Graduation Report Draft
Healthy Mass Housing in Navi Mumbai

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I. Research Plan

Background

Navi Mumbai

This research will be focused on the planned city Navi Mumbai, situated in the state Maharashtra of India. Navi Mumbai, also known as New Bombay, is a planned city founded in 1971 by leading architects like Charles Correa, Shirish Patel, Pravina Mehta and R.K. Jha together with the City and Industrial Development Corporation (CIDCO)[1]. CIDCO is currently the main developer of the area in Navi Mumbai and owns the land property. Navi Mumbai was developed with the main purpose of solving the growing congestion on Mumbai Island. By disseminating the state work locations in Navi Mumbai the congestion in the city would be solved. Although great metropolitan planning was made for Navi Mumbai, the government did not relocate as the original plan in order to shift the working area and provide guidance to the city. This led to a slower development also visible in the population growth of the city. In 2021 Navi Mumbai has a population of 1.1 million[2] which is a small amount compared to the population of 12.4 million in Mumbai City[3].

Covid Pandemic

The COVID-19 pandemic has recently shown globally the vulnerability to new diseases. The pandemic also affected the population in India and especially in Mumbai. From figure 1 it becomes obvious that the state Maharashtra had the most cases in India. In the figure the cases are mostly centered around the location of Mumbai. In comparison to figure 2 it seems the density did not have a major influence on the number of cases. This observation is also made in a research from the UNHabitat[4], which means density is not the decisive factor for increased infection.

The vulnerability for pandemics has become evident not only in Mumbai, but also globally. This has shifted the perspectives of many architects into how design should focus more on health and the environment.

As Kengo Kuma recently stated in an interview[5]:

"I am really impressed by birds' nests. You find the original form of a house in the nest. We have gotten this pandemic because we are spoiling the earth. And now when we have spoiled the environment, we can see that our lives are at stake. This pandemic could be our chance to change our way of thinking. After the pandemic, I want to change my architecture to be even more kind to nature. We cannot as before only think of what is inside. People have to get out and walk in nature. Cities hardly have any places to walk outside."

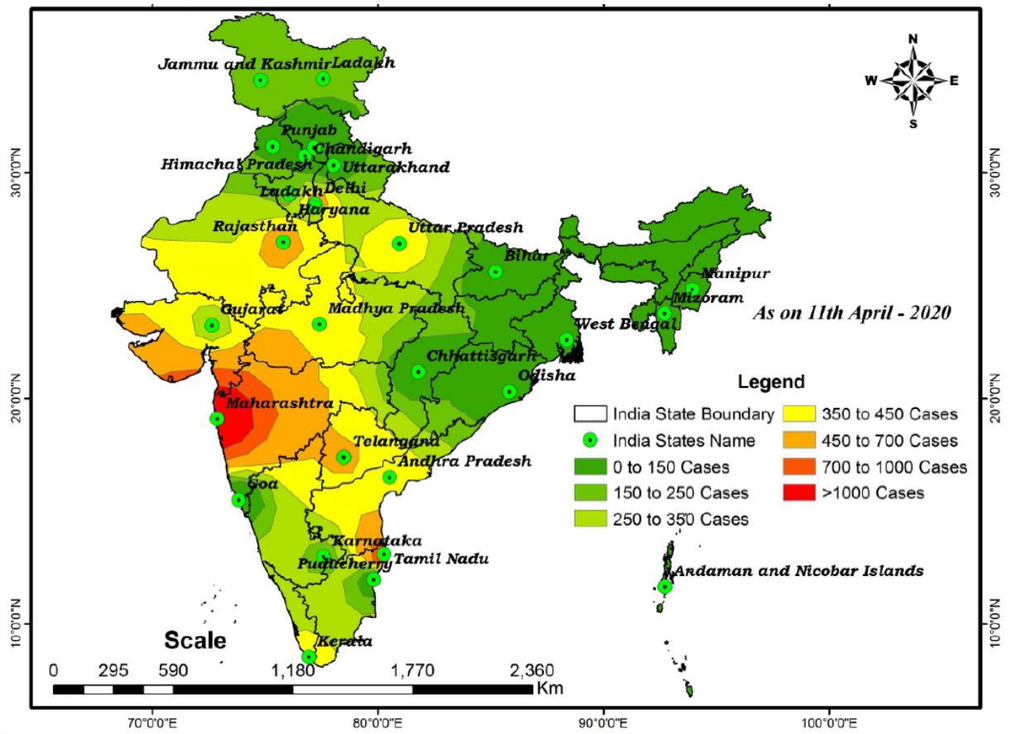


Figure 1 COVID-19: Distribution of estimated confirmed patients in 11.04.2020 *figure from Raj Bagya, "Journal of Geographical Studies," Distribution and Trend Analysis of COVID-19 in India: Geospatial Approach, April 29, 2020, pp. 41-42, https://doi.org/10.21523/gcj5.*

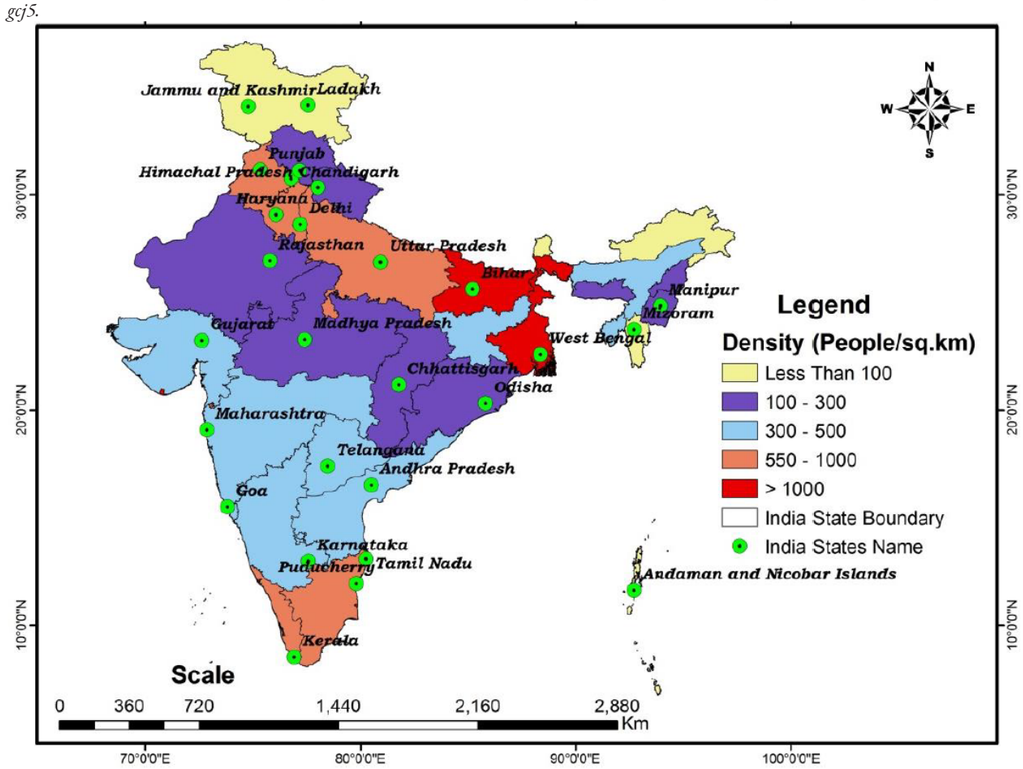


Figure 2 Distribution of population in India *figure from Raj Bagya, "Journal of Geographical Studies," Distribution and Trend Analysis of COVID-19 in India: Geospatial Approach, April 29, 2020, pp. 41-42, https://doi.org/10.21523/gcj5.*

1. Aparna Vedula, "Blueprint and Reality: Navi Mumbai, the City of the 21st Century," *Habitat International* 31, no. 1 (May 3, 2006): pp. 12-23, https://doi.org/10.1016/j.habitatint.2006.02.002.
2. Census 2011, "Navi Mumbai City Population 2011 - 2021," Navi Mumbai City Population Census 2011-2021 | Maharashtra (Census Population 2021 Data, 2021), https://www.census2011.co.in/census/city/368-navi-mumbai.html.
3. Census 2011, "Mumbai (Greater Mumbai) City Population 2011 - 2021," Mumbai (Greater Mumbai) City Population Census 2011-2021 | Maharashtra (Census Population 2021 Data, 2021), https://www.census2011.co.in/census/city/365-mumbai.html.
4. António Guterres, "Cities and Pandemics: Towards a More Just, Green and Healthy Future," 58th ed., vol. HS (Kenya, Nairobi: United Nations Human Settlements Programme (UN-Habitat), 2021), pp. 88-91.
5. *Kengo Kuma Interview: Architecture for Our Time, YouTube* (Louisiana Channel, 2021), https://www.youtube.com/watch?v=aLXppWXsR9Y&t=162s.

Problem Statement

The problem statement addressed in this research is about the quality of health in mass housing designs. Mumbai has been producing mass housing schemes in order to resolve the housing shortage. However the designs for the schemes are mainly focused on efficiency and economic profitability. Especially with the COVID-19 pandemic the importance of health in buildings has become very apparent.

Housing crisis

The challenge Mumbai faces is creating affordable housing for their population in which nearly 52 lakh (5.2 million) people live in the slums with poor housing conditionssource. This is **almost 42% of Mumbai's people living in slums** in 2011. Also **57% of households live in one room dwellings**. In order to afford a house the prices are nearly **12 times the annual income** of Rs. 2.4 lakhs. Since affordable housing in Mumbai is difficult some have moved to Navi Mumbai for housing.[1]

CIDCO, who is responsible for developing affordable housing, expected Navi Mumbai to take over a part of Mumbai's population and jobs. An estimated population of 2 million(regional plan-1973) in Navi Mumbai by 2011 turned out to be only 1.1 million. Therefore housing units have become unoccupied. One of the arguments given to the delayed growth of the city is the poor connectivity with major central business districts of Mumbai and Navi Mumbai lacking its own identity[2].

Health in Mass Housing

The importance of the quality of health in housing has become painfully apparent during the COVID-19 pandemic. Cities going into lockdown as a last resort to reduce the cases need housing which actually can protect the health of residents. Although Bombay had a plague between 1896 and 1899 which had a death toll of 44.984 people and more than a half million flee from the city[3]. Currently more than one century later the city's housing quality has not improved and the COVID-19 pandemic appears like a déjà vu in Mumbai city.

Photograph by Manoej Paateel, 2020, Shutterstock.com, 2020

1. Kamla Gupta, Fred Arnold, and H. Lhungdim, "Health and Living Conditions in Eight Indian Cities" (Mumbai: IIPS, 2005), pp. 18-23.
2. Nitai Mehta, "Pdf" (Mumbai, November 1, 2014).
3. Nadia Nooreyezdan, "How the 1896 Bombay Plague Changed Mumbai Forever," Atlas Obscura (Atlas Obscura, May 18, 2020), https://www.atlasobscura.com/articles/how-bombay-plague-changed-mumbai.

Research Question

Main question
Health has been an important aspect of architecture long before the COVID-19 pandemic. In the first century before Christ architects were advised to study medicine by a theory of Vitrivius[1]. He even based architectural theory on theories of medicine, describing the internal system of buildings as if they are human bodies.

Furthermore Le Corbusier is one of many architects who argued for change from the scale of housing design to urban design. Emphasizing in his film L'Architecture d'aujourd'hui (1929) the importance of sunbathing and exercise. Using architecture as a form of therapy for the health of the people.

Navi Mumbai is providing mass housing projects to accommodate the housing shortage in Mumbai. This research could provide more insight in the opportunities of protecting the health through architecture. Meaning the research aims to have an interdisciplinary approach to design post pandemic mass housing in Navi Mumbai for the middle income group. Therefore, the research question states:

In which way can **affordable mass housing** through a *salutogenesis approach* improve the wellbeing of people from different income groups in Navi Mumbai?

Affordable mass housing like the CIDCO mass housing scheme, residential housing design which are designed for efficiency and economically profitable to produce in mass amounts.

Post pandemic design with a salutogenesis approach to proactively prevent sickness and increase the wellbeing of residents

Different income groups around the middle income groups. Targeting also different household dynamics.

Sub-questions
The research question is divided in three categories people, place and purpose, which is also used by Mecanoo to describe the way they seek for an identity in a global world[2]. This desire is also forthcoming for Navi Mumbai, a city showing aspirations for a global identitysource. The research consist of the following sub questions for the three domains.

> People
What are the current living conditions of MIG in Navi Mumbai and how does their cultural background influence the use of space?

> Place
What are the current designs in affordable mass housing and where could they improve to prevent sickness and increase wellness?

> Purpose
In which ways can architecture with a salutogenesis approach improve the health on individual, community and global scale?

1. Beatriz Colomina, "Health and Architecture: From Vitruvius to Sick Building Syndrome," in *X-Ray Architecture* (Zürich, Zürich: Lars Müller publishers, 2019), pp. 13-20.
2. Francine Houben, "People Place Purpose: New Monograph Francine Houben/Mecanoo," > Mecanoo, November 27, 2015, https://www.mecanoo.nl/News/ID/215/People-Place-Purpose-New-monograph-Francine-HoubenMecanoo#:~:text=People%20Place%20Purpose%20describes%20the,tree%2C%20or%20rituals%20of%20inhabitants.&text=Since%201984%20Mecanoo%20has%20been,contributes%20to%20a%20better%20world.

Theoretical Framework

The theoretical framework for the research will be based on three time frames. In each of the time frames a disease which went out of control was an instigator for architects to react on disease control in the building environment. After each disease the reaction of architectural design will be the literary research.

Bombay Plague

After the Bombay plague in 1896 and the outbreak of influenza, a new style of architecture was formed in Bombay. The art deco allowed buildings to have indoor toilets, cross ventilation, open courtyards and green spaces. Mustansir Dalvi, who is a professor at the Sir J. J. College of Architecture in Mumbai, responded in an interview about Art Deco: "Up until then, the Imperial style was all revivalist, whether classical Greek, or Gothic or Edwardian baroque. This was a completely modern style – it was forward-looking. I've described it as a form of resistance." Art Deco seems to be an architectural reaction on the outbreaks during those times. This building style shows forms of disease control, which will be valuable for the research.[1]

Tuberculosis

During the early 20th century Tuberculosis influenced many architects to change their design principles. In order to design buildings to function as safe spaces to treat tuberculosis architects like Alvar Aalto resorted to rationalism and functionalism or one could call it modern architecture. Paimio Sanatorium was also designed for two special purposes. The first one was to observe the relation of a single human being and his living room. The second purpose was to observe the protection of a single human being in large groups of people and the pressure from collectivity.[2]

COVID-19

WHO housing and healthy guidelines states "Whether housing is healthy also depends on factors outside its walls. It depends on the local community, which enables social interactions that support health and well-being." The immediate housing environment is the foundation for healthy housing. This extends to the public services, green space, public transportation, protection from waste, pollution and natural disasters.[3] The same conclusion is made in a research of UNHABITAT, in the chapter addressing systematic poverty and inequality in cities in response to the pandemic, the concluding chapter states "While targeted place-based solutions should be an immediate focus for cities, in the long run a fundamental restructuring of markets and social protection systems is required."[4]

The framework of the research also includes data from epidemiology studies on the spatial disease patterns in buildings.

Photograph by Manoej Paateel, 2020, Shutterstock.com, 2020

1. Ronojoy Mazumdar, "Mumbai's Iconic Art Deco Buildings Were Made to Conquer Disease," Bloomberg.com (Bloomberg, October 30, 2020), https://www.bloomberg.com/news/articles/2020-10-30/how-india-s-bombay-deco-buildings-battle-disease.
2. Hyon-Sob Kim, "Alvar Aalto and Humanizing of Architecture," *Journal of Asian Architecture and Building Engineering* 8, no. 1 (2009): pp. 9-16, https://doi.org/10.3130/jaabe.8.9.
3. "WHO Housing and Health Guidelines" (Geneva: World Health Organization, 2018), pp. 2-3.
4. António Guterres, "Cities and Pandemics: Towards a More Just, Green and Healthy Future," 58th ed., vol. HS (Kenya, Nairobi: United Nations Human Settlements Programme (UN-Habitat), 2021), pp. 88-91.

Methodology

The research will be done with an **integrative interdisciplinary approach** and a **salutogenesis approach** to health in mass housing design.

The integrative interdisciplinary approach will allow epidemiology and architecture of health to incorporate two fields into the design research. For the research to be more specific a salutogenesis approach will also be taken, this is a concept which has been defined by sociologist Aaron Antonovsky in 1979.[1]

The aim of salutogenesis is to realize a state of wellness by utilizing people's resources and positions with regard to health. Through these approaches a quality of health in mass housing design can be improved. The perspective is from a preventative health orientation, making use of the interdependent body, mental, social and spiritual to realize wellness.

The research methods will consist mainly of research on architectural design combined with the following research methods:

Interdisciplinary research
Interdisciplinary research approach has been chosen to connect the fields of epidemiology and architecture of health to understand the risks and opportunities of health in residential mass housing.

Ethnographic research
In order to understand the cultural perspective and living circumstances from the residents in Navi Mumbai, ethnographic research will be done. Focusing on primary sources, photographic analyses and literary research.

Typological comparative research
By comparing typologies of mass housing design and architecture for health.

Photograph by Radiokafka, 2020, Shutterstock.com, 2020

1. Jacob J. Wilhelm and Dina Battisto, "Discovering an Architecture for Health," in *Architecture and Health: Guiding Principles for Practice* (London, United Kingdom: Routledge Taylor & Francis Group, 2020), pp. 8-13.

Reflection on the Relevance

The aim of the thesis is to set an example of healthy mass housing. Showing how affordable mass housing design can be dense typology without having to sacrifice the quality of health.

Safety of Health
In a post pandemic scenario, housing needs to be equipped for resistance against disease outbreaks. The need for this has also become clear to the Government of India. Therefore, a plan under the Pradhan Mantri Awas Yojana Urban (PMAY-U), a government mission to provide housing to all households by 2022, has been introduced to provide better living qualities for the poor.[1] A plan to increase the safety of the public health. This research can show an example of how a dense residential housing design can still protect the safety of the public health and thus be more resilient to pandemics.

Equipped for the future
In order to be equipped for the future, architects need to learn how design impacts the health of human beings. From the book "Architecture for Health" the WHO recognized urban planning as a way to prevent sickness.[2] However, there seems to be a lack of convincing concepts to act in a sustained, coordinated and planned way. The research can bring a more defined concept to the key pillars from the WHO Healthy City concept.

"You can't save the world, but you can set it an example."

Alvar Aalto[3]

Photograph by Manoej Paateel, 2020, Shutterstock.com, 2020

1. "HFA(Urban)," PMAY (Ministry of Housing and Urban Affairs, Government of India), accessed November 18, 2021, https://pmaymis.gov.in/.
2. Christine Nickl-Weller and Hans Nickl, Architecture for Health = Architektur für Gesundheit (Salenstein: Braun Publishing, 2021).
3. Hyon-Sob Kim, "Alvar Aalto and Humanizing of Architecture," Journal of Asian Architecture and Building Engineering 8, no. 1 (2009): pp. 9-16, https://doi.org/10.3130/jaabe.8.9.

List of relevant theoretical, historical and theoretical references

Bagya, Raj. "Journal of Geographical Studies." *Distribution and Trend Analysis of COVID-19 in India: Geospatial Approach*, April 29, 2020, 41–42. https://doi.org/10.21523/gcj5.

Colomina, Beatriz. "Health and Architecture: From Vitruvius to Sick Building Syndrome." Essay. In *X-Ray Architecture*, 13–20. Zürich, Zürich: Lars Müller publishers, 2019.

Gharipour, Mohammad, and Caitlin DeClercq, eds. *Epidemic Urbanism: Contagious Diseases in Global Cities*. S.l., Chicago: UNIV OF CHICAGO PRESS, 2022.

Gupta, Kamla, Fred Arnold, and H. Lhungdim. Rep. *Health and Living Conditions in Eight Indian Cities*. Mumbai: IIPS, 2005.

Guterres, António. Rep. *Cities and Pandemics: Towards a More Just, Green and Healthy Future* HS. 58th ed. Vol. HS. 20E. Kenya, Nairobi: United Nations Human Settlements Programme (UN-Habitat), 2021.

"Health and Housing for Urban Poor in India Post Covid-19." *Regular 9*, no. 3 (2020): 208–16. https://doi.org/10.35940/ijrte.c4350.099320.

Kim, Hyon-Sob. "Alvar Aalto and Humanizing of Architecture." *Journal of Asian Architecture and Building Engineering* 8, no. 1 (2009): 9–16. https://doi.org/10.3130/jaabe.8.9.

Mehta, Nitai. "The State of Affordable Housing in Mumbai." Mumbai: Praja, November 1, 2014.

Nickl-Weller, Christine, and Hans Nickl. *Architecture for Health = Architektur für Gesundheit*. Salenstein: Braun Publishing, 2021.

Rep. *WHO Housing and Health Guidelines*. Geneva: World Health Organization, 2018.

Vedula, Aparna. "Blueprint and Reality: Navi Mumbai, the City of the 21st Century." *Habitat International* 31, no. 1 (May 3, 2006): 12–23. https://doi.org/10.1016/j.habitatint.2006.02.002.

Wilhelm, Jacob J., and Dina Battisto. "Discovering an Architecture for Health." Essay. In *Architecture and Health: Guiding Principles for Practice*, 8–13. London, United Kingdom: Routledge Taylor & Francis Group, 2020.

Bibliography

2011, Census. “Mumbai (Greater Mumbai) City Population 2011 - 2021.” Mumbai (Greater Mumbai) City Population Census 2011-2021 | Maharashtra. Census Population 2021 Data, 2021. https://www.census2011.co.in/census/city/365-mumbai.html.

2011, Census. “Navi Mumbai City Population 2011 - 2021.” Navi Mumbai City Population Census 2011-2021 | Maharashtra. Census Population 2021 Data, 2021. https://www.census2011.co.in/census/city/368-navi-mumbai.html.

Bagya, Raj. “Journal of Geographical Studies.” *Distribution and Trend Analysis of COVID-19 in India: Geospatial Approach*, April 29, 2020, 41–42. https://doi.org/10.21523/gcj5.

Colomina, Beatriz. “Health and Architecture: From Vitruvius to Sick Building Syndrome.” Essay. In *X-Ray Architecture*, 13–20. Zürich, Zürich: Lars Müller publishers, 2019.

Correspondent, Special. “Navi Mumbai Has Not Addressed Housing Crisis in Mumbai, Finds IIT Bombay Study.” The Hindu. The Hindu, March 17, 2019. https://www.thehindu.com/news/cities/mumbai/navi-mumbai-has-not-addressed-housing-crisis-in-mumbai-finds-iit-bombay-study/article26563073.ece.

Gupta, Kamla, Fred Arnold, and H. Lhungdim. Rep. *Health and Living Conditions in Eight Indian Cities.* Mumbai: IIPS, 2005.

Guterres, António. Rep. *Cities and Pandemics: Towards a More Just, Green and Healthy Future* HS. 58th ed. Vol. HS. 20E. Kenya, Nairobi: United Nations Human Settlements Programme (UN-Habitat), 2021.

“Health and Housing for Urban Poor in India Post Covid-19.” *Regular 9*, no. 3 (2020): 208–16. https://doi.org/10.35940/ijrte.c4350.099320.

“HFA(Urban).” PMAY. Ministry of Housing and Urban Affairs, Government of India. Accessed November 18, 2021. https://pmaymis.gov.in/.

Hill, Lauren Jade. “Building Health: The Link between Architecture and Well-Being -.” Christie’s International Real Estate. Christie’s International Real Estate, September 25, 2020. https://www.christiesrealestate.com/blog/building-health-the-link-between-architecture-and-well-being/.

Houben, Francine. “People Place Purpose: New Monograph Francine Houben/Mecanoo.” > Mecanoo, November 27, 2015. https://www.mecanoo.nl/News/ID/215/People-Place-Purpose-New-monograph-Francine-Houben-Mecanoo#:~:text=People%20Place%20Purpose%20describes%20the,tree%2C%20or%20rituals%20of%20inhabitants.&text=Since%201984%20Mecanoo%20has%20been,contributes%20to%20a%20better%20world.

Indorewala, Hussain, and Shweta Wagh. *After the Pandemic, Will We Rethink How We Plan Our Cities?*, April 30, 2020, sec. URBAN.

Kengo Kuma Interview: Architecture for Our Time. YouTube. Louisiana Channel, 2021. https://www.youtube.com/watch?v=aLXppWXsR9Y&t=162s.

Kim, Hyon-Sob. “Alvar Aalto and Humanizing of Architecture.” *Journal of Asian Architecture and Building Engineering* 8, no. 1 (2009): 9–16. https://doi.org/10.3130/jaabe.8.9.

Mazumdar, Ronojoy. “Mumbai’s Iconic Art Deco Buildings Were Made to Conquer Disease.” Bloomberg.com. Bloomberg, October 30, 2020. https://www.bloomberg.com/news/articles/2020-10-30/how-india-s-bombay-deco-buildings-battle-disease.

Mehta, Nitai. “The State of Affordable Housing in Mumbai.” Mumbai: Praja, November 1, 2014.

Nickl-Weller, Christine, and Hans Nickl. *Architecture for Health = Architektur für Gesundheit.* Salenstein: Braun Publishing, 2021.

Nooreyezdan, Nadia. “How the 1896 Bombay Plague Changed Mumbai Forever.” Atlas Obscura. Atlas Obscura, May 18, 2020. https://www.atlasobscura.com/articles/how-bombay-plague-changed-mumbai.

Rep. *WHO Housing and Health Guidelines.* Geneva: World Health Organization, 2018.

Roychowdhury, Anumita, Rajneesh Sareen, and Mitashi Singh. “Mass Housing and Liveability: Mapping of the Ground Reality.” *Centre for Science and Environment,* 2021, 4–6.

Vedula, Aparna. “Blueprint and Reality: Navi Mumbai, the City of the 21st Century.” *Habitat International* 31, no. 1 (May 3, 2006): 12–23. https://doi.org/10.1016/j.habitatint.2006.02.002.

Wilhelm, Jacob J., and Dina Battisto. “Discovering an Architecture for Health.” Essay. In *Architecture and Health: Guiding Principles for Practice*, 8–13. London, United Kingdom: Routledge Taylor & Francis Group, 2020.

Bibliography Figures and Images

Bagya, Raj. "Journal of Geographical Studies." *Distribution and Trend Analysis of COVID-19 in India: Geospatial Approach*, April 29, 2020, 41–42. https://doi.org/10.21523/gcj5.

Moss, C. Workers *Clean a House in a Neighborhood Affected by the 1896 Bubonic Plague. How the 1896 Bombay Plague Changed Mumbai Forever.* Atlas Obscura, 2020. https://www.atlasobscura.com/articles/how-bombay-plague-changed-mumbai.

Paateel, Manoej. *Aerial View of Appa Pada Slum in Malad, Which Is under Government-Ordered Isolation Due to a High Number of Positive COVID-19 Cases Detected.* 2020. Shutterstock.com. https://www.shutterstock.com/nl/image-photo/mumbaiindia-june-25-2020-aerial-view-1763684111.

Paateel, Manoej. *Health workers wearing protective gear monitor body temperature of people during the health check up camp at a slum in Mumbai. COVID-19 Cases Detected.* 2020. Shutterstock.com. https://www.shutterstock.com/nl/image-photo/mumbaiindia-june-17-2020-health-workers-1758632429

Paateel, Manoej. *Police wearing mask monitor body temperature of people at Chhatrapati Shivaji Maharaj terminus India has begun gradually lifting its restrictions imposed by the governmentCOVID-19 Cases Detected.* 2020. Shutterstock.com. https://www.shutterstock.com/nl/image-photo/mumbaiindia-june-17-2020-police-wearing-1759030163

Radiokafka. *Traditional street life with a sellers of small spices shops & passers-by people at morning on January 2, 2013. Varanasi urban agglomeration had a population of 1,435,113* 2020. Shutterstock.com. https://www.shutterstock.com/nl/image-photo/varanasi-india-january-2-traditional-street-194107613

II. Reference Projects

Hajikasam Chawl

A chawl typically is a housing typology with rooms connected along a corridor. Each room houses different households. All the households share sanitation facilities. The toilets are connected to the end of the corridors or along the hallways. Sharing sanitation facilities allows households with a low income to have access to proper sanitation, but during pandemics and in overall it is not ideal to share the toilet with your neighbours. Allowing viruses and germs to spread easily among the community. In order to prevent this, the sanitation facilities need to be cleaned regularly and have access to desinfection materials.

