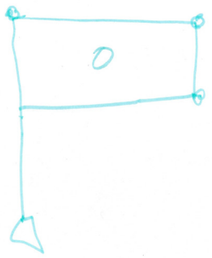
Through this process, the children were encouraged to feel a sense of involvement in the design process, and the study sought to respect children's rights.

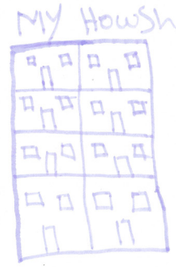
Figure 14. Sketch survey in progress
(Kaspar ter Glane, 2024).

Figure 15. Children drawing sketches of their dream houses
(Joelle, 2024)

My House






My Housh
In Bangladesh

Site Context

Courtyard Culture

Children

Ritual Tree

Site Context

Lack of Space

Unclean Environment

Flooding (700mm)

What do the people of Sweeper Colony want?

1. Better future for their children

2. Maintaining bonded community

3. Flood-resisting house

Kalindi Apartment

Architect: Bashirulhaq
Location: Dhaka, Bangladesh
Materiality: Concrete and Fire Brick
Completion: 1992

Kalindi Apartment is a high-income residential complex built in Dhaka that responds effectively to the climate of Bangladesh. The central courtyards within the building clusters, privacy-enhancing louvers on the façades, and recessed windows collectively reflect a deep understanding of Bangladeshi architectural principles and climatic responsiveness.

Figure 16. View of the Tara Housing 1 (Courtyard)
(Bashirul Haq & Associates, 2025)

Figure 17. View of Kalindi Apartment 2
(Bashirul Haq & Associates, 2025)

Barbican

Architect: Chamberlin, Powell and Bon
Location: London, UK
Materiality: Concrete
Completion: 1982

The Barbican is a residential complex in London, comprising two theatres, a concert hall, a library, an art gallery, three cinemas, a conservatory, offices, restaurants, shops, and foyers. This diverse program allows for the integration of various open spaces within the residential environment. In addition, the Barbican features a beautiful façade created by planters placed on upstand walls.

Figure 18. View of the Barbican 1
(Hyosik Kim, 2024)

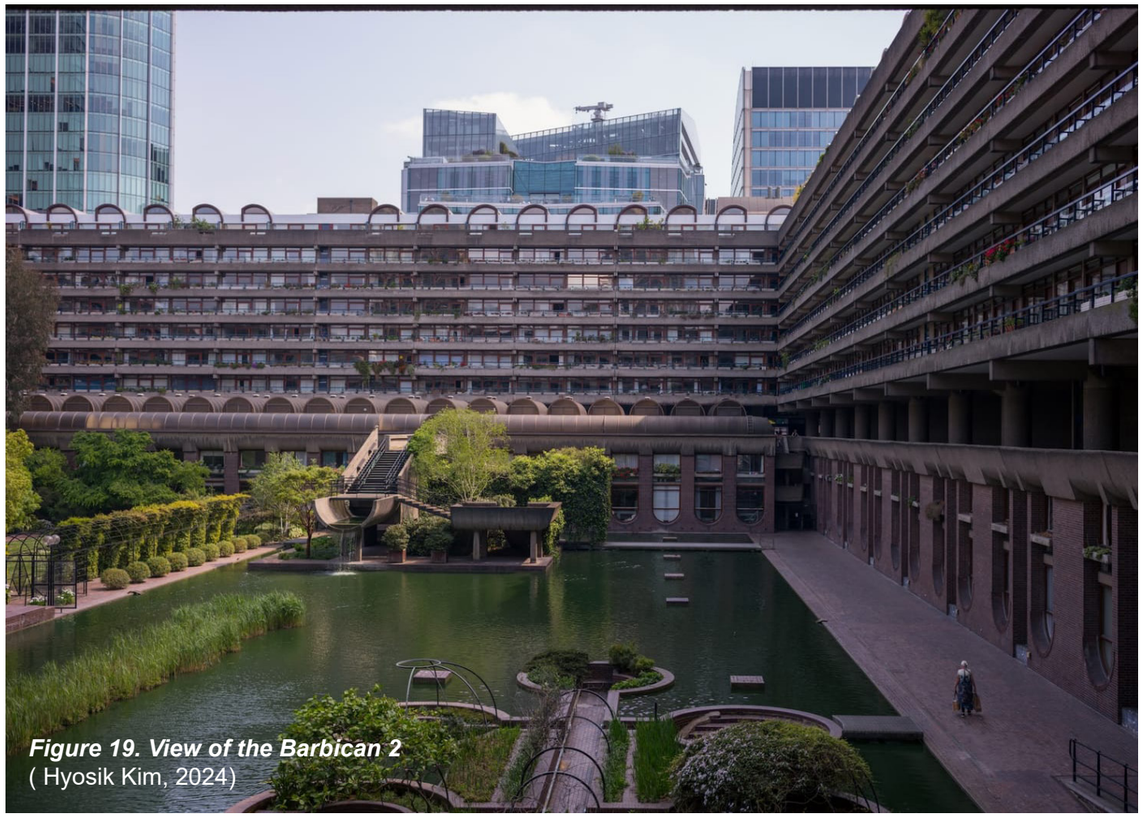


Figure 19. View of the Barbican 2
(Hyosik Kim, 2024)

Tara Housing

Architect: Charles Correa
Location: Delhi, India
Materiality: Concrete and Firebrick
Completion: 1975

Tara Housing, an affordable housing complex designed by Charles Correa, is an excellent example of utilizing site level differences to create diverse open spaces. The architect incorporated staircases as key design elements to shape various public areas within the neighborhood and separated pedestrian and vehicular access to establish a walkable, community-oriented environment.

Figure 20. View of the Tara Housing
(Rohan Varma, n.d.)

Figure 21. View of the Tara Housing
(Rohan Varma, n.d.)

How can I design Children Centric Housing?

1. Space for the Children

2. Safe environment for Children

3. Green & Walkable street

Figure 22. Children with Sketches
(Joelle, 2024).

AGE 1-3

86cm 90cm

Average Heigh of 3 year-old

Circle of proximity
(in immediate proximity)

Attachment to their mothers
Safe indoor space

AGE 3-6

116cm 116cm

Average Heigh of 6 year-old

The exploration space
(within sight or earshot)

Relation with peers & skill development
Larger indoor space

AGE 6-12

149cm 149cm

Average Heigh of 12 year-old

The exploration space
(Within sight or shouting distance)

Advanced skill developement
Outdoor playground

AGE 13+

165cm 151cm

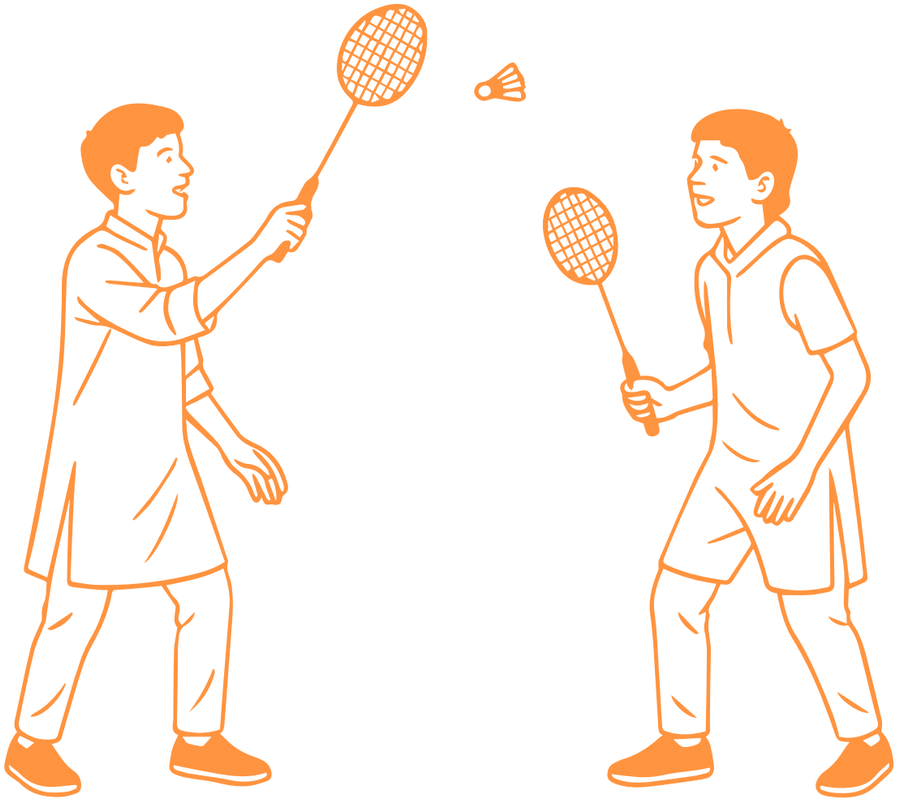
Average Heigh of 15 year-old

Independent space
(Within Neighborhood)

Private & Independennt
outdoor spacce for peer group
outdoor spacce for Sport

Girls

Less Activity (Near by home)
Chatting / Gathering



Boys

Active (Outdoor)
Sports, Adventure, Games

LEARNING

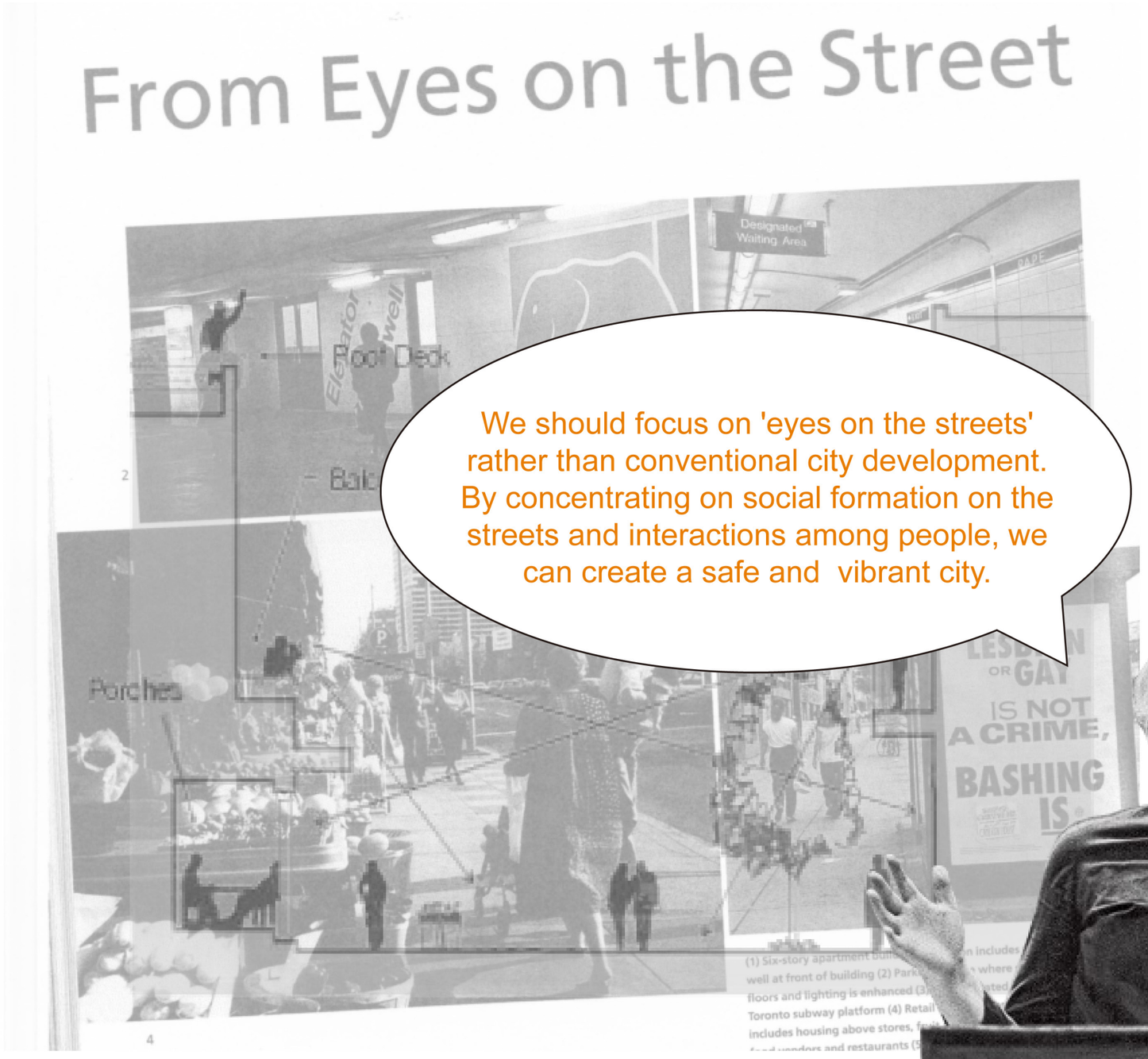
Children from low-income families often struggle with reading and academic performance. Therefore, it is important to provide them with a reading room to ensure they have equal access to educational opportunities.

CARING

When parents go out to work, children are often left in the care of their siblings. To improve this situation, a day care room is necessary.

GATHERING

To raise children effectively, information sharing among parents and collaboration within the local community are essential. Therefore, a gathering room should be designed to support these interactions.



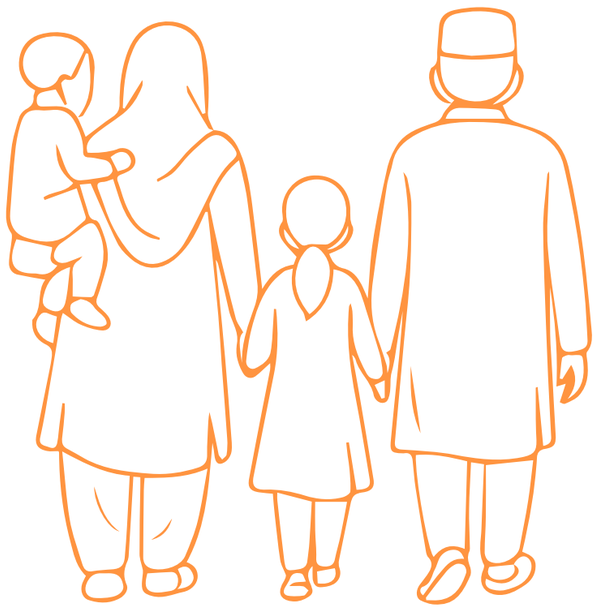
We should focus on 'eyes on the streets' rather than conventional city development. By concentrating on social formation on the streets and interactions among people, we can create a safe and vibrant city.

20
Breaths per minute

40
Breaths per minute

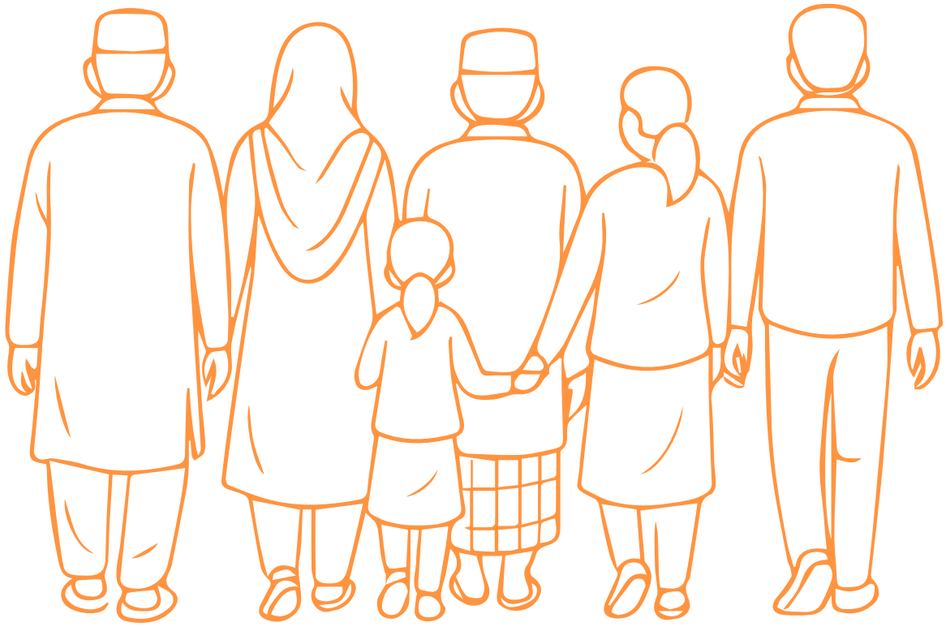
Air pollution poses a threat to young children in particular because they breathe more polluted air into their developing respiratory system than do older children and adults.

Required sidewalk width for a family to walk together



2.4 M (8ft)

Required sidewalk width for a family to walk together



4.8 M (16ft)

03. *Design Proposal*

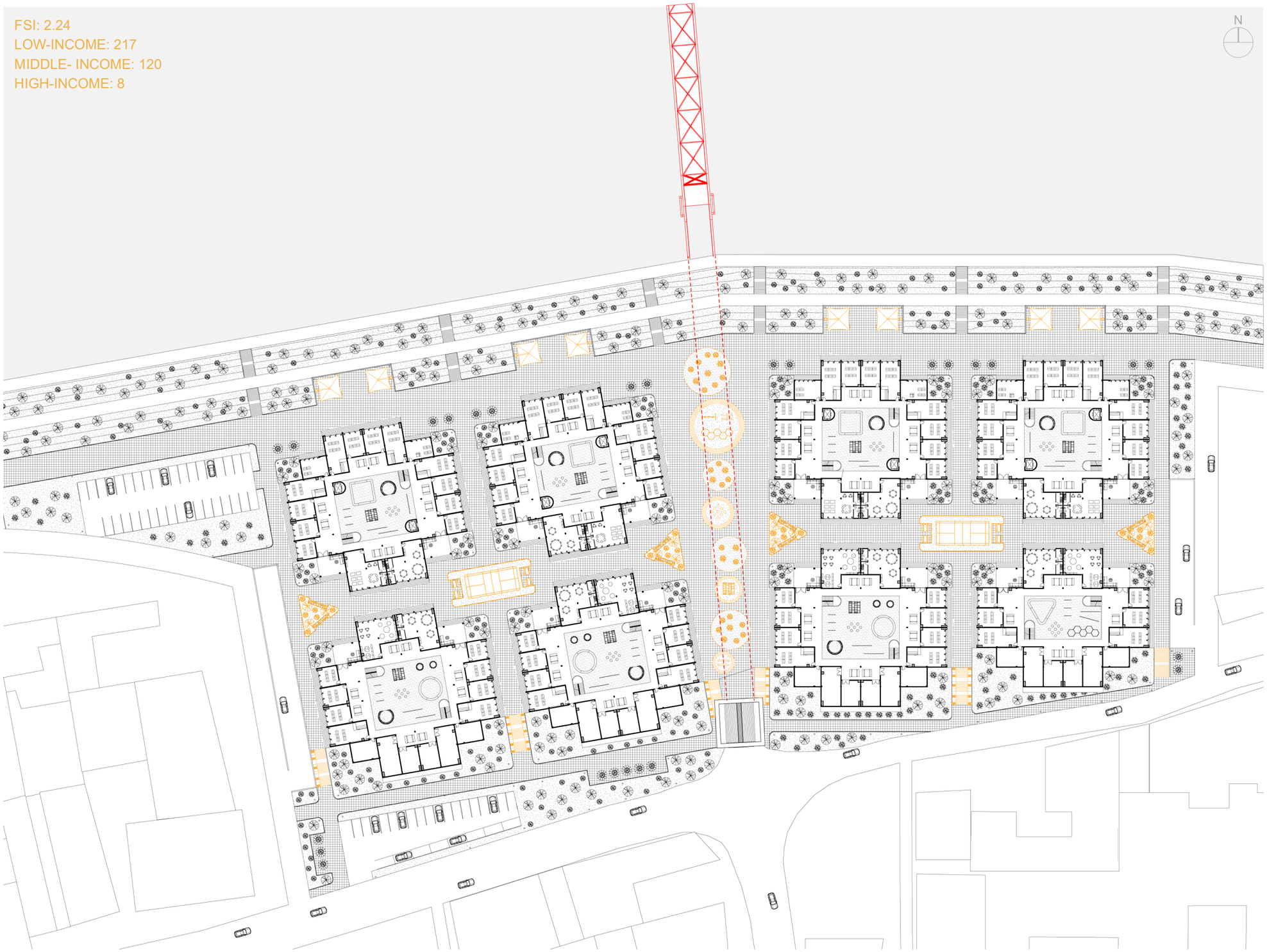
Masterplan Overview

View from the Keane Bridge

Masterplan

Scale 1 : 1000

FSI: 2.24
LOW-INCOME: 217
MIDDLE- INCOME: 120
HIGH-INCOME: 8

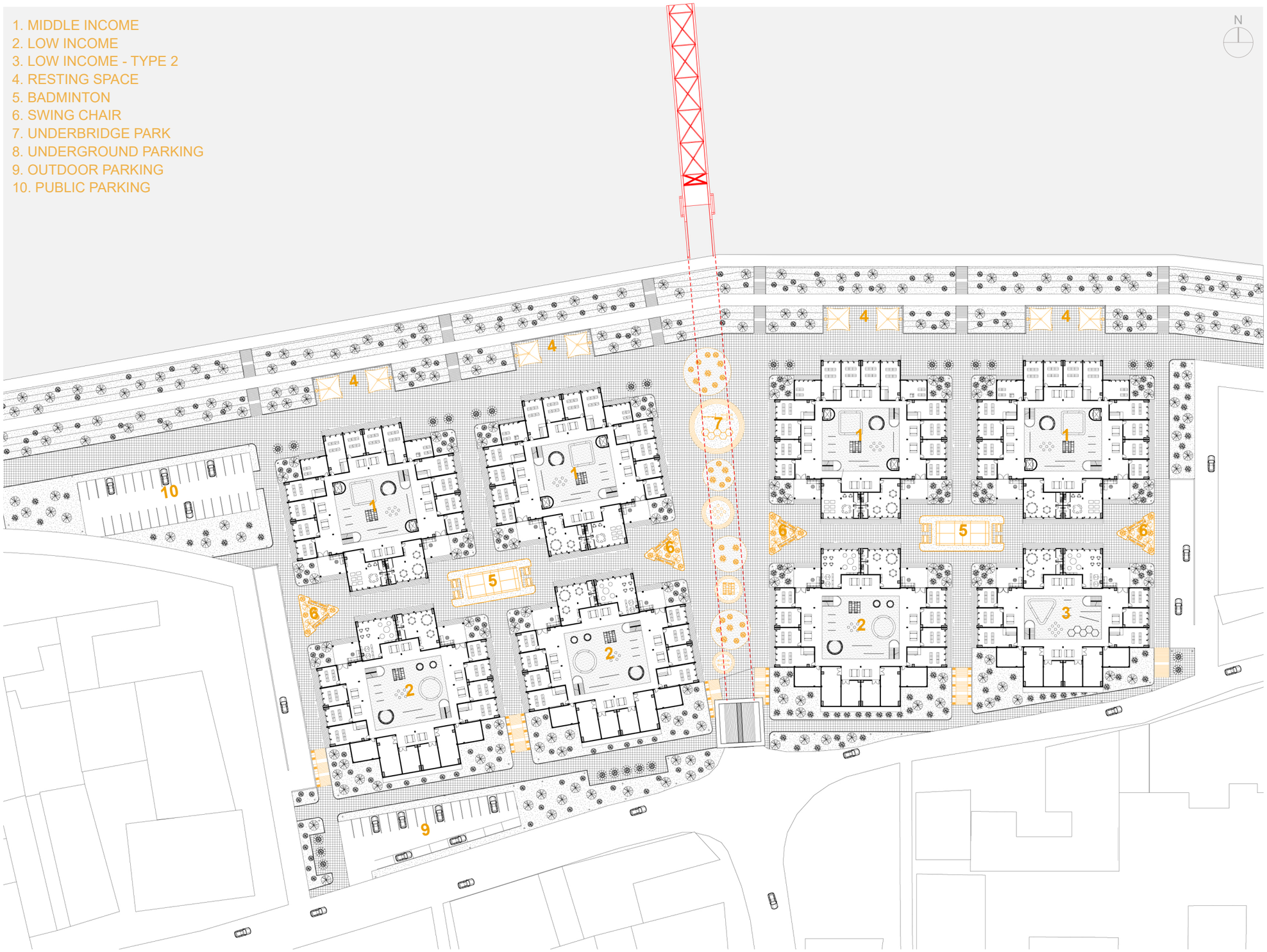


The masterplan includes play areas and open spaces in various shapes such as triangles, circles, and rectangles, designed to provide recreational opportunities for teenagers.

Masterplan Overview

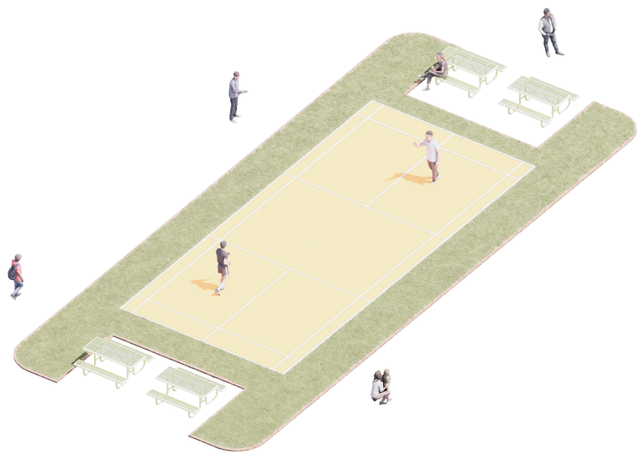
Scale 1 : 1000

1. MIDDLE INCOME
2. LOW INCOME
3. LOW INCOME - TYPE 2
4. RESTING SPACE
5. BADMINTON
6. SWING CHAIR
7. UNDERBRIDGE PARK
8. UNDERGROUND PARKING
9. OUTDOOR PARKING
10. PUBLIC PARKING



The masterplan includes 2.4-meter-wide streets and broader family-friendly paths. Combined with a car-free layout and children's play areas, these elements enhance the neighborhood's liveliness and diversity.