Currently Chawls are being redeveloped and are slowly disappearing as a housing typology in Mumbai. In the early 1700 till the late 1900s chawls have been the urban housing type for Mumbai, which means Chawls have been around for around 300 years. This has also created a specific communal life in the chawls, neighbours met each other on the the corridors and a lot of activities take place on the corridors, staircases and courtyards.

https://bardstudio.in/chawl-as-home/

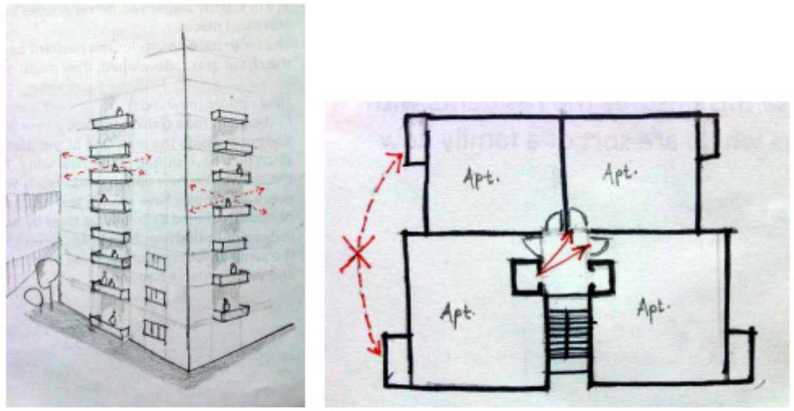
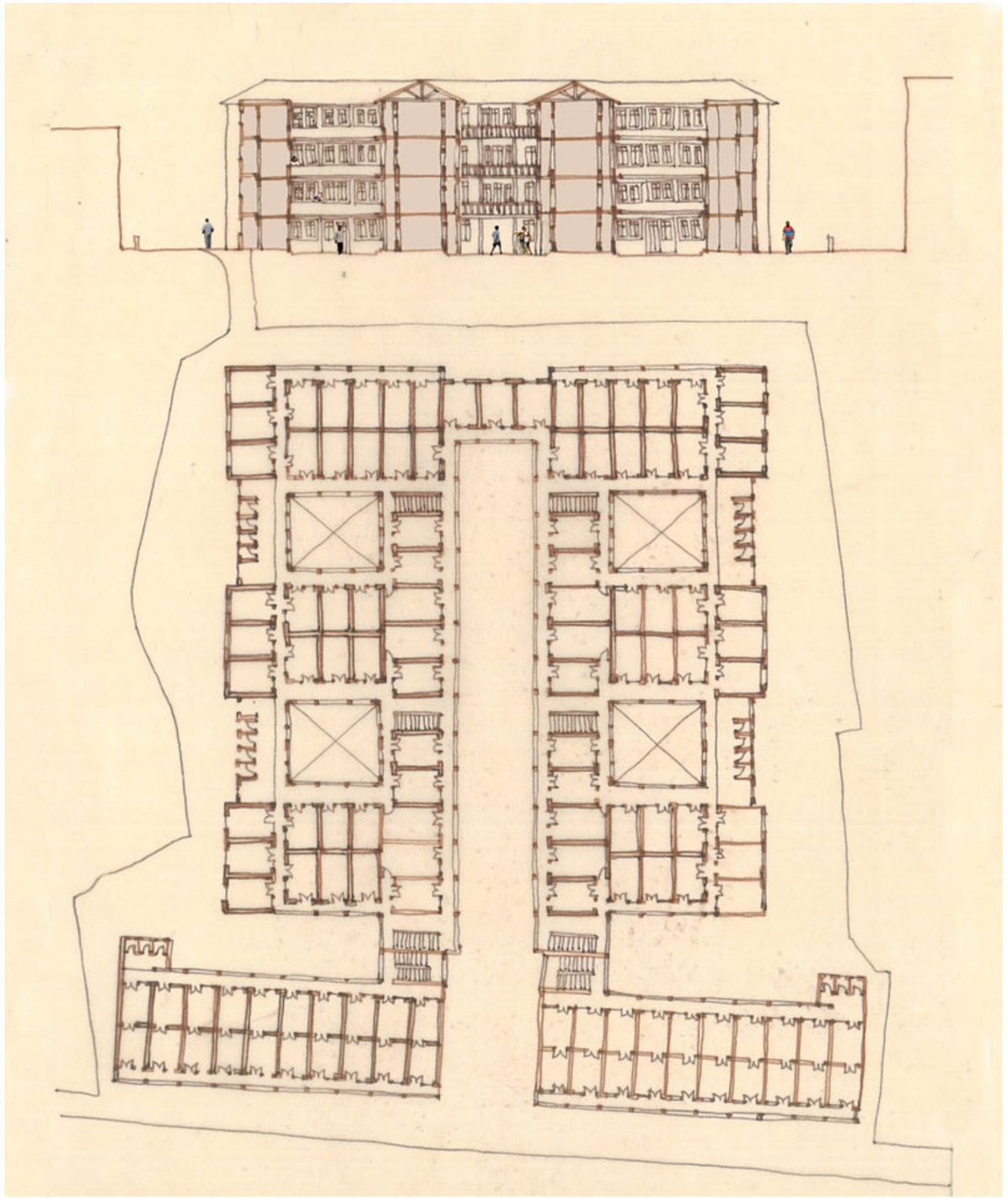
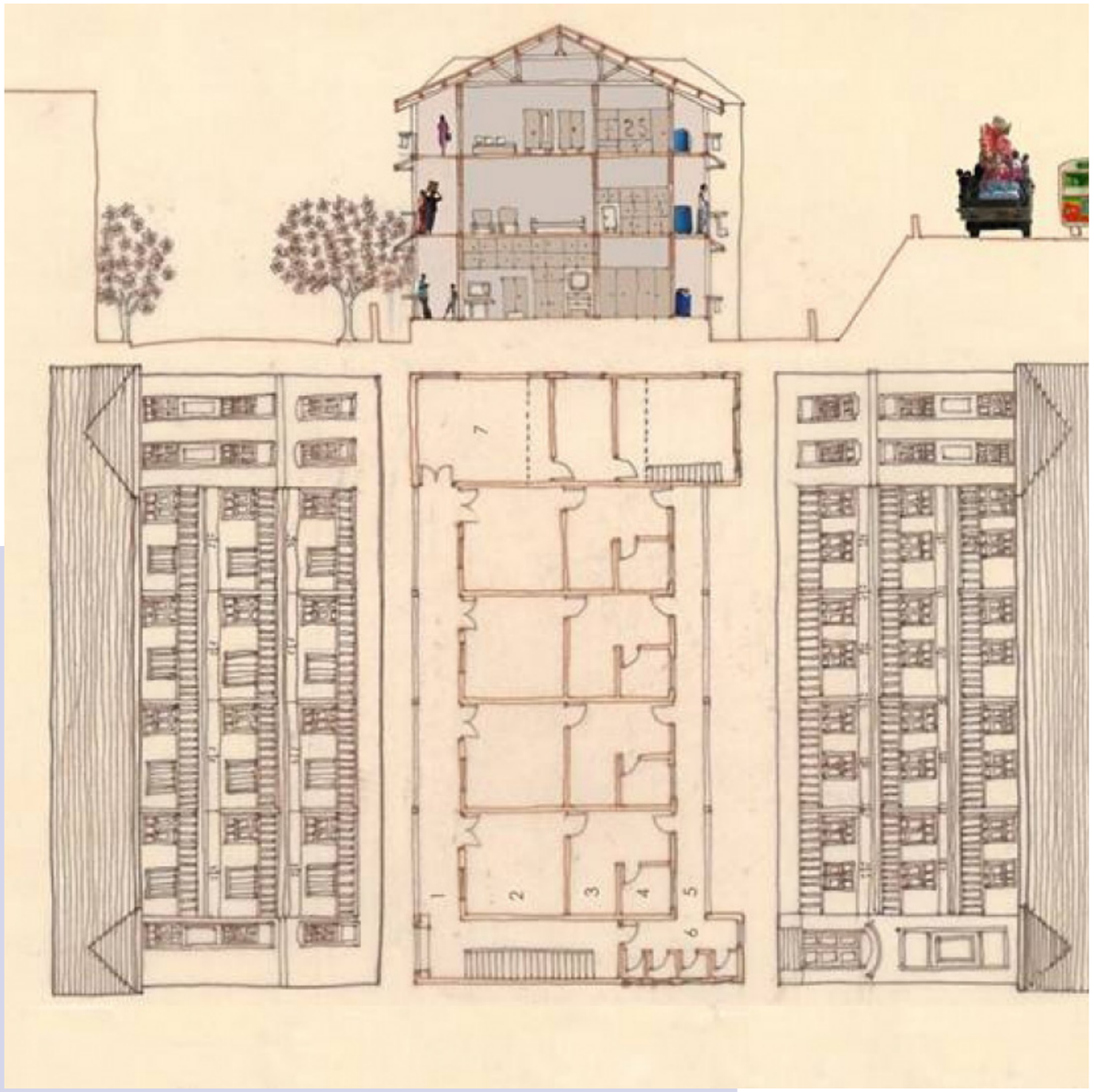


Fig.58: Number of social connections in a typical apartment building.

Source of Image: Drawing by Author



Hajikasam chawl represents a typology that shows a unique feature, where a single large building accommodating a large number of tenements is articulated with a series of internal courtyards for light and ventilation. Here you find long corridors that not only string along single-room tenements, but also courtyards and toilets.



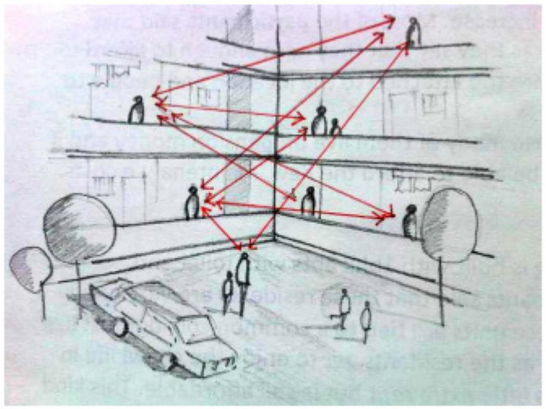


Fig.57: Number of social connections in a Chawl.

Source of Image: Drawing by Author

Creative Co-Housing

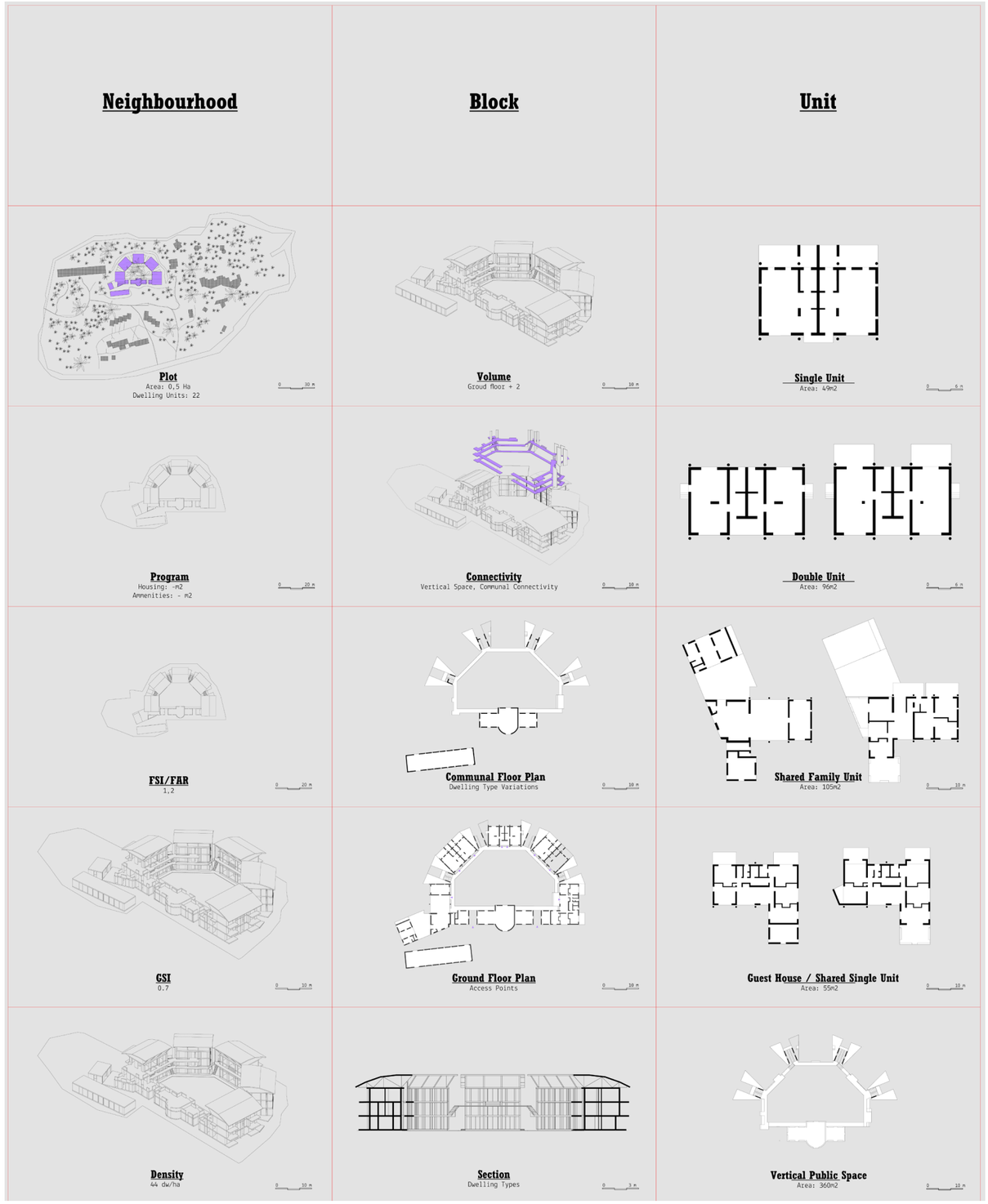
The project is located in Auroville, a town that aims to be a universal town where men and women of all countries are able to live in peace and progressive harmony above all creeds, all politics and all nationalities. The purpose of the town is to realise human unity. The town is located in south-east India.

In order to accommodate the town this project was made, part of 5 housing-clusters in the residential area of Auroville. The town consists of experimental projects, challenging different concepts of living. For this particular project the concept of co-housing was introduced in the floorplans of the units.

Units consisting of different levels of privacy allow residents to interconnect with each other. Shared communal spaces allow the residents to cooperate as a small community. Communal spaces are specifically created for gatherings and social interactions. Vertical public spaces allow the neighbors to meet and create different levels of public spaces. A guesthouse shared by the community allows visitors to interact with the residents.

In the present day programs are being held in the communal spaces. Activities show the interconnection of the residents in the units.

A prototype for collective living promoting community and sharing, the project was planned as one of 5 housing clusters for around 360 deliberately diverse residents. Realized as an example for an independently managed cluster accommodating 50-60 persons, residents shared common facilities at cluster-level and have some facilities for useby the larger community. A variety of social and economic backgrounds were integrated to make it a relevant prototype for sustainable community housing in an urban low-density context. Aiming to be much more than an arrangement of residences by creating a neighborhood, public spaces are distributed for different scales of groupings with a gentle hierarchy that included intimacy. Streets created on the upper levels facilitate communication. Voids between the house and the street promote privacy while enhancing natural ventilation through the venturi effect. The excavated onsite soil was used to build rammed earth walls in a contemporary technique using a special large formwork, adding 5% cement for water resistance, lending a contemporary character to a material associated with the vernacular. Specially designed insulating terracotta roofing units on part-prefab beams were assembled as an easy modular construction of high insulation properties.A root-zone treatment plant recycles sewage water for irrigation.



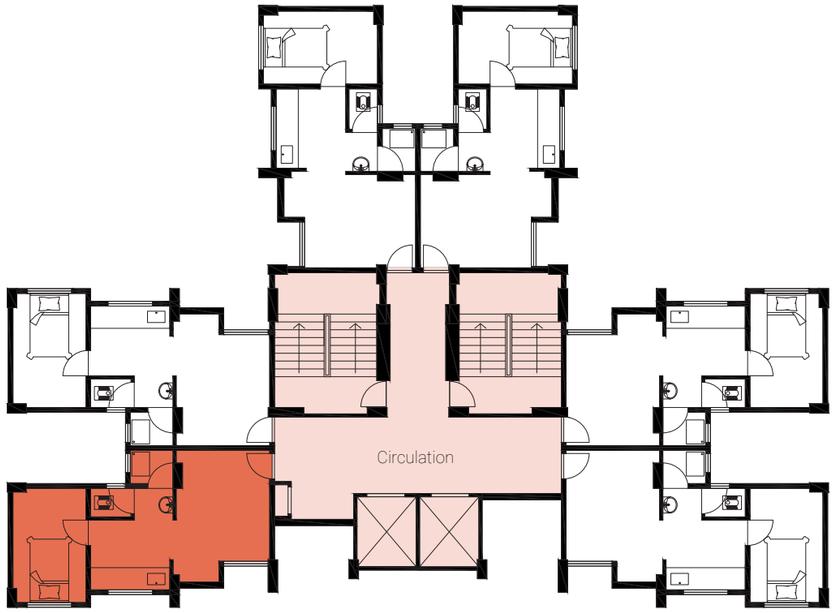
CIDCO Mass Housing

CIDCO, also known as the City and Industrial Development Corporation of Maharashtra was formed in 1970 with the mission to shift the population and the commercial activities of Mumbai to Navi Mumbai in order to solve the congestion in Mumbai. Currently they also are also the New Town Development Authority (NTDA) and Special Planning Authority (SPA) in the Government of Maharashtra. CIDCO owns all the plots in new cities and is the richest Government Authority in India.

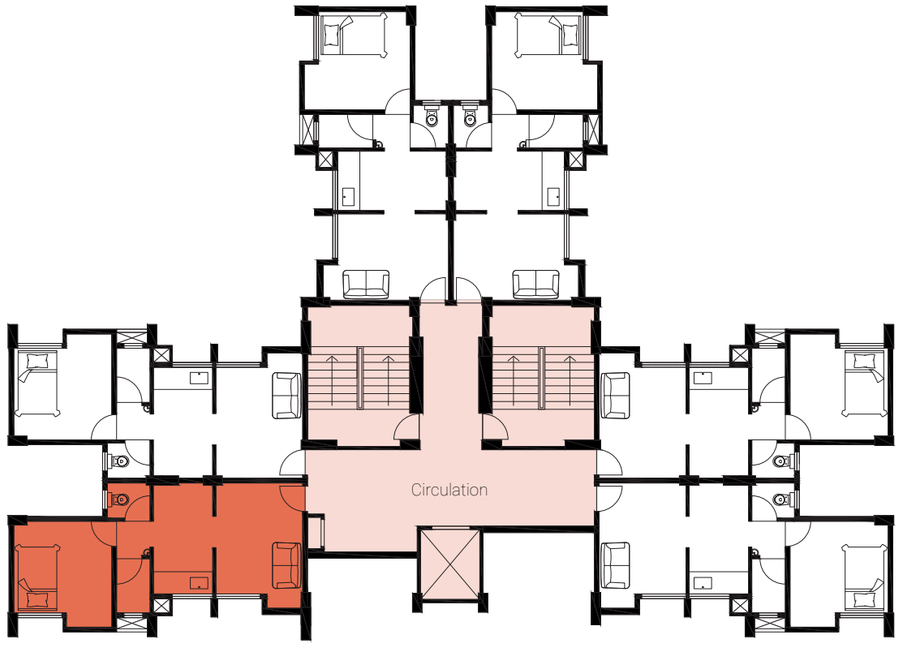
CIDCO Mass Housing Scheme
aims for 15.000 houses at the end of 2021 with 65.000 houses in the coming year of 2022 in Taloja, Dronagiri, Kalamboli, Ghansoli and Kharghar as part of the Pradhan Mantri Awas Yojana (PMAY). Pradhan Mantri Awas Yojana – Urban (PMAY-U), a flagship Mission of Government of India being implemented by Ministry of Housing and Urban Affair

Project Concept
The design concept of the mass housing scheme consists of a repetition of one unit, an EWS or LIG single person unit. This unit is repeated on every floor 6 times, all connecting to the same circulation of the building. The units fit together like a puzzle piece and every building complex can be connected to its neighbouring building. All together creating an mass housing scheme.

Typical floorplans
The floorplans are designed for single households. They consist of a kitchen, living room, bedroom, toilet and bathroom. Every floorplan is mirrored and repeated in a total of six times on every floor. All the toilets connect to the outer facade, but when a building complex has a neighbouring complex the toilets of 4 units of every floor become connected to one air shaft. Windows of one unit all face the same direction. In the unit storage spaces are available against the ceilings. The structure consists of concrete beams that are thicker that the walls, creating a wall surface with more corners than one is used to in the western world.

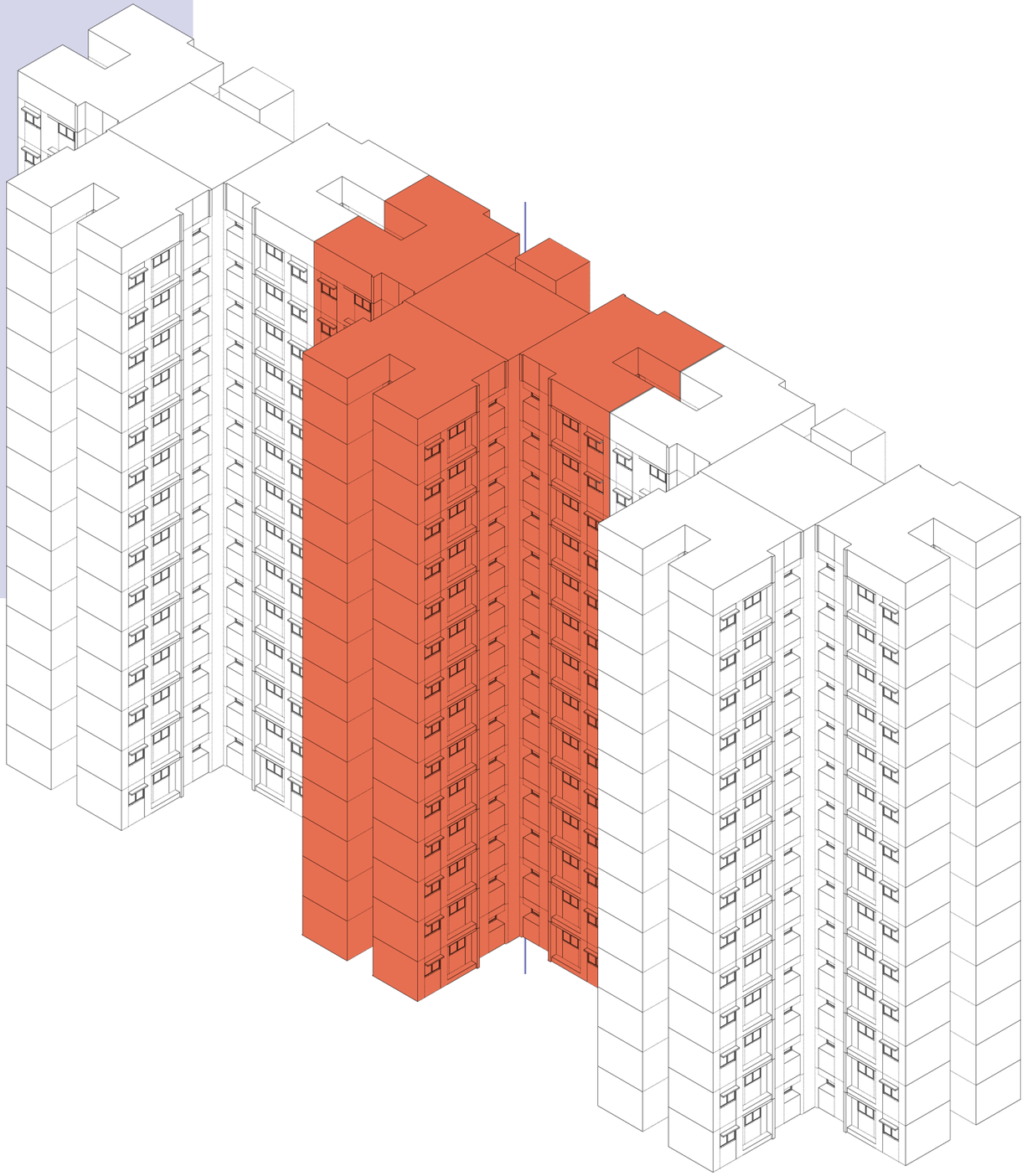


EWS - Typical Floorplan



LIG - Typical Floorplan

10 M



III. Program of Requirements & Graphic Documentation

Program of requirements

Gross site area
63.5 ha

Gross built ground area
8.9 ha

Ground Space Index Typical Neighbourhood
0.70

Floor Space Index Typical Neighbourhood
1.78

Number of plots/unit Typical Neighbourhood
56

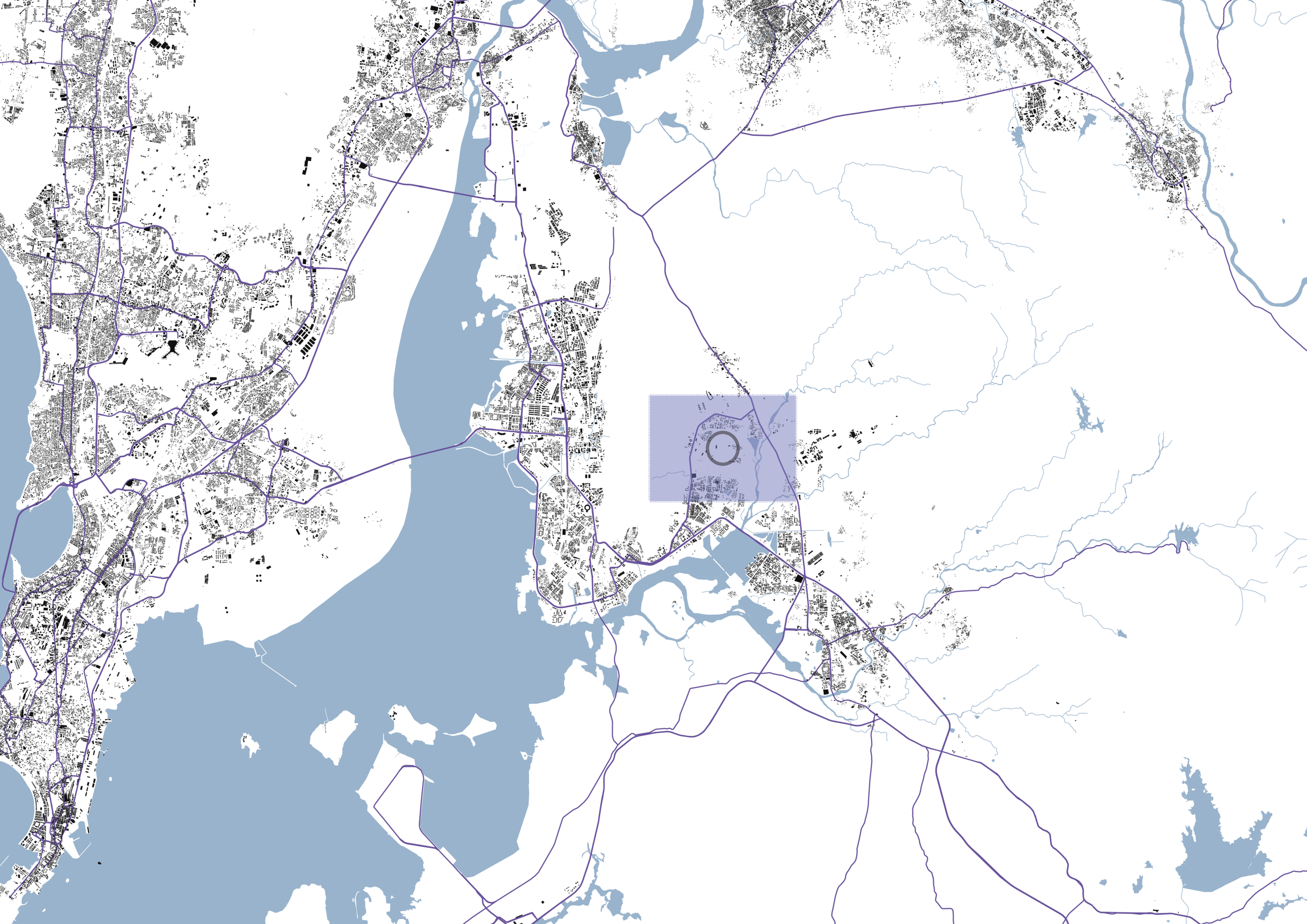
Units/ha Typical Neighbourhood
342

Dwelling types
8

Research question

How could **affordable mass housing** with mixed households prevent sickness and increase wellness through a *salutogenesis approach* in Navi Mumbai?

Location Analysis




Stone Quarries
Forest Area
CIDCO Colony
Taloja Central Jail
Sri Sathya Sai Sanjeevani Hospital
Taloje Panchnad
Stone Quarries
Residential Area
CIDCO Colony
Taloja CIDCO Mass housing scheme
TATA Memorial Centre Advanced Centre For Treatment, Research & Education in Cancer
Hanuman Kada Waterfall
Holding Pond
Pandavkada Waterfalls
4000m
2750m
1250m
500m
NMIMS Navi Mumbai University
Stone Quarries
Central Park - Kharghar
Kharghar Golf Course
Residential Area
Taloje River
Kharghar Hills
Kalamboli
Panvel Creek

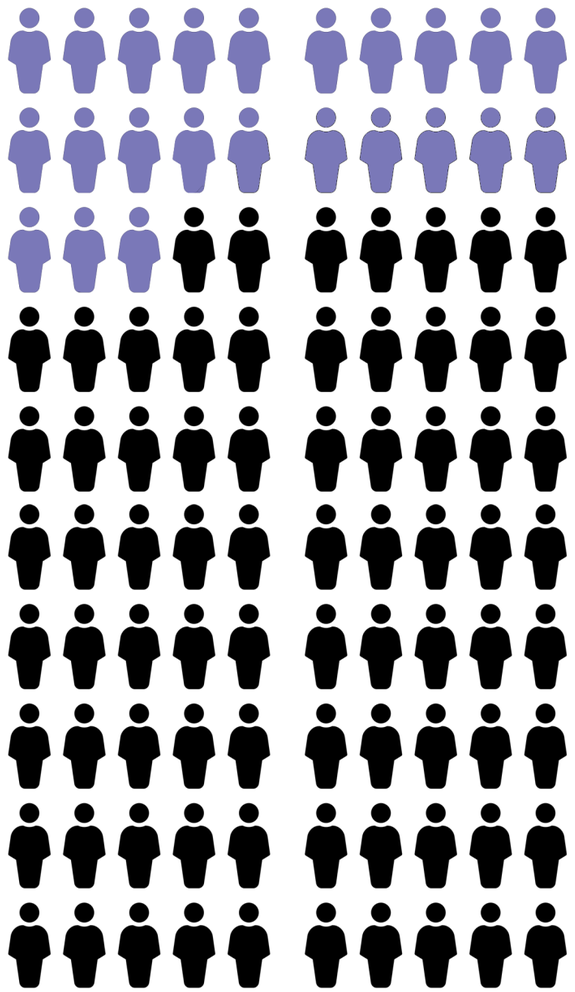
Health Status

Of adolescents in Navi Mumbai, 2011 study

Study Design: *Cross-sectional study*
Setting: *Six Colleges in Navi Mumbai*
Participants: *317 adolescents aged 17 - 19 years*

59,9 % females

40,1 % male



Adolescence is defined by WHO
as the age group of 10– 19 years. Adolescents constituted **22.8%** of the population in India.

The adolescents in the Netherlands(2019) are **12%** of the population.

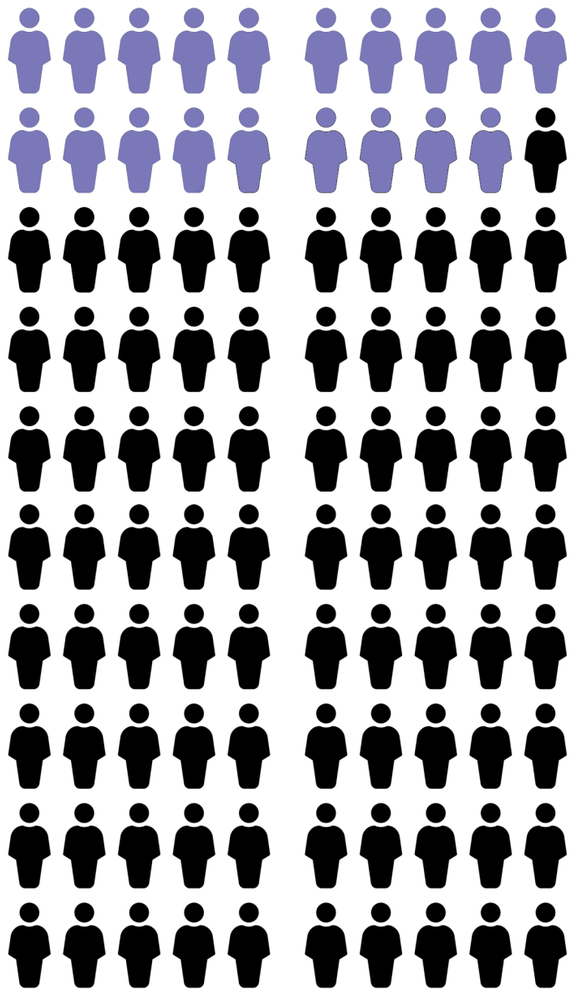
Health Status

Of adolescents in Navi Mumbai, 2011 study

The prevalence of the psychosocial problems was **19.2%** among adolescents

Most common problems:
- Educational difficulties
- Trouble sleeping
- Crying a lot
- Easily irritable
- Get easily in arguments or fights

This is **10.4%** in the Netherlands

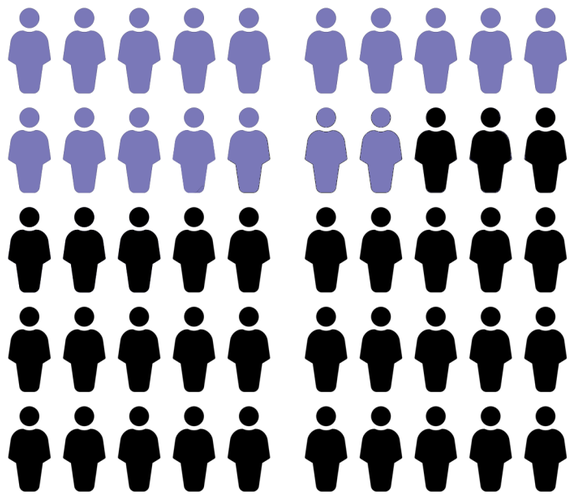


Health Status

Of adolescents in Navi Mumbai, 2011 study

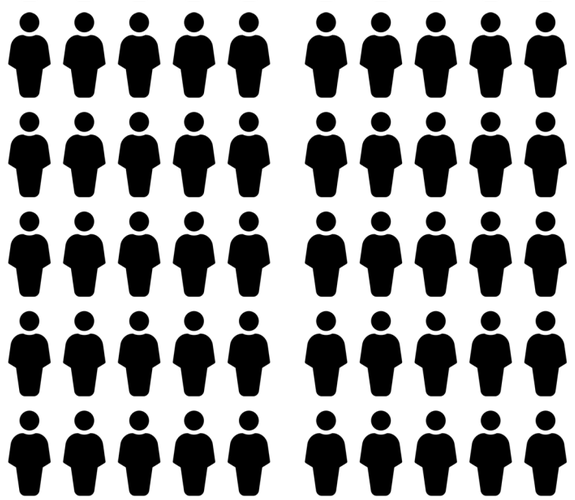
Navi Mumbai
Stressed
16,6%

Suicidal tendencies
16,8%



Netherlands
Stressed
25%

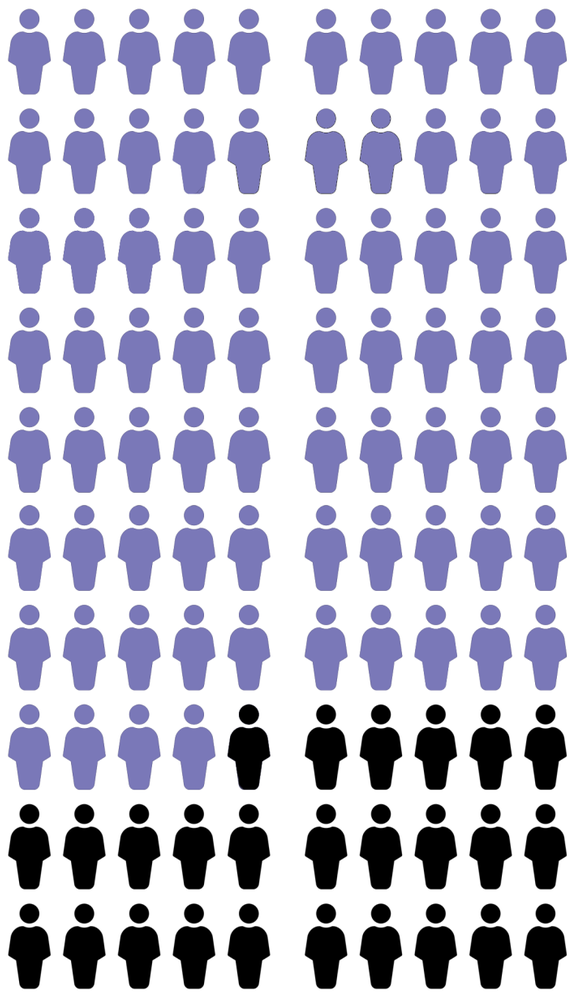
Suicidal tendencies
13,2%



Health Status

Of adolescents in Navi Mumbai, 2011 study

74% are underweight
out of which 85.3% are females and 58.2% are males.



Consumption of fast food in a week

40,1% Once a week
39,1% Twice a week
14,8% Daily

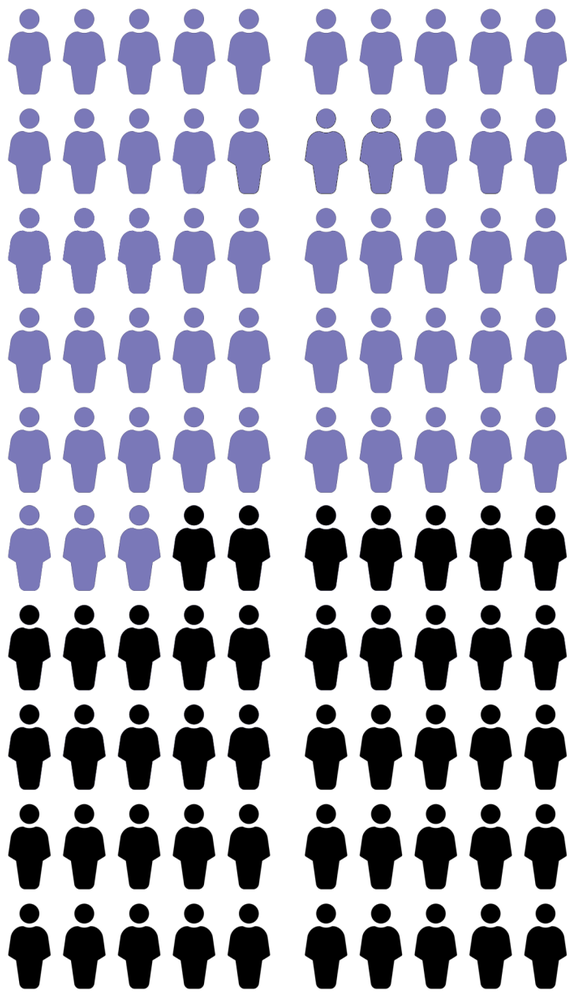
Less than 4% in the Netherlands is underweight

Health Status

Of adolescents in Navi Mumbai, 2011 study

Knowledge about emergency contraceptives is only around 53%

Knowledge about contraceptives is a mandatory curriculum for primary and secondary schools in the Netherlands.



Current Masterplan “Heart of the City”

Design Strategy

Design strategy

Focus point to achieve a salutogenesis approach

Social Cohesion

(create opportunities for social connectivity)

Greenery

(reduce airpollution with greenery, produce local plants for the local community)

Water Management

(design interventions to minimize monsoon effects)

Amenities

(accessible amenities in the neighbourhood)

Connectivity

(encouraging cycling and walking)

Individual Health

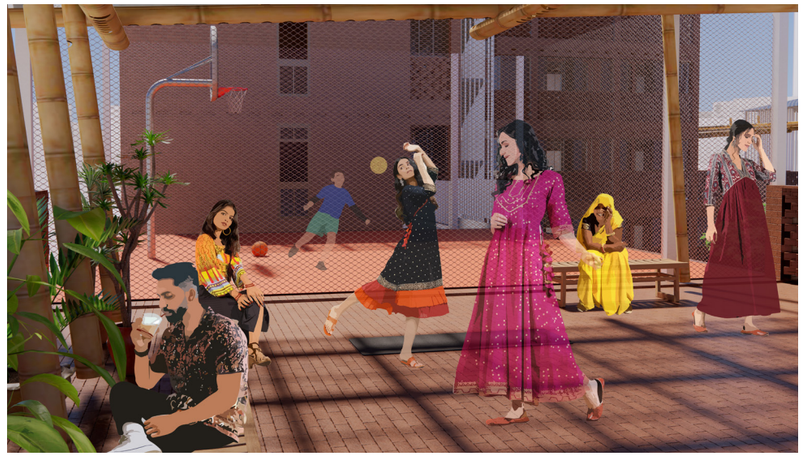
(providing healthy living environment)

Cultural Aspects

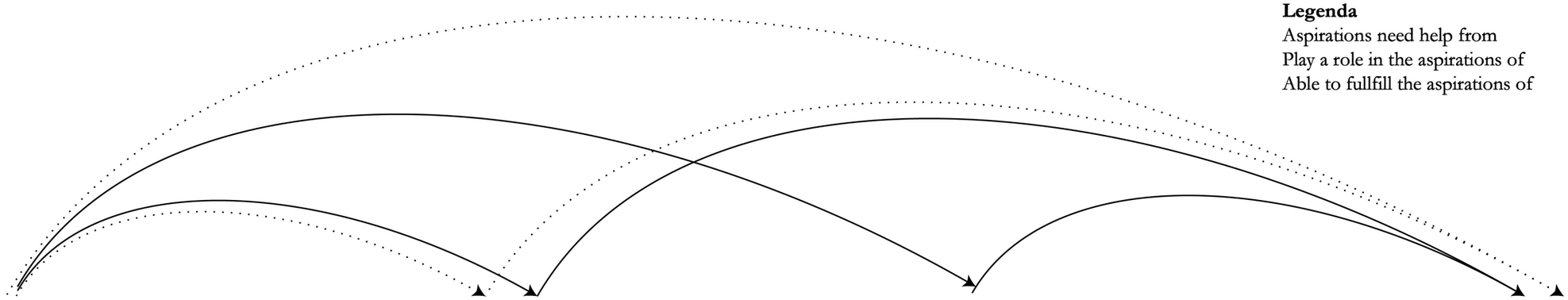
(design suited for cultural lifestyle)

Social Cohesion	Greenery	Water Management	Amenities	Connectivity	Individual Health	Cultural aspects

Social Cohesion	Greenery	Water Management	Amenities	Connectivity	Individual Health	Cultural aspects



Managerial Strategy



Legenda
Aspirations need help from
Play a role in the aspirations of
Able to fullfill the aspirations of

Residents
- MIG ranged income groups
- LIG ranged income groups
- migrant workers

aspirations
- better living qualities
- generating income; employment; building a business
- affordable housing
- comfortable living and safe living environment

offer
- the people to build a community
- the need for living ammenities: healthcare, education, shops, services, public parks etc.
- workers & employers

CIDCO
City and industrial development corporation
- ownership plot
- government corporation

aspirations
- FSI of 3 or higher
- selling to corporates to make a profit
- better version of Bandra - Kurla Complex with nightlife
- lively city centre of Kharghar

offer
- investment for the project
- managing the whole process
- possible ownership to corporates, businesses or residents

PM-JAY
National Health Protection Scheme
- financed by taxes
- government scheme

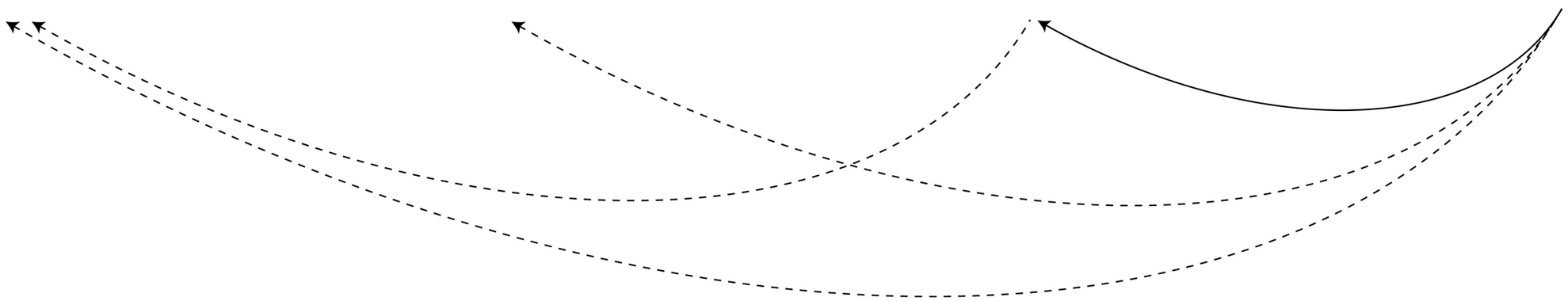
aspirations
- allow low-income to get cashless secondary and tertiary care at private facilities
- giving financial support in order to improve public health

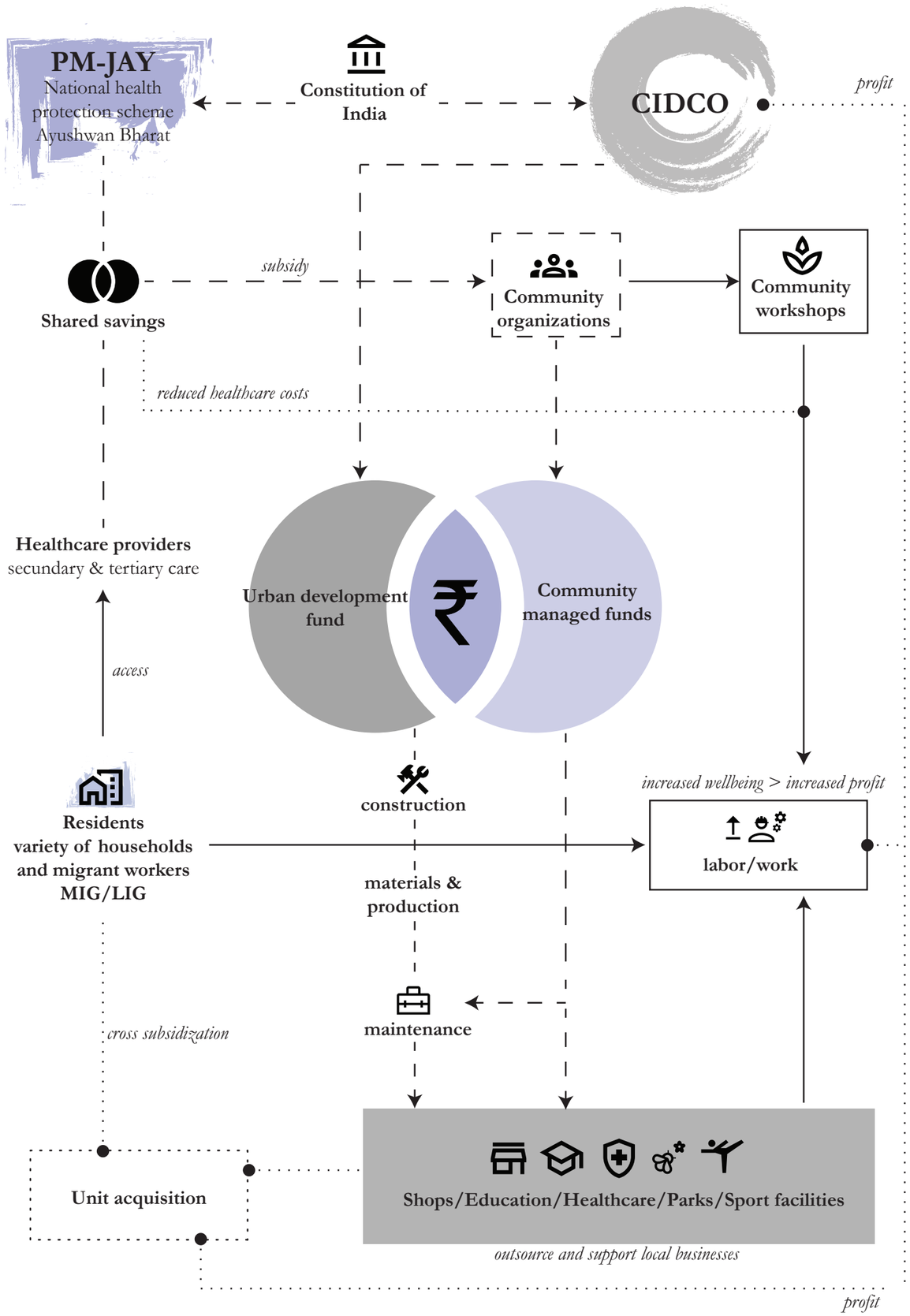
offer
- state health agency
- financial aid for secondary and tertiary care
- coverage of 5 lakhs for each family in the lower-income

Architect/Designer

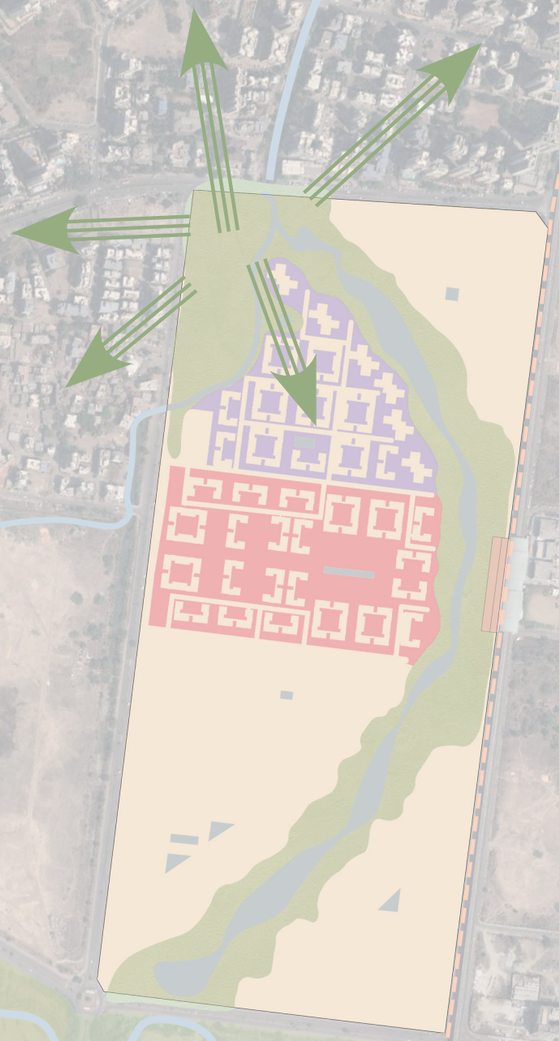
aspirations
- raising quality of health in residential build environment
- providing affordable housing suited for the residential needs
- raising the well being of the residents and creating opportunities for a rich community life

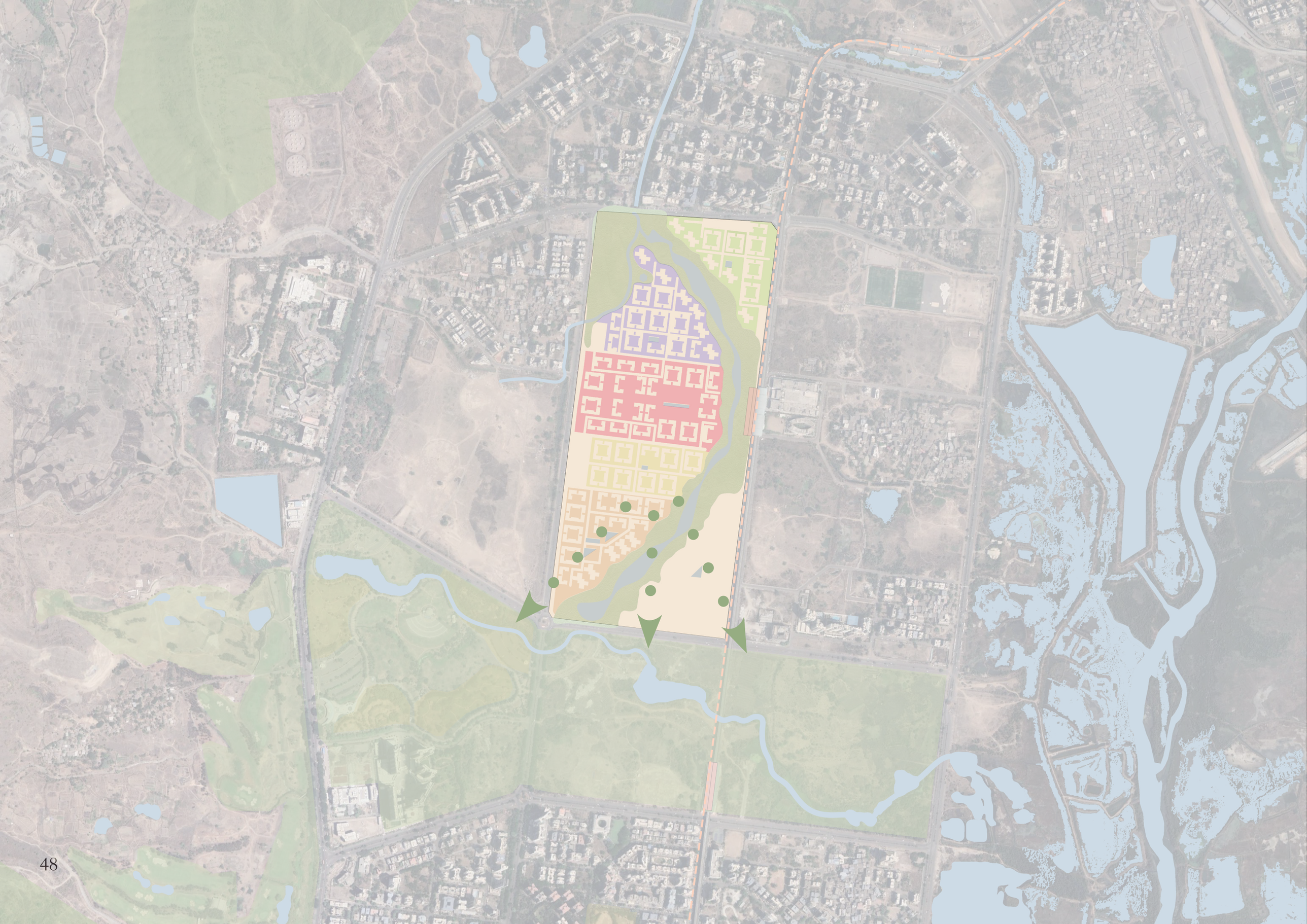
offer
- healthy affordable housing design
- allocated variety of ammenity spaces in the vicinity
- opportunity to reduce healthcare costs by improving the well being
- housing design for a variety of households