Diverse Playspace in Masterplan

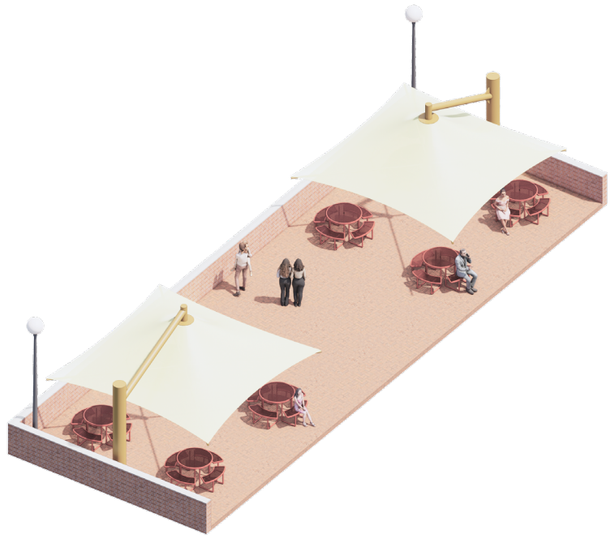


Badminton Court

Age +13
Neighborhood

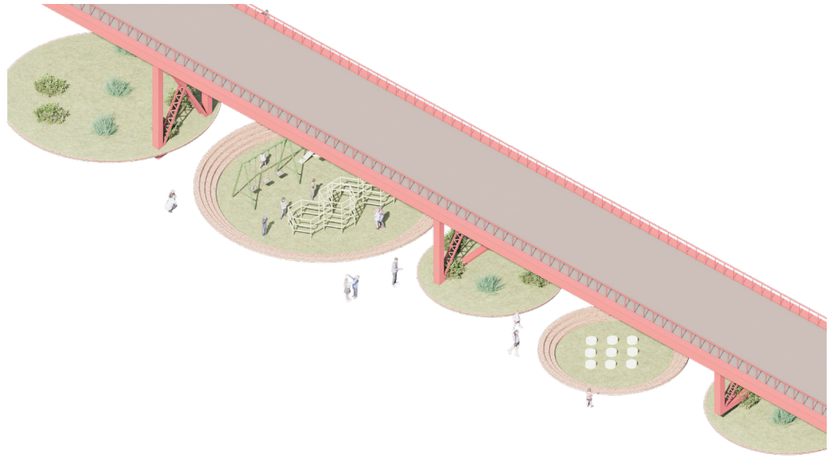
Swing Chair

Age +13
Neighborhood



Riverbank openspace

Age +13

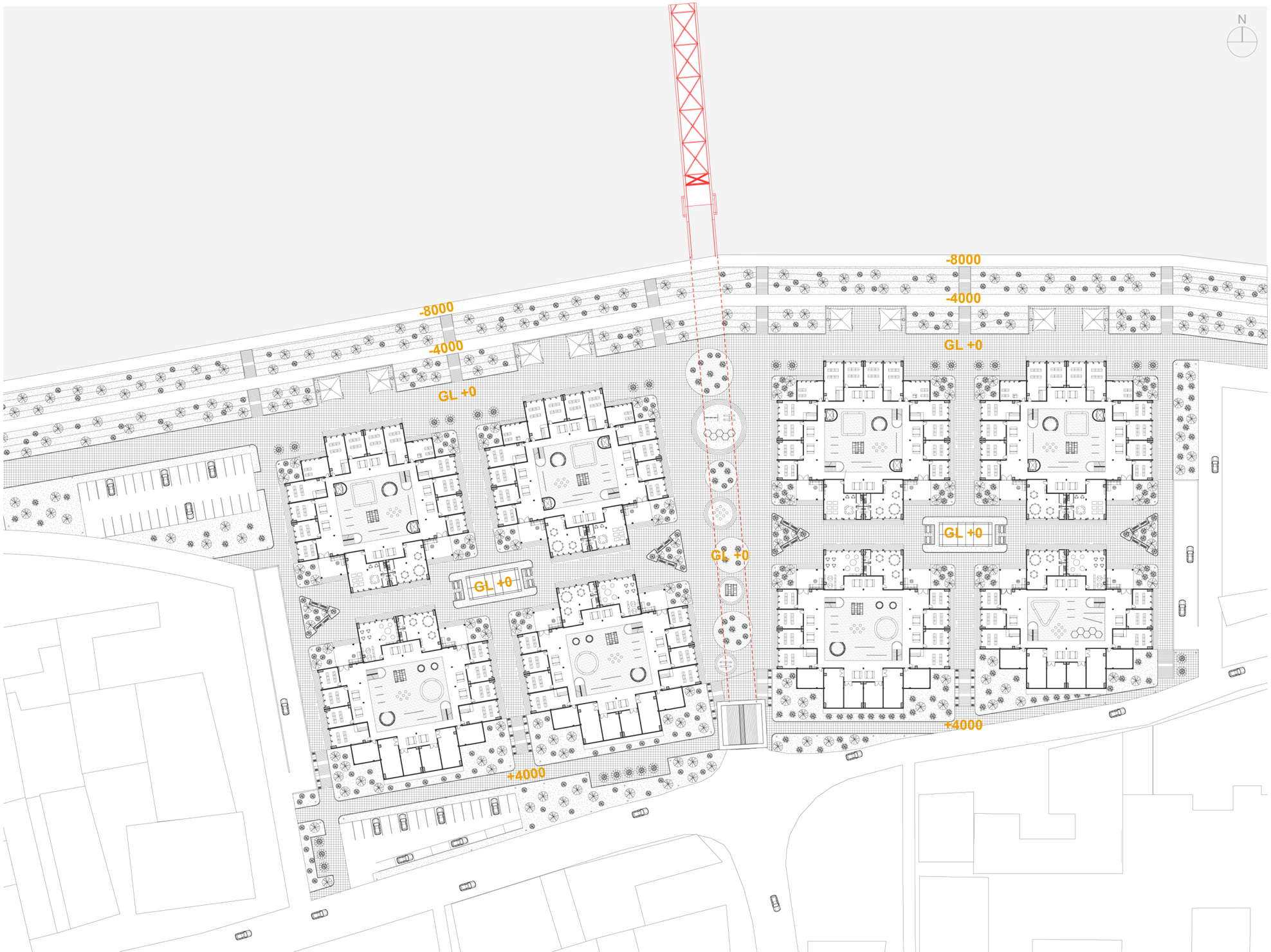


Playground under bridge

Age 6-12, Age +13

Site Level

Scale 1 : 1000



There is a 4-meter level difference between the main road and the riverside at the project site. This required a design that responds to the site's topography.

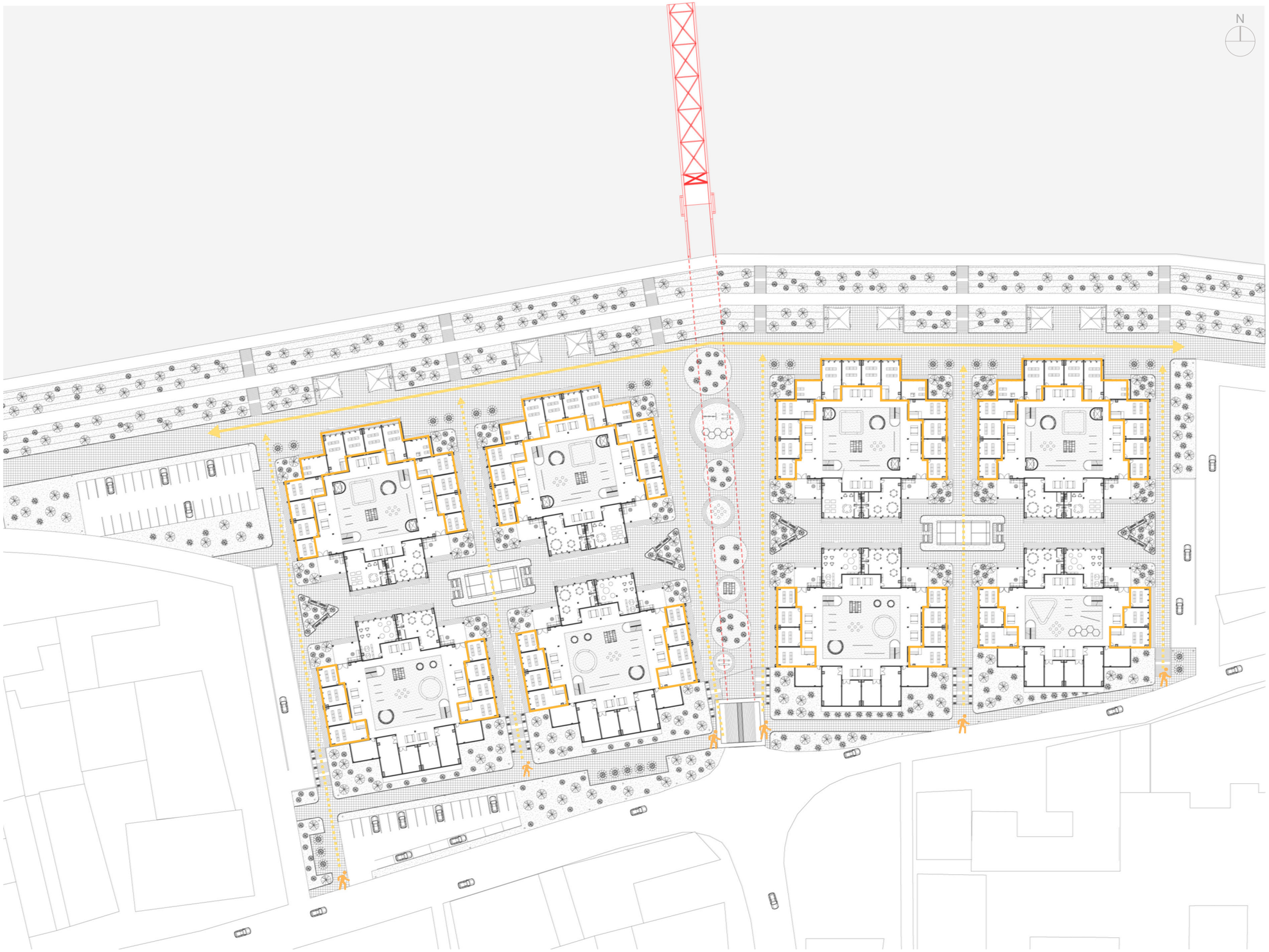
Site Section (Masterplan)

There is a 4-meter level difference between the main road and the riverside at the project site. This required a design that responds to the site's topography.

To prepare for the typical flood level of 700mm, the plinth level was set at 750mm, and the residential units were arranged starting from the first floor to prevent flood damage.

Public Access

Scale 1 : 1000



People move from south to north to reach the public space located along the riverside. Shops are placed at ground level along this circulation.

Entrance View

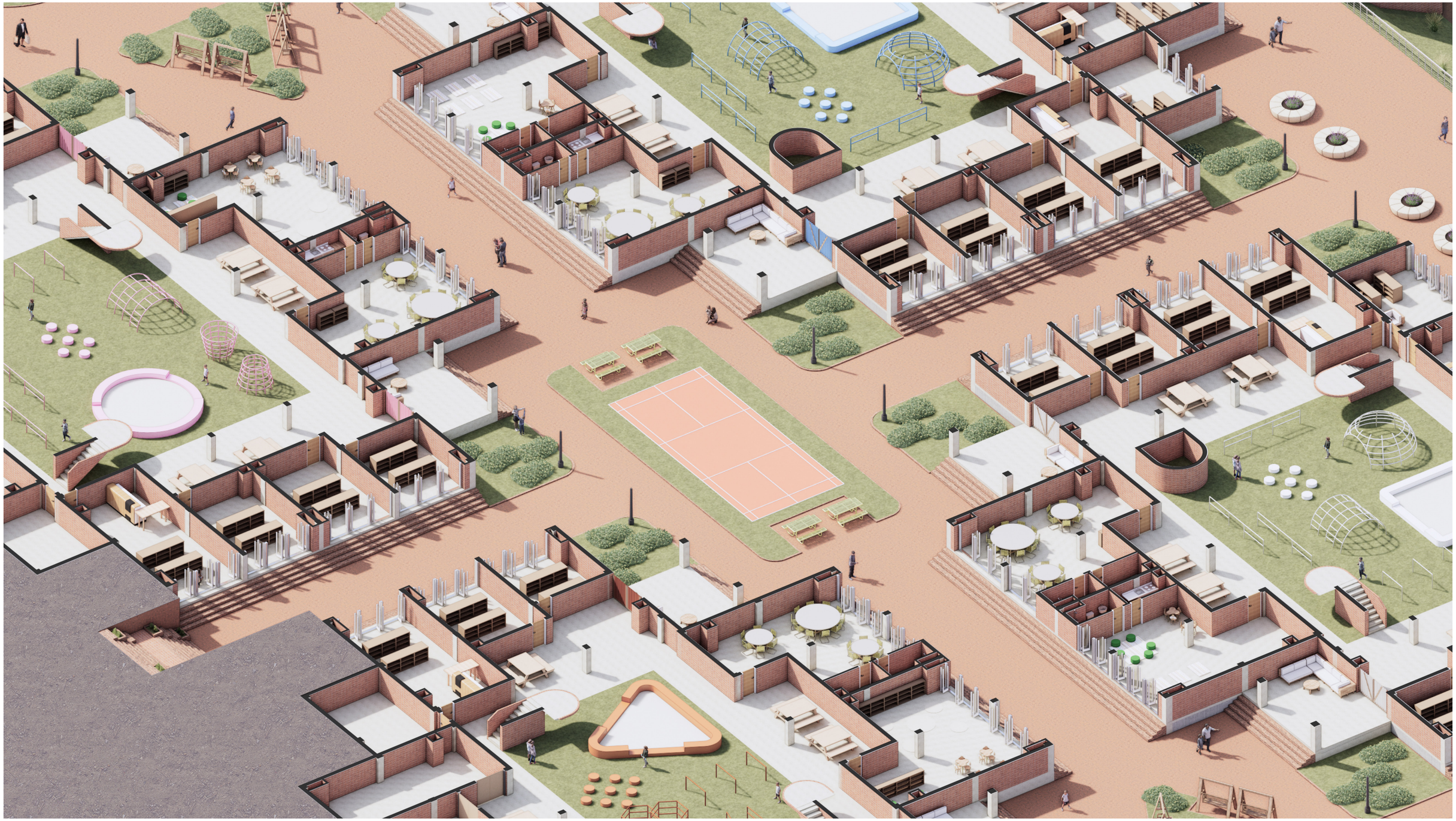
View of the Public Space

Community Spine

Scale 1 : 1000

In contrast, the east–west axis forms a semi-public community spine with less pedestrian traffic. Along this spine, community facilities are strategically placed.

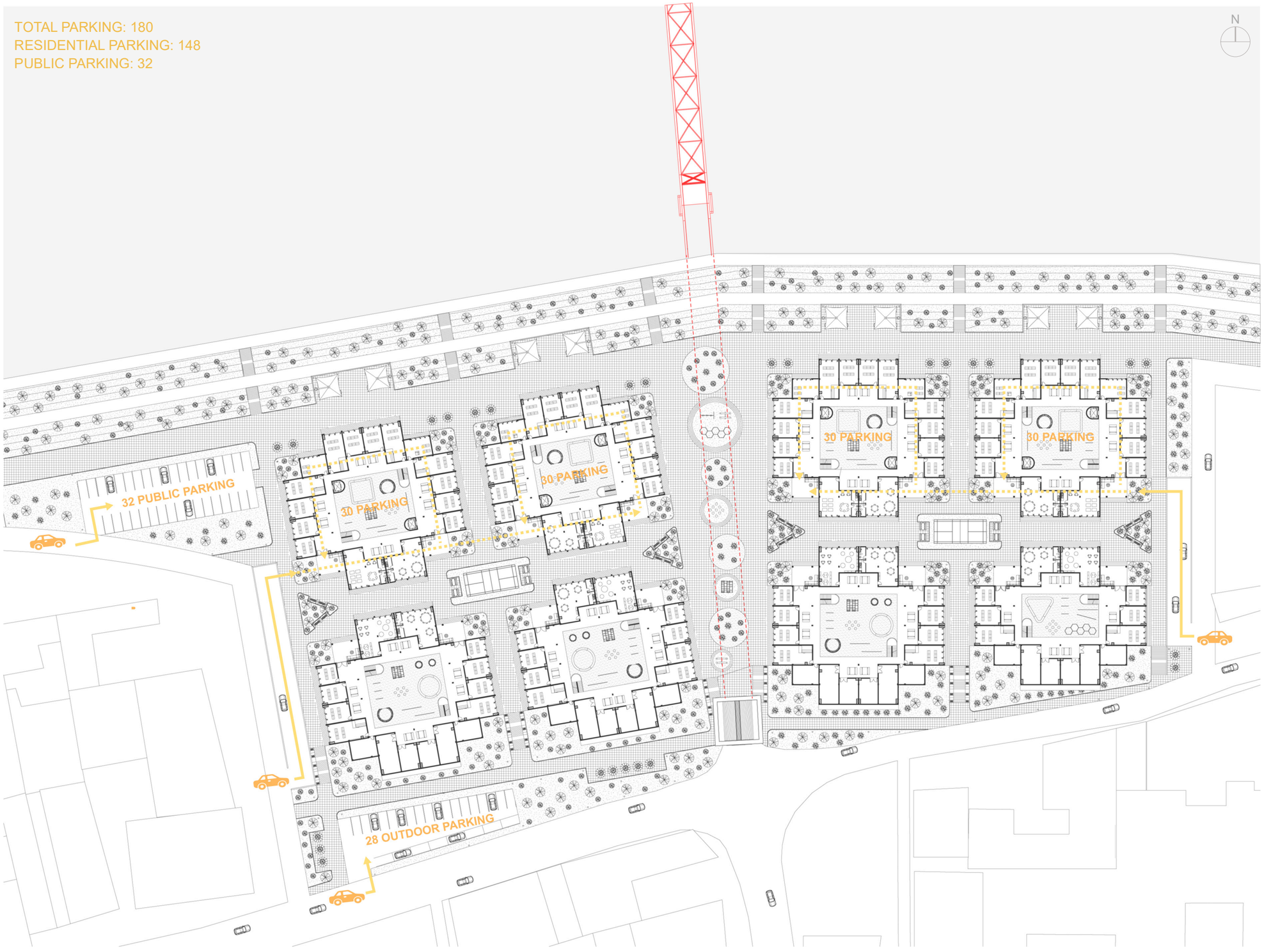
Community Spine



Parking Space

Scale 1 : 1000

TOTAL PARKING: 180
RESIDENTIAL PARKING: 148
PUBLIC PARKING: 32



Parking areas are mostly located underground, creating a car-free neighborhood that ensures a safer environment for children.

Green Space

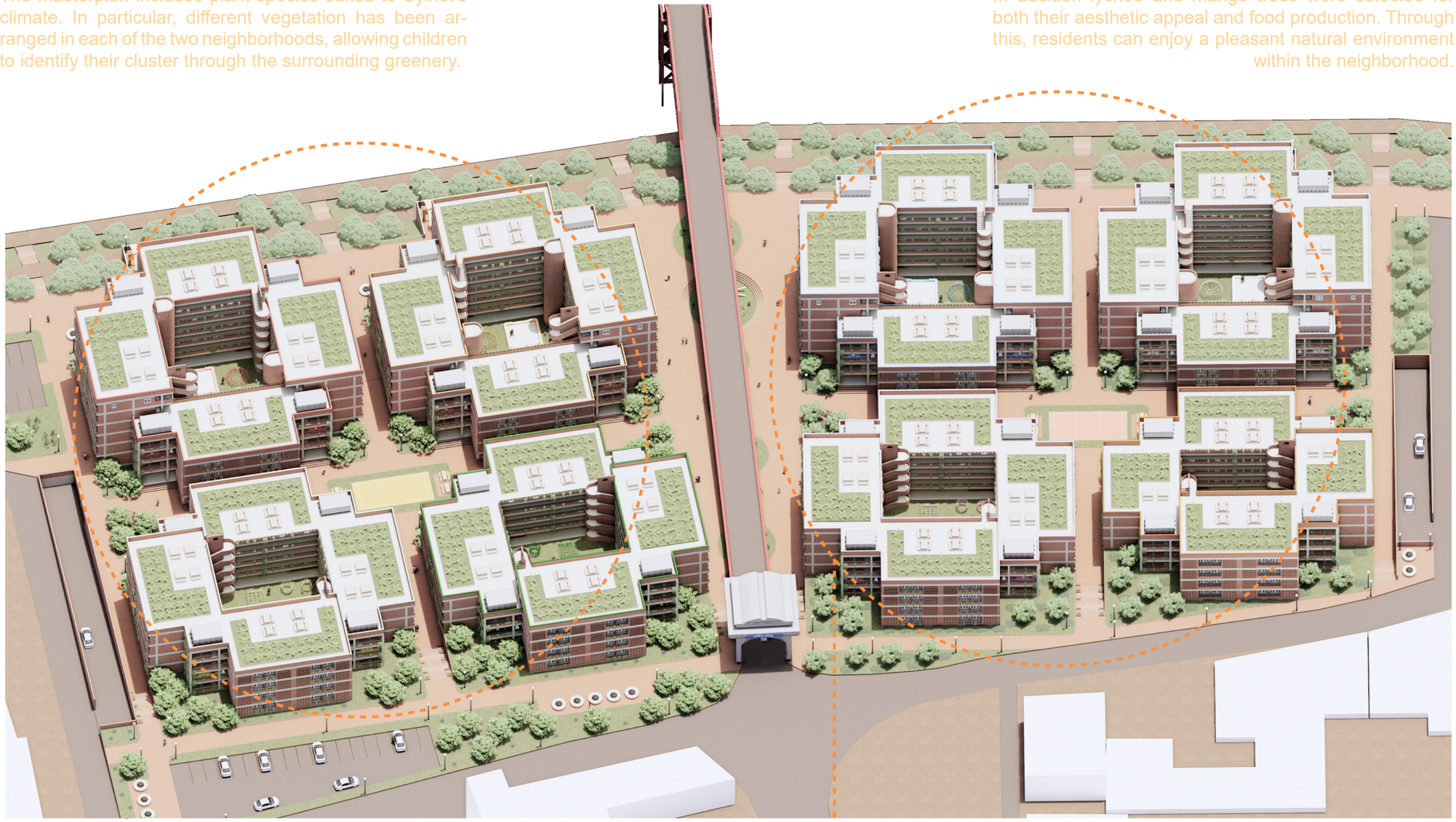
Scale 1 : 1000

The large green spaces within the masterplan provide clean air for children and help absorb noise, contributing to a highly comfortable and healthy living environment.

Green Space

The masterplan includes plant species suited to Sylhet's climate. In particular, different vegetation has been arranged in each of the two neighborhoods, allowing children to identify their cluster through the surrounding greenery.

In addition lychee and mango trees were selected for both their aesthetic appeal and food production. Through this, residents can enjoy a pleasant natural environment within the neighborhood.



Lychee Tree (4-8M)

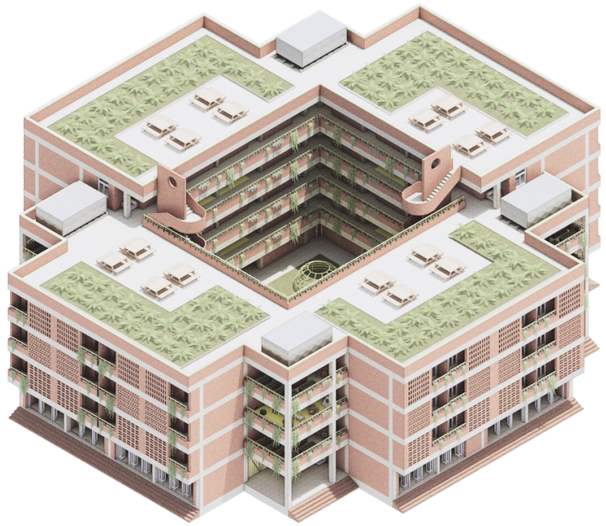
Chaste Tree (0-4M)

Mango Tree (4-8M)

Primrose Willow (0-2M)

Lighting Plan

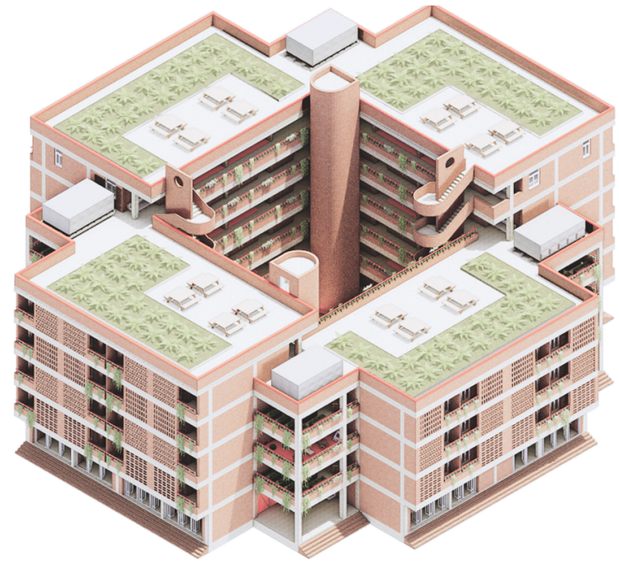
One of the most essential aspects of a children-centric neighborhood design is safety. Children are especially vulnerable to safety issues on the streets at dusk. To address this, 400W streetlights were installed at intervals of less than 20 meters to enhance street safety.



LOW - INCOME CLUSTER (GL+4)

1. 35 sqm studio unit - 28
2. 50 sqm one-bed room unit - 28
3. Pocket play space
4. Playground
5. Shops
6. Community Ammenities
7. Storage

The low-income cluster is located along the southern edge of the master plan, adjacent to the main road. This cluster features shops and community facilities on the ground level, with residential units positioned above.

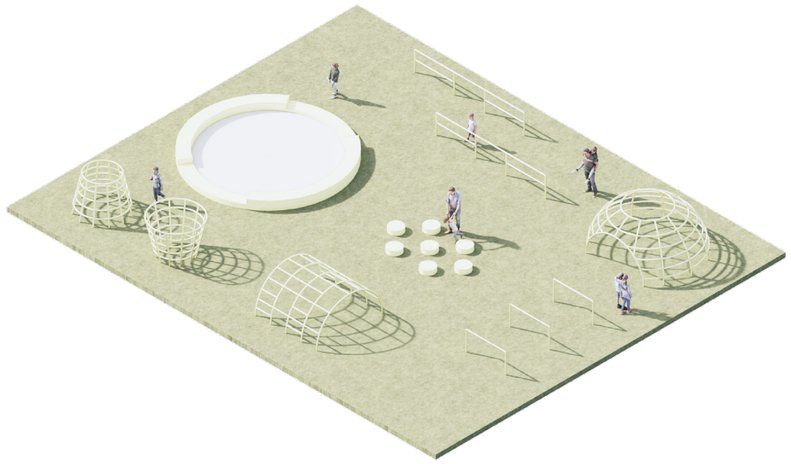


MIDDLE - INCOME CLUSTER (GL+5)

1. 85 sqm three-bed unit - 30
2. 120 sqm three-bed room unit - 2
3. Pocket play space
4. Playground
5. Shops
6. Community Ammenities
7. Underground Parking

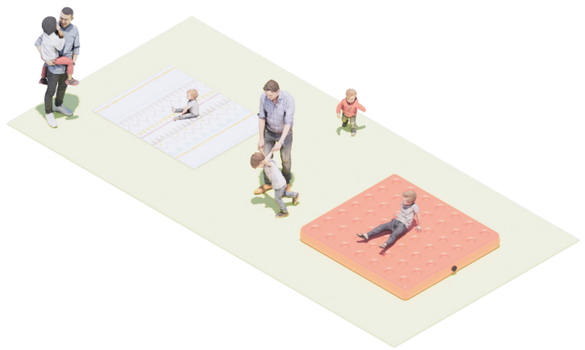
Located along the riverside, Middle Income cluster offers scenic views and a higher living standard. Revenue generated from this cluster supports the development of affordable housing, making the project financially feasible.

Play Space in Cluster



Courtyard Playground

Age 6-12
shouting distance



Pocket Play Space

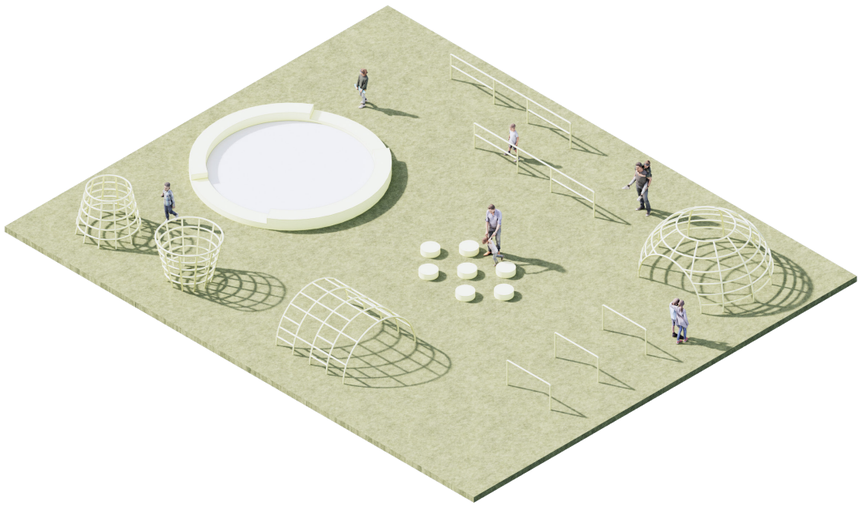
Age 1-6
Sight distance

Pocket Play Space

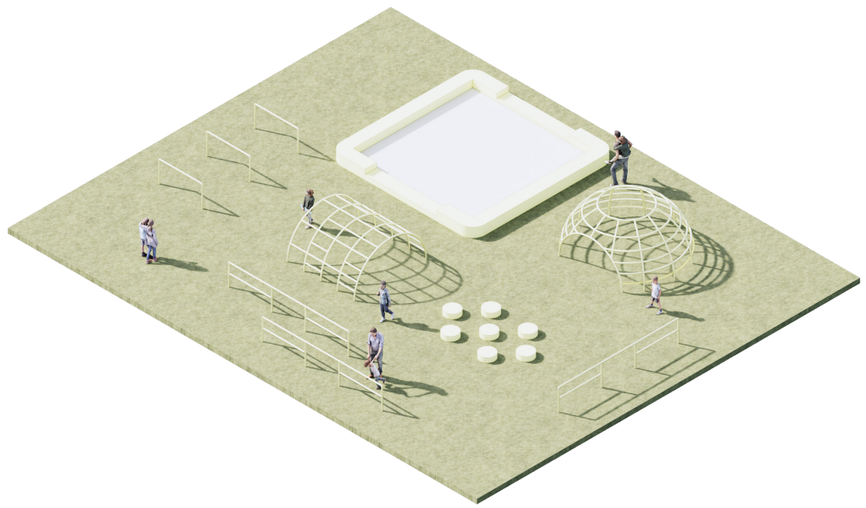
Age 1-6
Sight distance

The cluster provides safe play spaces for children aged 0 to 12. Pocket play spaces for children aged 0 to 6 are placed within sight distance, while playgrounds within shouting distance are located in the courtyards. This spatial arrangement enables caregivers to safely monitor children of different ages.

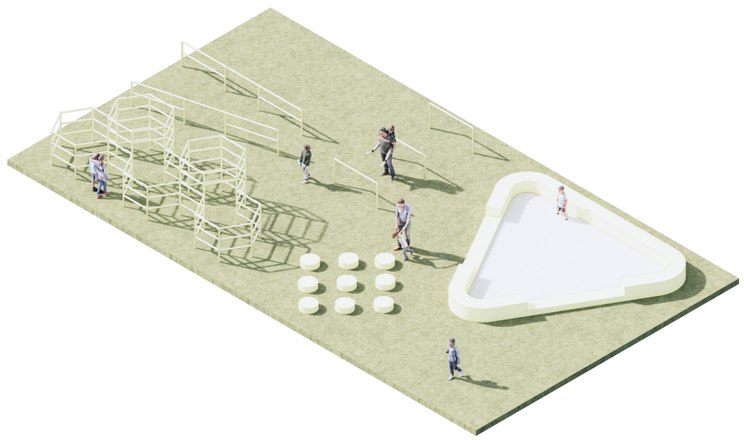
Play Space in Cluster



Playground Type A



Playground Type B

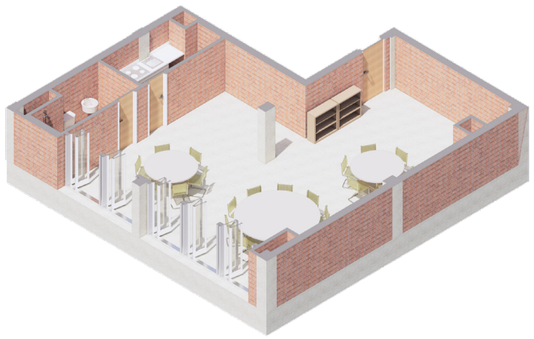


Playground Type C

Within the cluster, various forms of affordable playgrounds are designed to provide children with safe and enjoyable play spaces.

Daycare Space

The daycare space is a place where children can receive care while their parents are away at work.



Gathering Space

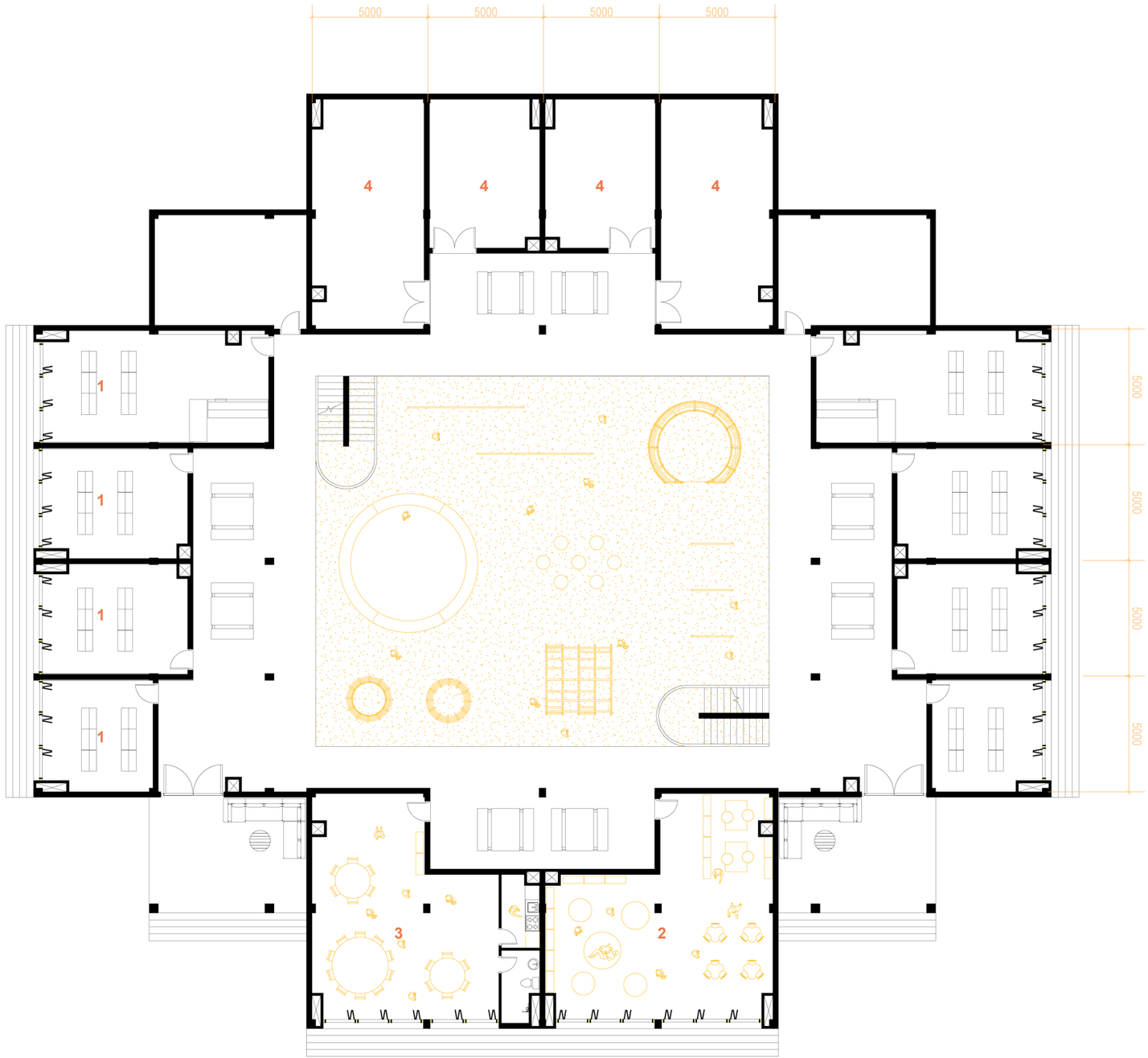
The gathering space is a flexible area where various child-related activities take place and parents can interact and exchange information.

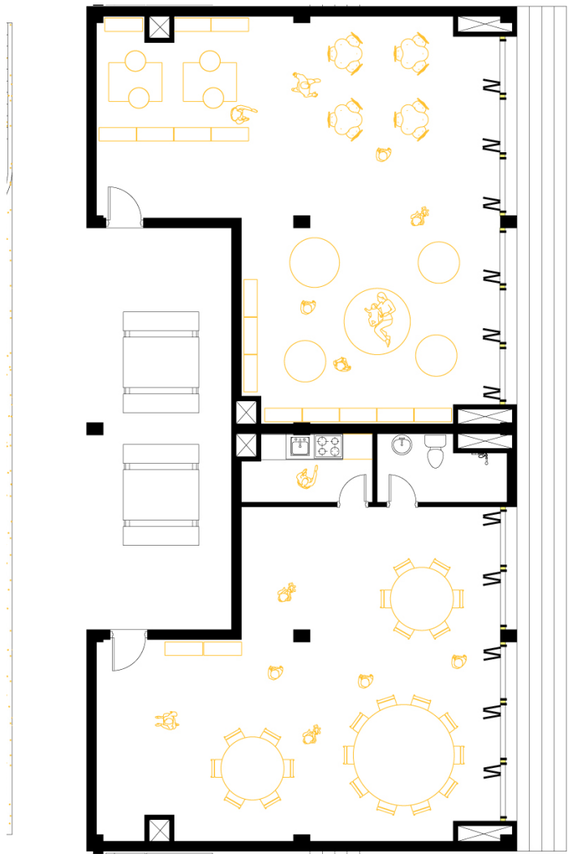
Reading Space

The reading space is a place where children can learn how to read and engage with a variety of books, fostering their academic development.

Along the community spine at the ground level of the cluster, various community spaces are designed to facilitate the sharing of child-rearing information and to provide educational opportunities for children from low-income families.

Cluster Plans

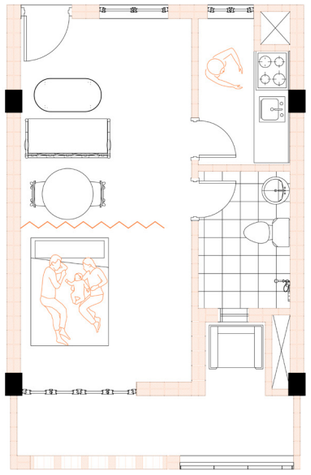


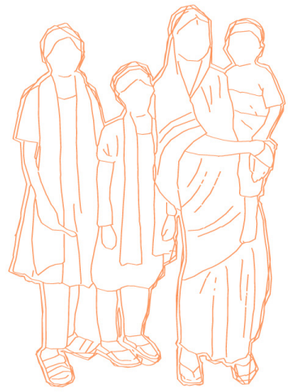


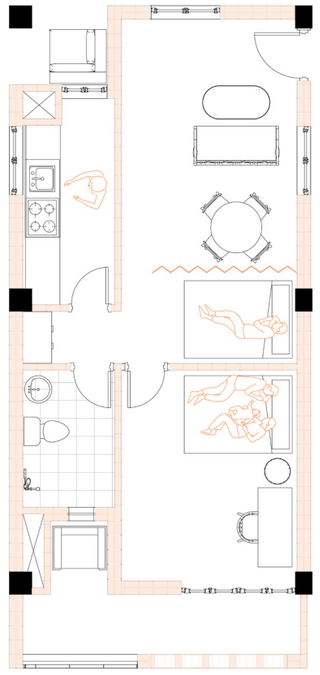
Low income cluster GL

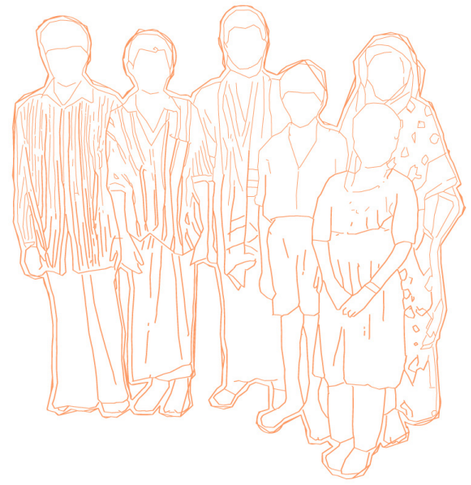
1. Shops
2. Library
3. Gathering space
4. Storage

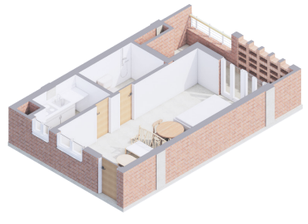
Unit Plans







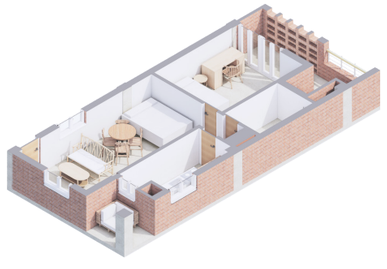




Low income unit - 35 sqm

For 2-4 people

Living space (bedroom at night)
Dining table
Bed
Kitchen
Toilet
Balcony (1.2m)



Low income unit - 50sqm

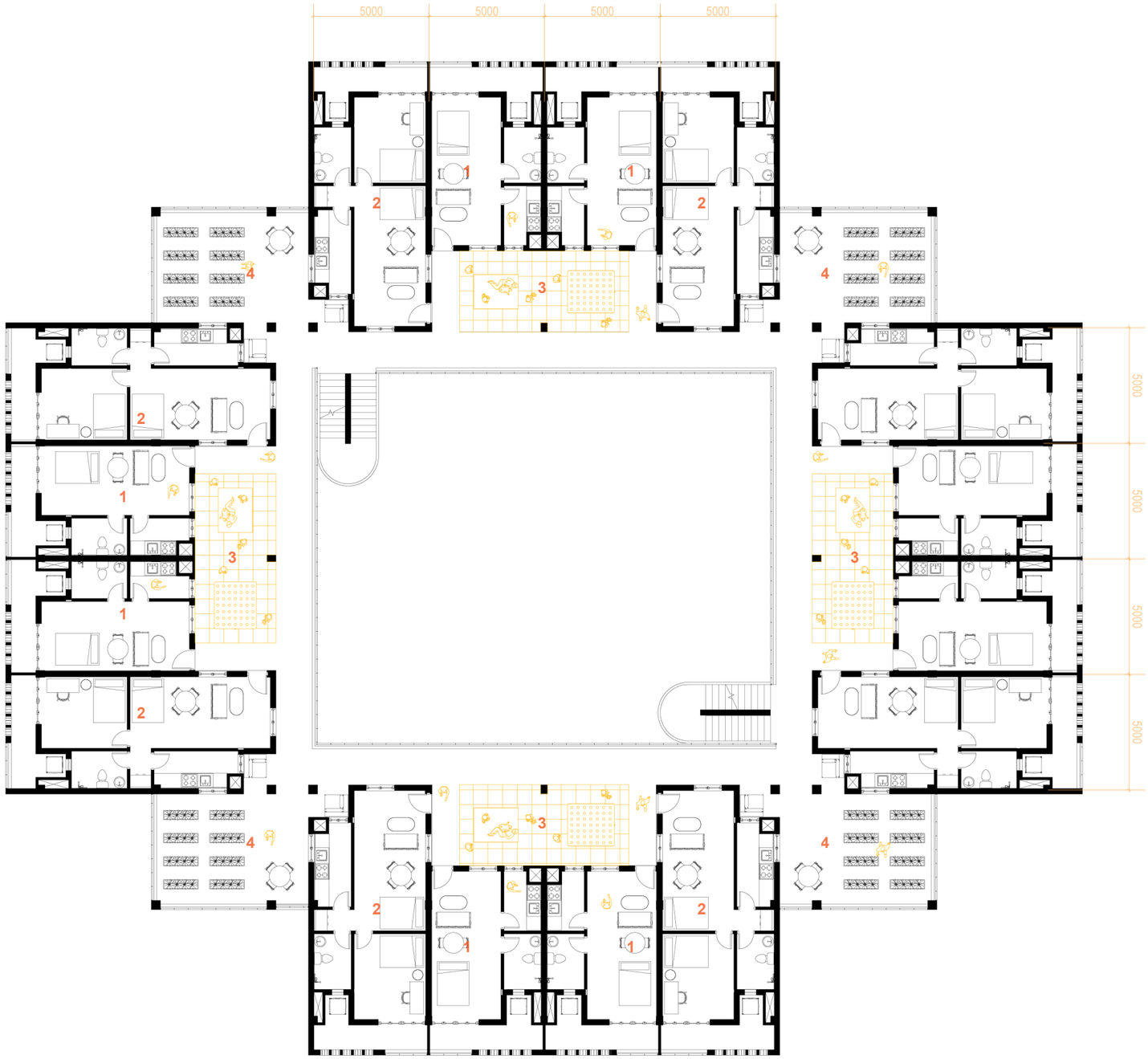
For 4-6 people

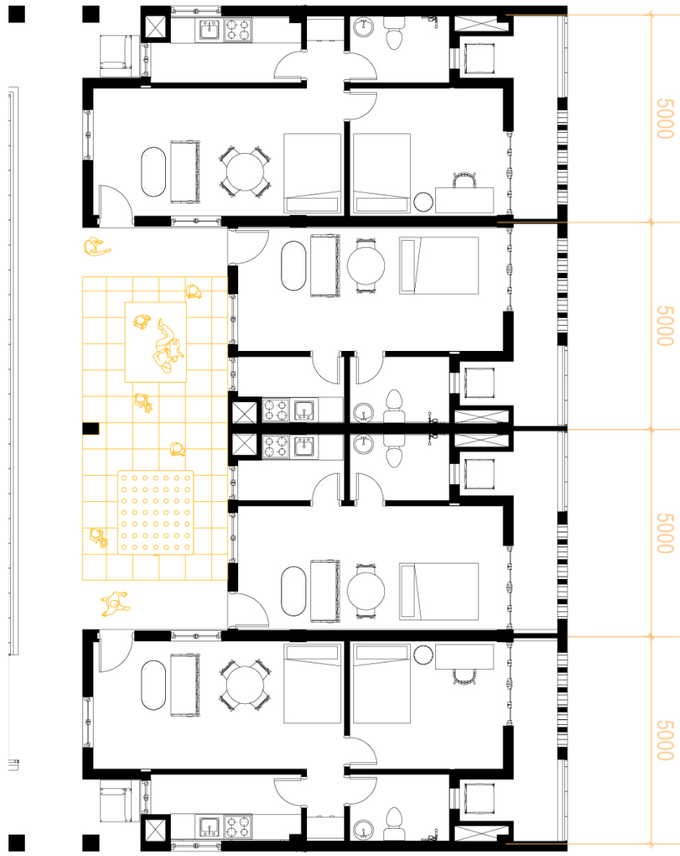
Living space (bedroom at night)
Dining table
Bed room
Kitchen
Toilet
Balcony (1.2m)

In the low-income units, the distinction between living room and bed room is not clearly defined. However, curtains are used to allow flexible separation and use of space.

Interier View

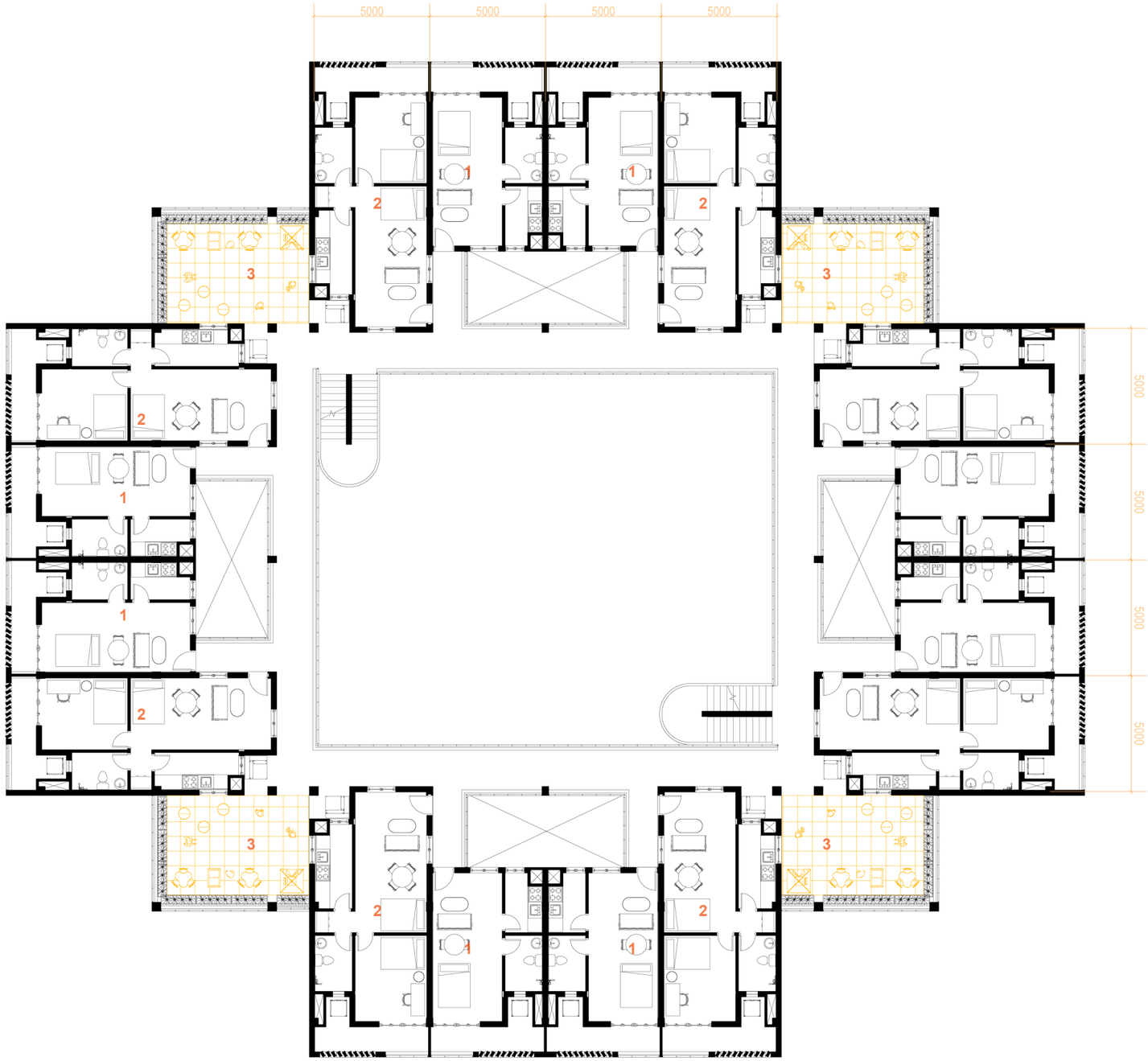
Cluster Plans

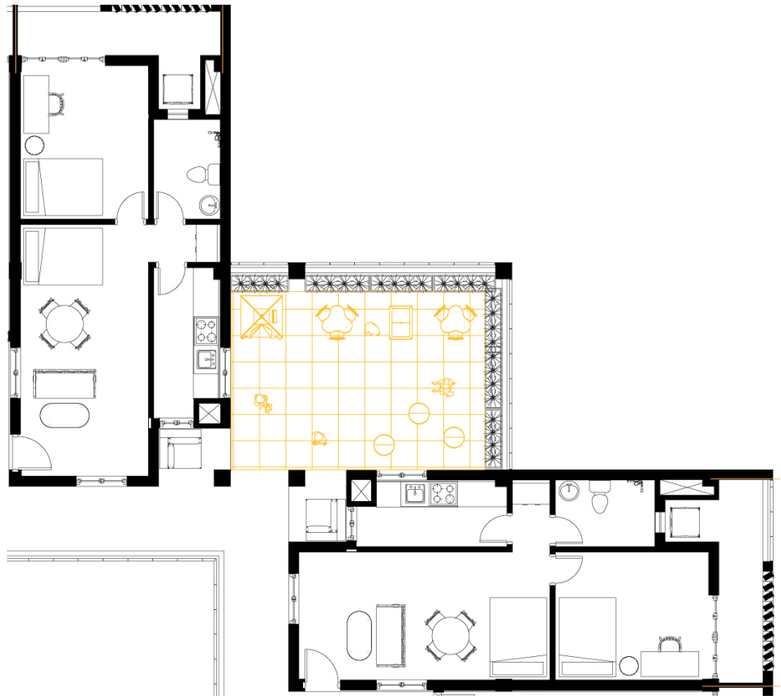




Low income cluster 1st floor

1. 35 sqm studio unit (2-4 person) - 8
2. 50 sqm one-bed room unit (4-6 person) - 8
3. Pocket play space
4. Farming balcony



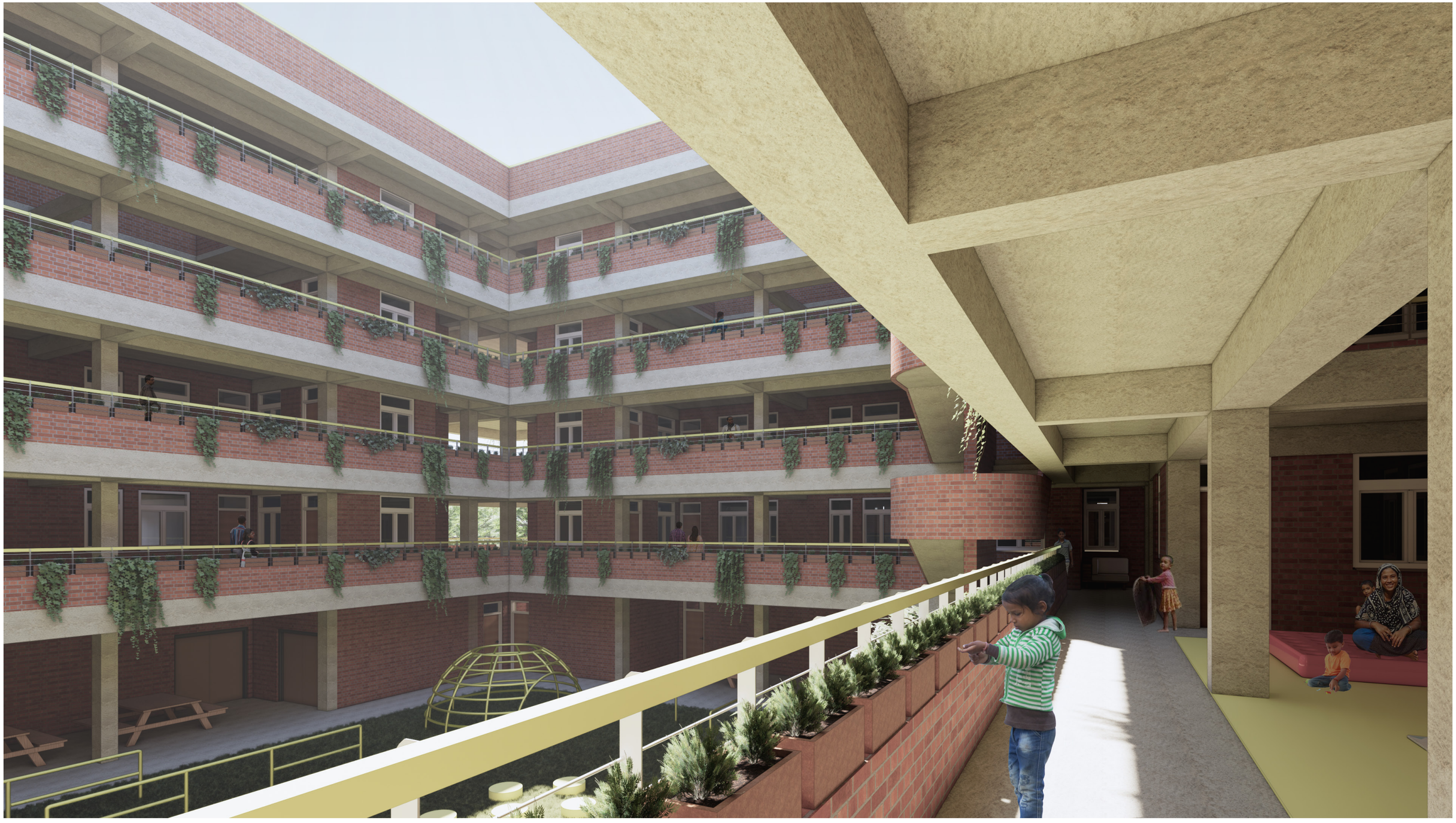


Low income cluster 2nd floor

1. 35 sqm studio unit (2-4 person) - 8
2. 50 sqm one-bed room unit (4-6 person) - 8
3. Pocket play space