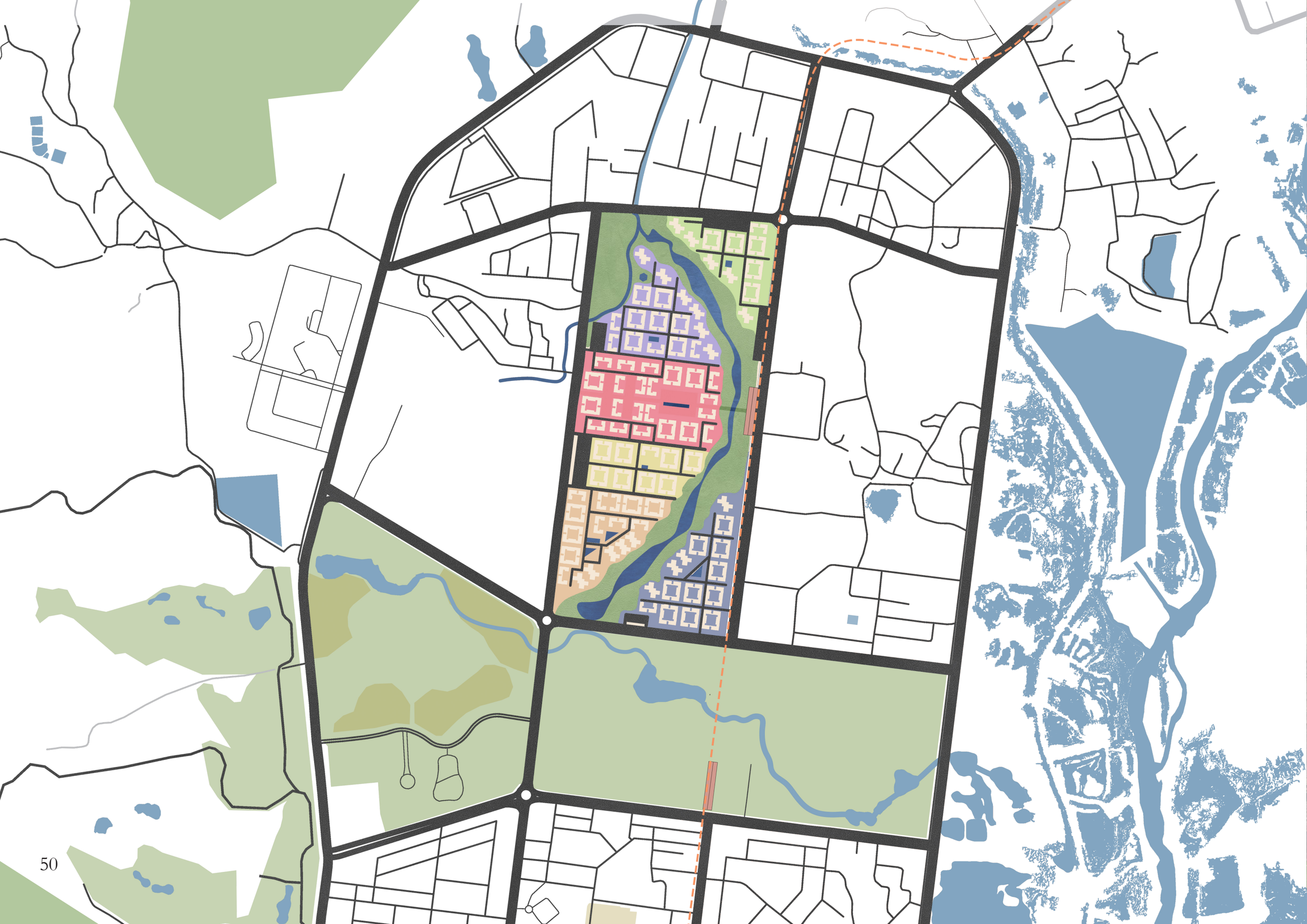


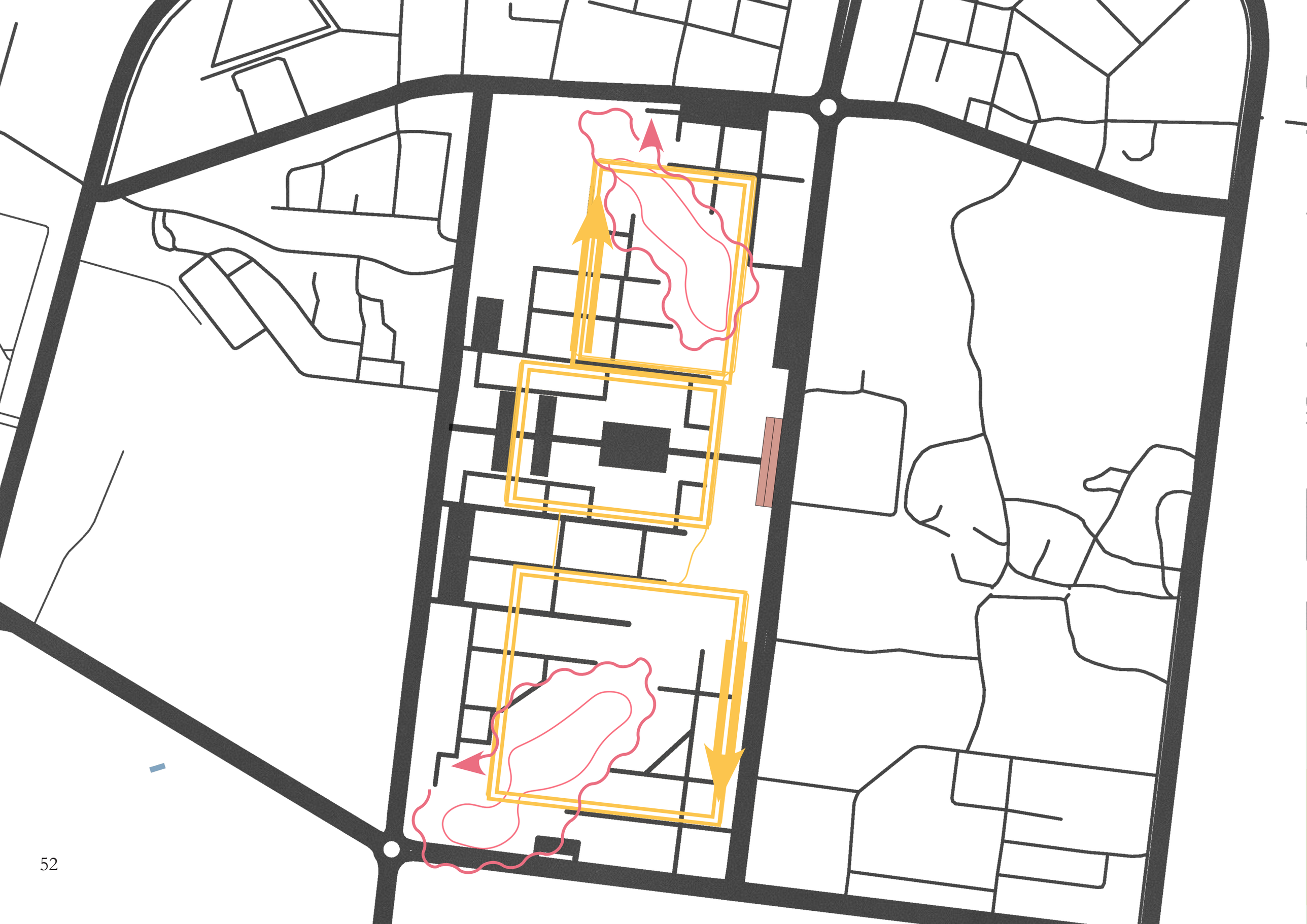

PM-JAY
National health protection scheme Ayushwan Bharat
Constitution of India
CIDCO
profit
subsidy
Shared savings
Community organizations
Community workshops
reduced healthcare costs
Healthcare providers
secundary & tertiary care
Urban development fund
₹
Community managed funds
access
construction
increased wellbeing > increased profit
Residents
variety of households and migrant workers
MIG/LIG
materials & production
labor/work
maintenance
cross subsidization
Unit acquisition
Shops/Education/Healthcare/Parks/Sport facilities
outsource and support local businesses
profit

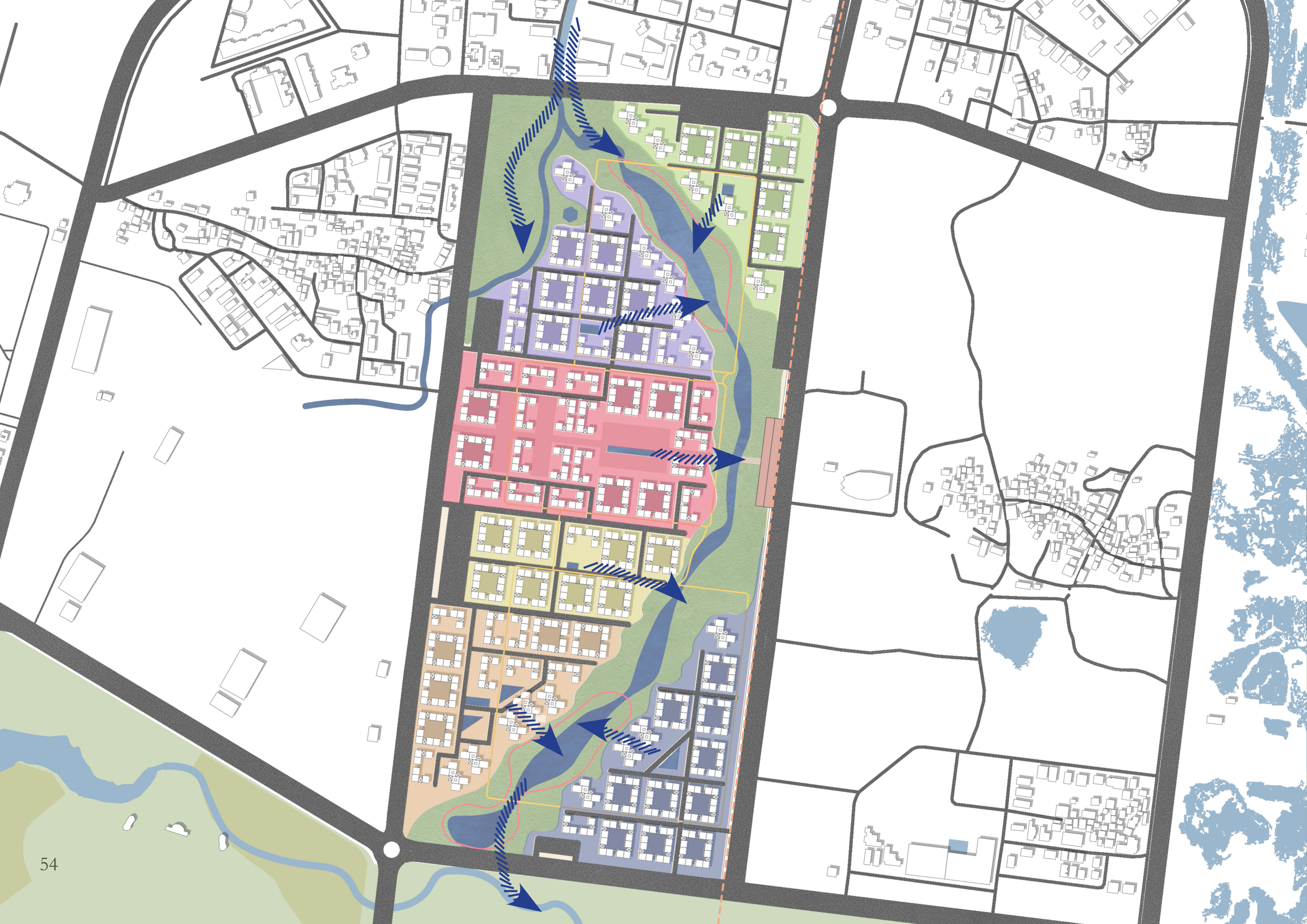
Urban Strategy

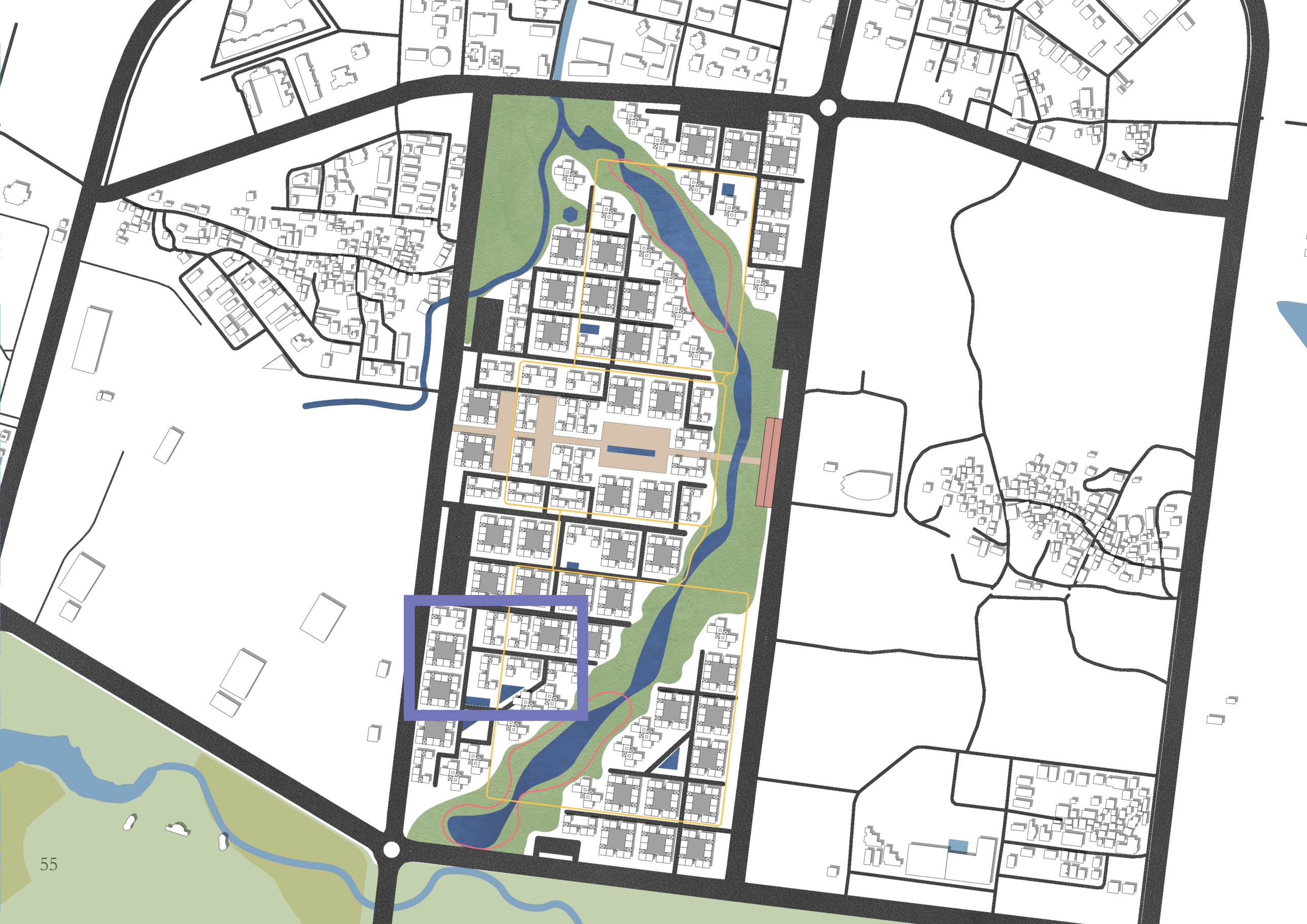




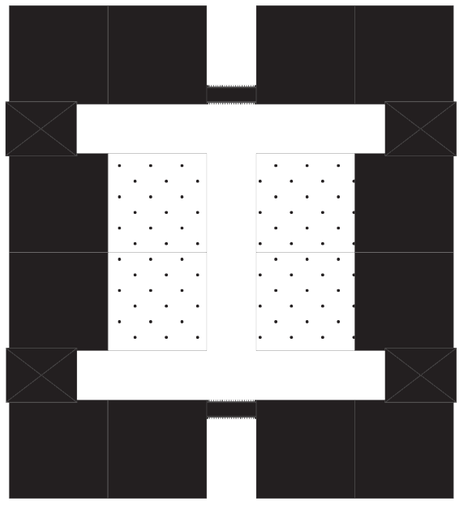




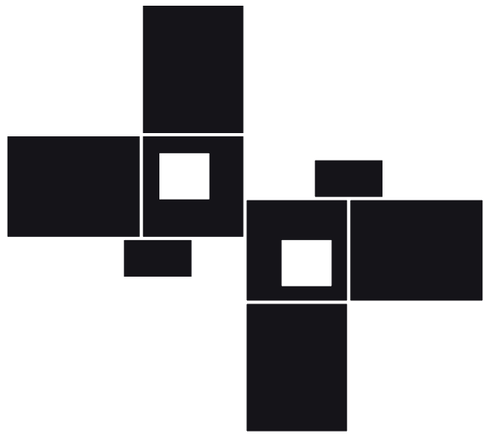




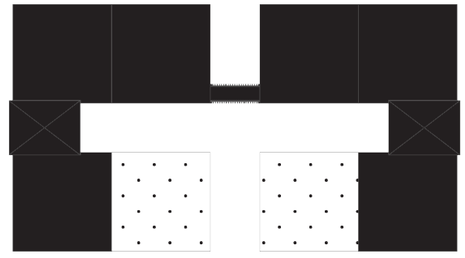
Neighborhood types



Typical Neighborhood

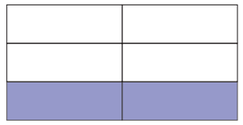


High-rise Neighborhood



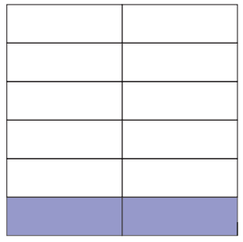
Open Neighborhood

Elevation

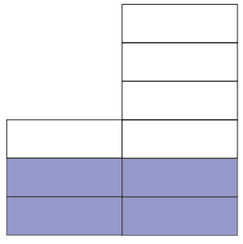


Topview

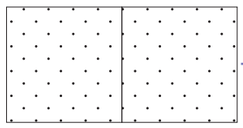
Type 3 - migrant workers and shared living



Type 6 - mixed households of a variety of income ranged around MIG or HIG

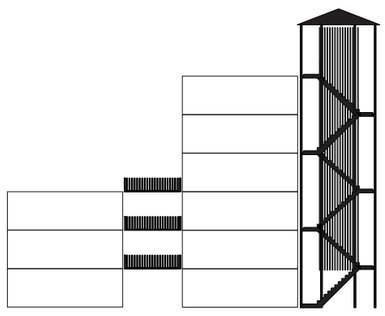


Type 36 - mixed use, variety of amenities, shops, schools, offices, healthcare, start-ups etc.



Public space - park, playgrounds, water storage, parking, kitchen garden

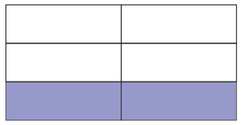
Elevation

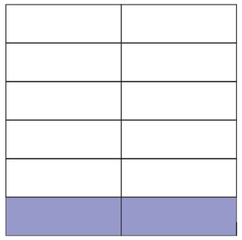


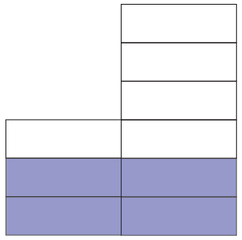
Topview **1.** **2.**

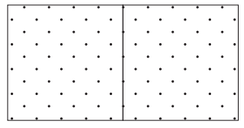
1. Horizontal connectivity - walkway connecting building blocks, residents only

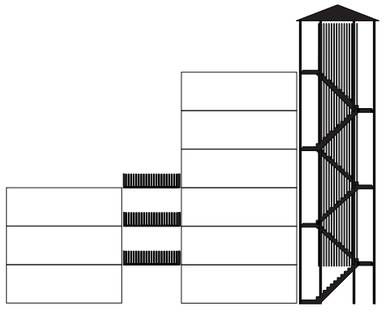
2. Vertical connectivity - stairway connecting building blocks, residents only