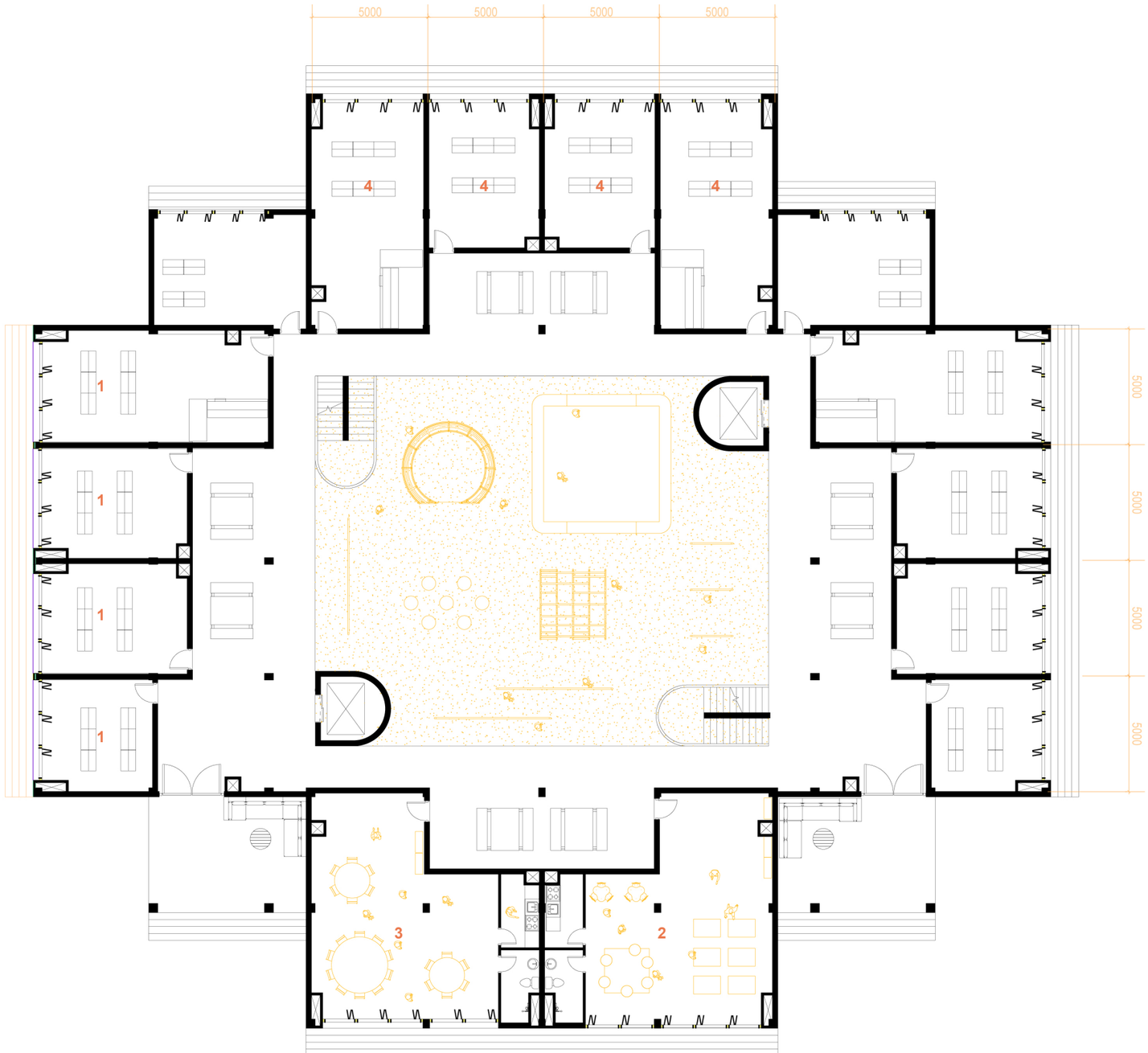
Section View

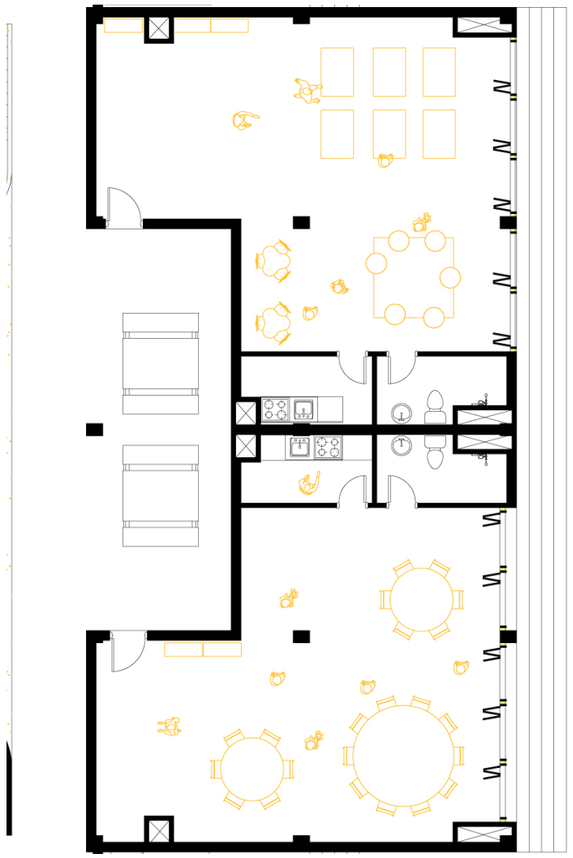
View of the Corridor



Overview

Cluster Plans

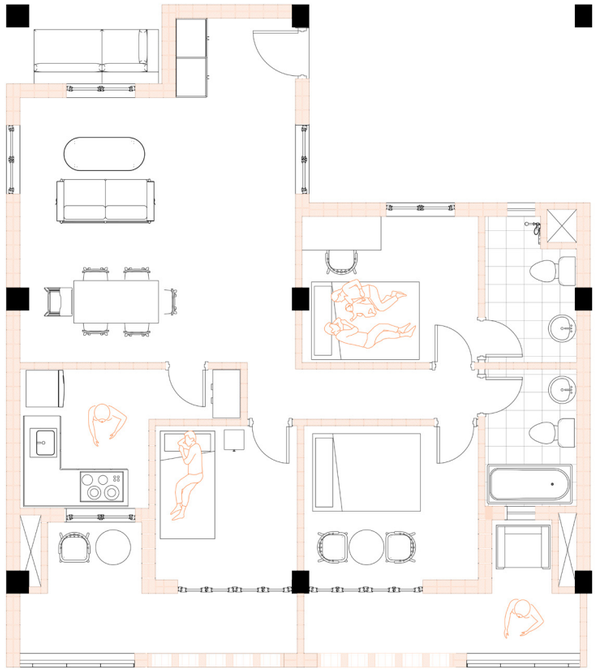


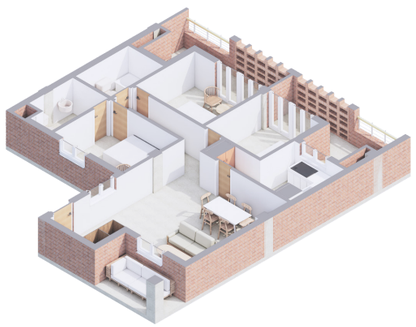


Middle income cluster GL

1. Shops
2. Day care center
3. Gathering space
4. Storage

Unit Plan

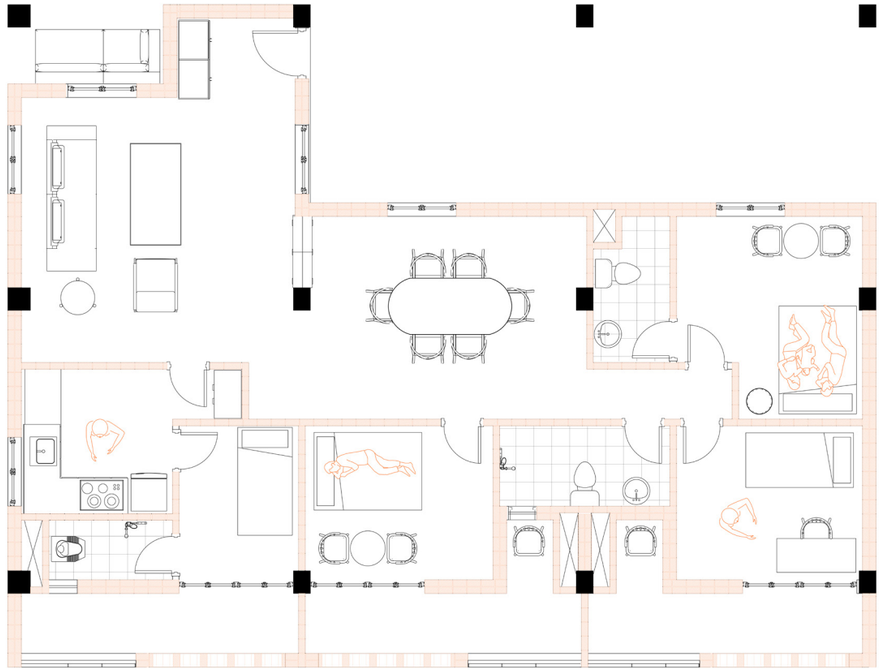


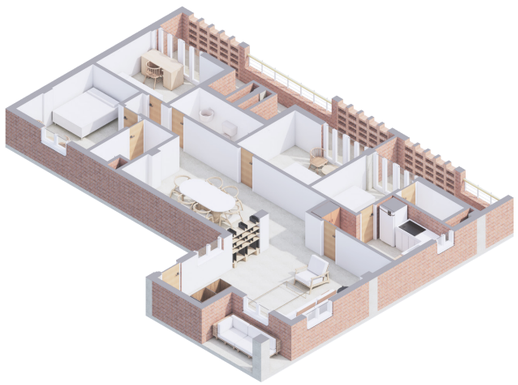


Middle income unit - 85sqm

For 4-6 people

Living space
Dining
3 bedrooms
Kitchen
2 toilet
Balcony (1.2m)



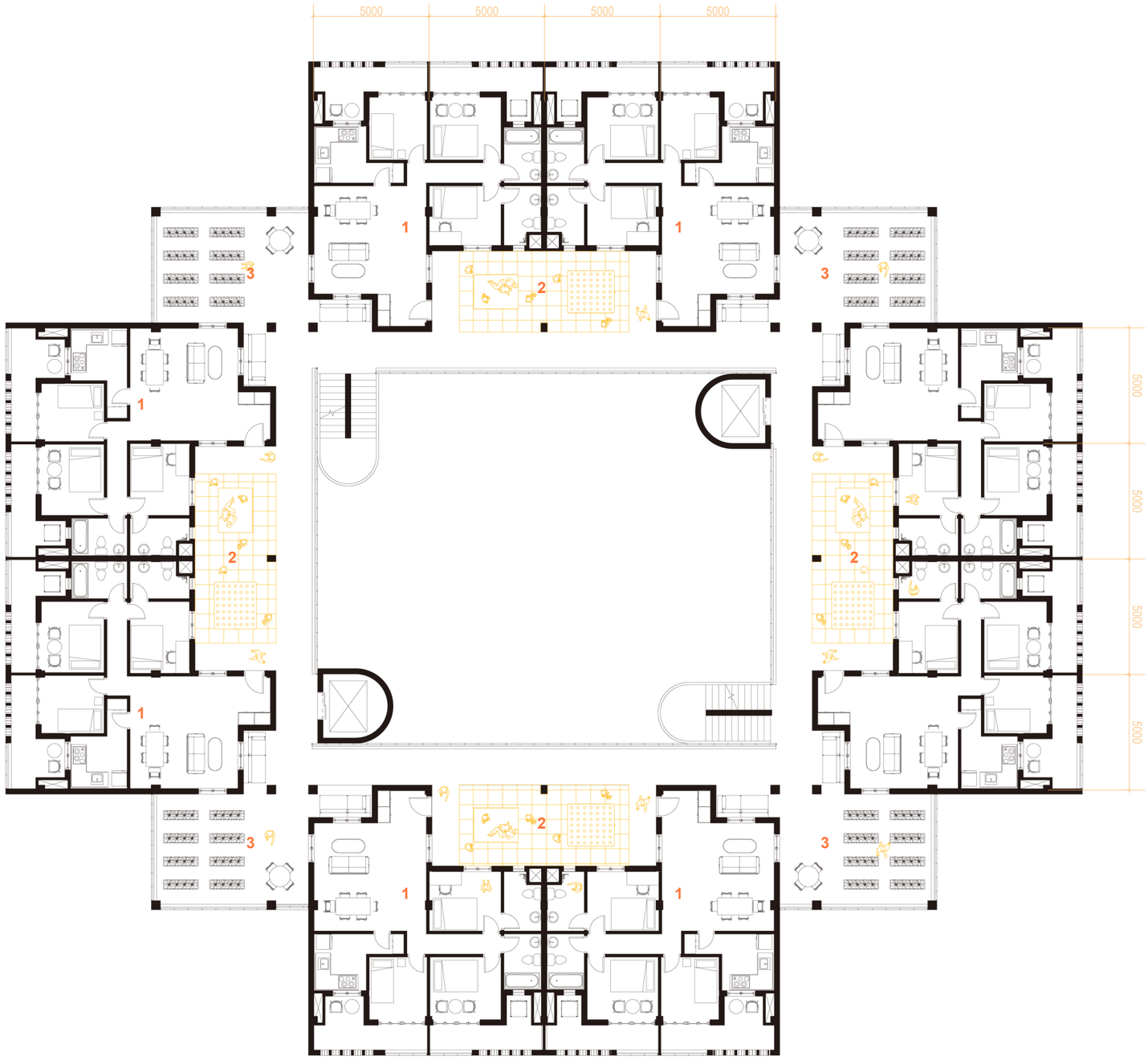


High income unit - 120sqm

For 4-6 people

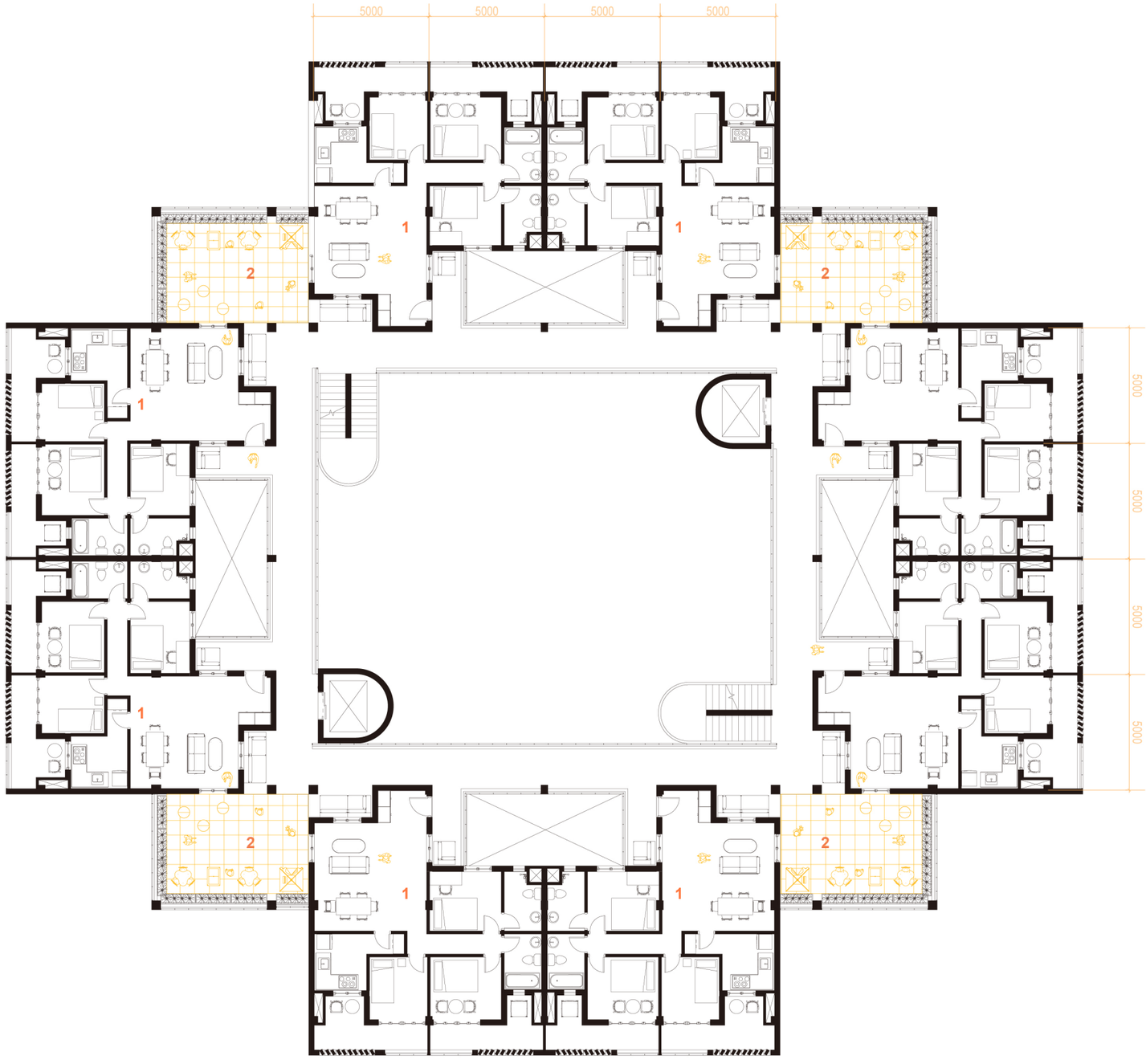
Living space
Dining
3 large bedrooms
Kitchen
ervant room
2 toilet
Balcony (1.2m)

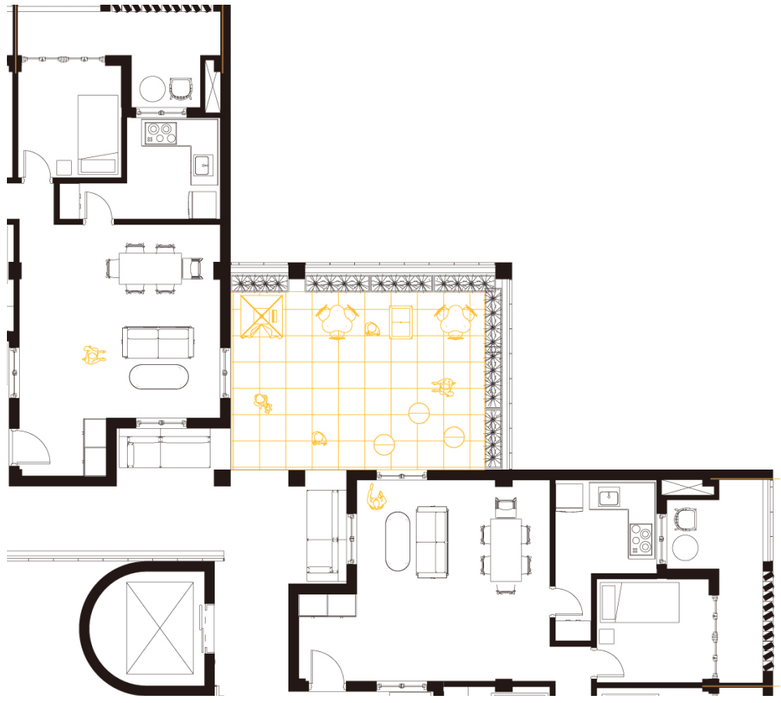
In the middle-income units, all residential functions are clearly separated. In the high-income units, privacy is given particular importance, reflecting cultural values in Bangladesh.



Middle income cluster 1st floor

1. 85 sqm three-bed unit (4-6 person)
2. Pocket play space
3. Farming balcony

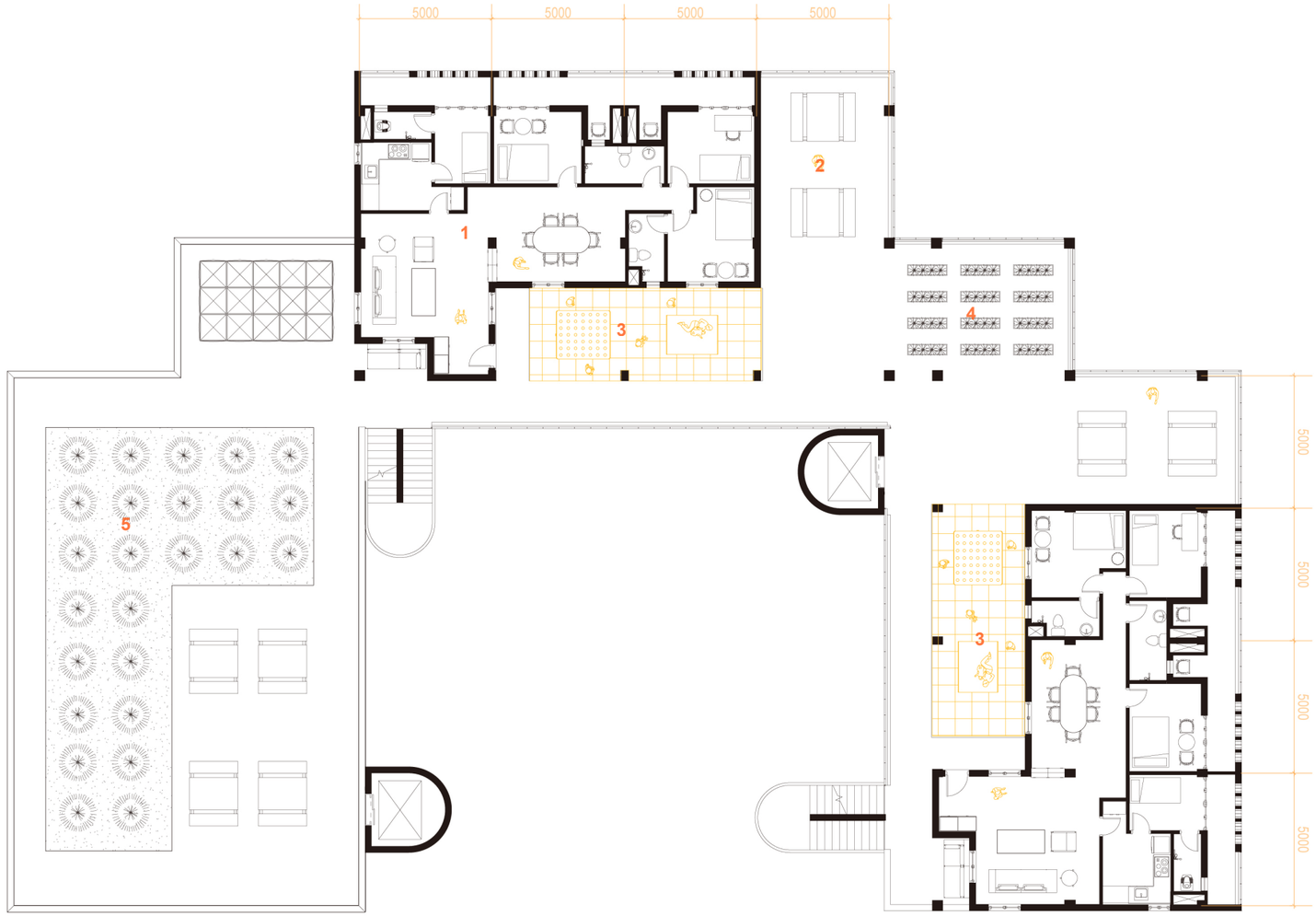




Middle income cluster 2nd floor

1. 85 sqm three-bed unit (4-6 person)
2. Pocket play space

Cluster Plans

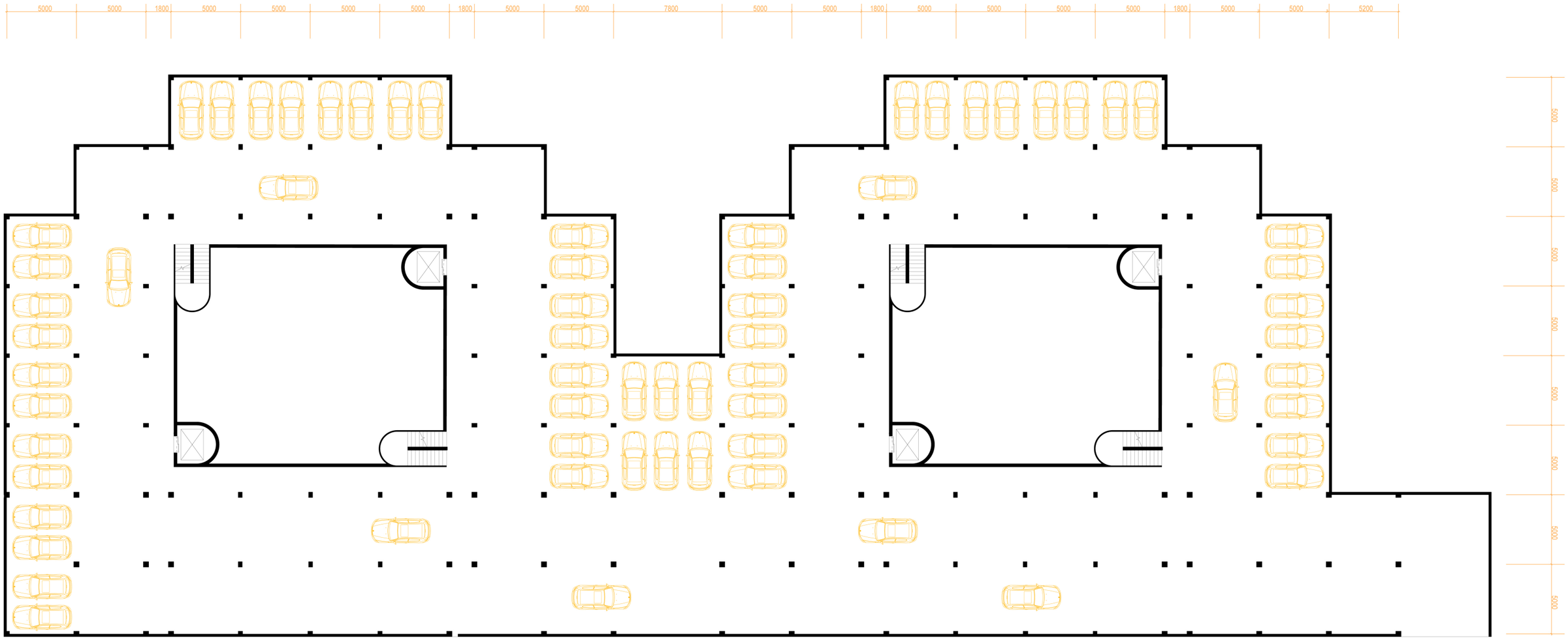


High income Floor

1. 120 sqm three-bed unit (4-6 person)
2. Exterior Balcony
3. Pocket play space
4. Farming balcony
5. Roof top Farming