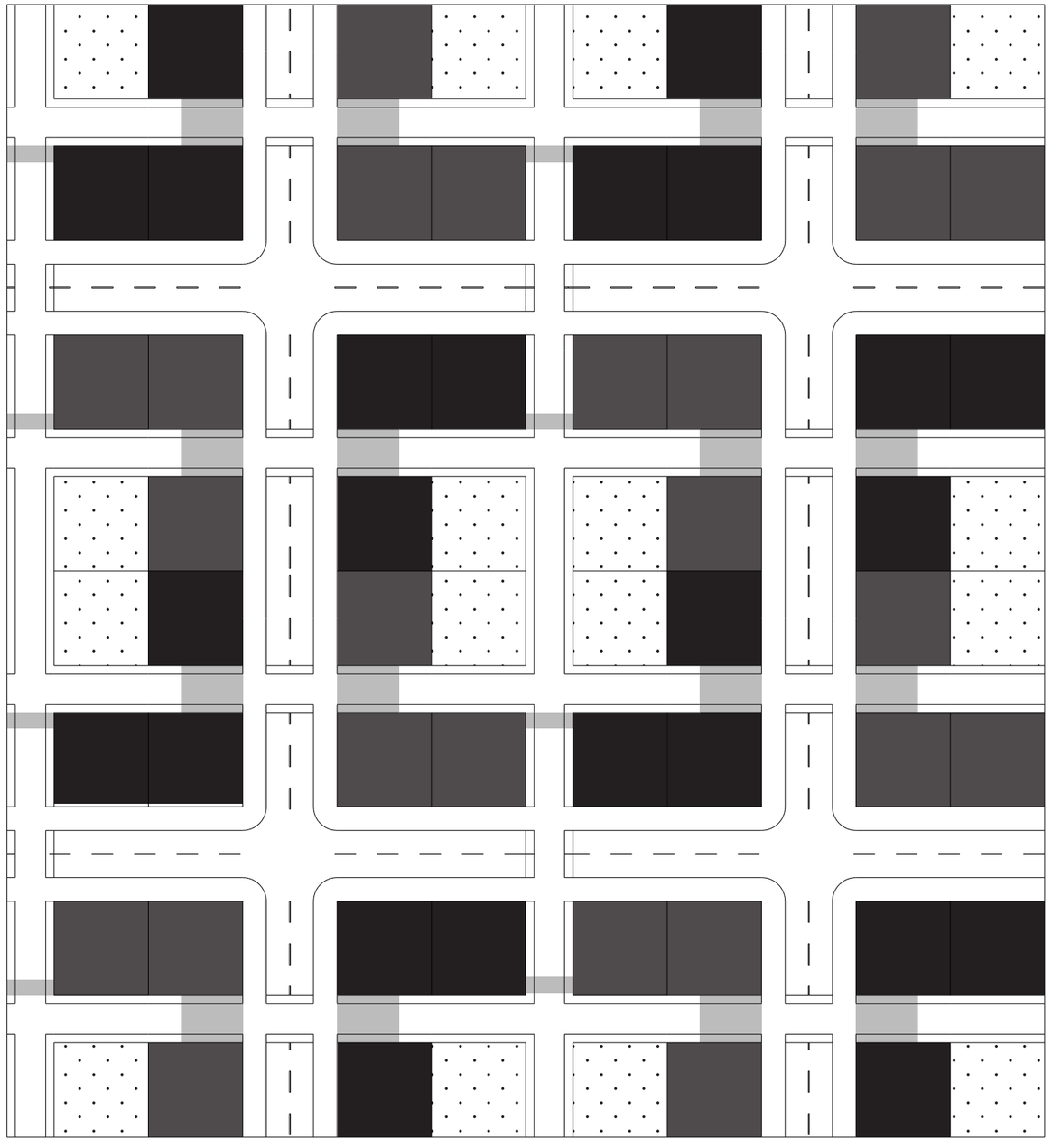




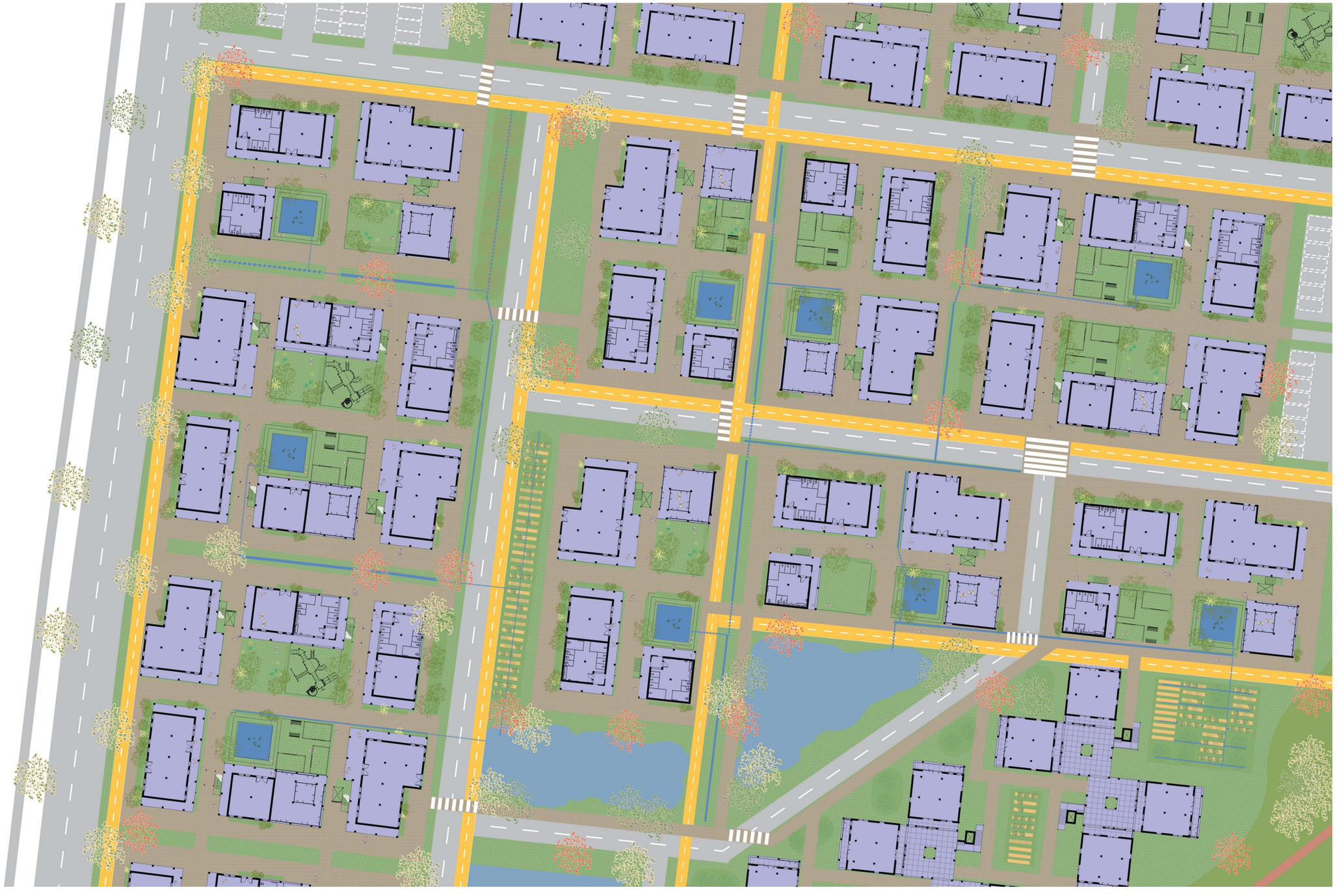


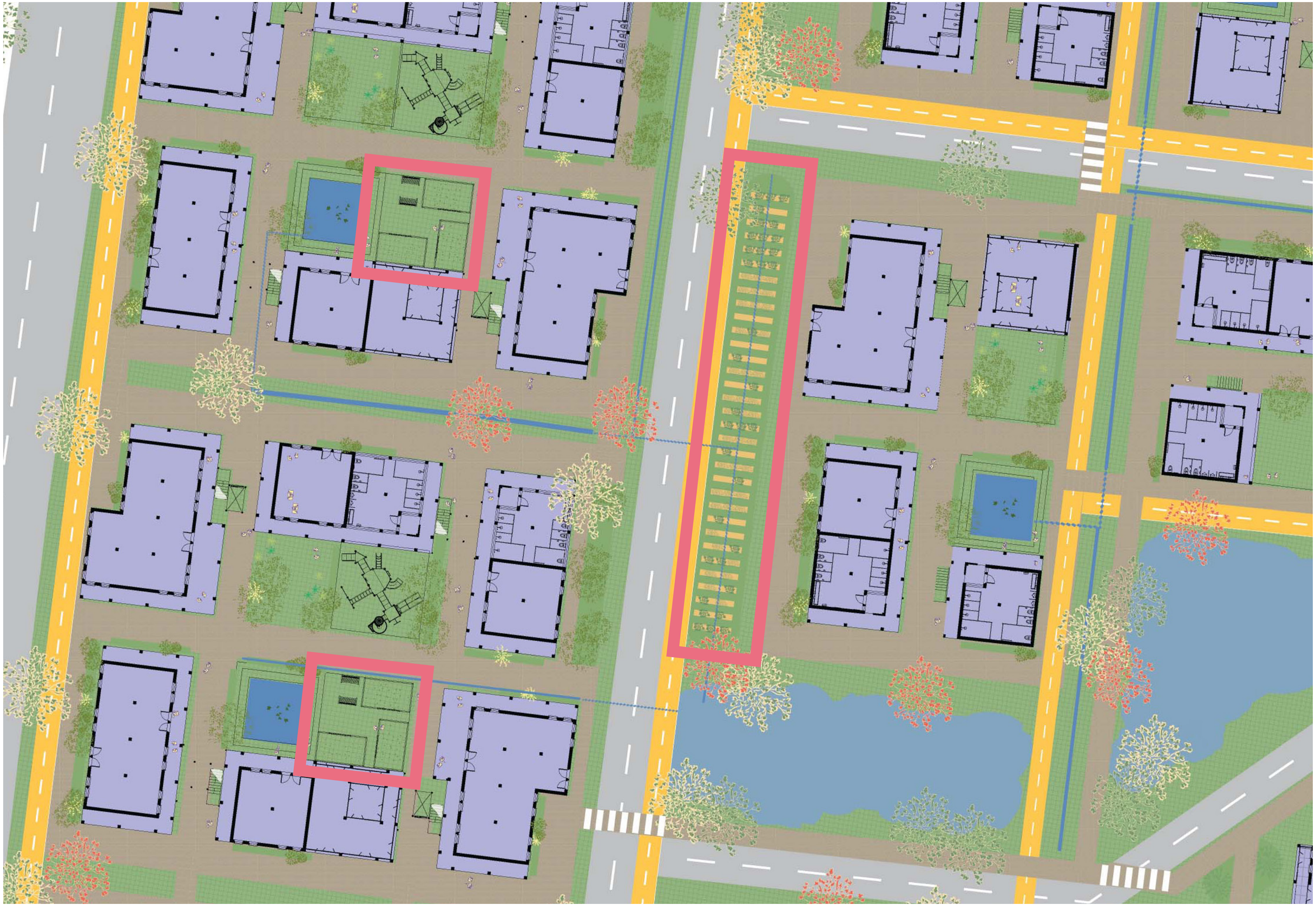






Situation Plan





Medicinal garden

Local plants used in medicine and the Indian kitchen


Amla


Black Cumin


Gilou


Ginger


Tulsi


Turmeric

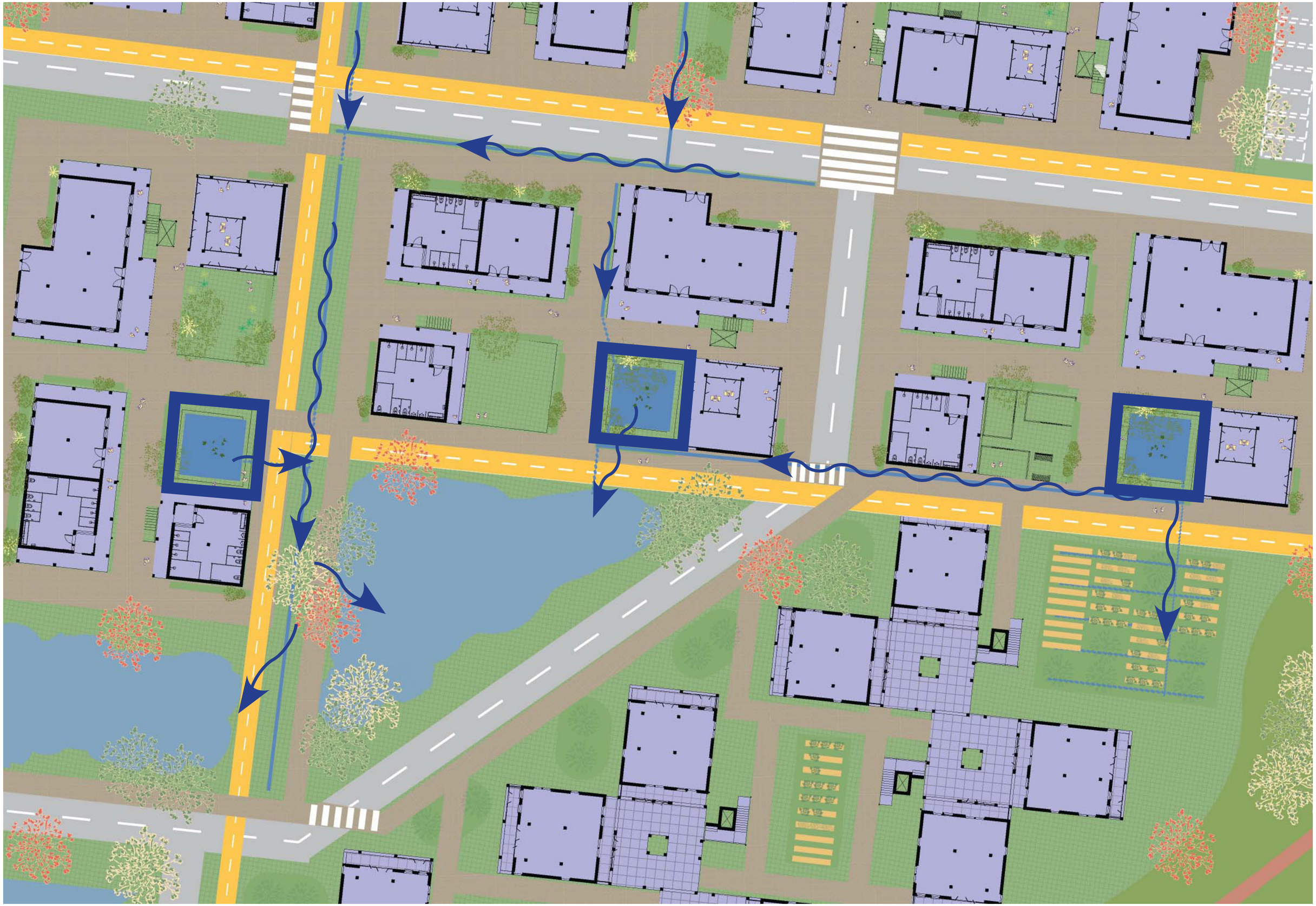

Ashwaghandha


Black Pepper


Cinnamon


Flax Seeds


Garlic

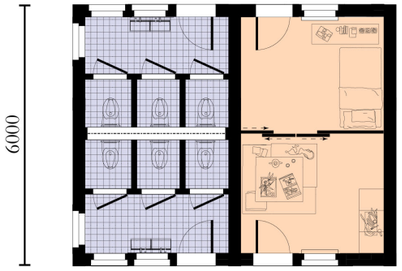


Axonometric

Street profile

Elevation, Plans and Sections

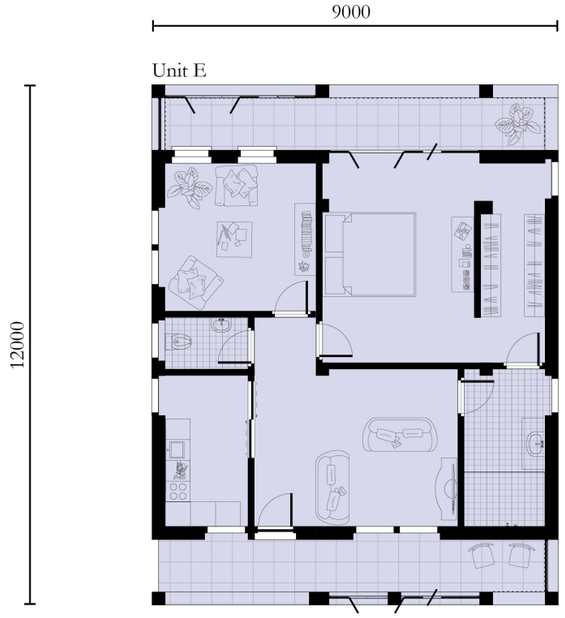
Housing units



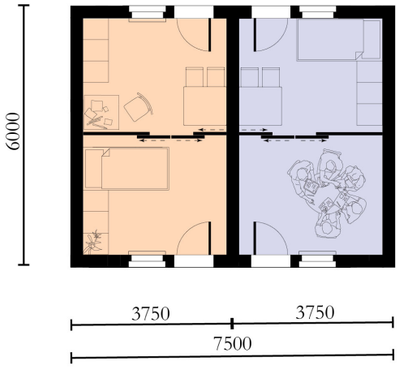
Type 1 - Unit A

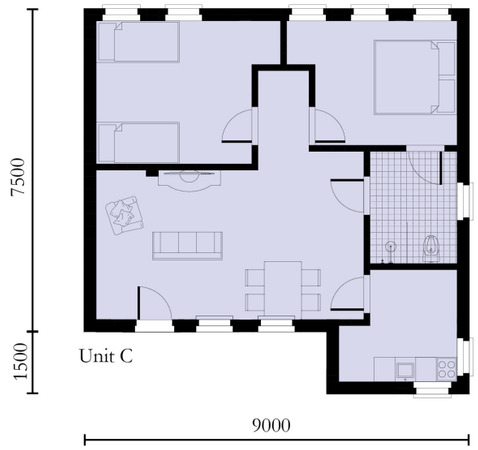
Type 1 - Unit B, C

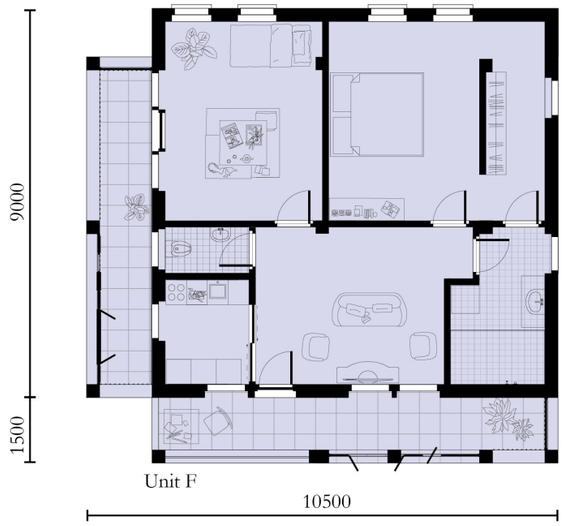
Type 1 - Unit D



Type 2 - Unit E, F







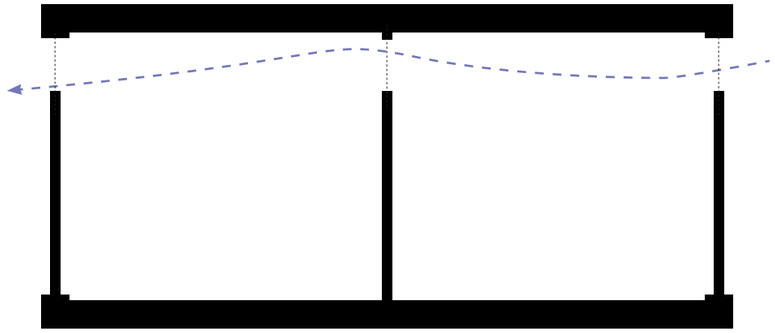
Unit A: Area 34 m^2
- 2 room apartment (roomdivider with sliding-doors).
- Shared toilet and access to bathspace on ground-floor.

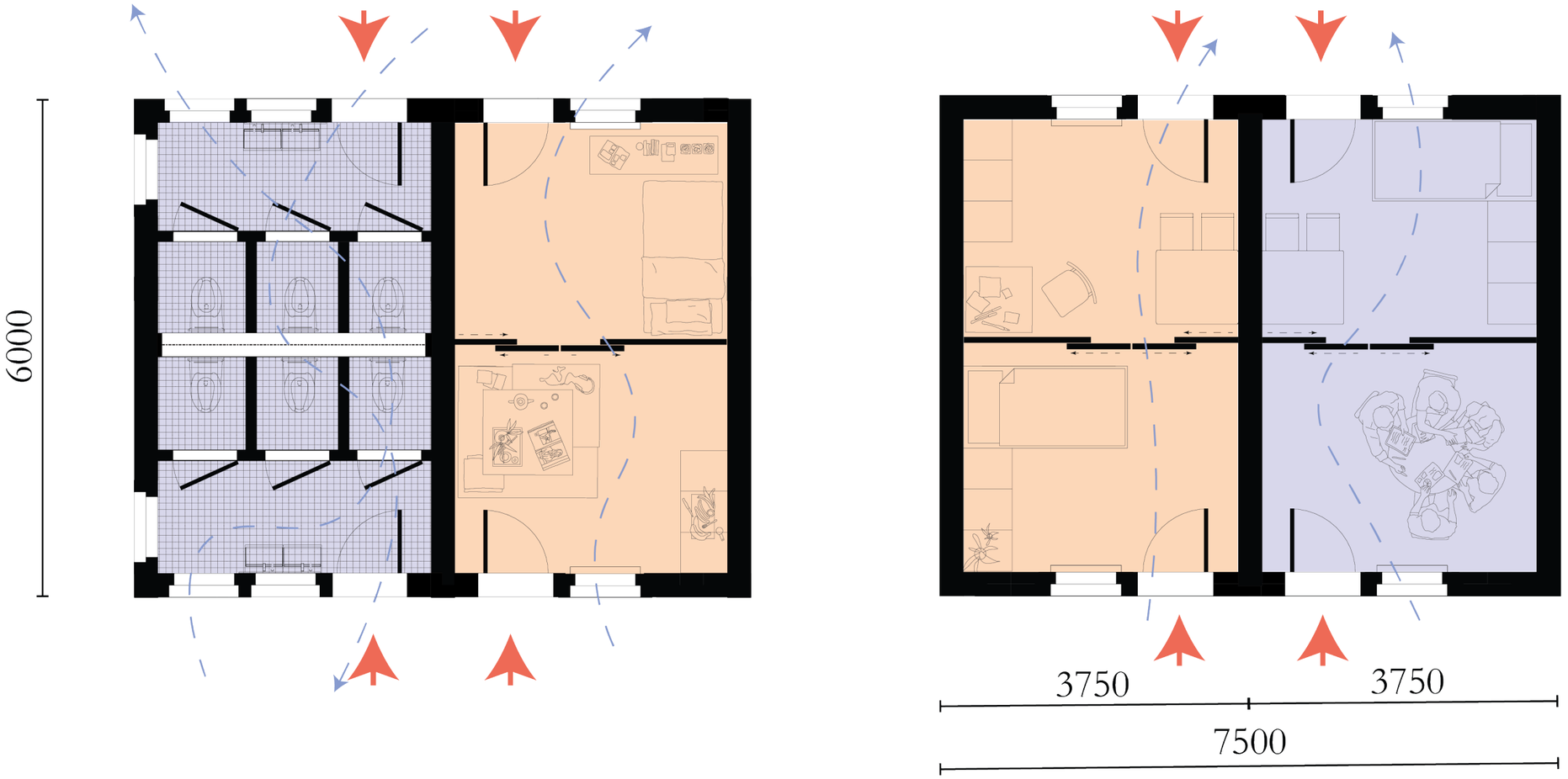
Unit B: Area 28; 39 m^2
- Studio apartment with seperate kitchen and bathroom.

Unit C: Area 72 m^2
- Livingroom, bathroom with toilet, kitchen and 2 bedroom apartment.

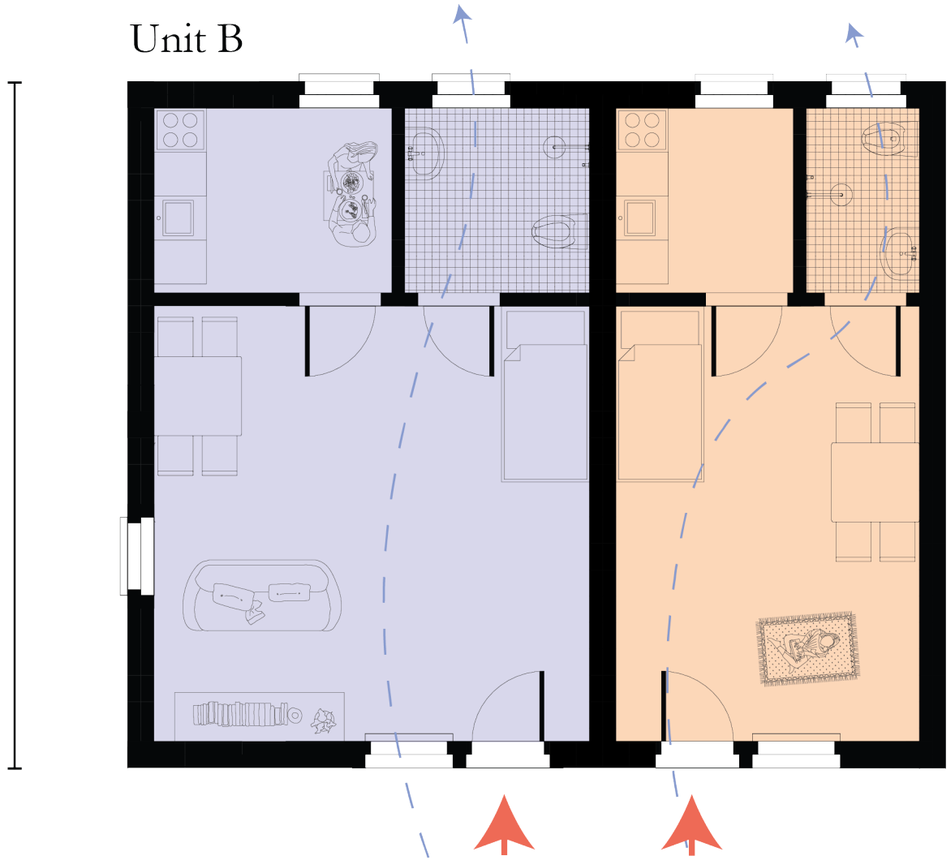
Unit D: Area 56; 69 m^2
- Maisonette apartment, livingroom, private livingroom with kitchen, bathroom, toilet and bedroom.

Unit E; F: Area 108; 106 m^2
- Front porch, livingroom, balcony, kitchen, bathroom, toilet, 2 bedrooms and master bedroom with walk in closet.

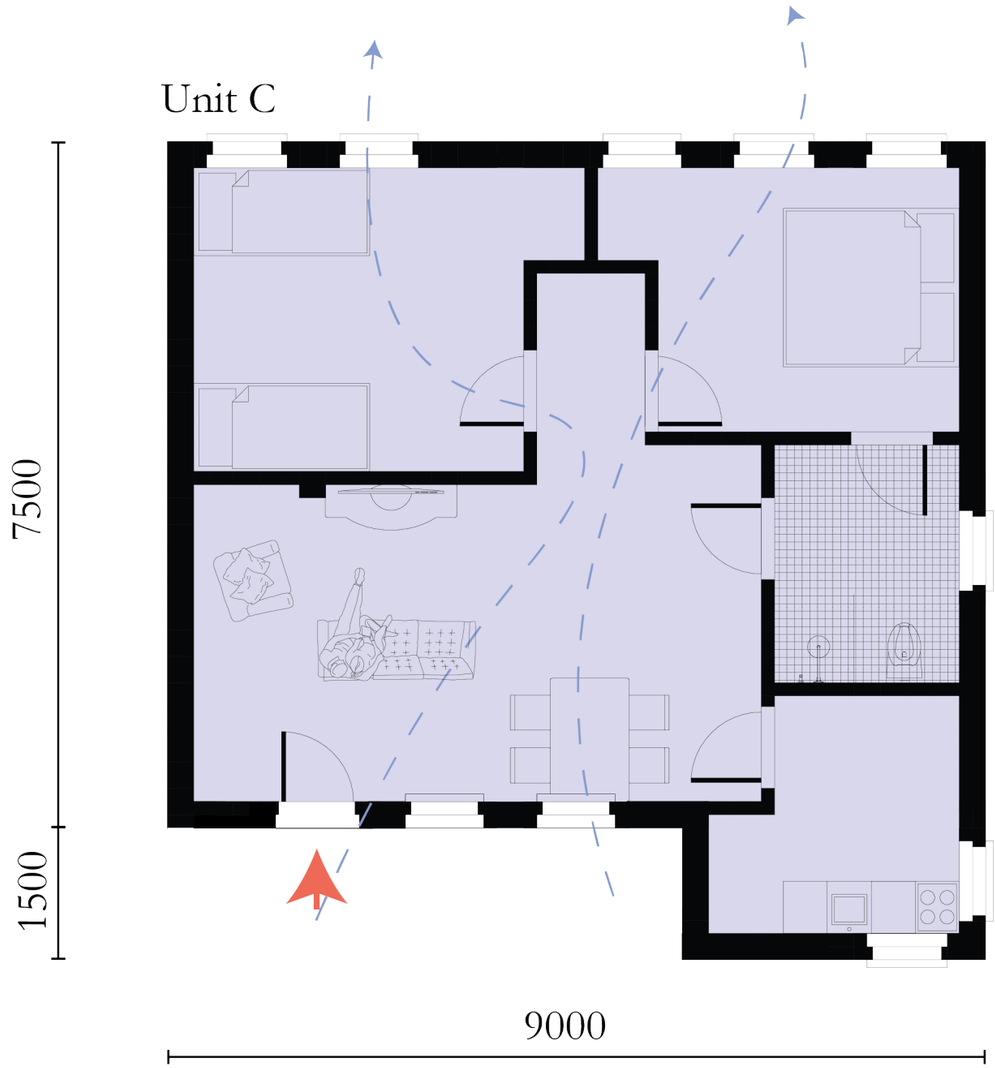



6000
3750
3750
7500

Unit B

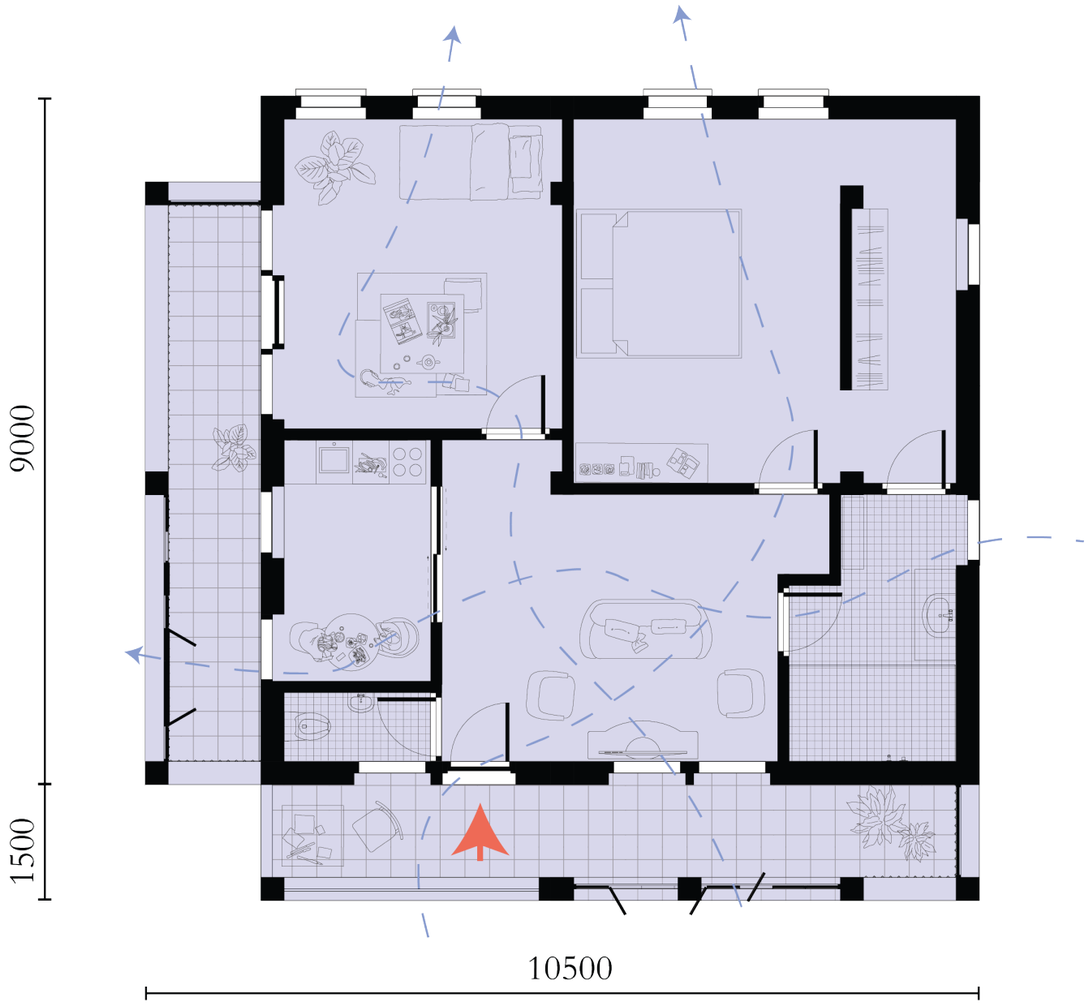


Unit C

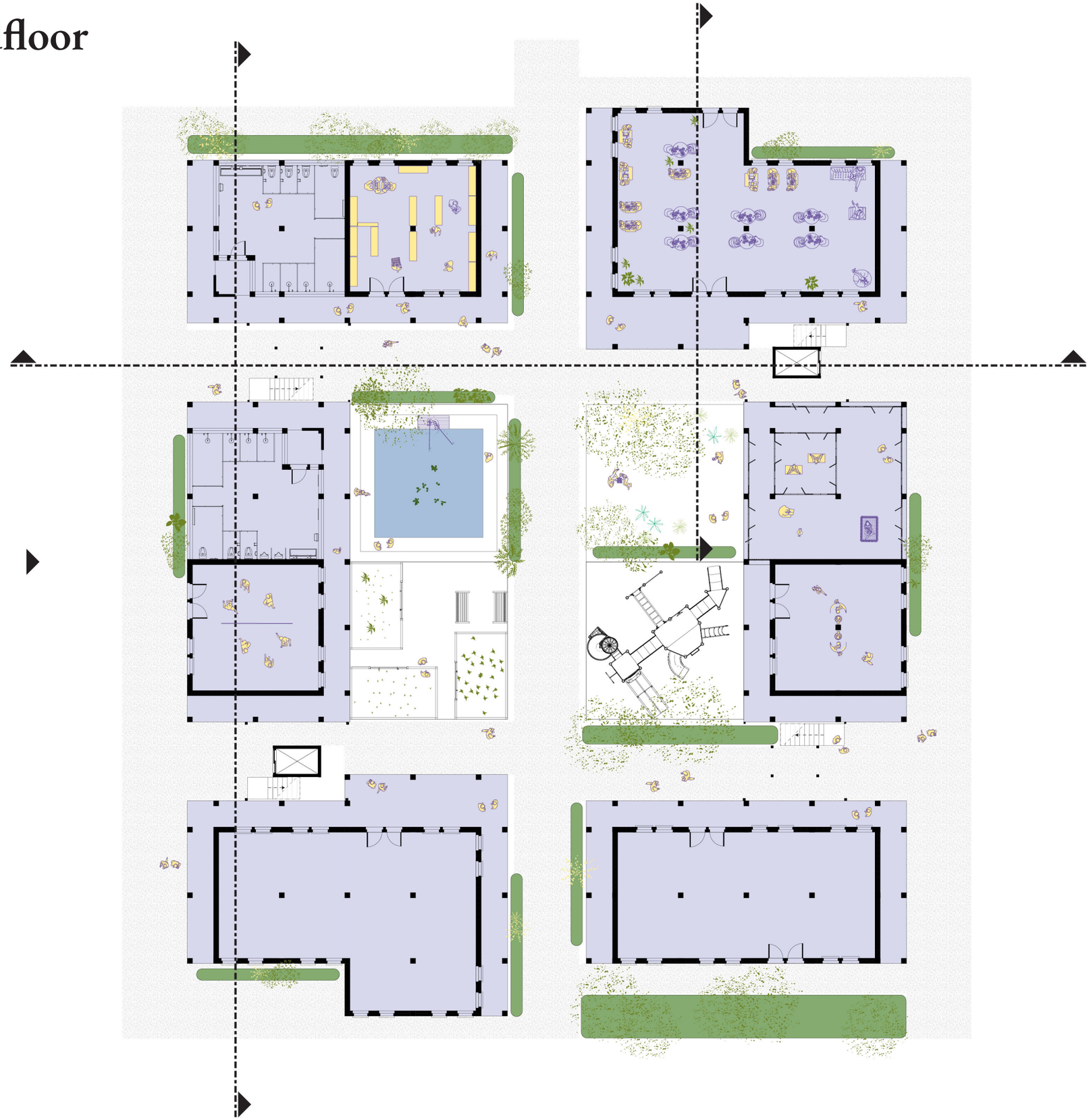


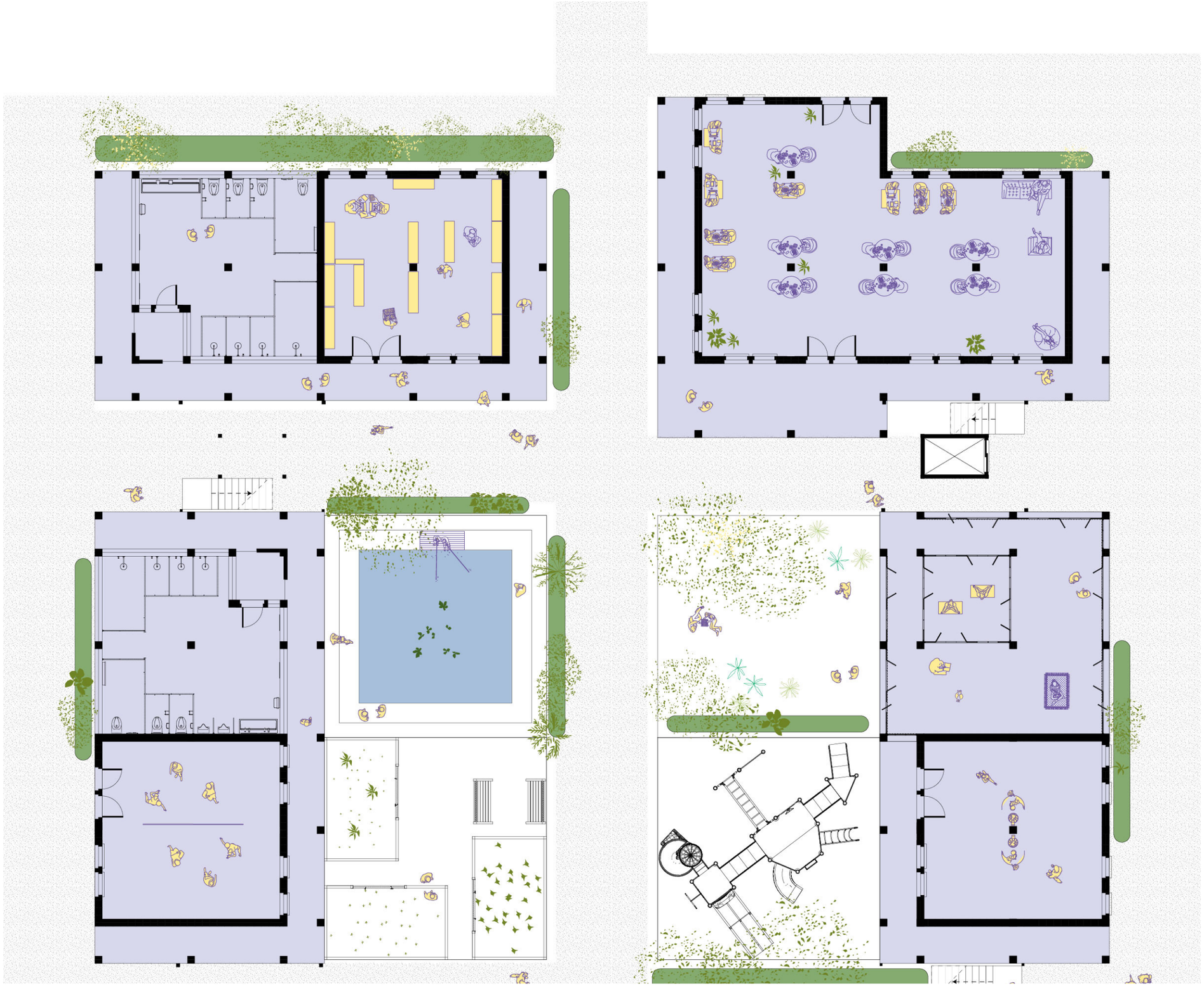
Unit E

Unit F

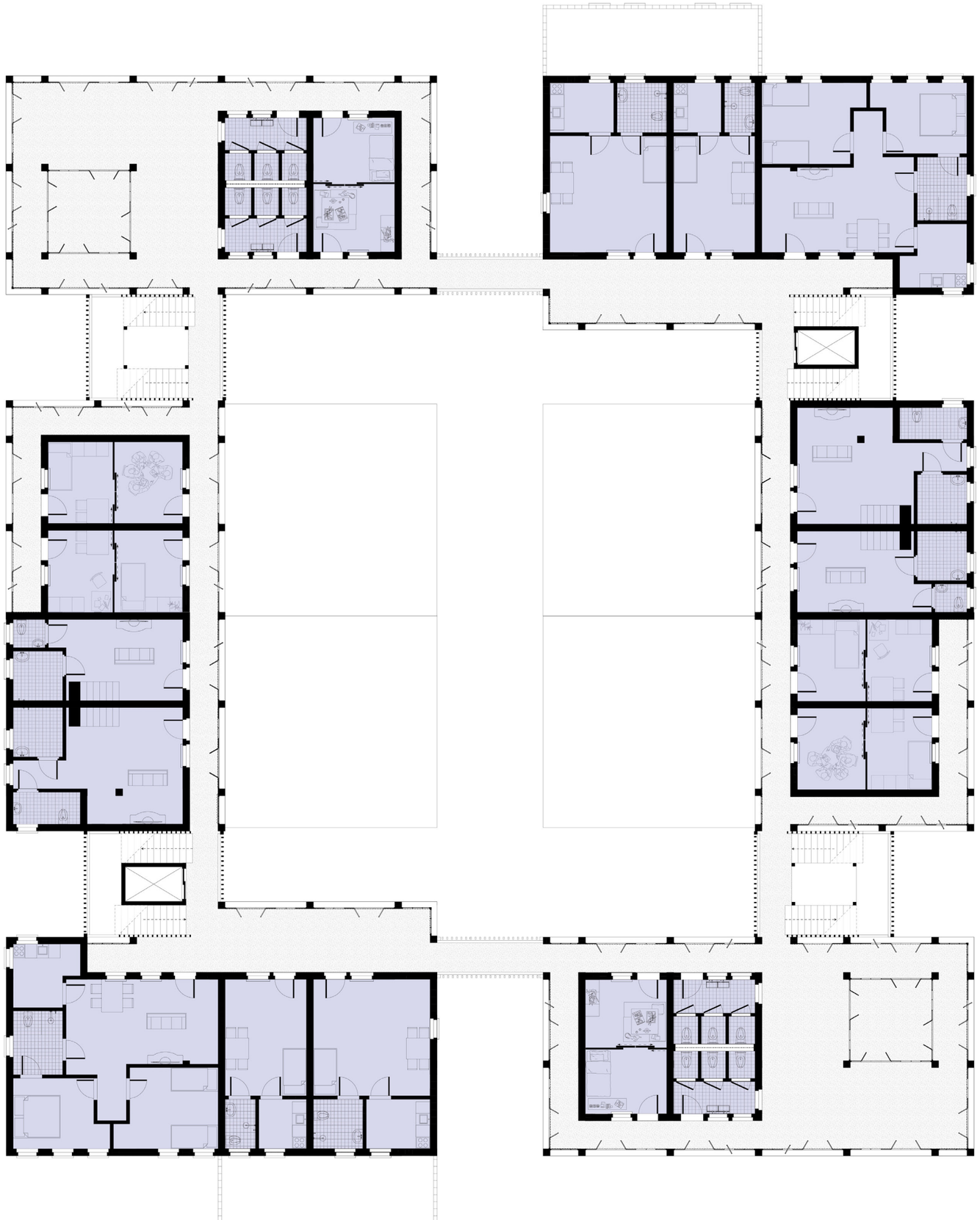


Type 1 Groundfloor

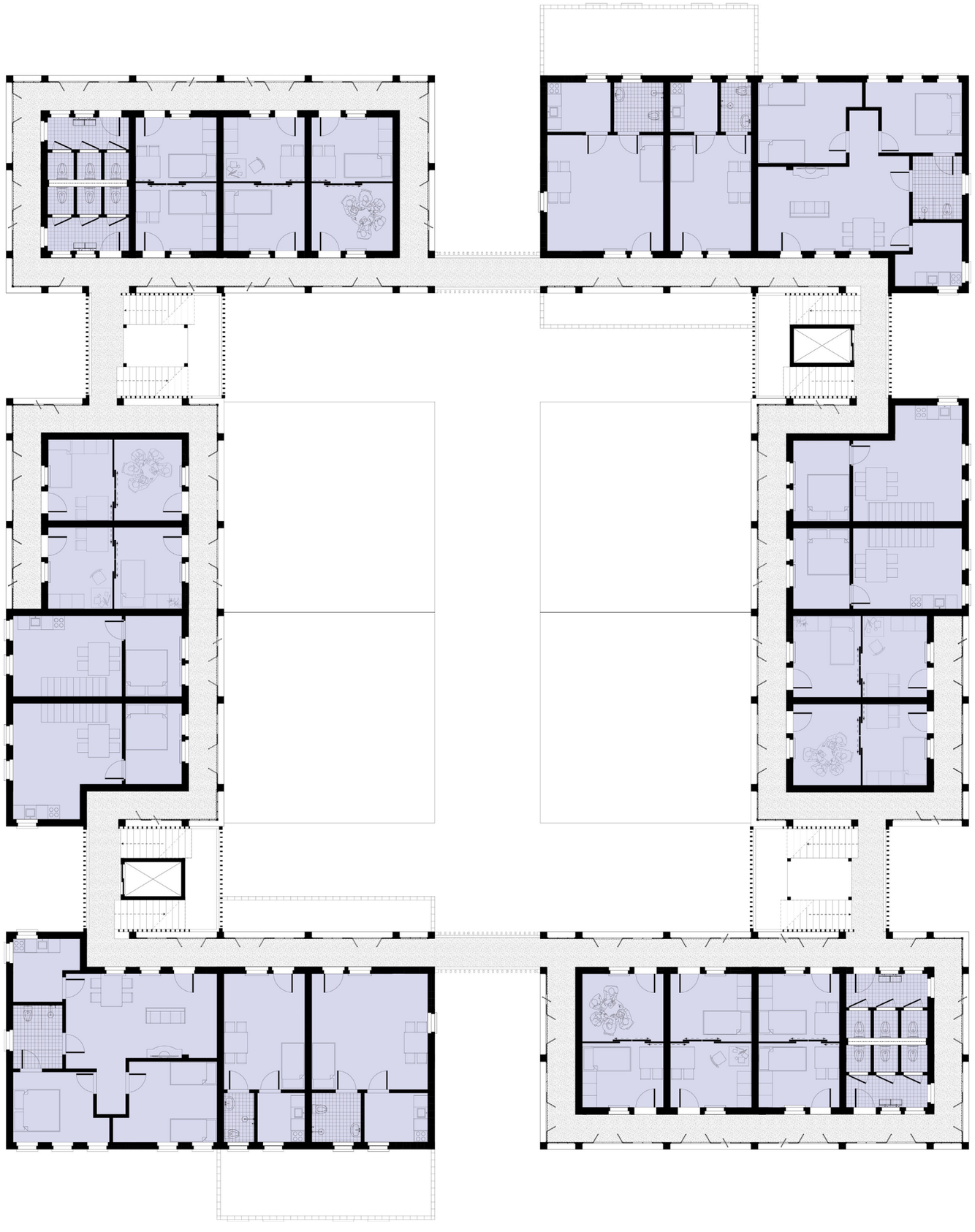


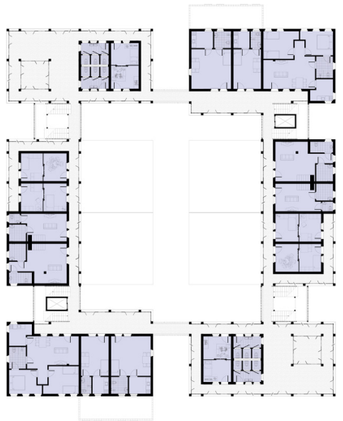


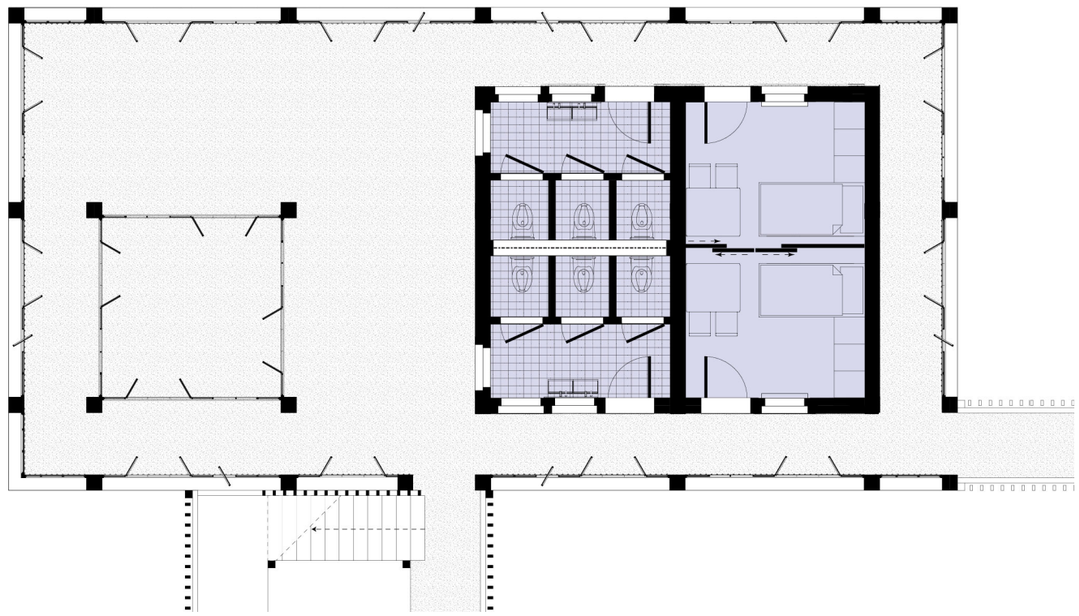
Type 1 - floor 1



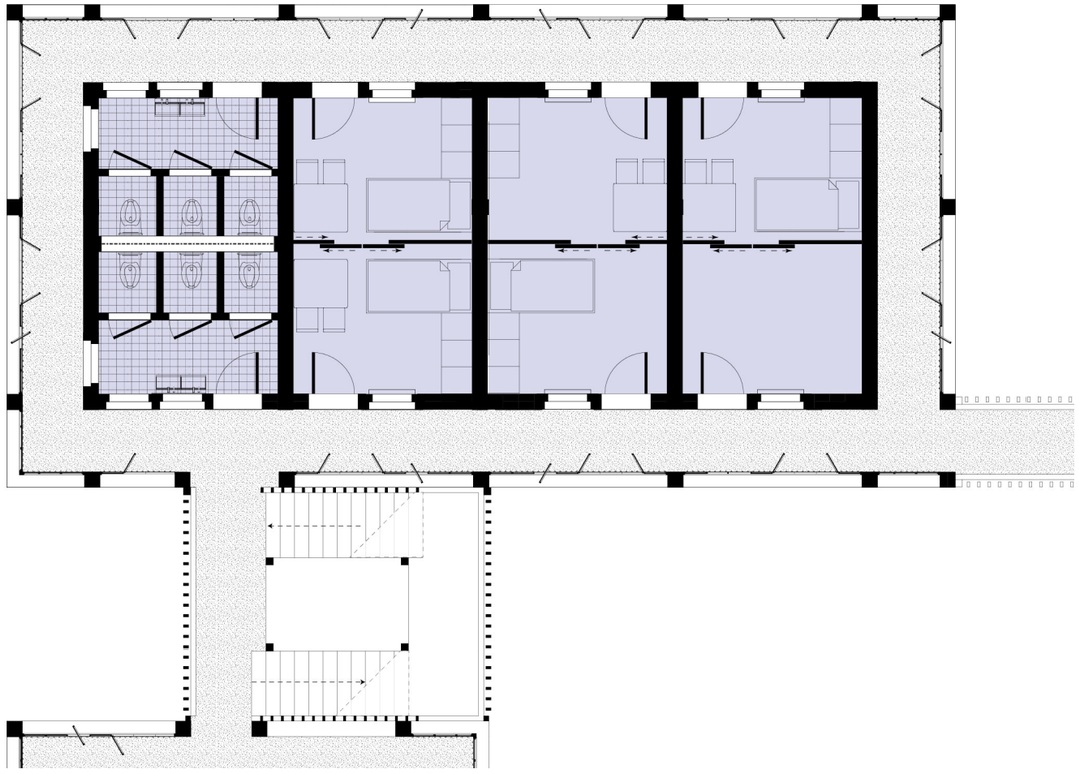
Type 1 - floor 2



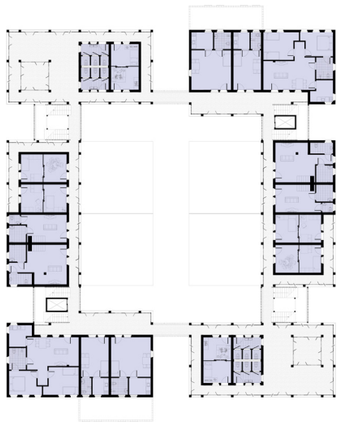


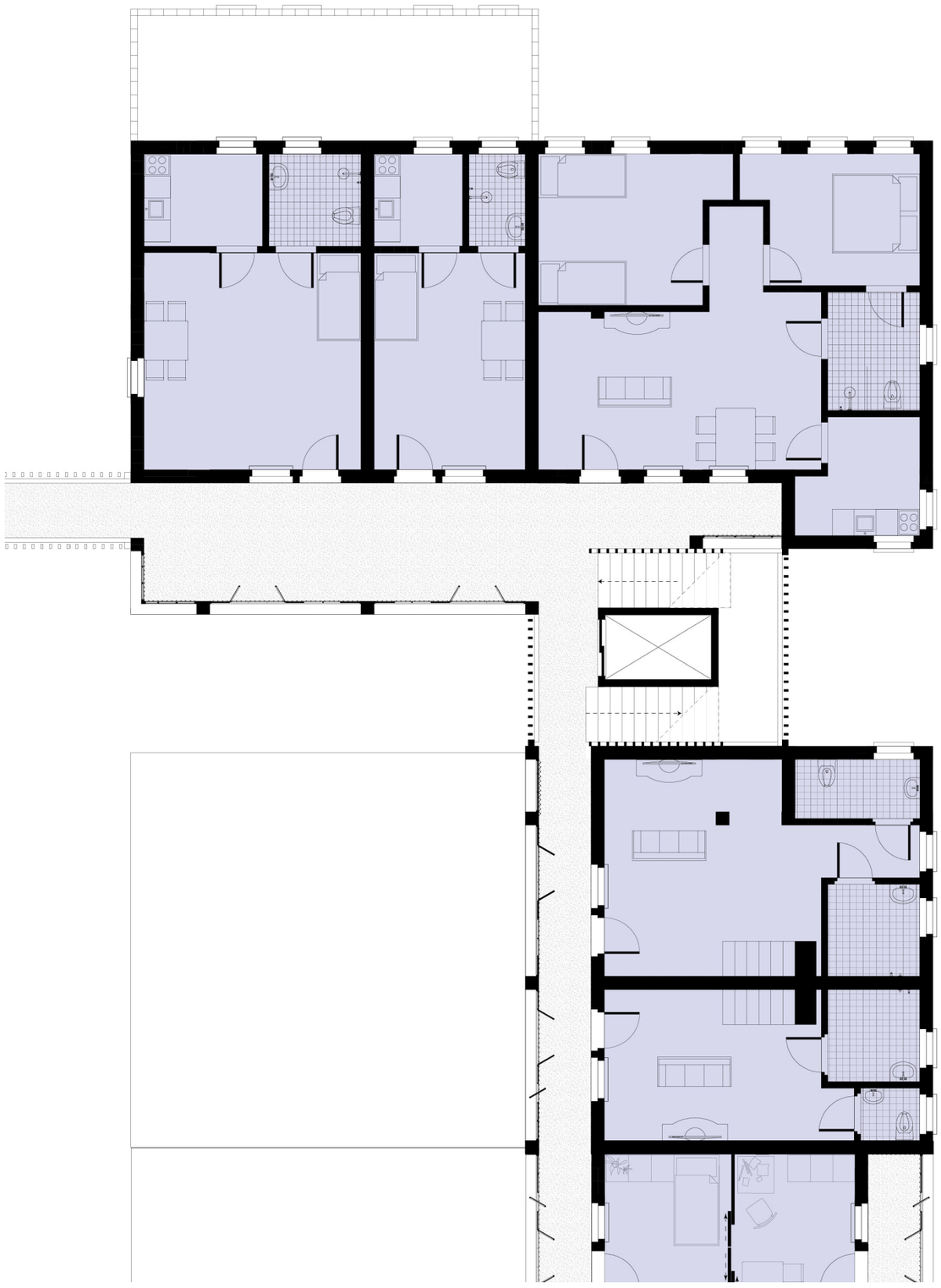


Type 1 - floor 1