View of the Playground

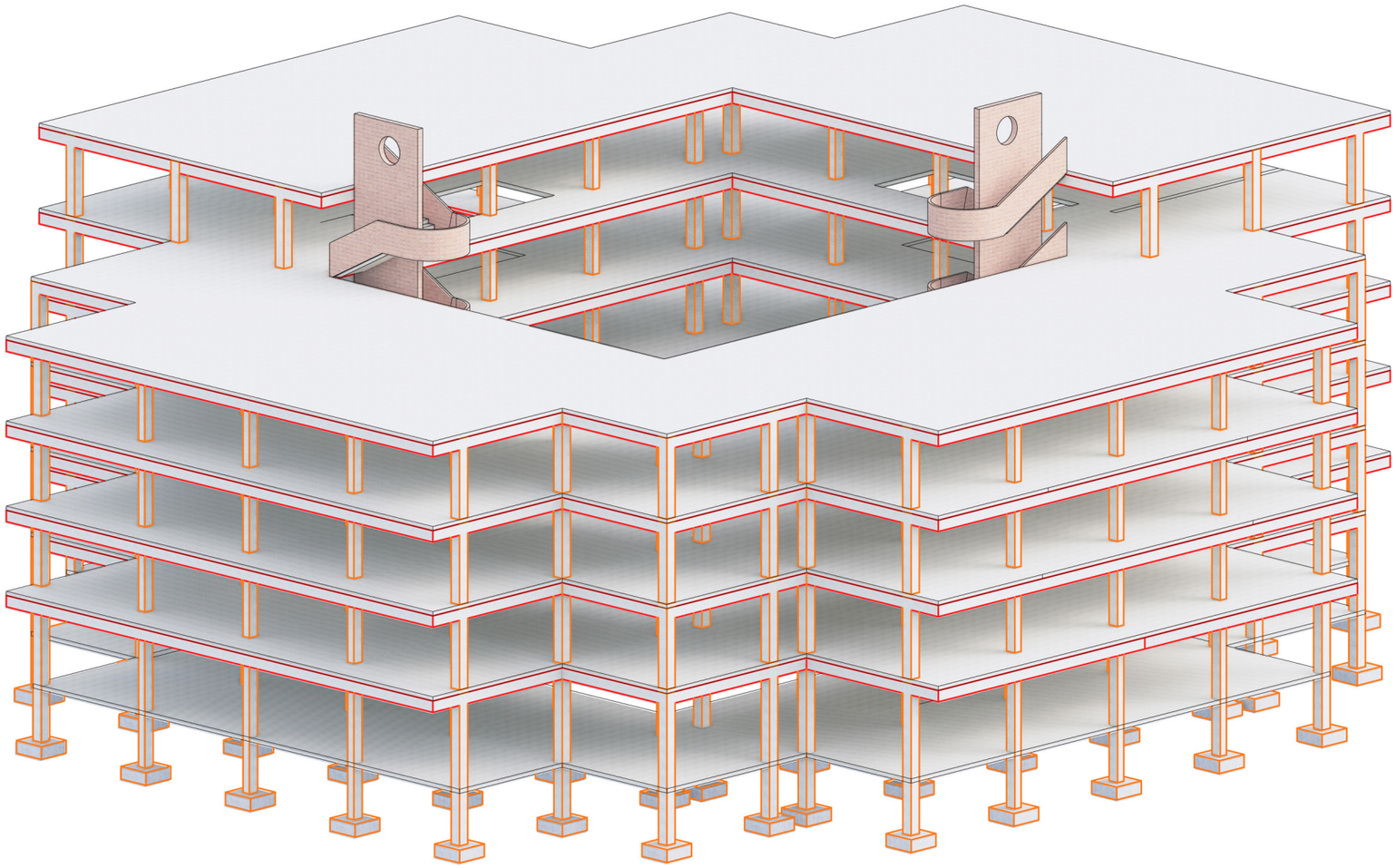
Cluster Plans



Parking Lot

1. 60 parking space

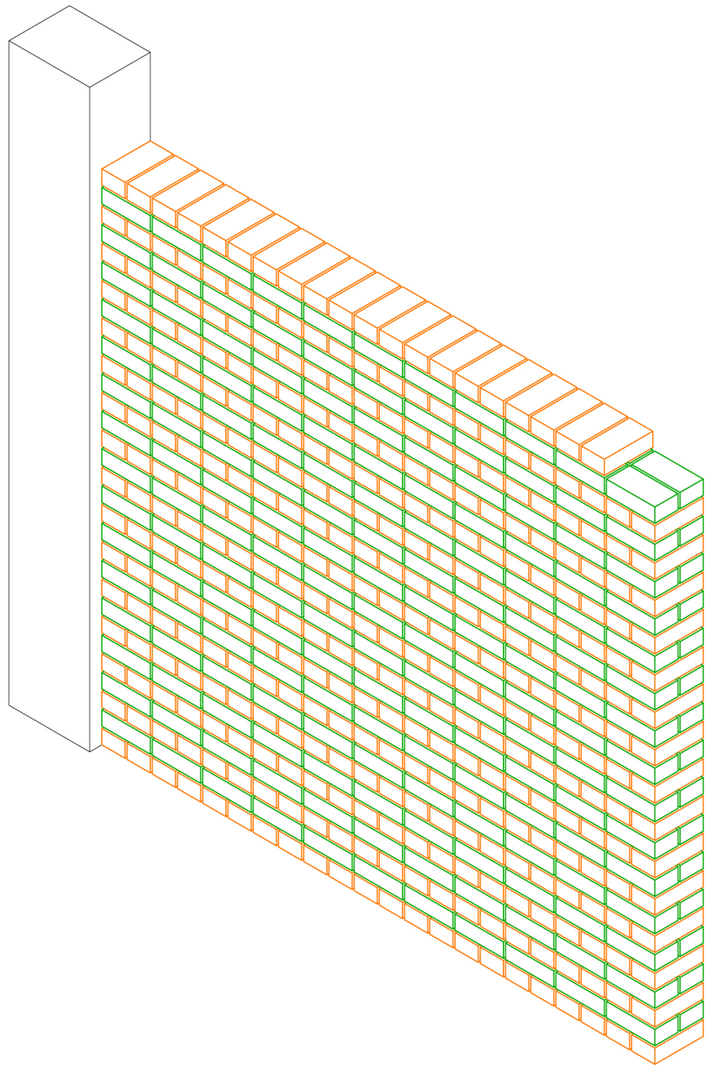
04. *Building Engineering*



LOAD BEARING STRUCTURE

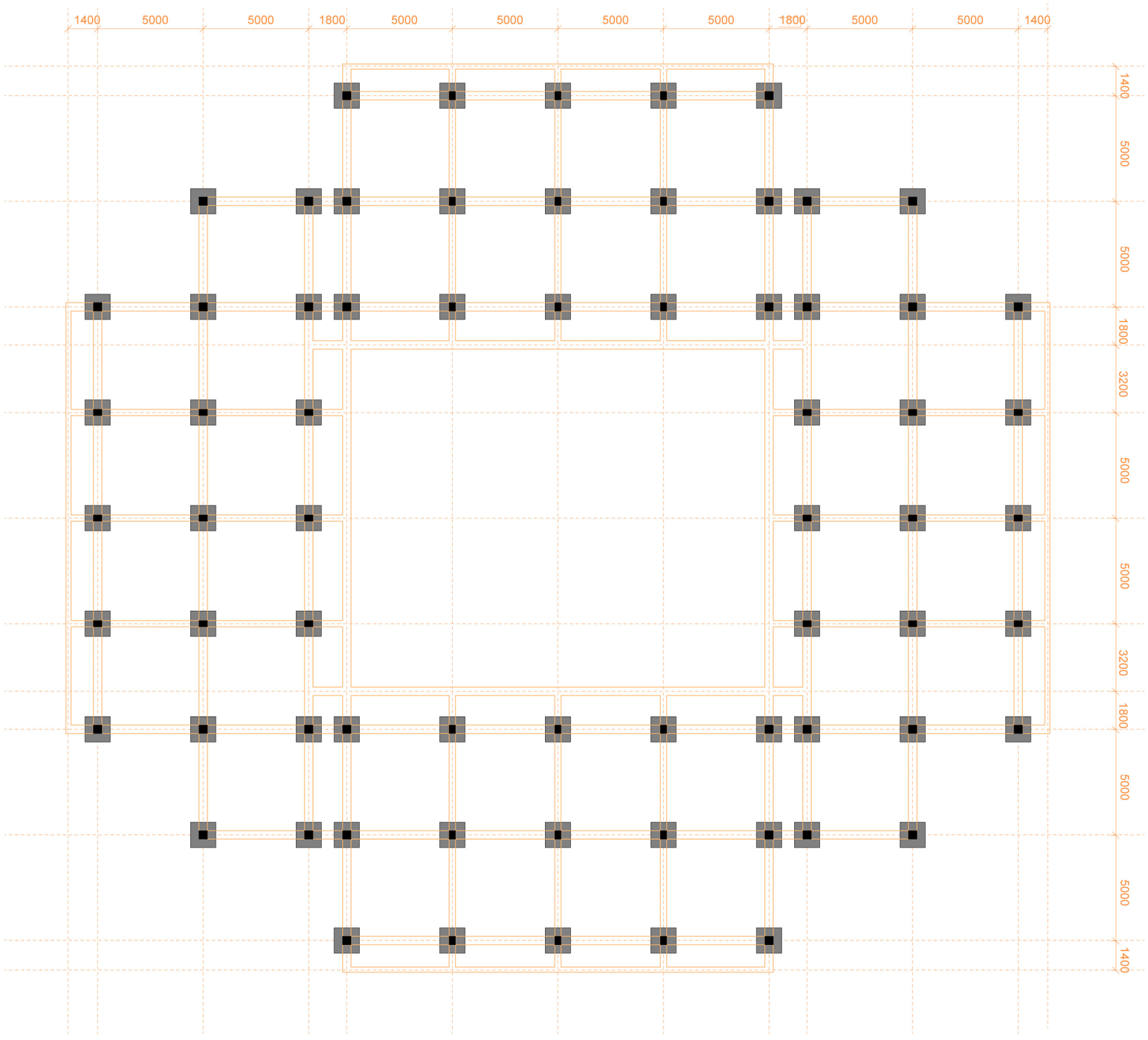
1. Concrete Column (400x400, 300x400)
1. Concrete Beam (400x400, 240x400)

Brick Infill

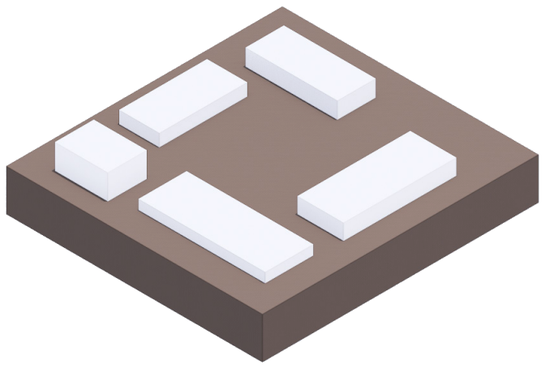


The application of the English brick bond resulted in a dense wall structure, effectively mitigating noise made by children.

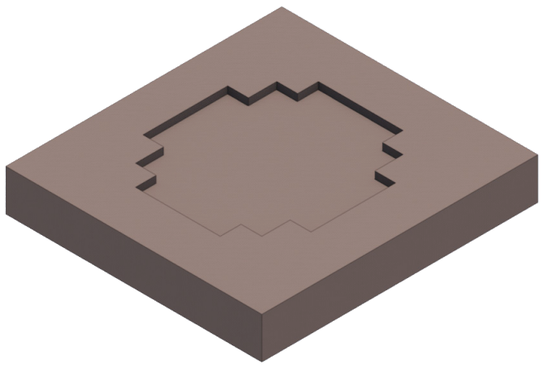
Structure Plan



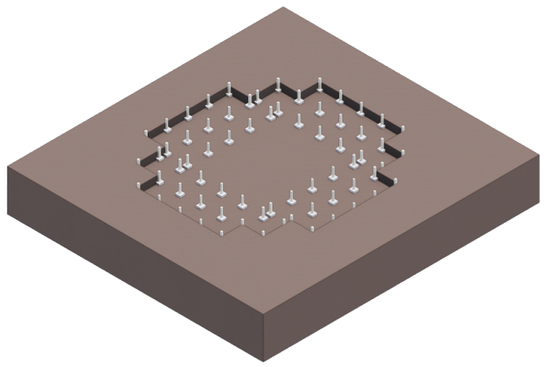
Construction Process



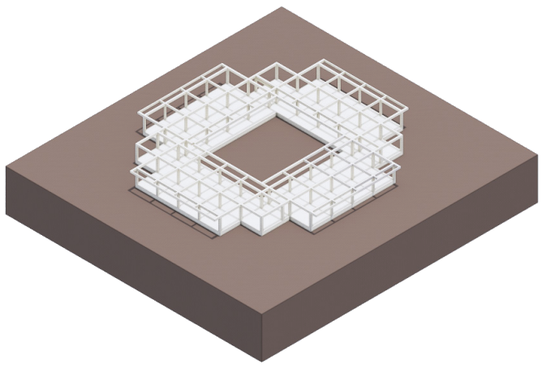
1. SITE PREPARATION



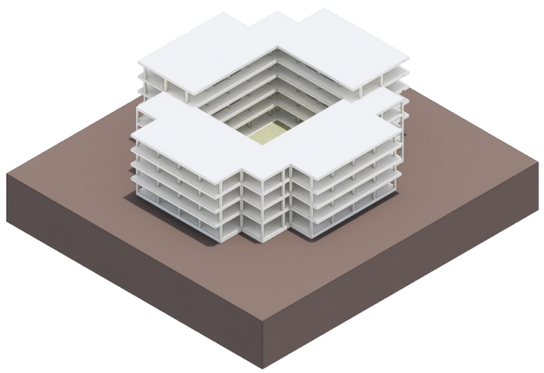
2. EXCAVATION



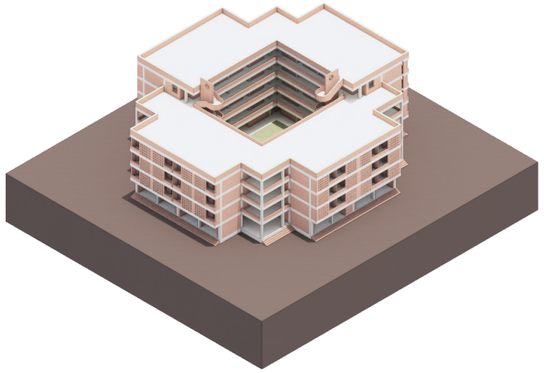
3. FOUNDATION



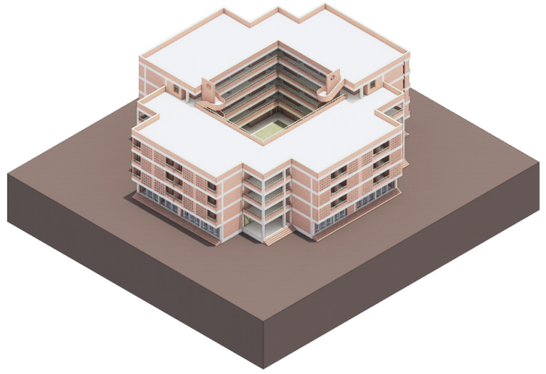
4, GROUND FLOOR



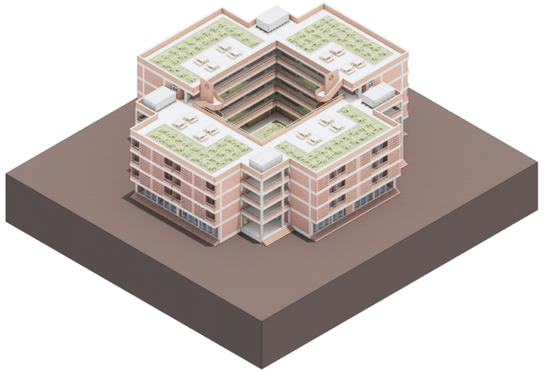
5. REPEATITION



6. BRICK INFILL



7. WINDOW AND DOOR



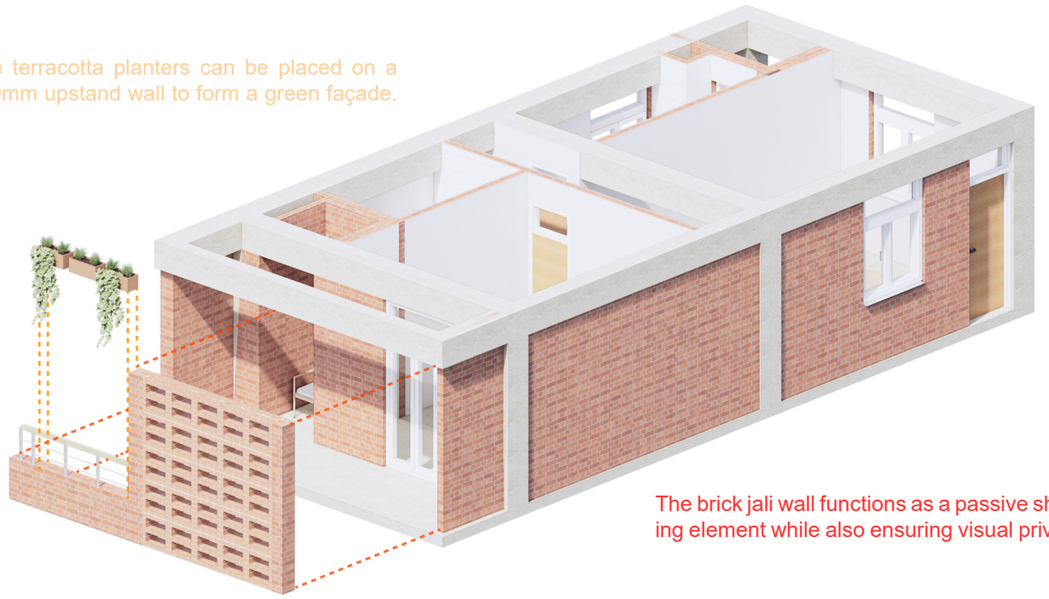
8. FINISH

Facade

SOUTH ELVEVATION

EAST ELEVATION

The terracotta planters can be placed on a 600mm upstand wall to form a green façade.



The brick jali wall functions as a passive shading element while also ensuring visual privacy

FIRE BRICK

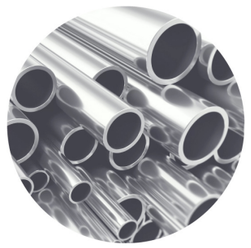
Affordability
Recyclable

CONCRETE

Durability

UPVC

Affordability
Easy to maintenance

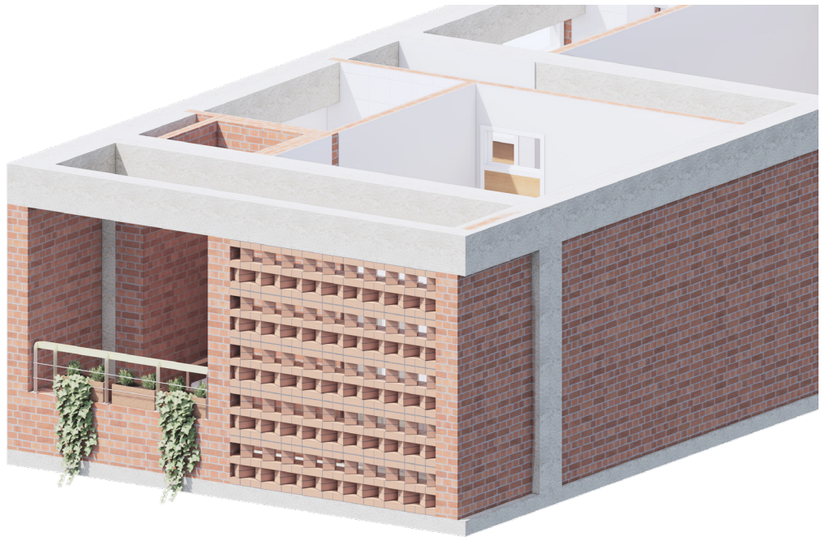


Metal

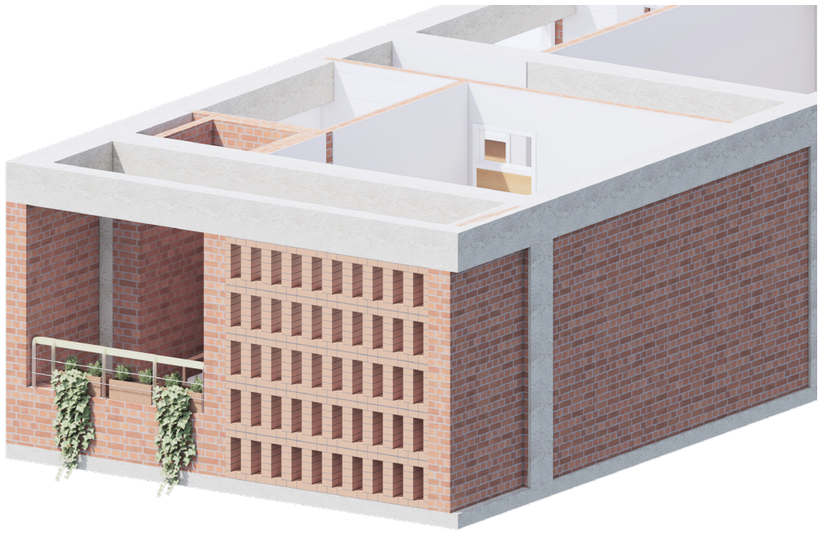
Aesthetics

Brick Jali Wall

Horizontal Brick Jali Wall



Crossed Brick Jali Wall



Vertical Brick Jali Wall

Various types of brick jali walls add diversity to the façade, enhance the residents' privacy, and simultaneously provide shading to block excessive sunlight.

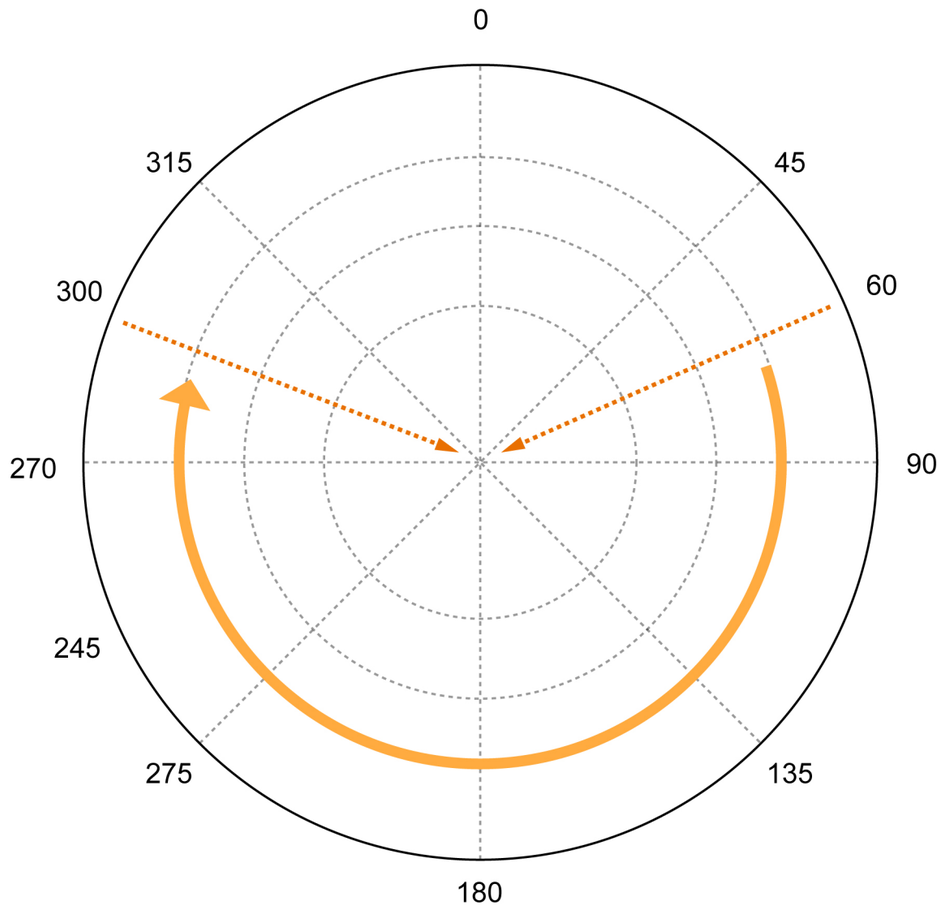
South Shading

To shade the southern sunlight, a minimum 0.7-meter shading space is required. To make use of this shading area, a 1.4m balcony was created, transforming it into a meaningful and functional space.

Latitude: 24˚
Sun Angle (meridian altitude) = 90˚-24˚ +23.5˚= 89.5˚ (SUMMER)
90˚-24˚ =66˚ (March)
90-24-23.5= 42.5 (Winter)

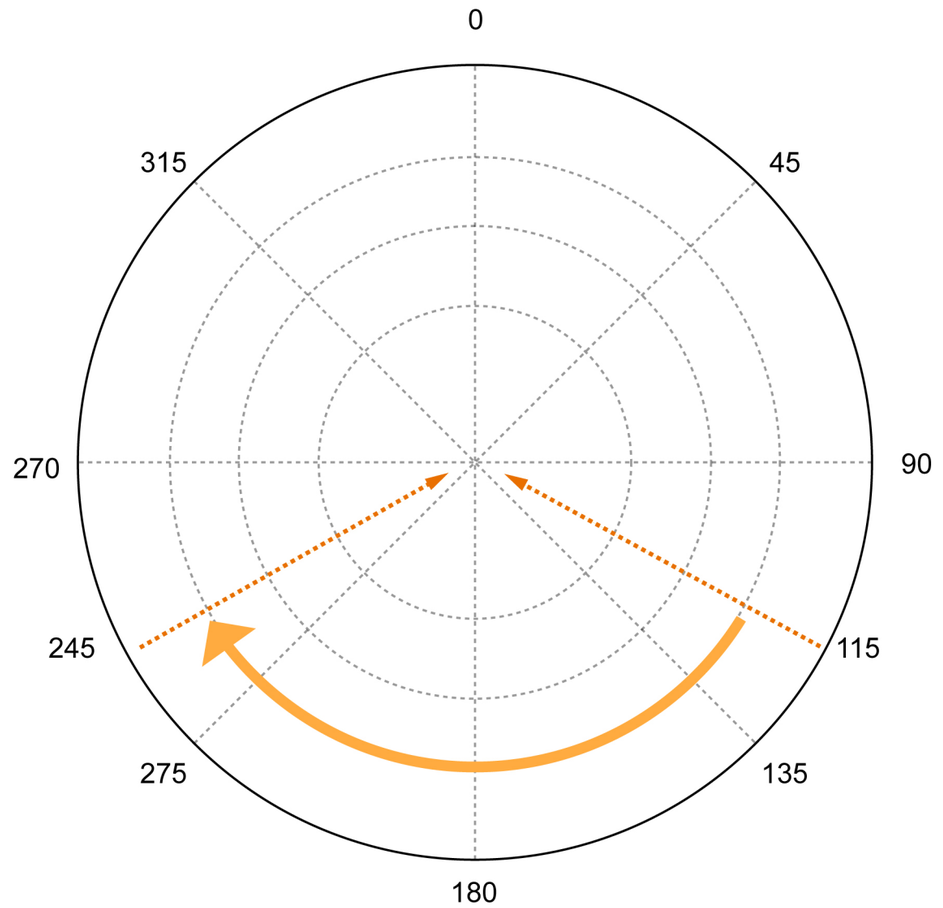
tan 24˚ (0.45) * 1.5M = 0.7M

Sun path Azimuth in Sylhet (Summer)



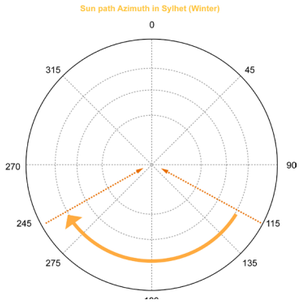
In summer, the sun rises in the northeast and sets in the northwest.