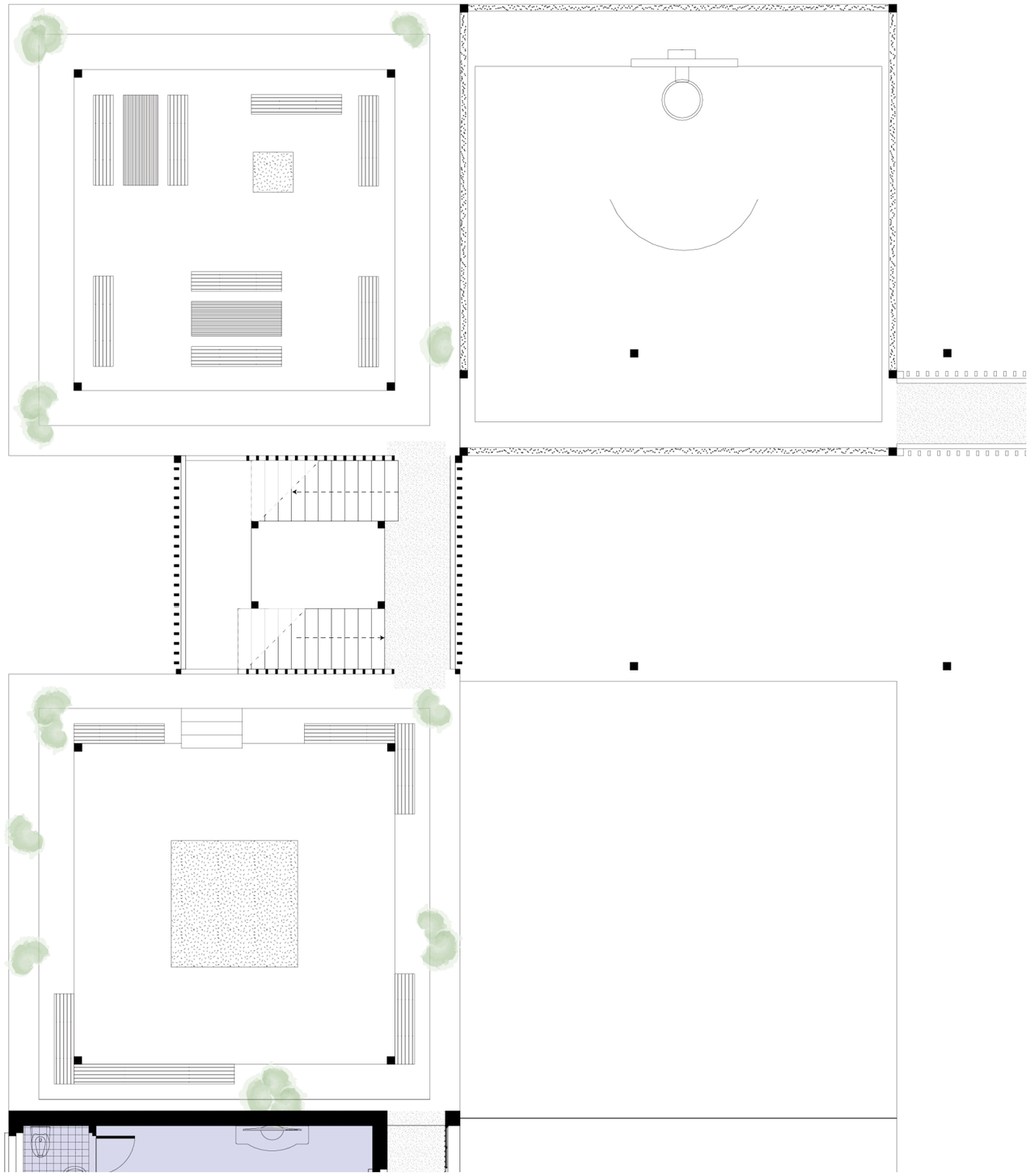
Type 1 - floor 2



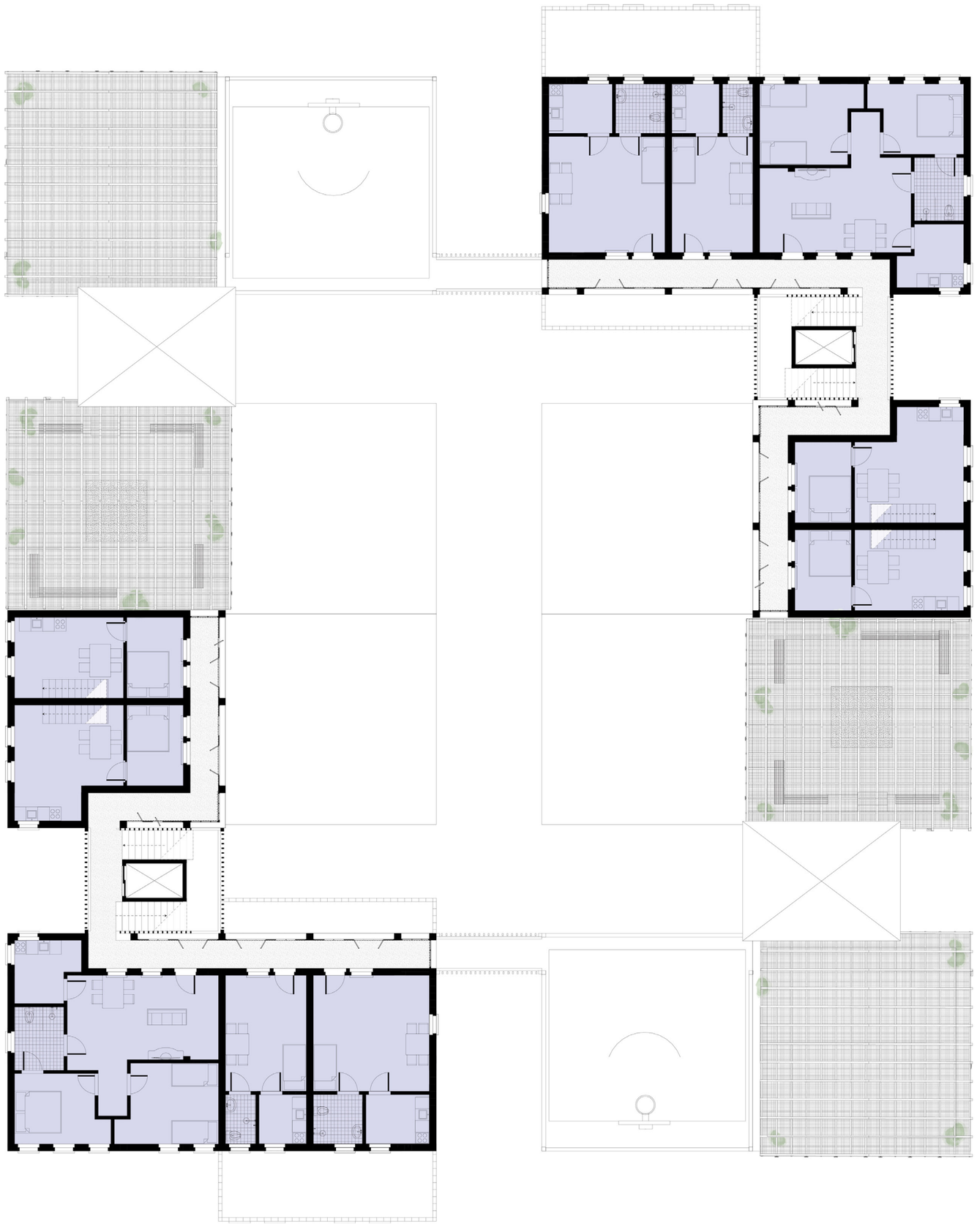


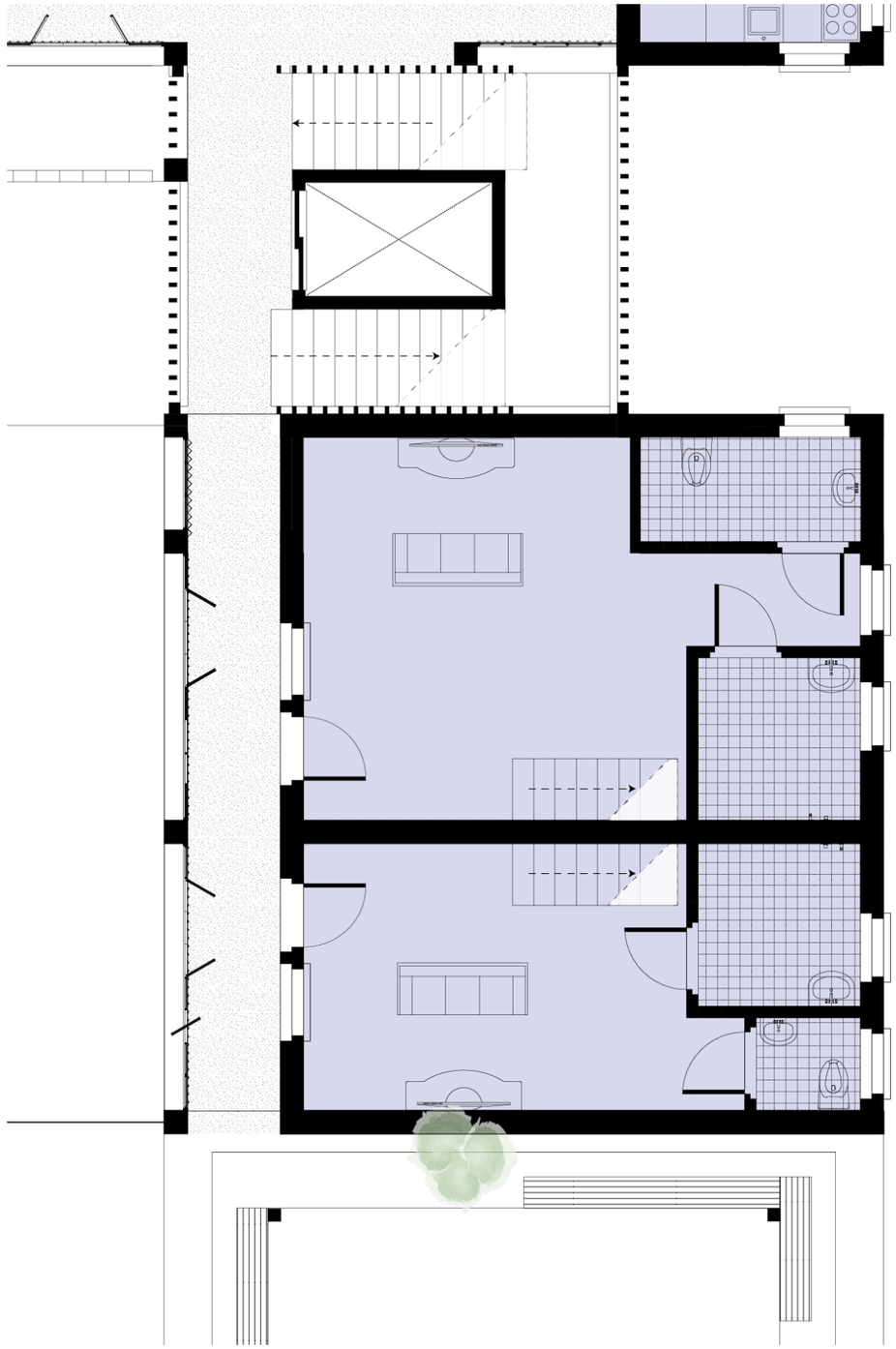
Type 1 - floor 1

Type 1 - floor 3

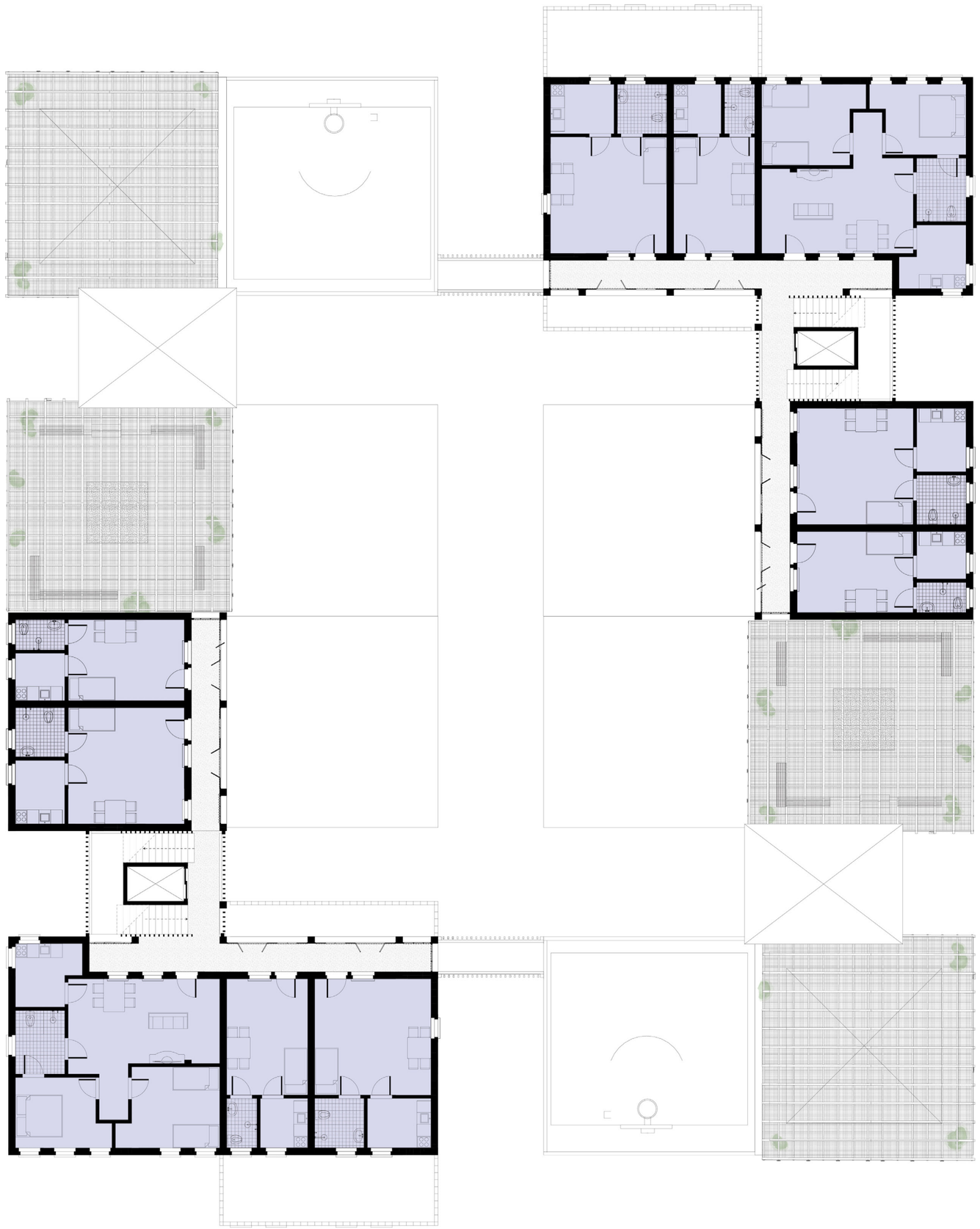


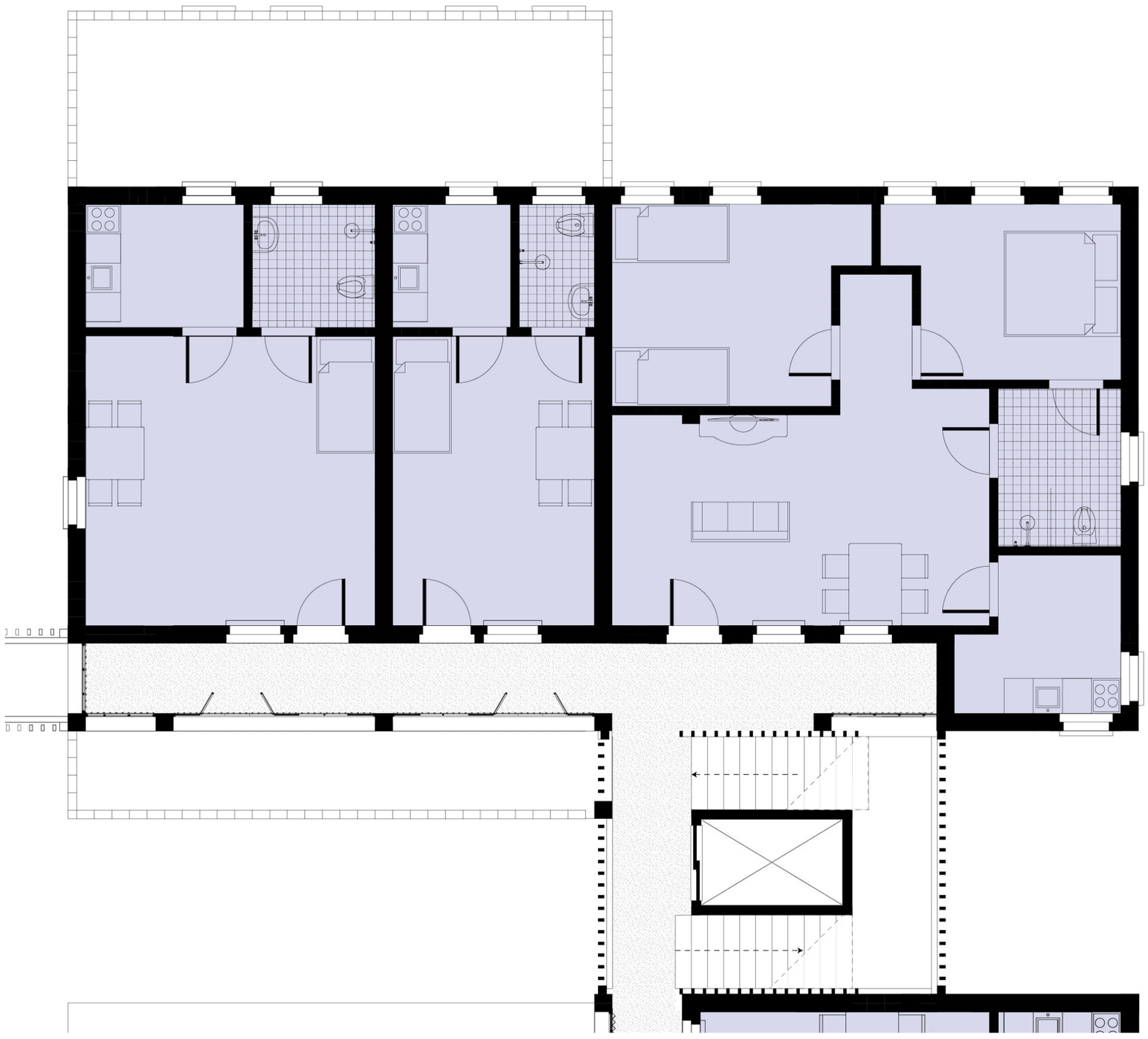
Type 1 - floor 4



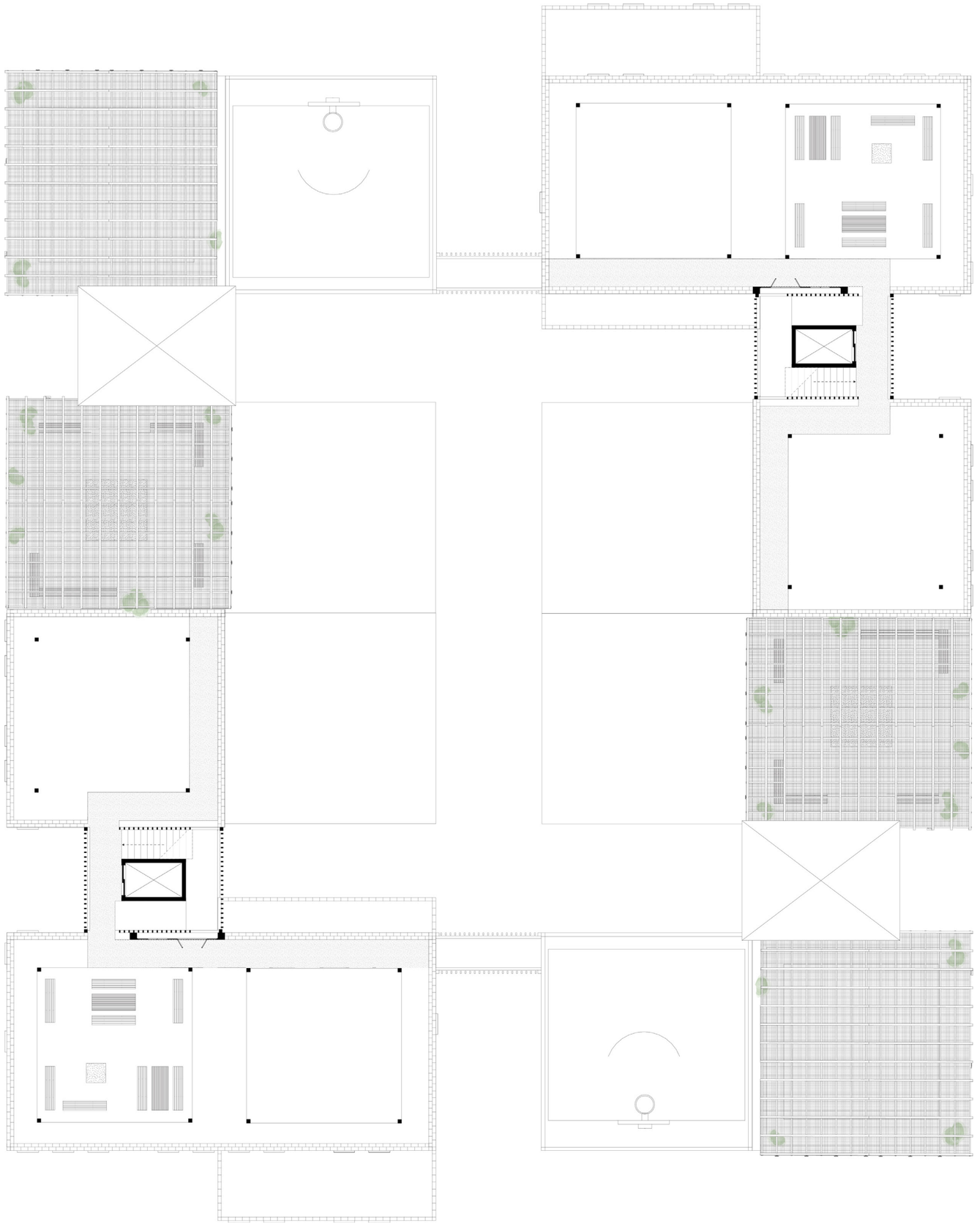


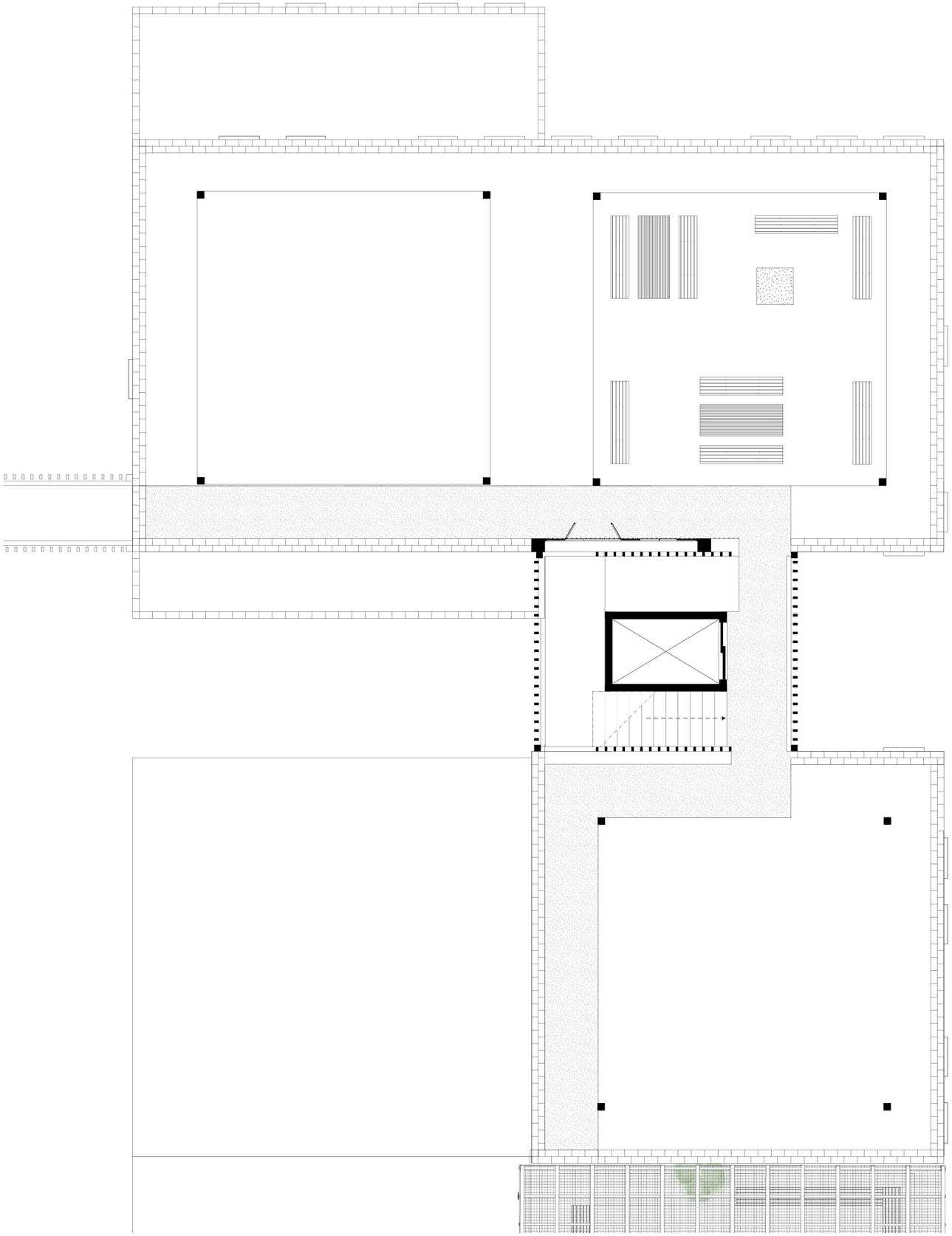
Type 1 - floor 5





Type 1 - floor 6



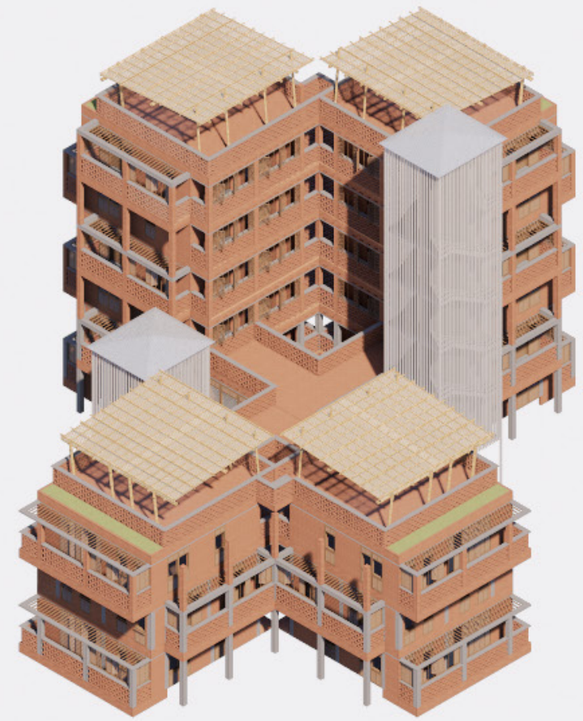


Type 1 - Elevation

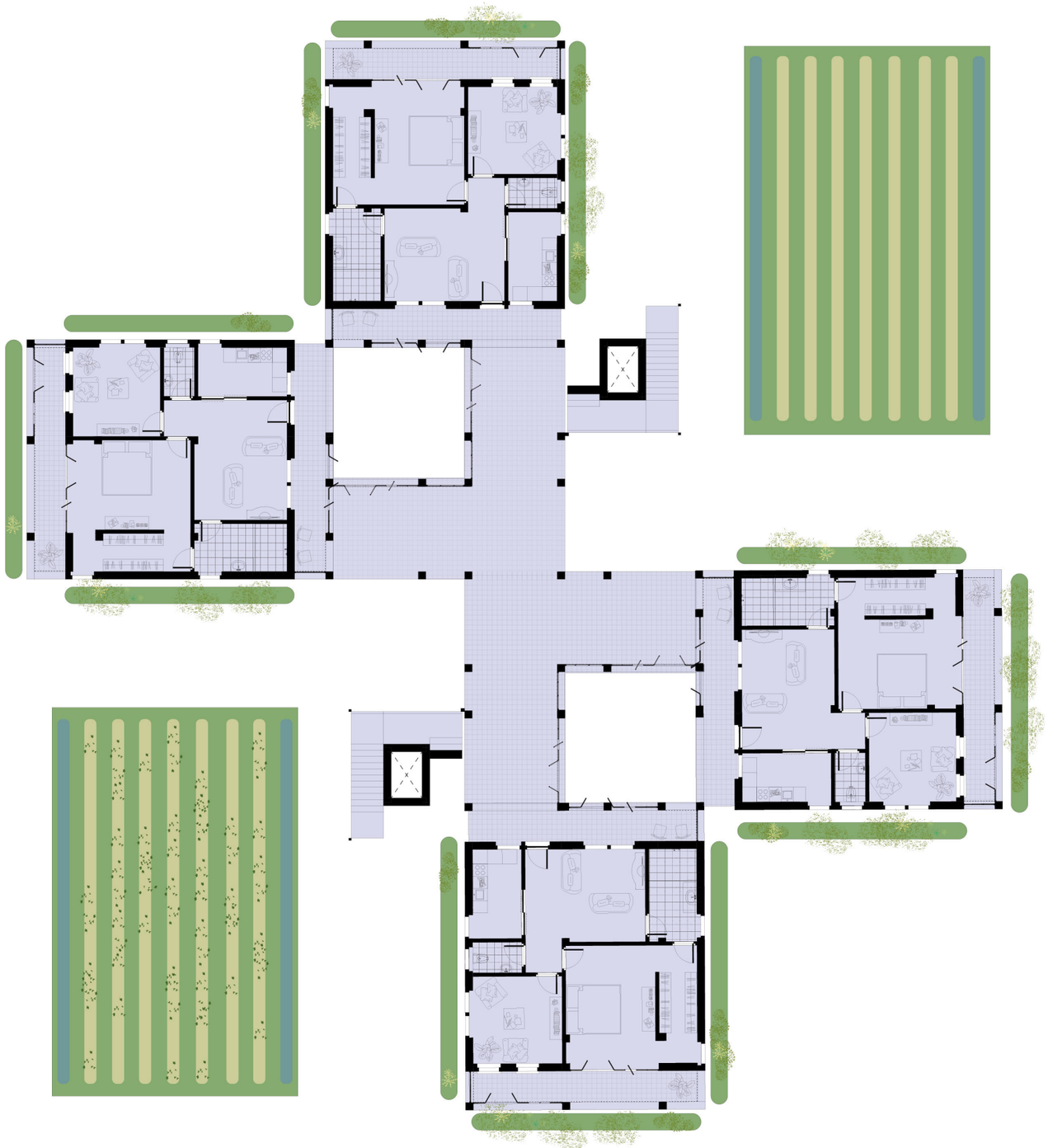
Type 1 - Section

Type 2 - South- ‚North Elevation

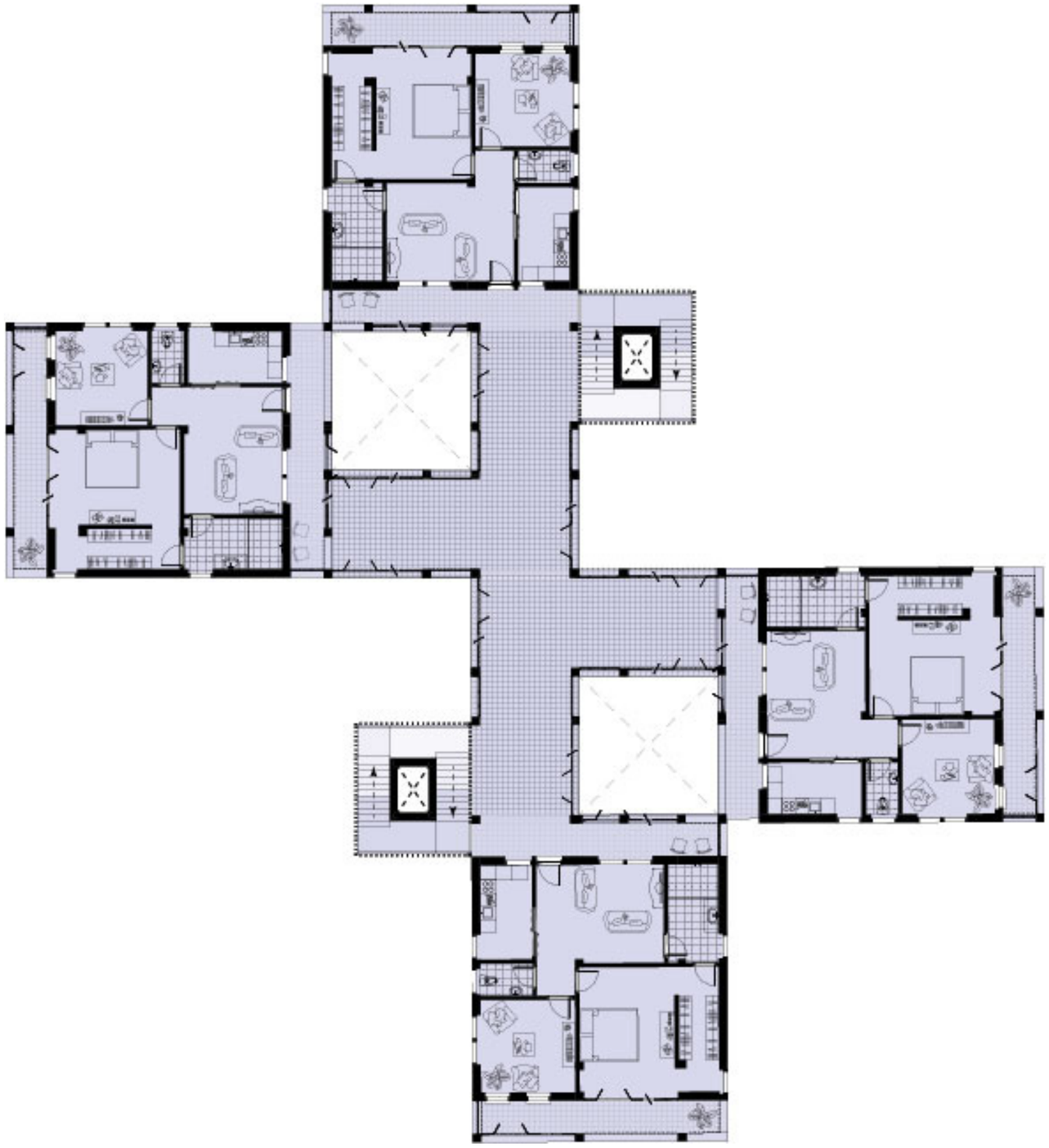