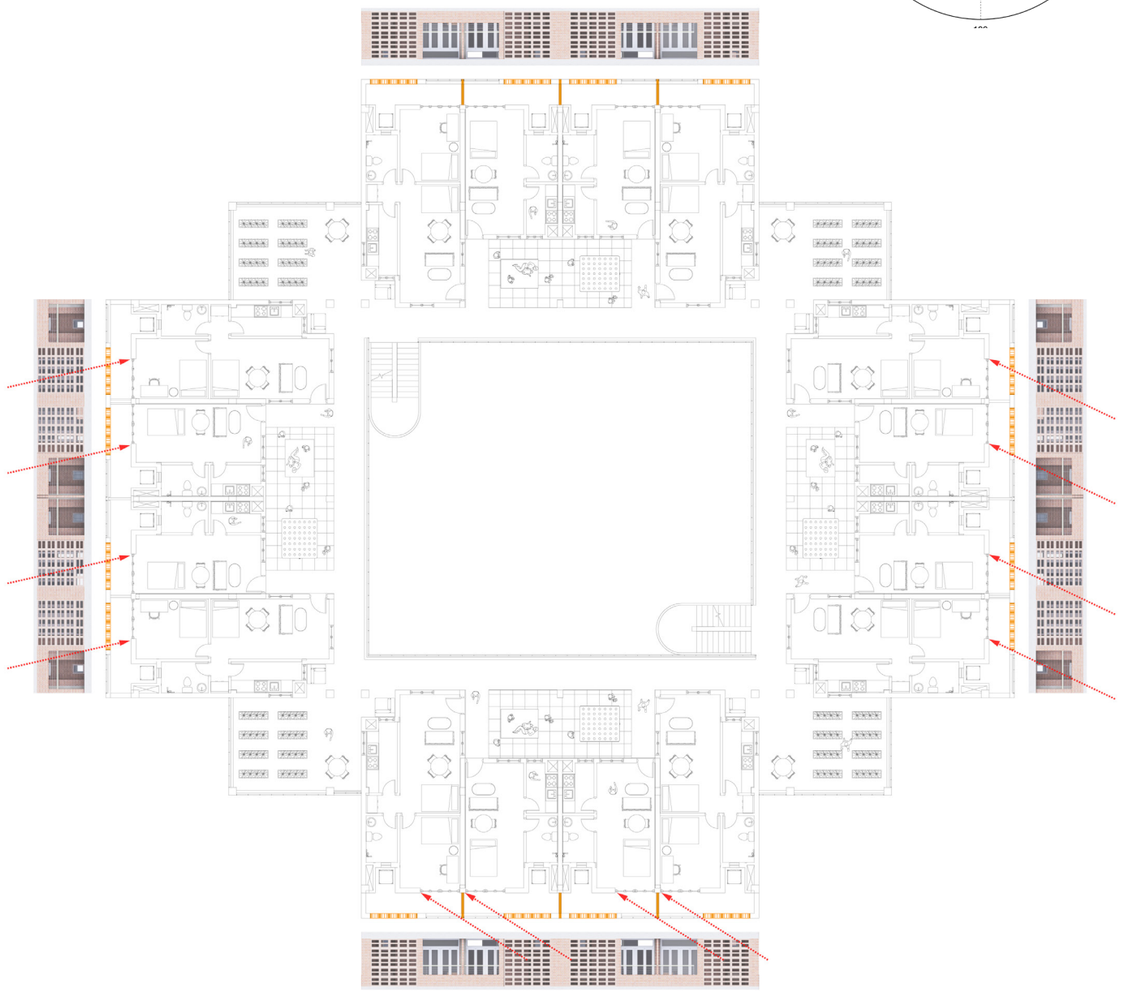
Sun path Azimuth in Sylhet (Winter)



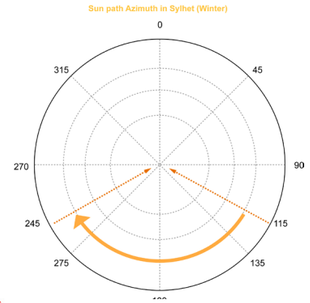
In winter, the sun rises in the southeast and sets in the southwest.

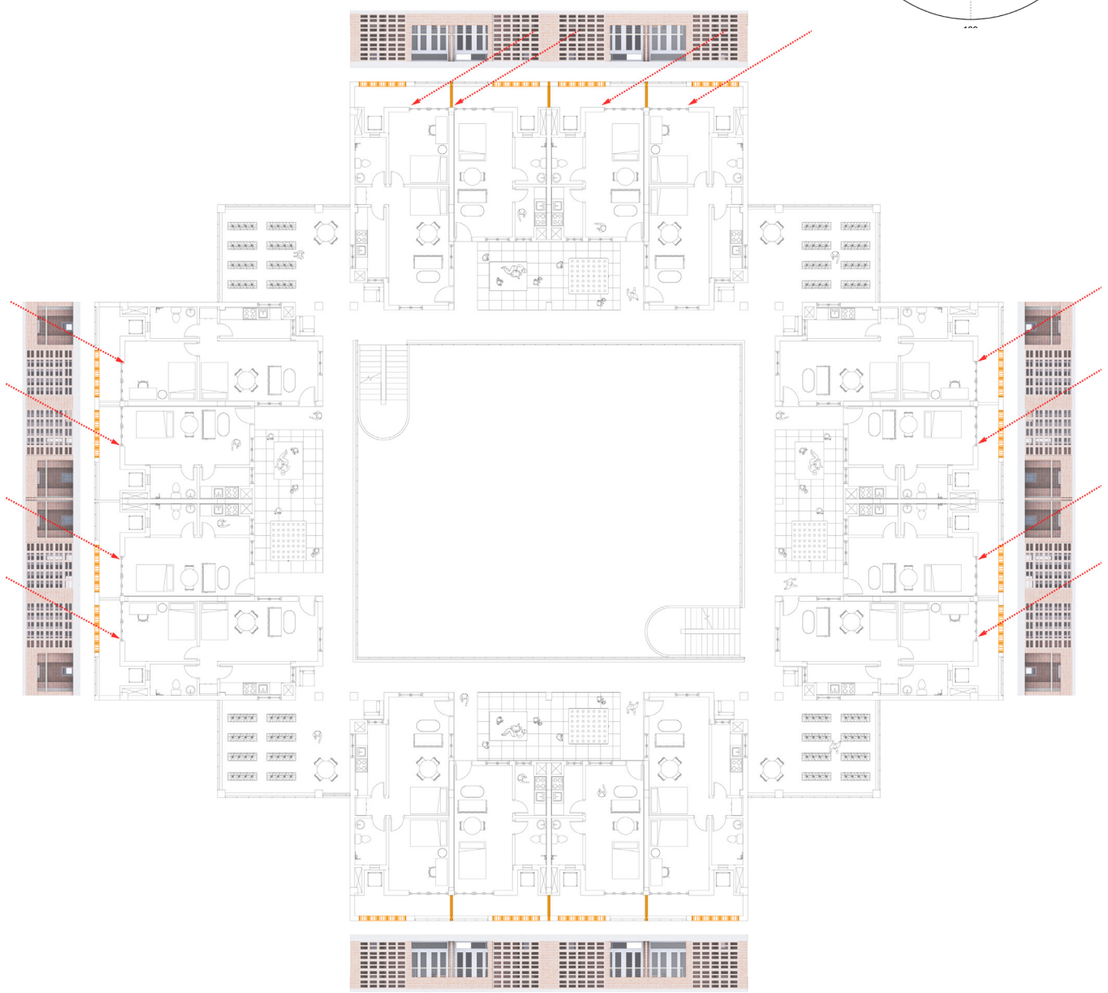
Winter & Summer Shading





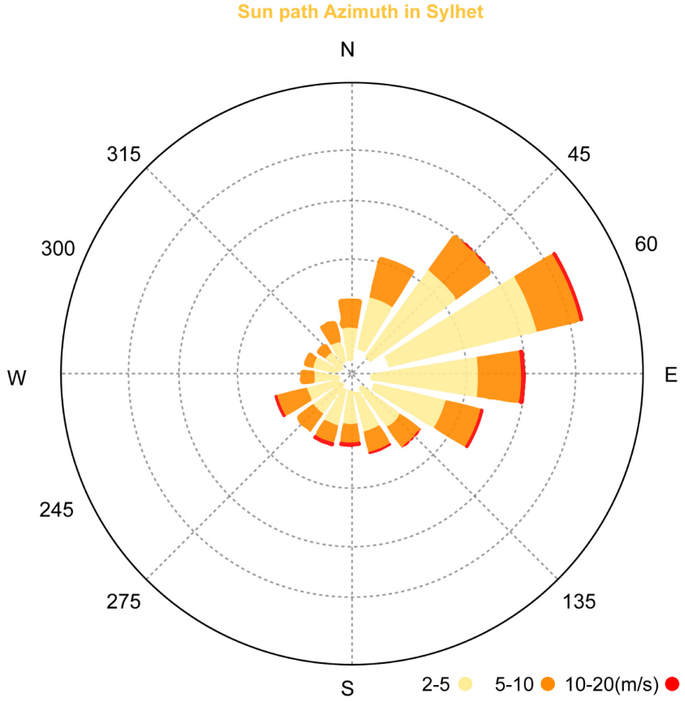
In summer, temperatures in Sylhet can rise up to 34°C, making east- and west-facing shading essential. The brick jali wall and partition wall shade the façade, effectively preventing overheating.

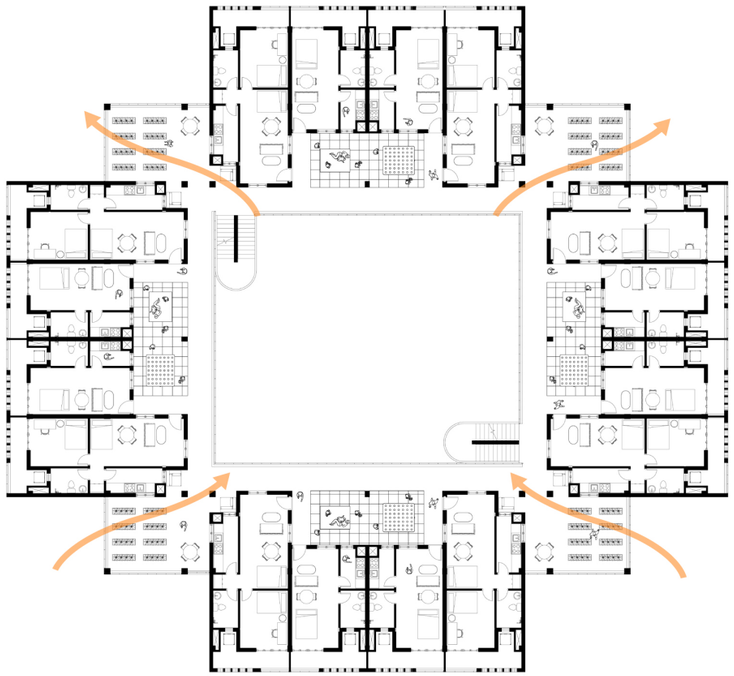


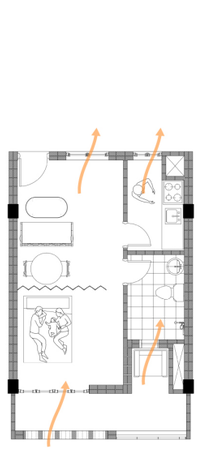


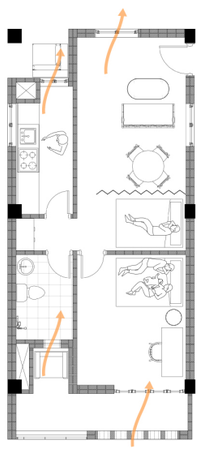
In winter, temperatures in Sylhet can reach up to 28.3°C, making east- and west-facing shading necessary even during the cooler months. The brick jali wall and partition wall provide shading for the façade, helping to prevent overheating.

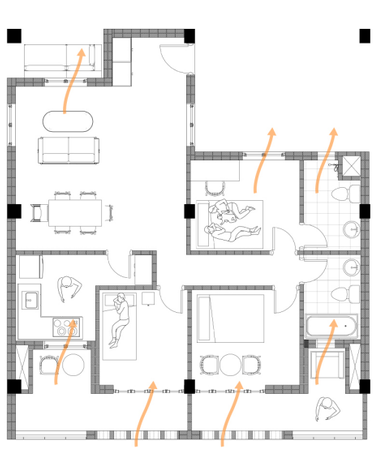
Cross Ventilation

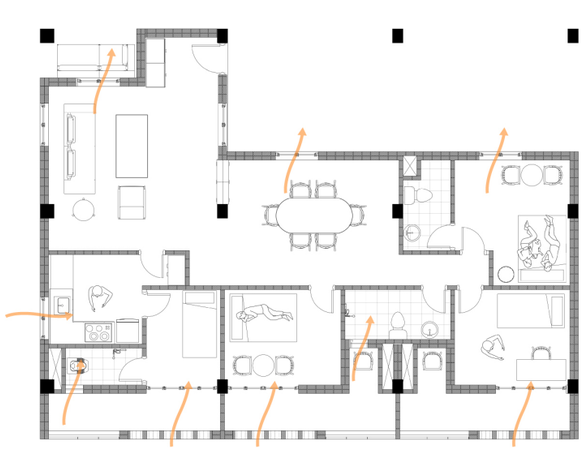






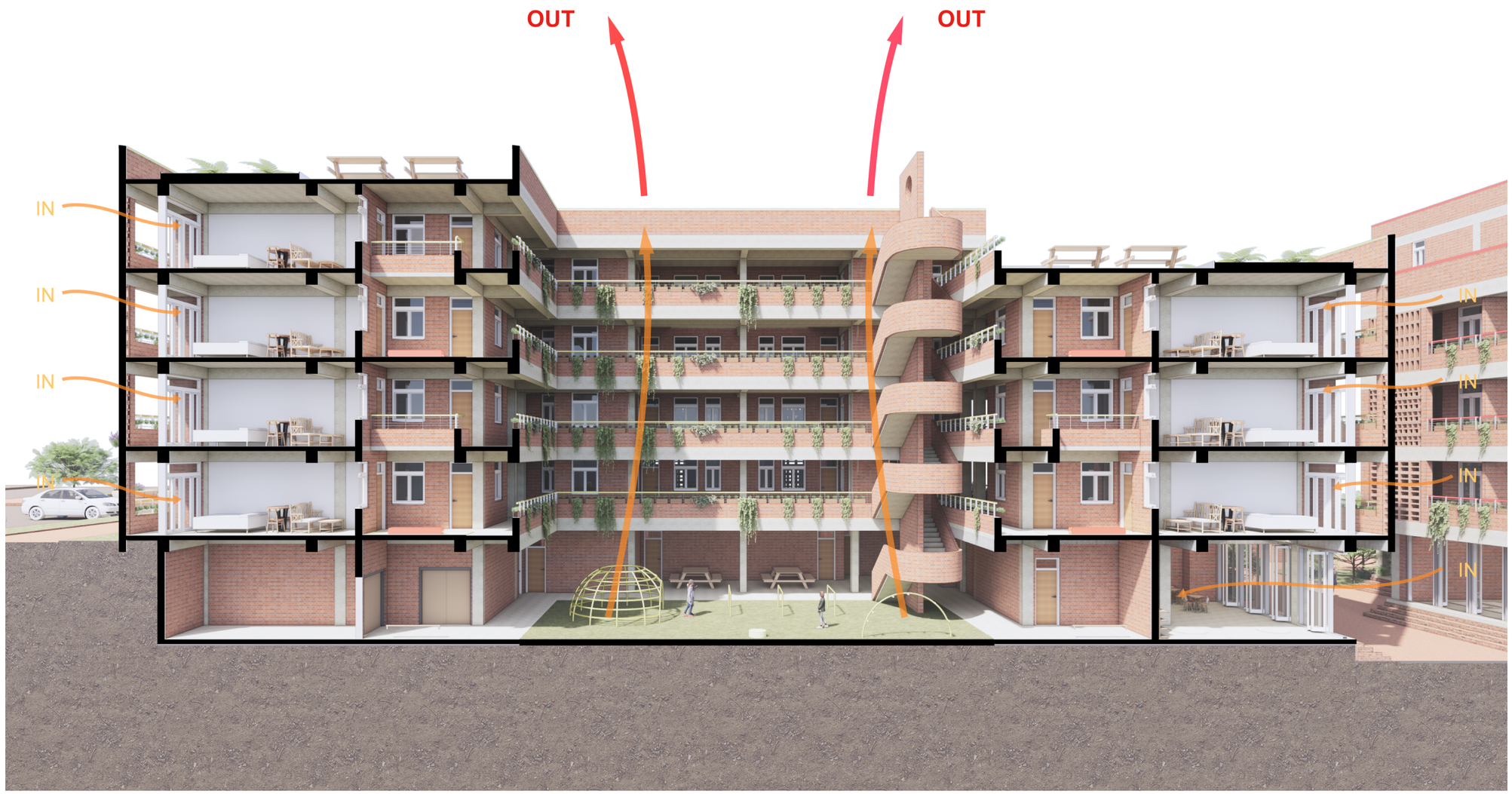






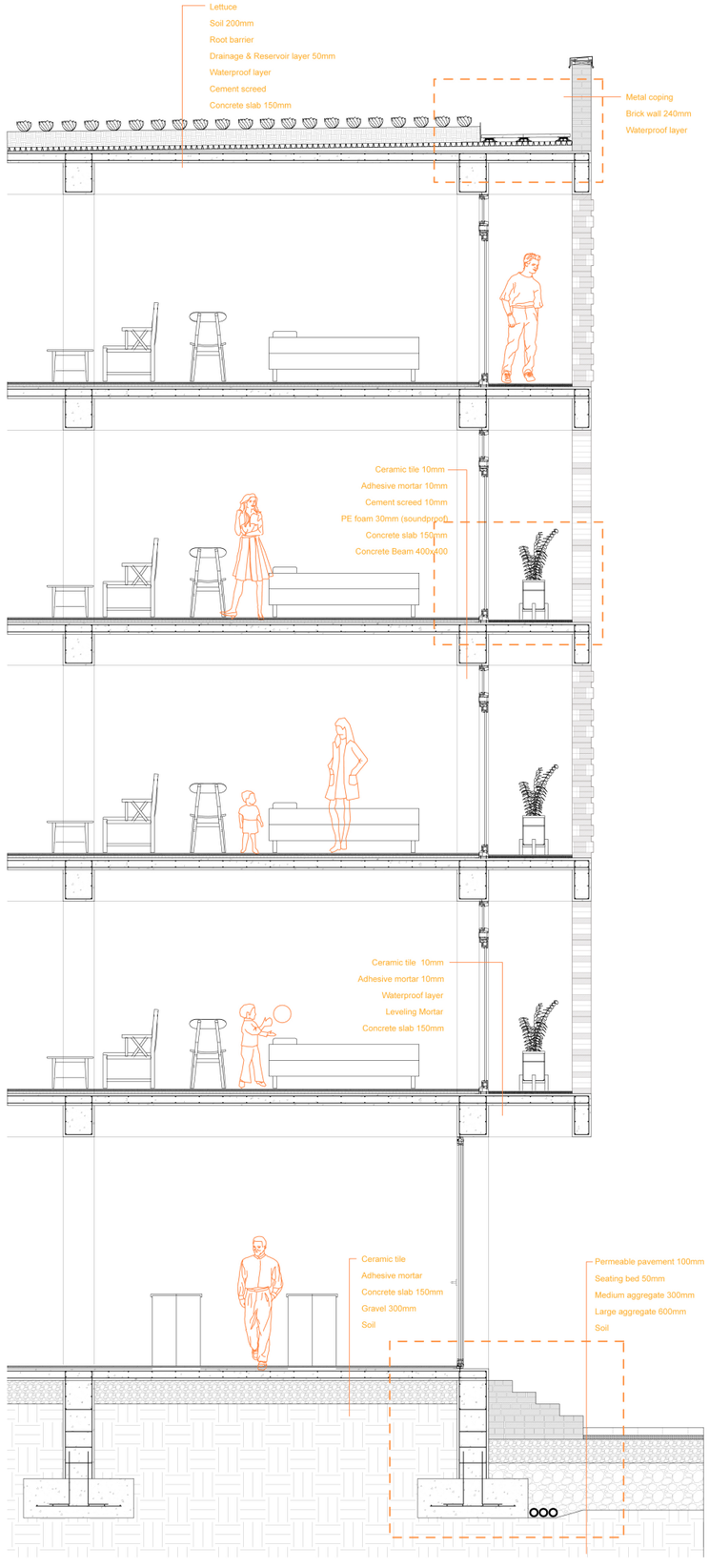
Each unit is designed to effective natural cross ventilation
for improved airflow and indoor comfort.

Stack Ventilation

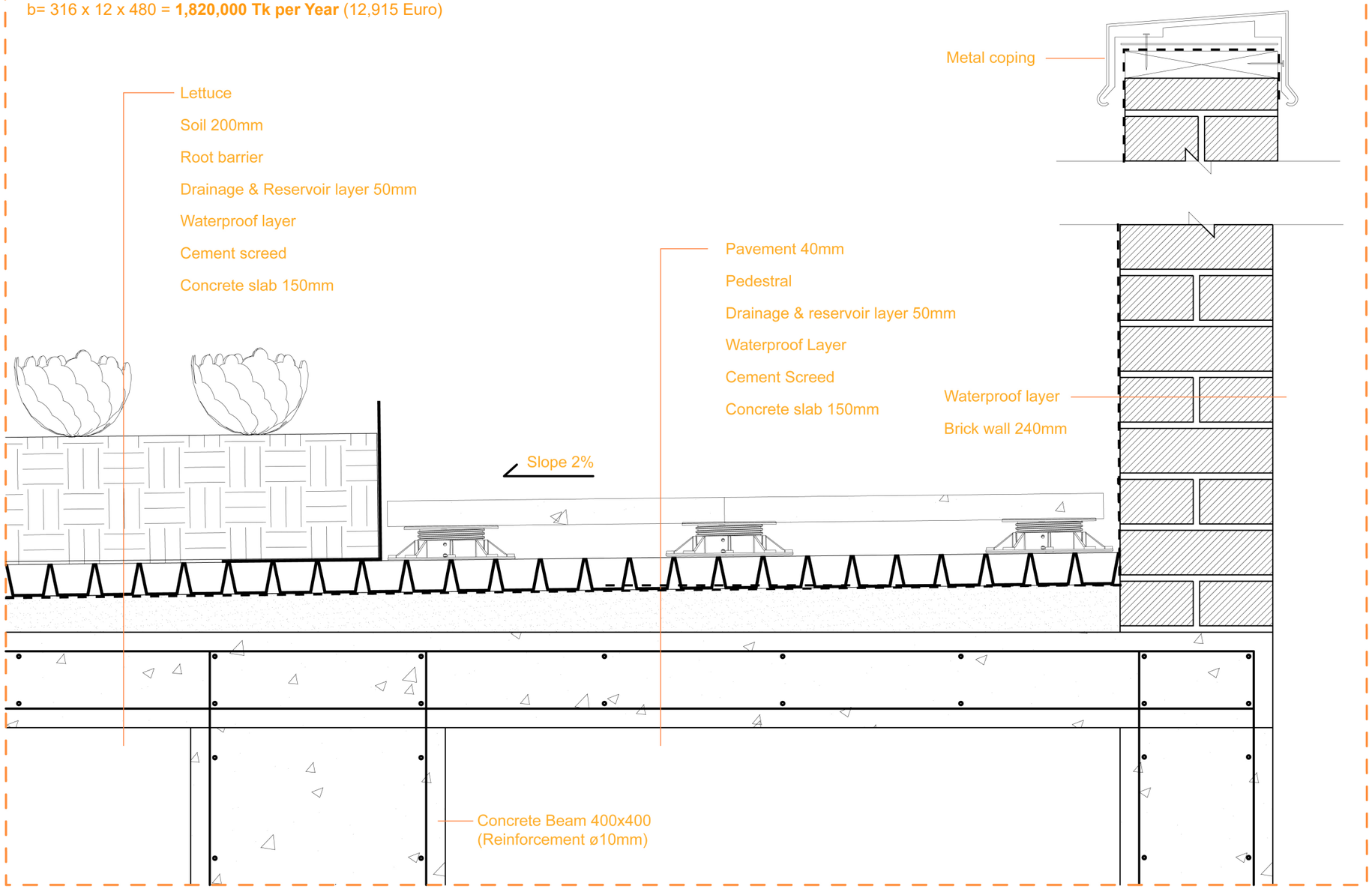


The courtyard, featuring a central green area, promotes stack ventilation across the cluster by encouraging vertical airflow through temperature differentials.

Vertical Section

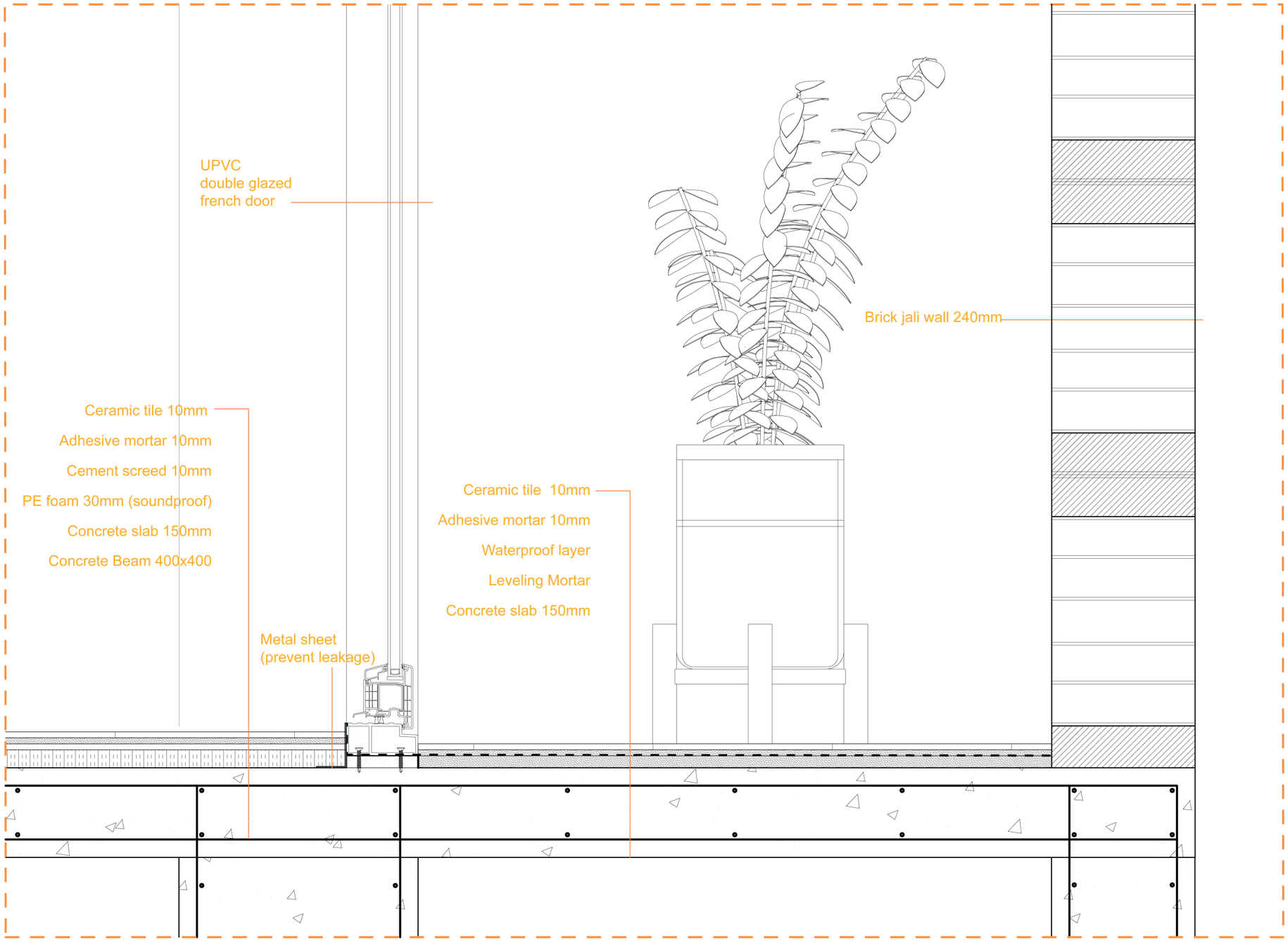


Urban Farming (Vegetable Value)
b=P*g*a (Tomalty & Komorowski, 2010)
a= square meter
g= duration of growing season
P= productity (158-1580 Tk per Month)
b= 316 x 12 x 480 = **1,820,000 Tk per Year** (12,915 Euro)



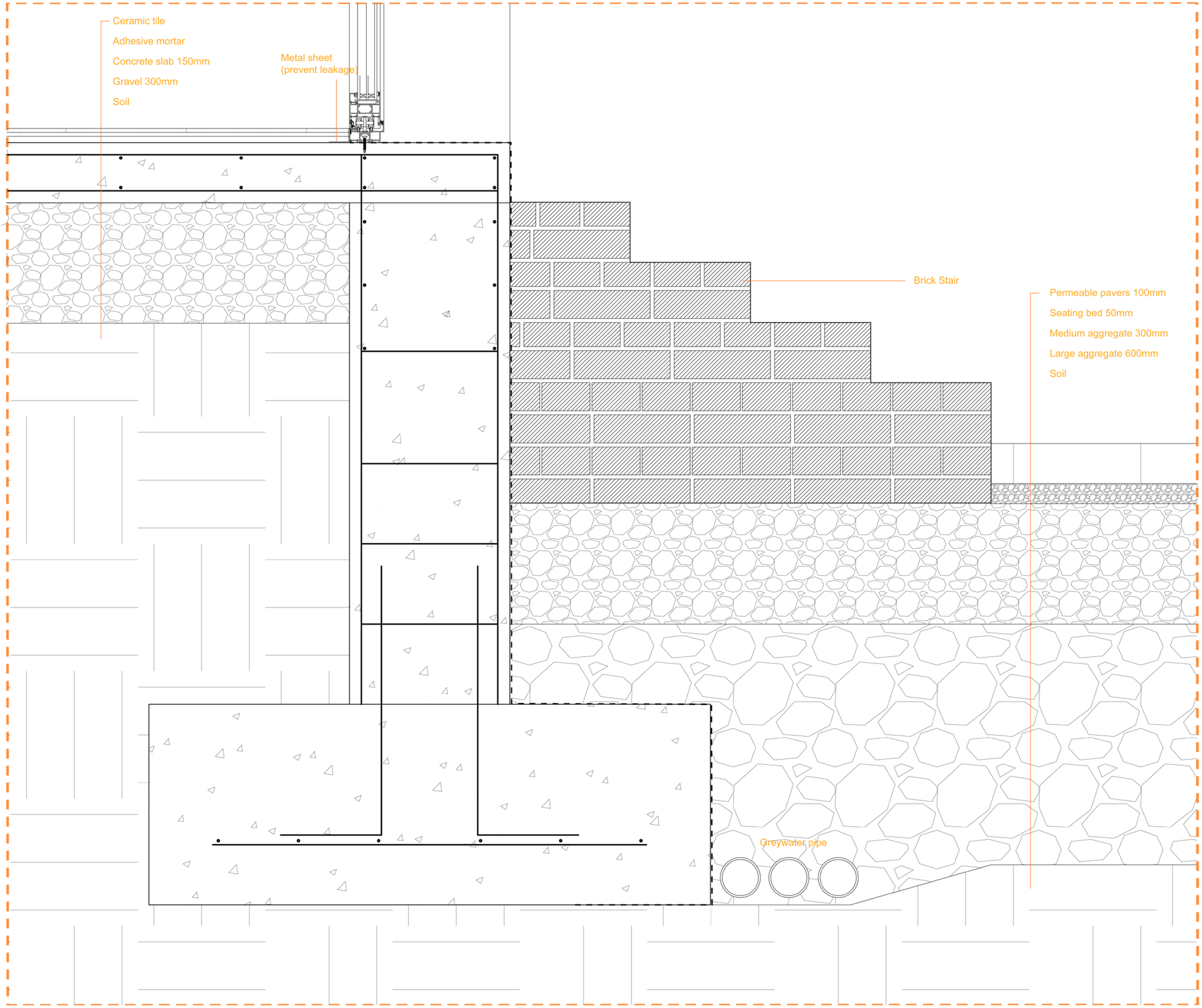
The 480 sqm extensive rooftop garden produces food worth 1,820,000 Tk per year (approximately 12,915 euros), supporting food self-sufficiency for children from low-income families.

Fragment - 2



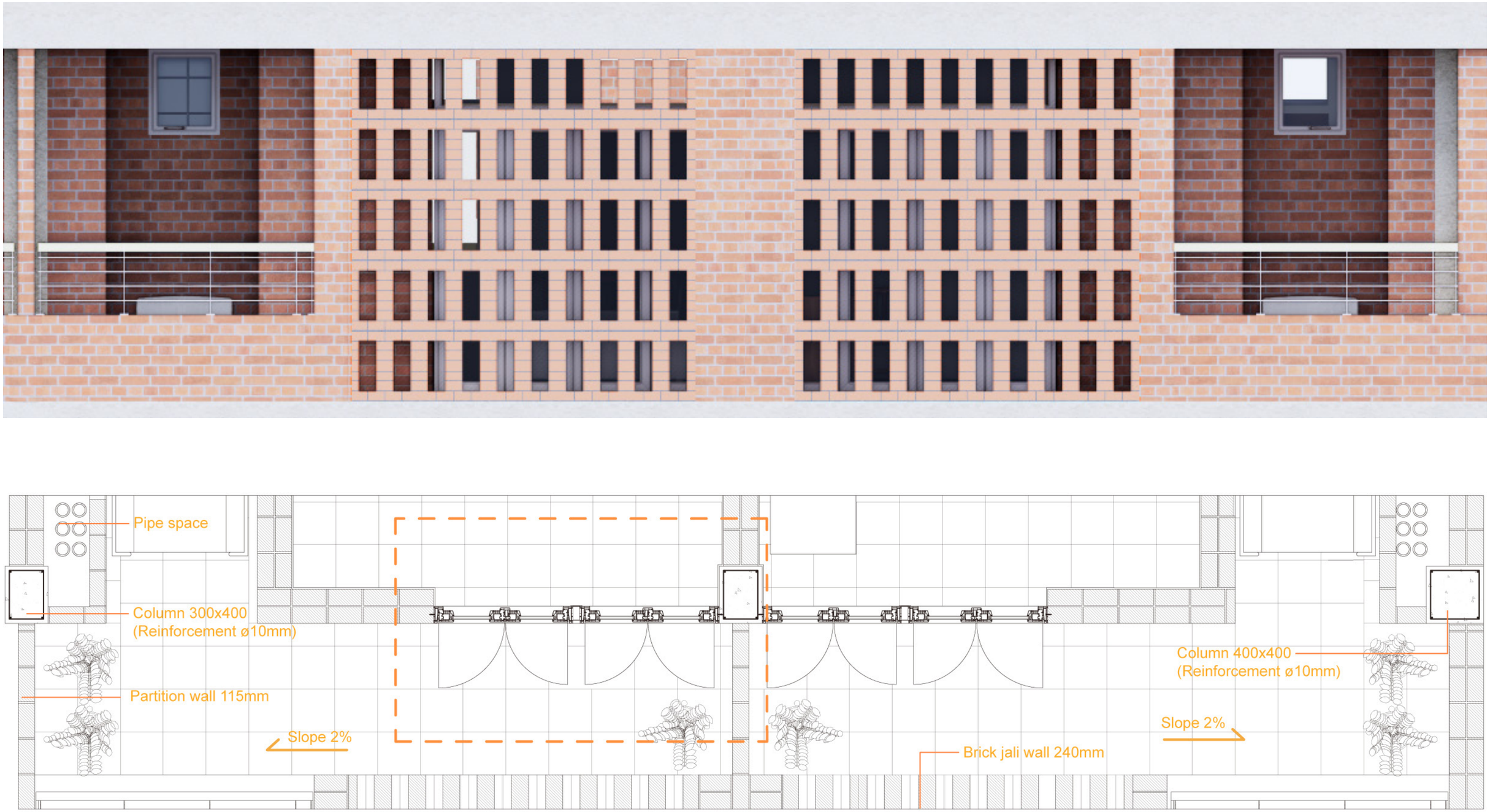
PE foam, a material that is readily available in Bangladesh, is applied to the flooring to absorb impact and reduce noise transmission between floors caused by children's activities.

Fragment - 3

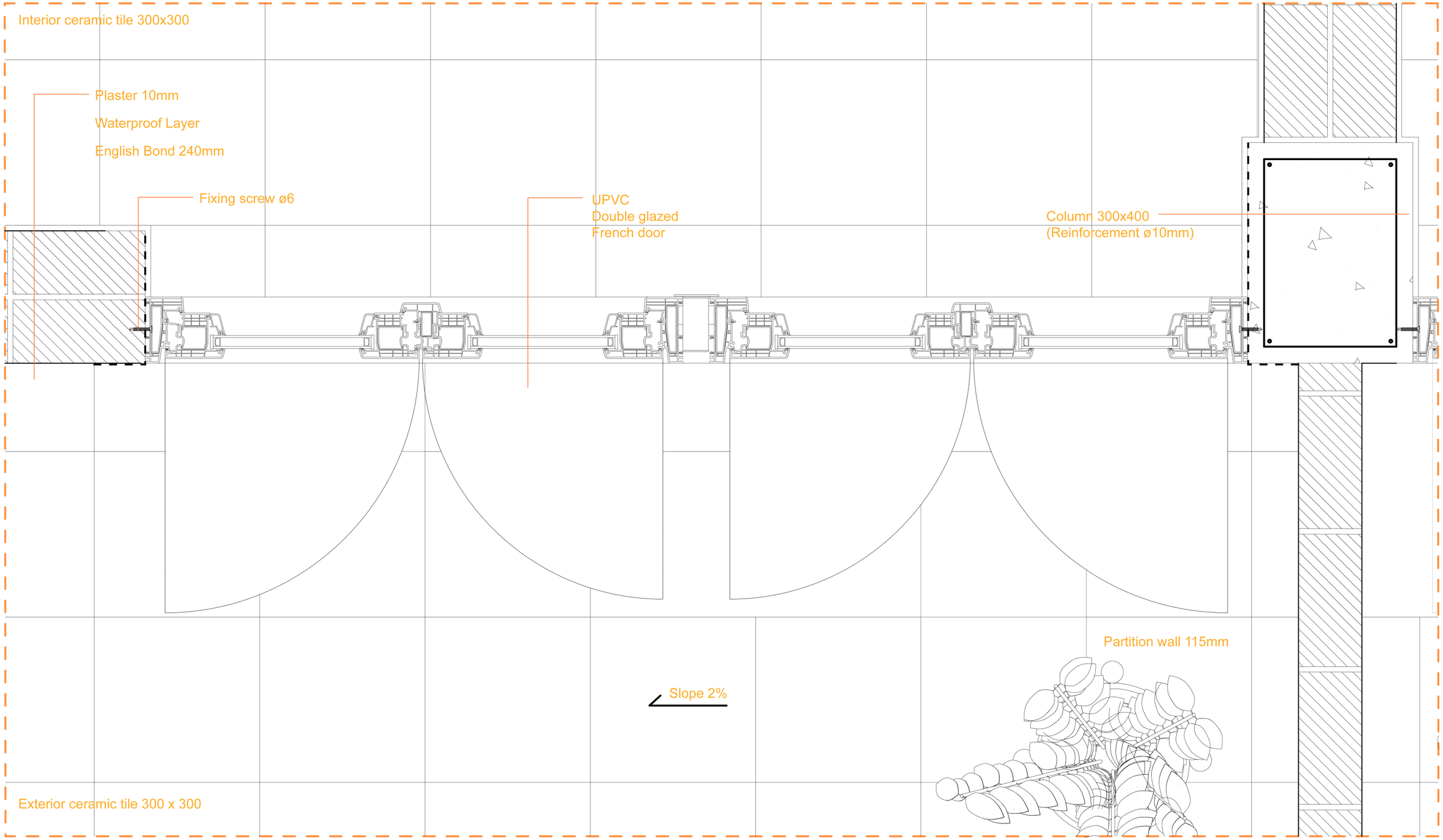


A greywater pipe installed beneath the permeable pavement absorbs rainwater and facilitates its reuse, thereby reducing the consumption of potable water.

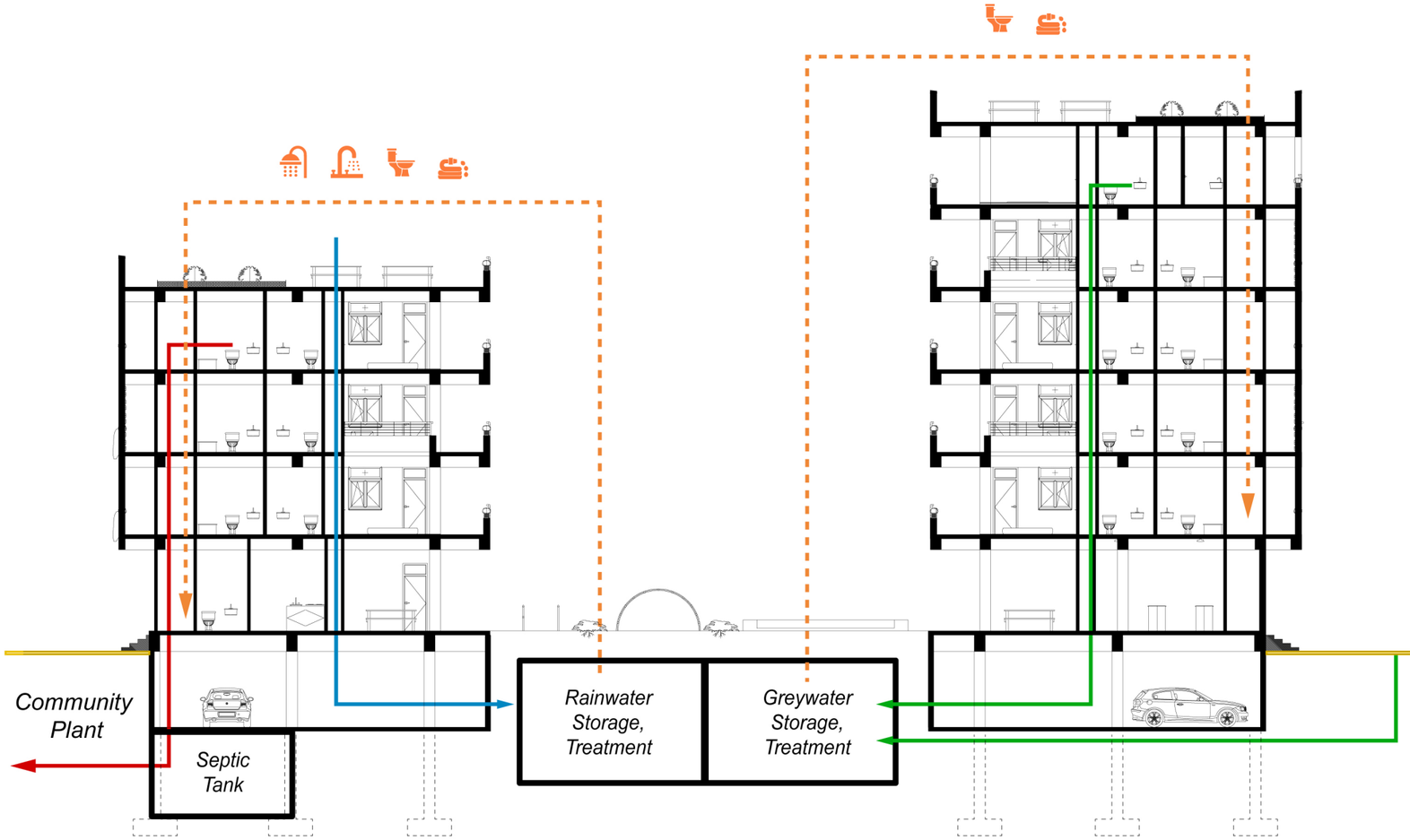
Horizontal Section



Fragment - 4


Interior ceramic tile 300x300
Plaster 10mm
Waterproof Layer
English Bond 240mm
Fixing screw ø6
UPVC
Double glazed
French door
Column 300x400
(Reinforcement ø10mm)
Partition wall 115mm
Slope 2%
Exterior ceramic tile 300 x 300

Water Mangement



RAIN WATER

Roof area of a cluster: 1200 sqm
Maximum rainfall per day: 305 mm
Collection rate: 70%
1200 * 0.3 * 0.7 = 252m3

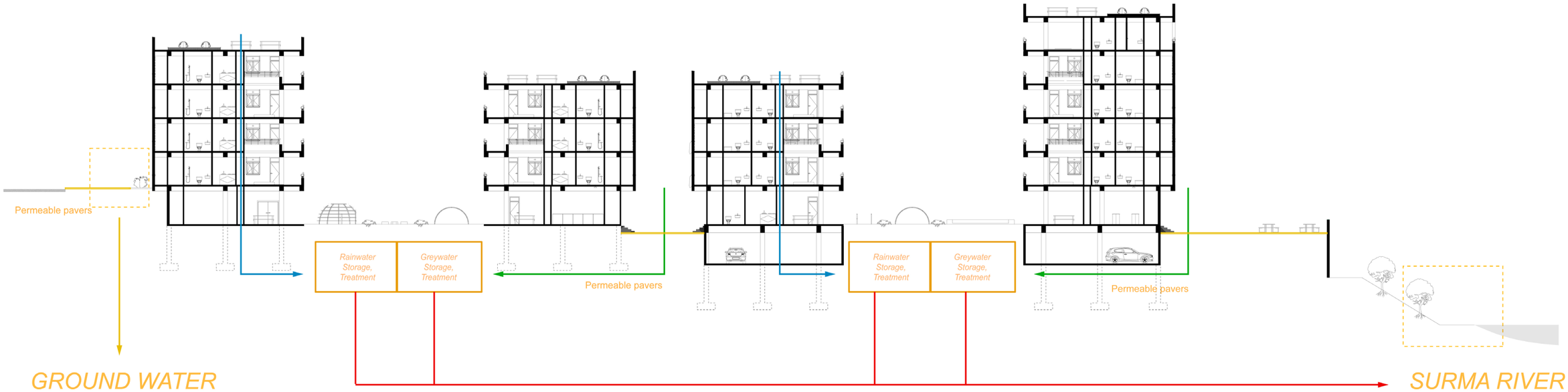
70% of the rainwater can be collected in the flat roof, and go to the treatment tank, after that, the treated water will be stored and pumped to be reused for flusing, irrigation and other non potable tap.

GREY WATER

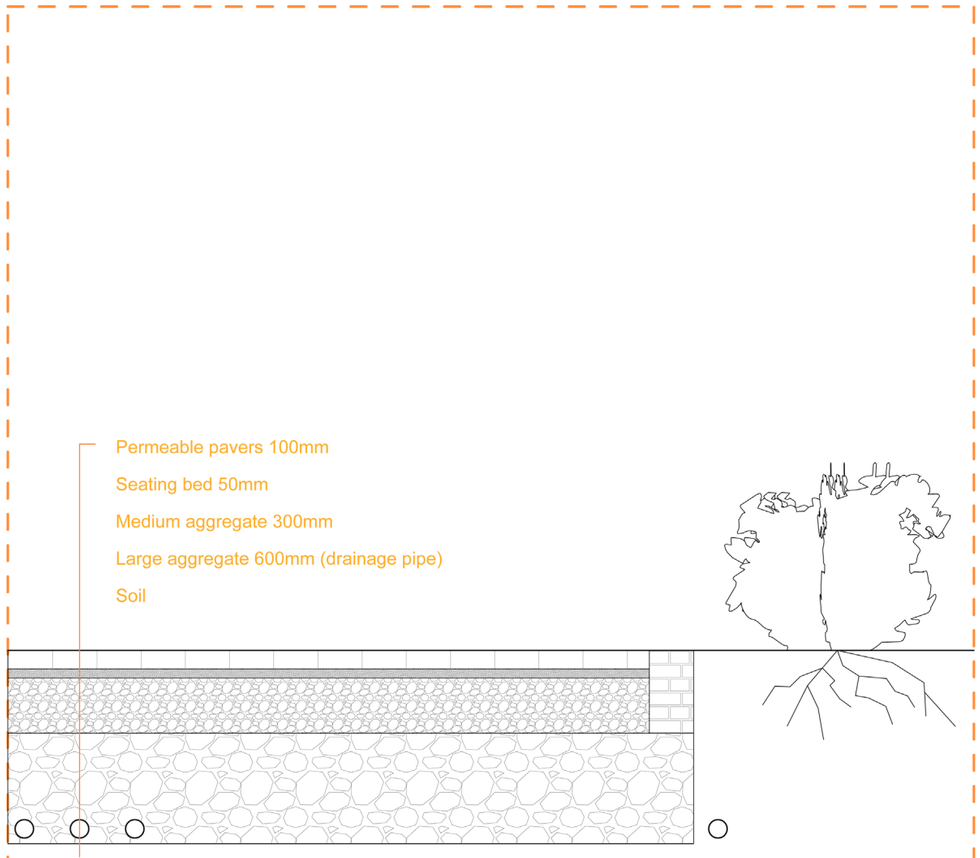
Number of residents: 280
Water consumption per person: 100 L/day
Water consumption of a cluster per day:
280×100 L =28000L=28 m3

Grey water include the waste water from laundry and shower, and the stormwater collected from the street, after treatment, they can be reused for flushing and irrigation.

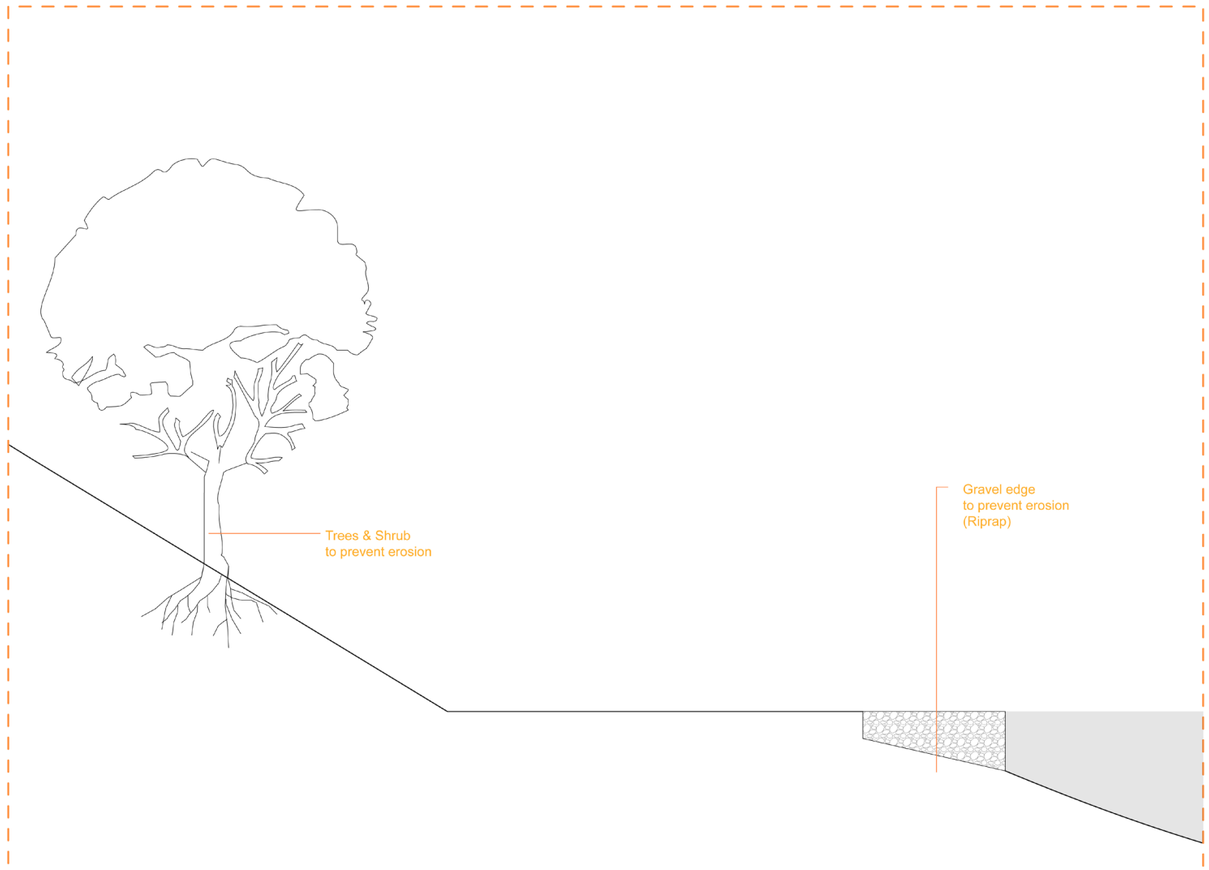
Water Mangement



Rainwater is either collected in a water tank within the cluster or absorbed into the ground through permeable pavers. The harvested rainwater is then reused for irrigation and toilet flushing. However, during periods of excessive rainfall, the overflow is discharged into the Surma River through a pipe system, ensuring efficient water management.



A greywater pipe installed beneath the permeable pavement absorbs rainwater and facilitates its reuse, thereby reducing the consumption of potable water.



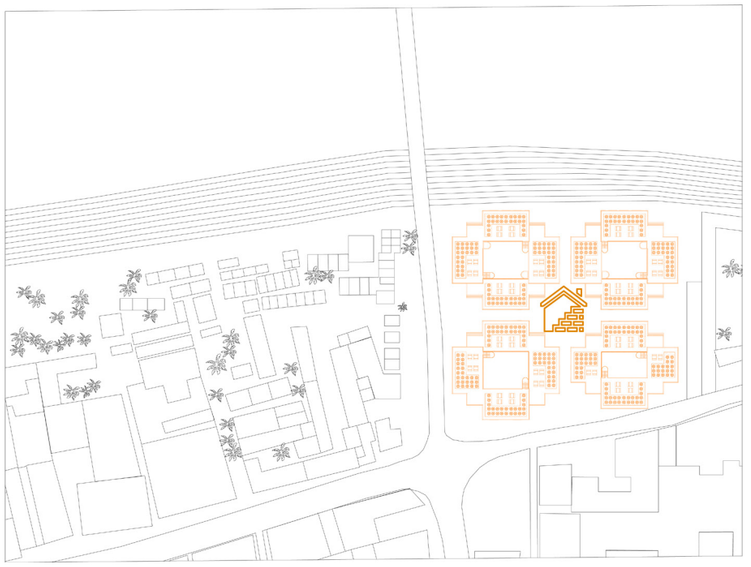
Trees planted along the riverbank slope help prevent soil erosion, while riprap made of gravel is installed at the edge of the river to further protect against erosion caused by the water flow.

05. *Managerial Strategies*

Construction Phase

1. Demolition (Sawmil Area)

2. Infrastructure installation (Sawmil Area)



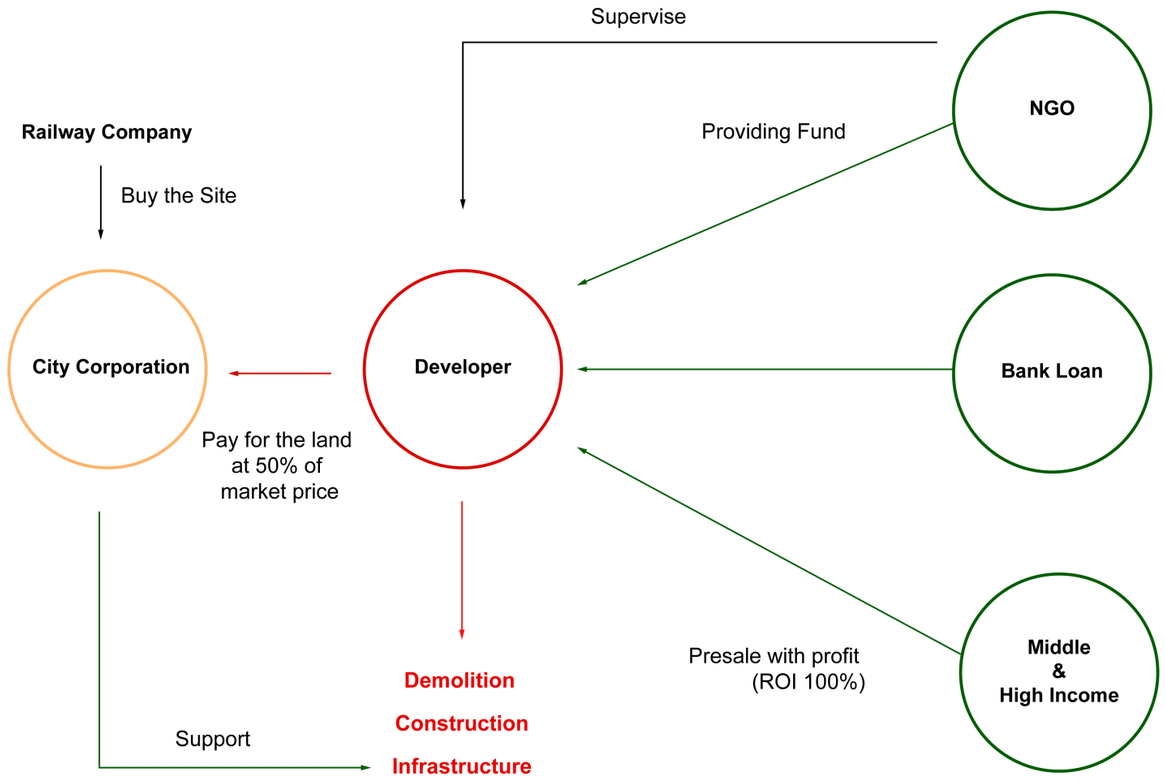
3. Cluster Construction (Sawmil Area)

4. Demolision (Sweeper Colony)

5. Infrastructure installation (Sweeper Colony)

6. Finished Construction

The development begins on the right side of Keane Bridge. Once the right side is fully developed, the community from the left side will be relocated, followed by the demolition of that area. This phased approach ensures that residents are not displaced without alternative housing and allows development to proceed without disrupting existing community.



Construction

The Keane Bridge area is currently owned by the railway company. The City Corporation purchases the land and sells it to the developer at 50% of the market price, under the condition that no profit is made from constructing the low-income cluster. The developer then finances the project through a combination of NGO support, bank loans, and presales. Infrastructure installation is supported by the City Corporation during construction.

Through this construction model, developers can carry out the project at a lower cost, while low-income families gain access to affordable housing. As a result, the development of the Keane Bridge area becomes an attractive option for developers.

Cost Analysis

	Previous situation	New Development
Area	2.12 ha	2.12 ha
FSI	0.35	2.3
GSI	0.28	0.45
Unit / ha		162
Low Income	60	217
Middle Income		120
High Income		8

Main Function List

Low income unit	217 (21200 sqm)
35 sqm unit	120
50 sqm unit	8

Construction cost 636,000,000 Tk

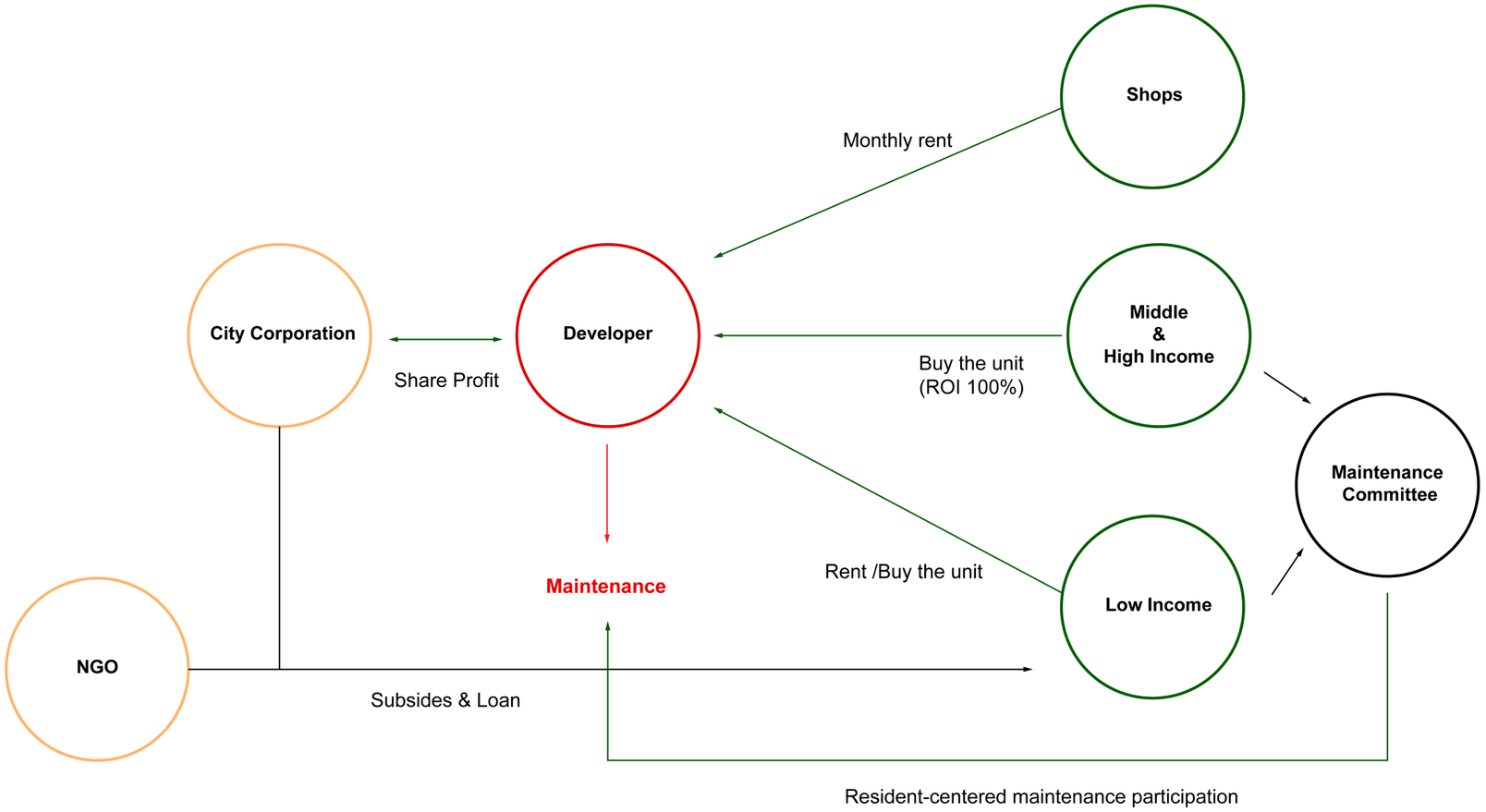
Middle & High unit	120 (21600 sqm)
85 sqm unit	120
120 sqm unit	8

Construction cost 708,000,000 Tk

Selling cost 1,416,000,000 Tk

ROI 100%

A cost analysis shows that apartments in central Sylhet are valued at approximately 60,000 Tk per square meter, while the average construction cost is around 30,000 Tk per square meter. This results in a 100% profit through the development of middle- and high-income housing. Given this financial advantage, the project presents an attractive opportunity for potential developers.



Operation

The developer generates revenue through the sale of middle- and high-income housing units (with a 100% ROI), rental income from commercial shops, and the sale of low-income units. A portion of this revenue is shared with the City Corporation, while another portion is allocated for maintenance. In addition, residents form a maintenance committee to help manage and sustain the housing complex.

Low-income residents initially rent their houses with the support of loans and subsidies from the City Corporation and NGOs. Over time, they can purchase the homes using the income they earn.

06. Reflection

Reflection

Motivation & Introduction

I believe that solving social problems through architecture is important. I have worked on various affordable housing design projects with the intention of addressing such issues. The Global Housing Studio places a strong emphasis on addressing critical global housing challenges through architectural interventions. This socially responsive approach to architecture deeply resonated with my academic and professional interests. Consequently, I chose to develop my graduation thesis within the framework of the Global Housing Studio, aiming to explore architecture as a tool for confronting pressing social and spatial inequalities.
Bangladesh, an emerging country in the Global South, is currently facing rapid urbanization along with severe issues related to slums. Amid these challenges, children from poor urban communities have been largely overlooked in the context of urban planning. Through my design, I sought to confront these issues and provide practical architectural solutions, using architecture as a tool to address pressing social problems.

Understanding the How and Why?

Rapid urbanization in Bangladesh has led to a massive influx of people into cities, resulting in the formation of extensive informal settlements. Within these slums, children are among the most vulnerable populations. They often face limited access to basic infrastructure, live in unsanitary environments that pose severe health risks, and are exposed to malnutrition and crime due to poverty and lack of safety. Considering these challenges, child-centered housing development emerges as a rational and necessary solution.

Children in slum areas suffer from inadequate housing conditions and a lack of safety. By designing child-centered housing typologies, architecture can offer secure and nurturing neighborhoods where parents can easily supervise their children and where children can safely play, explore, and grow. These spatial interventions have the potential to significantly enhance children's physical and mental well-being.

Therefore, the focus of my graduation project was to propose a healthy residential neighborhood and safe play environments for children living in urban poverty. My aim was to contribute to their development and help create pathways toward a better future. This research seeks to provide forgotten urban poor children with safe, high-quality living environments that acknowledge and support their potential. Recognizing that the conditions of childhood have lasting effects on adulthood, I explored a community focused child-centric housing typology to foster long-term social impact.

Response to Feedback and Personal Learning

The feedback I received throughout the design process from my research, design, and building engineering mentors significantly enriched and advanced my project. In particular, the guidance from my research mentor deepened my understanding of safety considerations in child-centered design and emphasized the importance of creating age-specific spatial configurations. This insight added substantial depth to my approach.
Under the supervision of my design mentor, I was able to develop a stronger ability to explore diverse housing typologies and address complex design challenges. Additionally, the support from my engineering tutor enabled me to translate conceptual ideas into practical, buildable solutions. As a result of this holistic feedback, I was able to adopt a more integrated design approach and substantially enhance the quality and feasibility of my research.

Continued Learning

While I studied architecture in Korea and participated in various design competitions, I often felt that my understanding of technical aspects was limited. However, my education at TU Delft has allowed me to develop a more integrated and holistic perspective on design. Through this studio, I gained valuable experience in designing for diverse contexts such as those found in the Global South, and I had the opportunity to explore architecture from multiple dimensions.
This comprehensive learning experience has provided me with the foundation to grow as an architect who can better understand and address global challenges. It has strengthened my ability to approach architecture with greater sensitivity to cultural, environmental, and technical contexts, enabling me to engage with international issues more effectively than before.

Relationship between Graduation Topic and Master Track

My graduation topic focuses on designing a housing typology for impoverished children in Bangladesh. This project represents one of the ways in which architecture can be used to address and resolve pressing social issues, and it aligns closely with the holistic design approach emphasized in my master's track. Through the formulation of a detailed research plan, I was able to refine the scope and direction of my study. Subsequently, by directly engaging with local communities in Bangladesh, I gained firsthand insights into the social dynamics of the problem. This experience allowed me to develop a socially informed perspective, which I later integrated into the design and engineering phases of the project. By combining research, community interaction, architectural design, and technical implementation, I learned how to approach social issues from multiple dimensions. This process has brought me closer to achieving the integrated architectural design objectives set by the master's program, particularly in advancing a child-friendly housing approach grounded in integrated approach.

Academic and Social Value

Many people believe that urban children enjoy a higher quality of life than their rural counterparts. Paradoxically, impoverished urban children often face more severe living conditions and lower standards of living than rural children. Bangladesh has recently experienced rapid urbanization, with increasing numbers of families migrating from rural areas to cities. As a result, many poor urban children end up living in slums, where they are among the most vulnerable, directly affected by the harsh realities of slum life. These challenges not only impact their childhood but also limit their future opportunities as they grow older.
While many studies have addressed these problems from various perspectives, there has been little discussion about solutions, especially architectural ones. Additionally, most research has focused on Dhaka's slums, even though cities like Sylhet face equally severe slum issues. Consequently, children in Sylhet's slums suffer from dangerous living conditions, which have been largely overlooked. Therefore, this study on child-centered housing typologies for impoverished urban children aims to explore these issues in depth and propose practical solutions. Through this, the thesis demonstrates how architectural intervention can provide a meaningful approach to addressing complex social challenges and improving the living conditions of vulnerable communities.

Transferability of Results

Although this thesis focuses on the Keane

Bridge area in Sylhet, its approach can be adapted to various slum areas across Bangladesh. Many countries in the Global South are currently facing similar challenges. While the solutions may not be universally applicable in a one-size-fits-all manner, with adjustments in material choices and minor design modifications based on local contexts, the proposed strategies have the potential to be implemented in slum redevelopment projects throughout the Global South.

Self-Developed Reflection Questions

- How can we design safe play environments for children within affordable housing?
- How can we realistically provide housing for low-income families while also ensuring access to educational opportunities for their children?

These were the central questions I continuously engaged with throughout my design process. Addressing the needs of low-income communities within limited resources, especially when trying to carve out child-friendly spaces in affordable housing was a challenging task. To tackle these issues, I conducted in-depth analyses of diverse case studies and synthesized their insights into an integrated design approach. Through this process, I was able to propose solutions that respond to the demand for safe and accessible environments in low-income housing, while remaining grounded in the socio-cultural realities of Bangladesh.

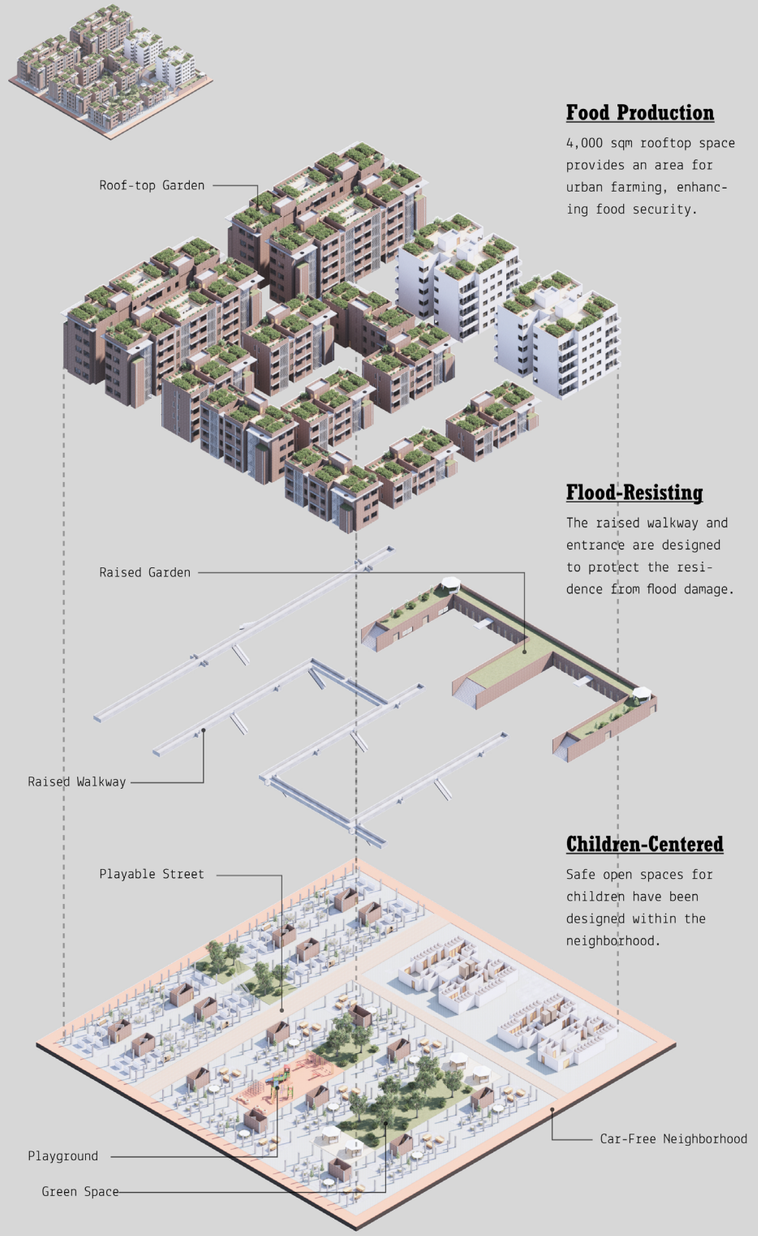
Looking Back

I have long held a strong interest in architectural practices beyond East Asia, particularly in how design responds to different climatic and cultural contexts. Through the course of this project, I was able to engage in an environment entirely distinct from those I had previously encountered, which enabled me to cultivate a deeper understanding of diverse cultural and environmental conditions. This rare opportunity proved to be both intellectually and personally enriching.

The individuals I met in Bangladesh, along with the tutors and classmates I worked with in the studio, were instrumental in shaping this experience. Their insights and perspectives contributed significantly to my growth as an aspiring architect, both in terms of design thinking and cross-cultural awareness.
Based on these experiences, I will continue to strive to become a more international and open architect in my future career.

Figure 23. With the Children of the Keane bridge Area
(Mascha, 2024).

07. *Appendix*



Food Production

4,000 sqm rooftop space provides an area for urban farming, enhancing food security.

Flood-Resisting

The raised walkway and entrance are designed to protect the residence from flood damage.

Children-Centered

Safe open spaces for children have been designed within the neighborhood.

The Density Challenge
2.5 FSI Middle-rise

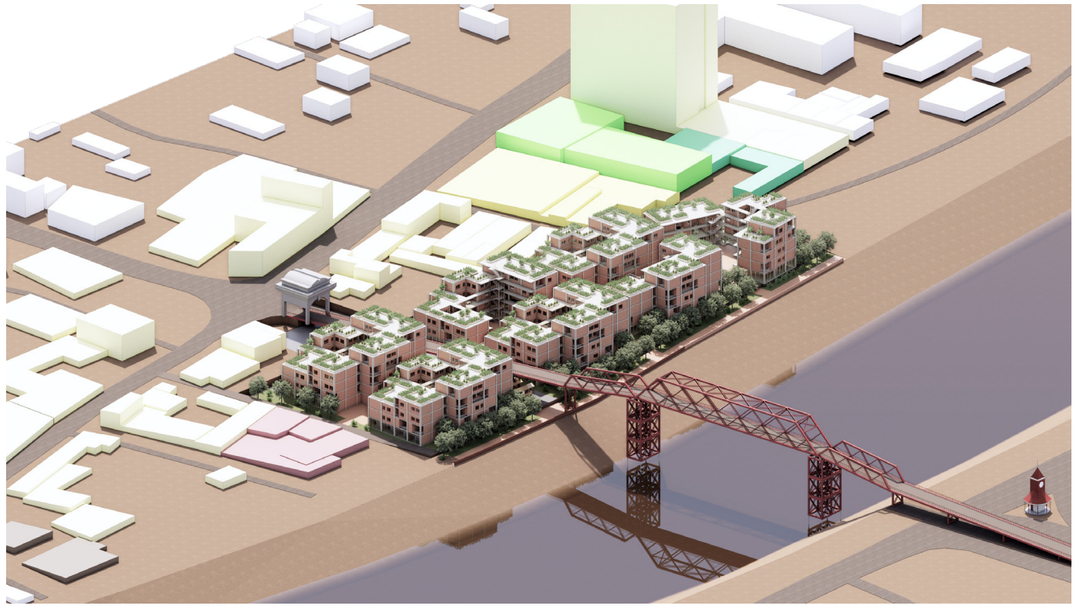
Student:
Hyosik Kim (5914566)

Global Housing Graduation Studio

Architecture of Transition in the Bangladesh Delta
Autumn Semester 2024/25 [AR3AD105]

GLOBAL HOUSING

TUDelft | Architecture and the Built Environment



Roof-top Farming (700sqm)

b=P*g*a (Tomalty & Komorowski, 2010)

a= square meter

g= duration of growing season

P= productity (158-1580 Tk per Month)

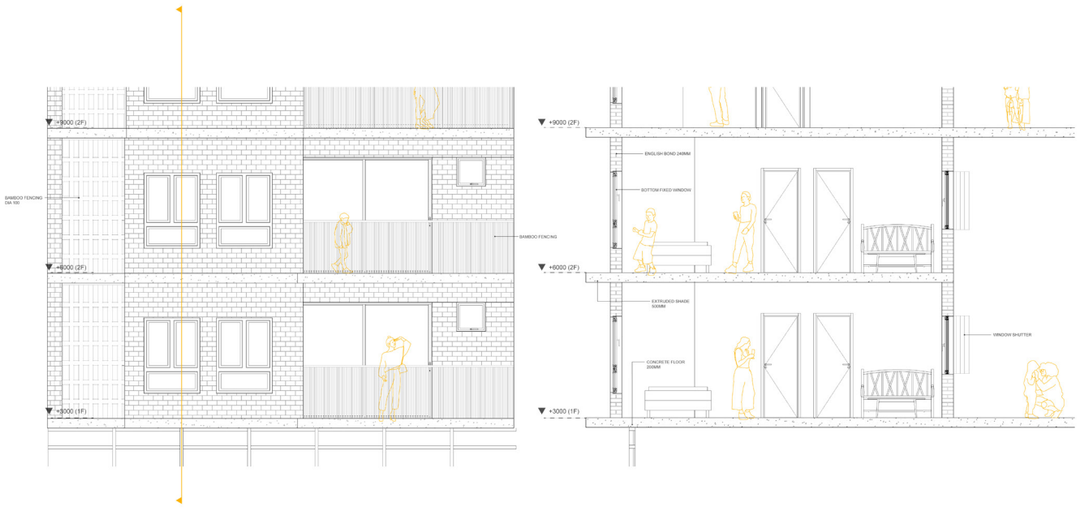
b= 870 x12 x 350 = 3,654,000 Tk per Year (28,700 euro)

Courtyard with Inner Balcony

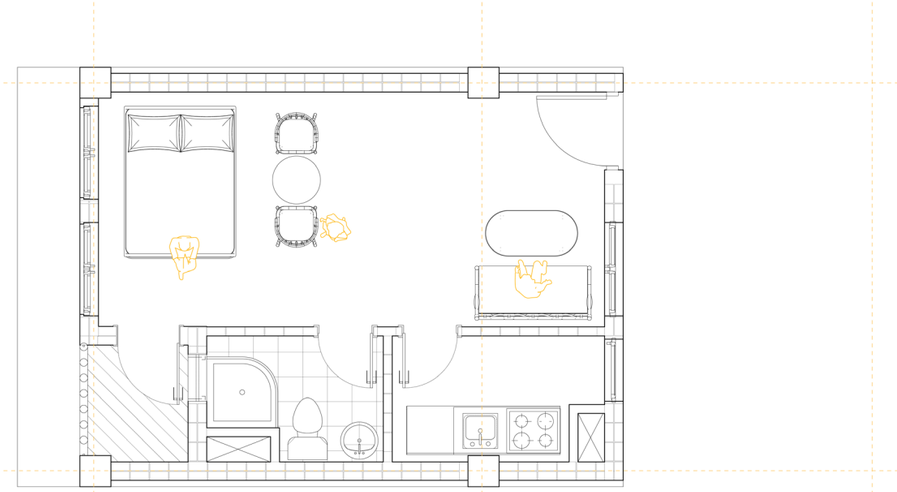
Community Spcae & Safe Playground

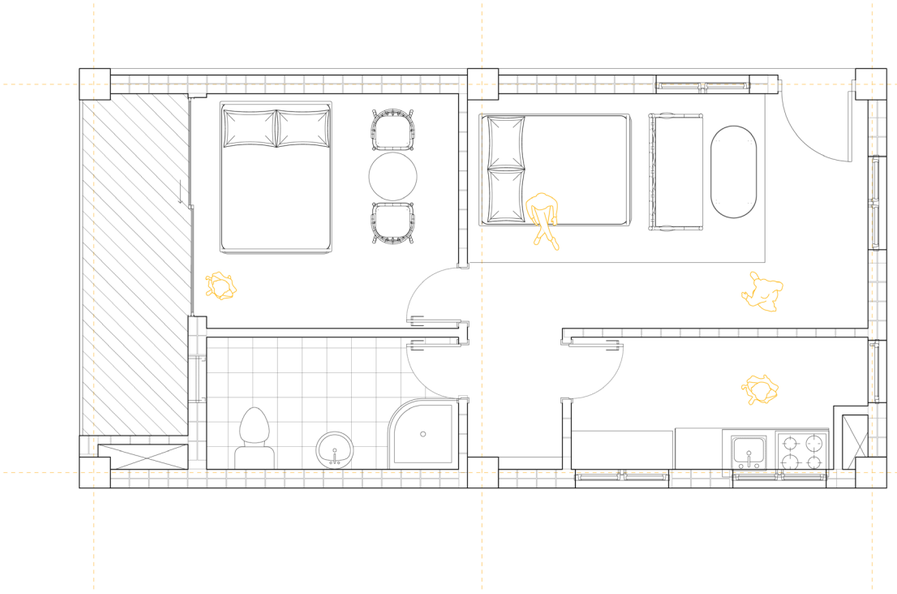
Flood- Resisting Desgin

Shops, School, Hindu temple,
Community space, Kindergarten



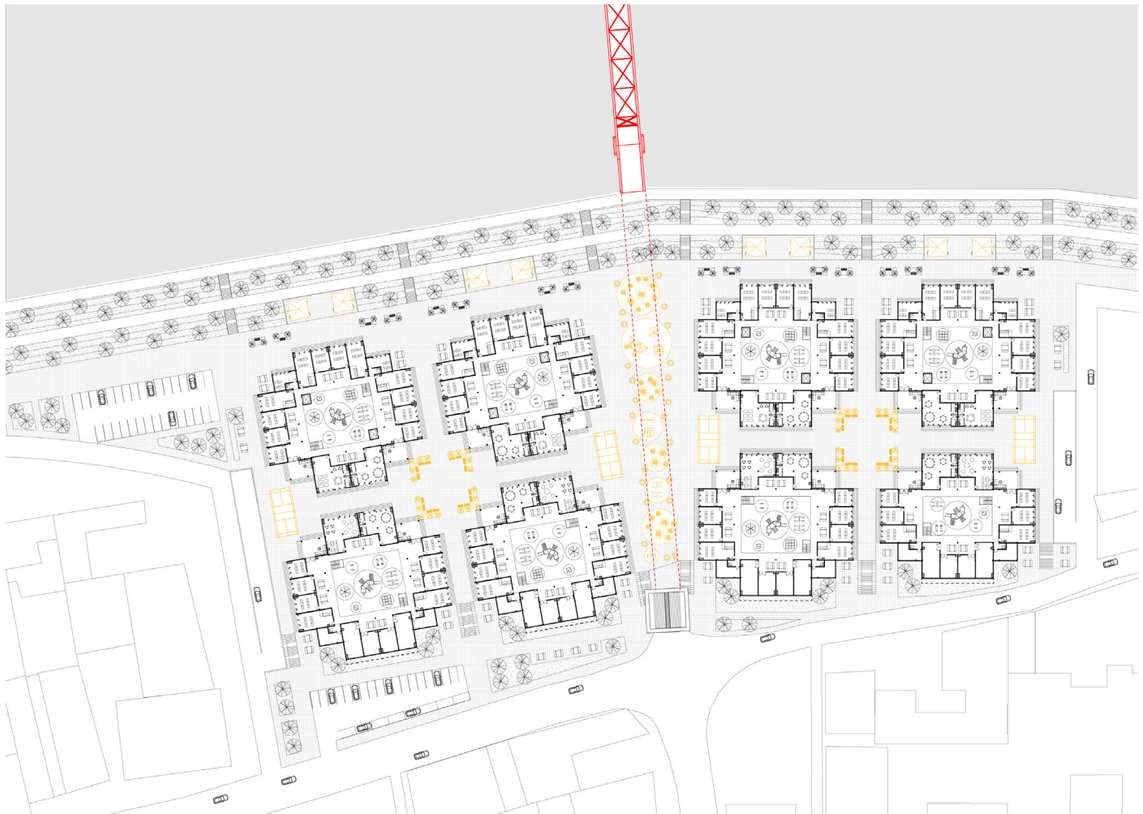
LOW-INCOME UNITS
35sqm (STUDIO) , 50sqm (1BED)





0 1 2M

GLOBAL HOUSING



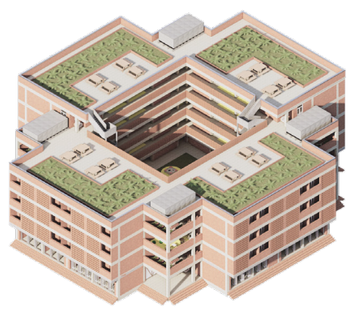


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Figure 10

Kim, H. (2024). Interview at Sweeper Colony [Photograph].

Figure 11

Kim, H. (2024). Interview at the Sawmill

Figure 13

Kim, H. (2024). View of the Muslim community

Figure 14

Ter Glane, K. (2024). Sketch survey in progress

Figure 15

Joelle. (2024). Children drawing sketches of their dream houses

Figure 16-17

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Figure 22

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Figure 23

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