Type 2 - East- ,West Elevation



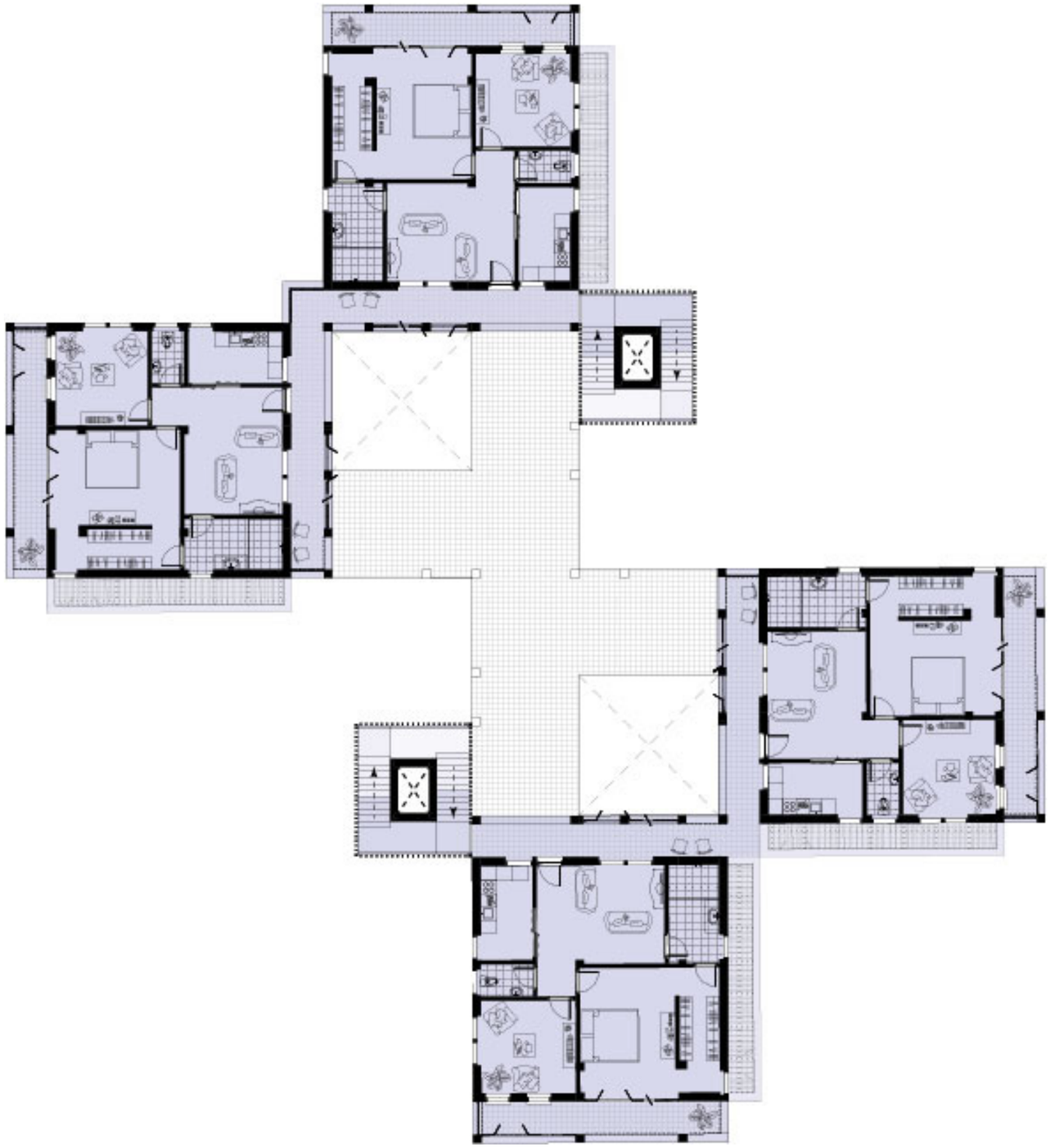
Type 2 - Groundfloor



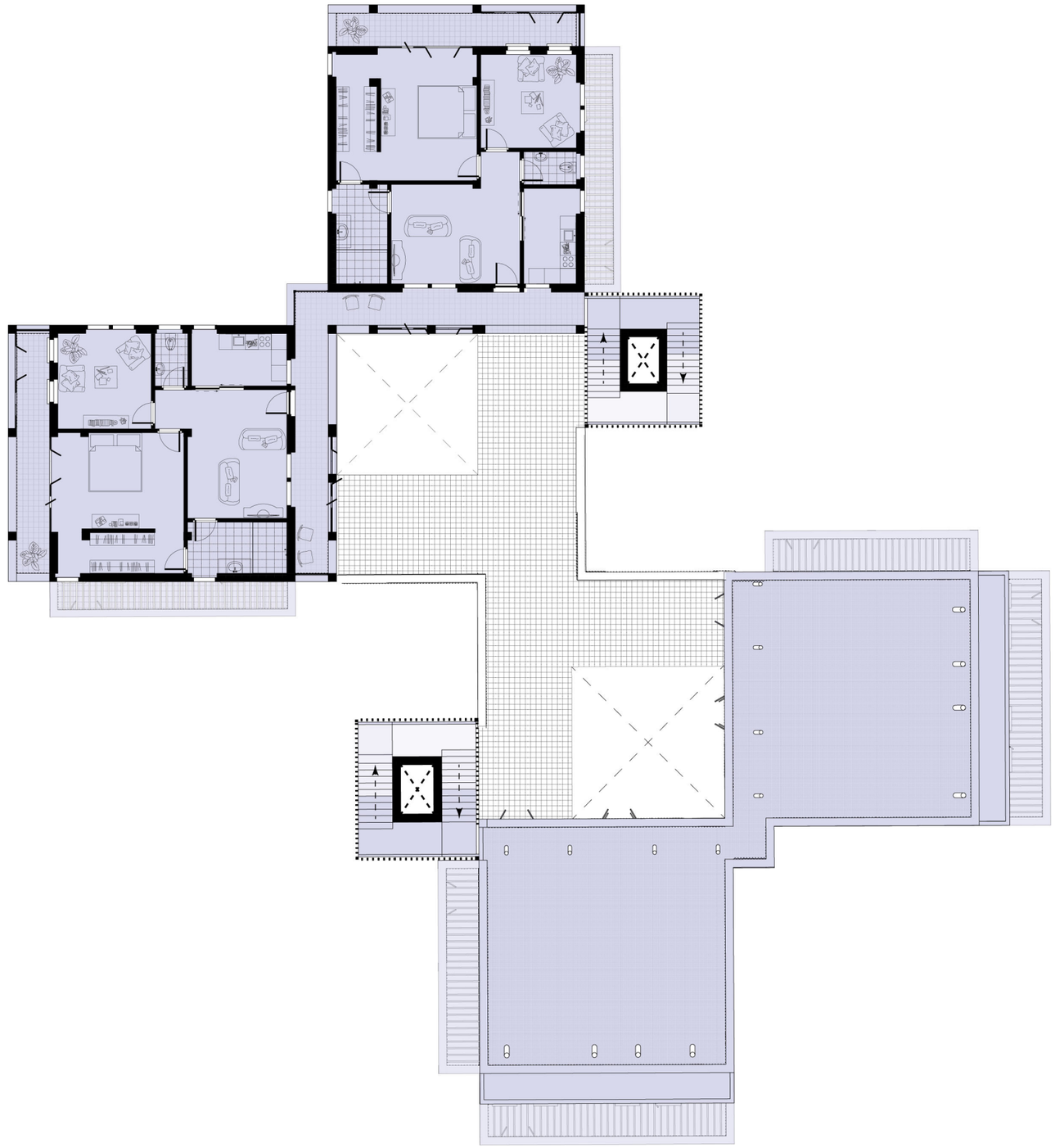
Type 2 - Floor 1



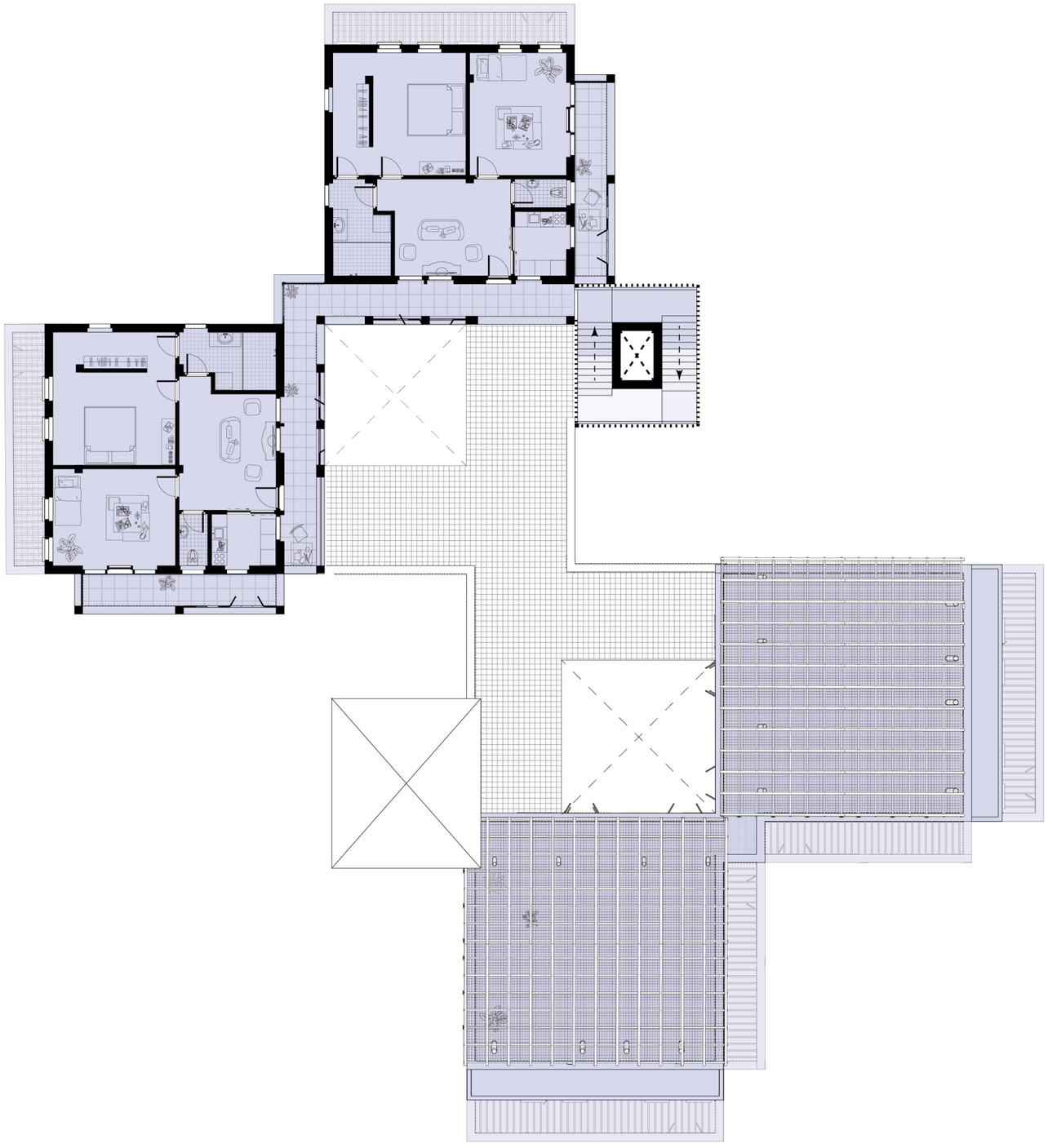
Type 2 - Floor 2



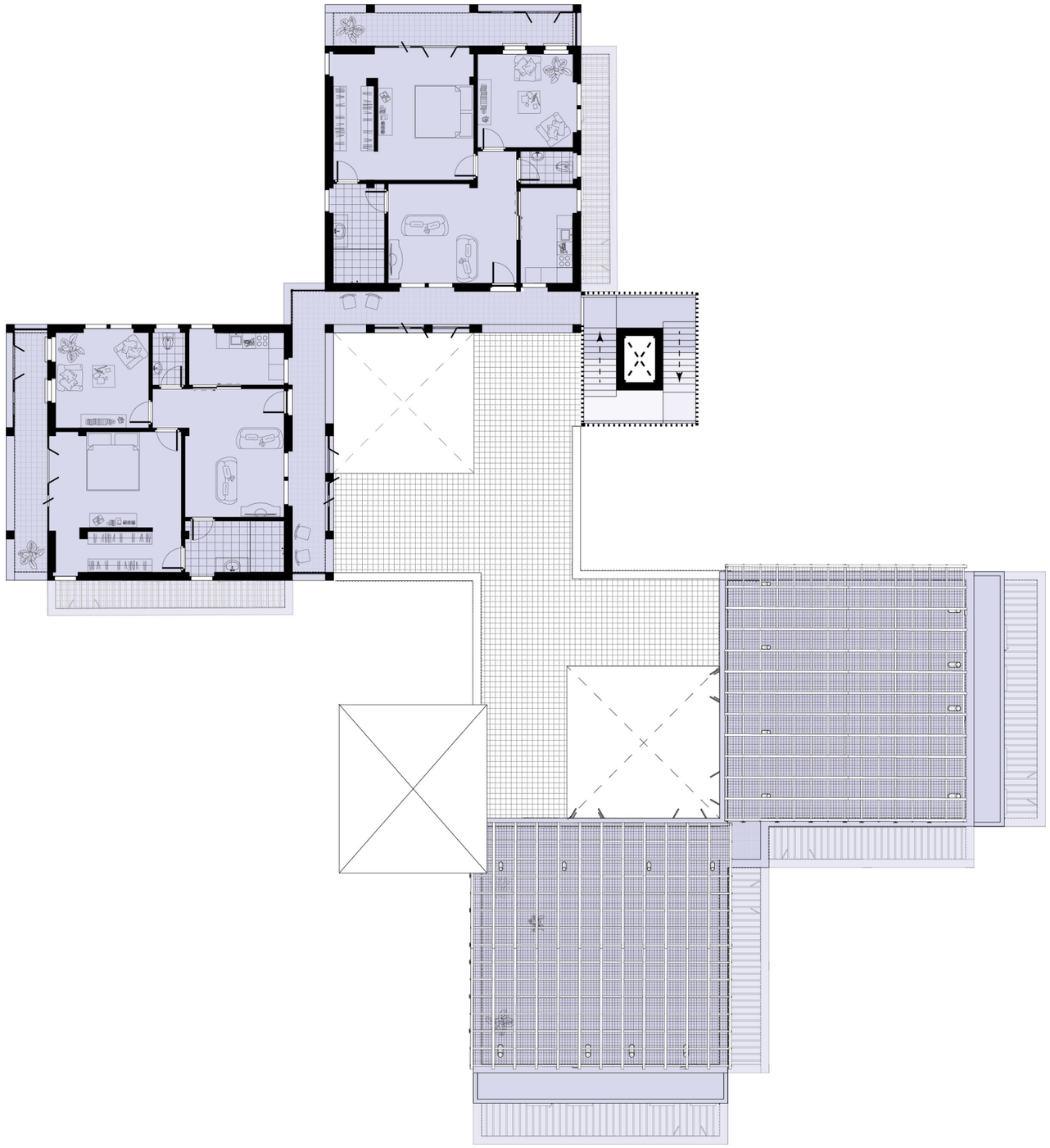
Type 2 - Floor 3



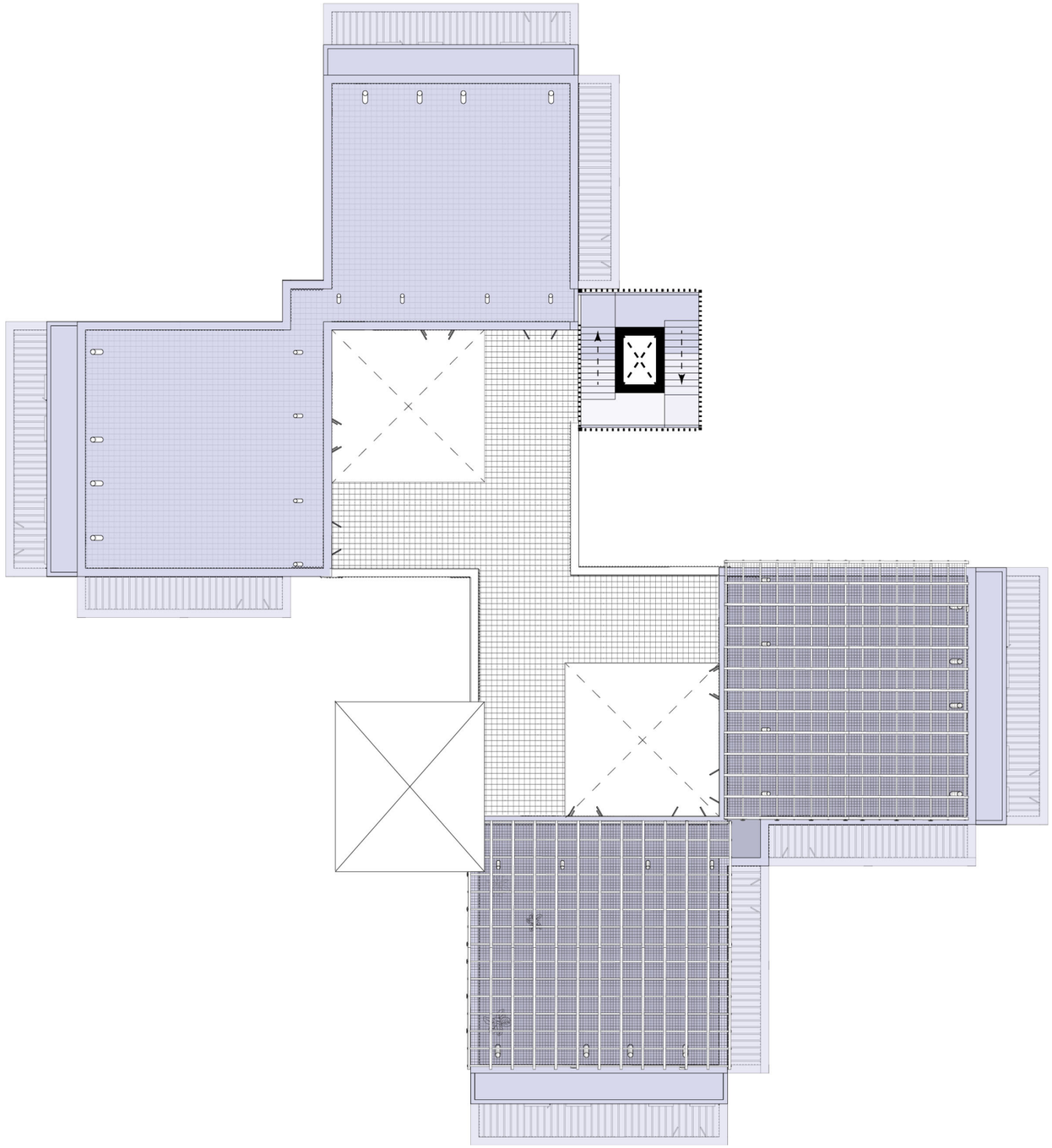
Type 2 - Floor 4



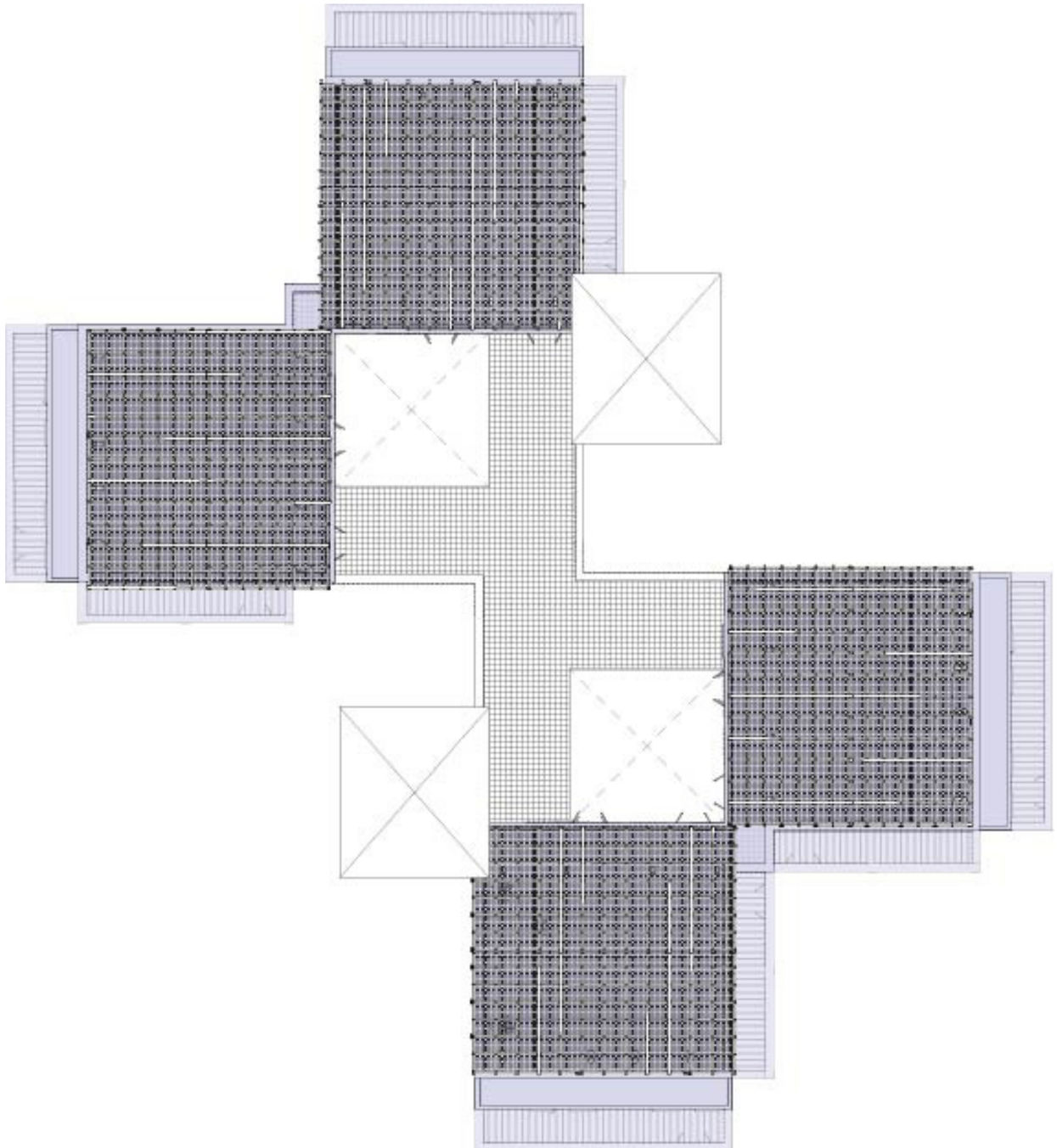
Type 2 - Floor 5



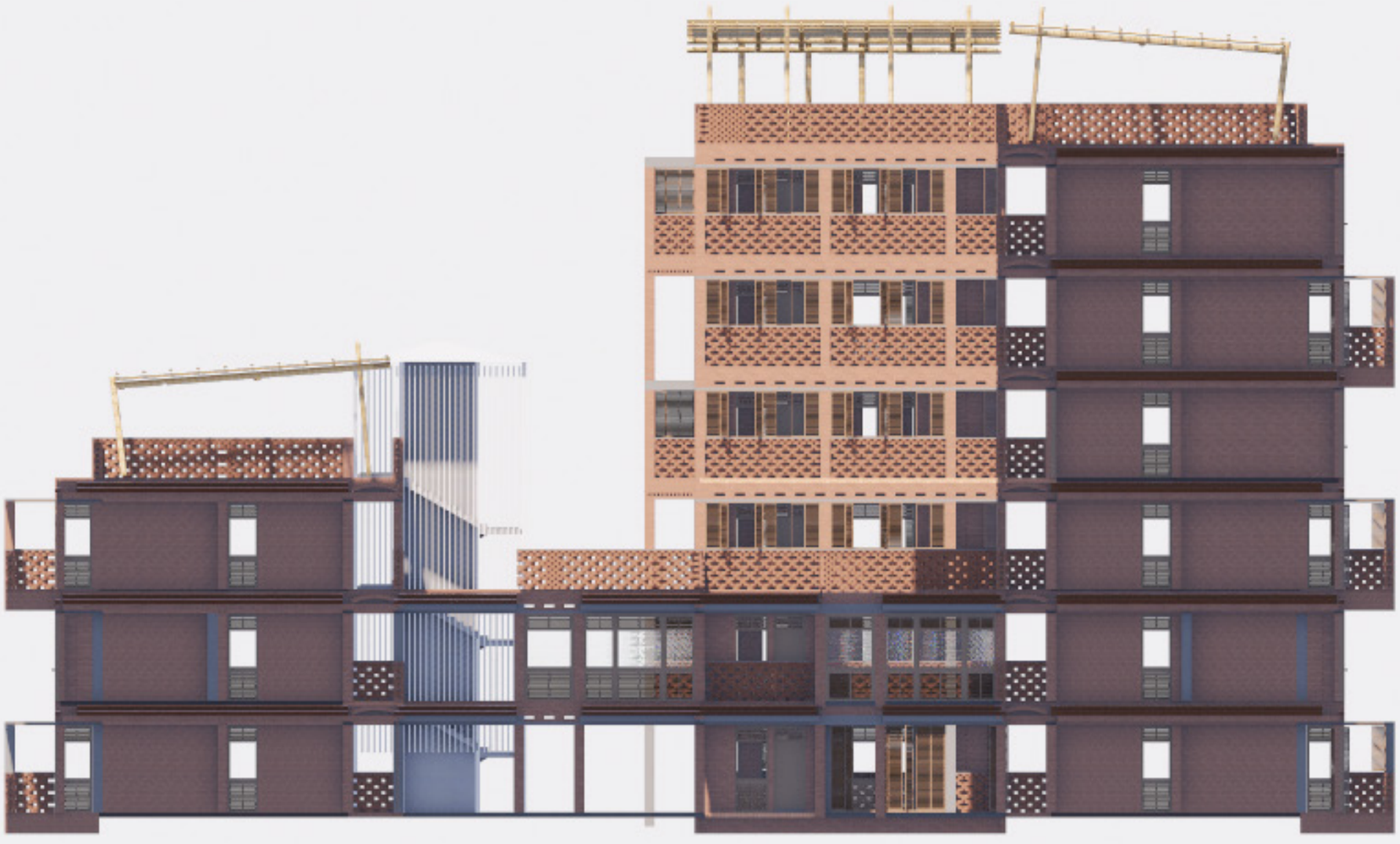
Type 2 - Roofterrace



Type 2 - Roof



Type 2 - Section



Type 2 - South Elevation

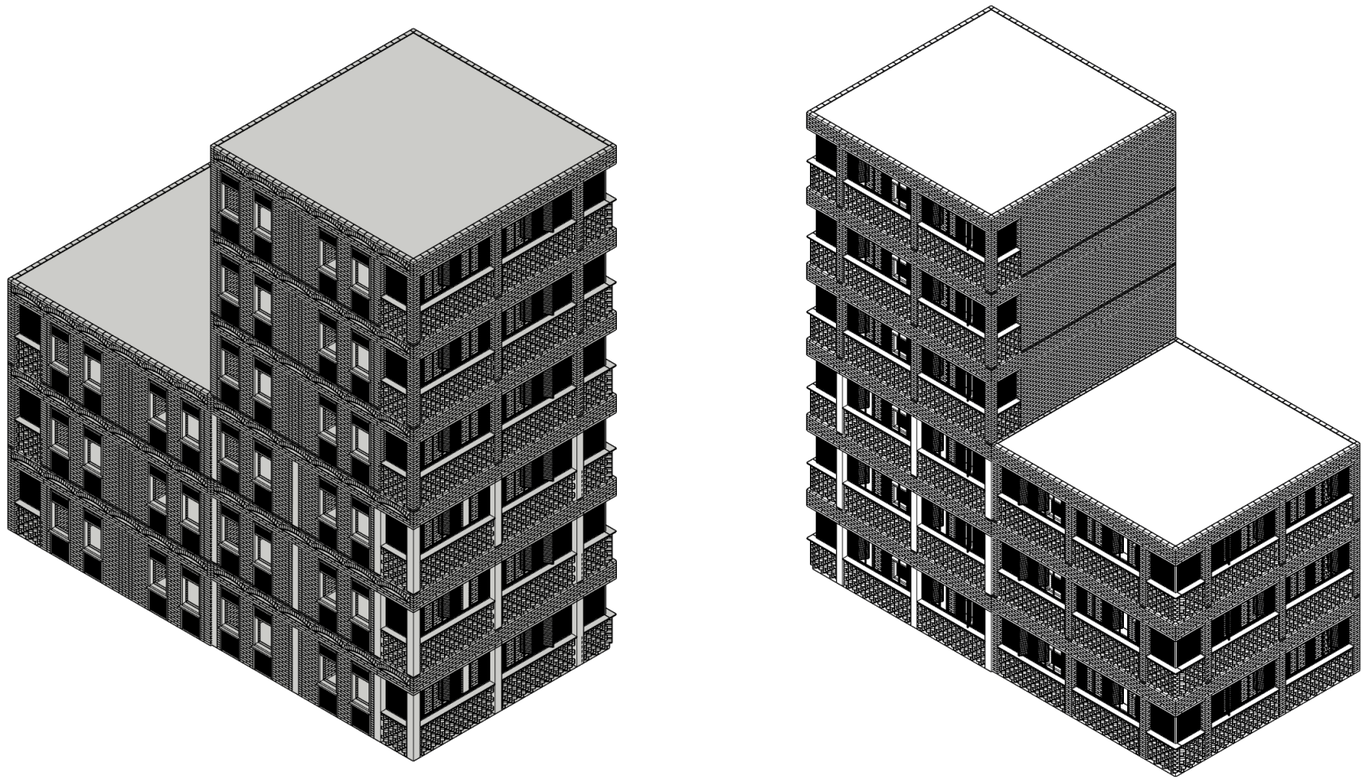
Type 2 - North Elevation

Type 2 - West Elevation

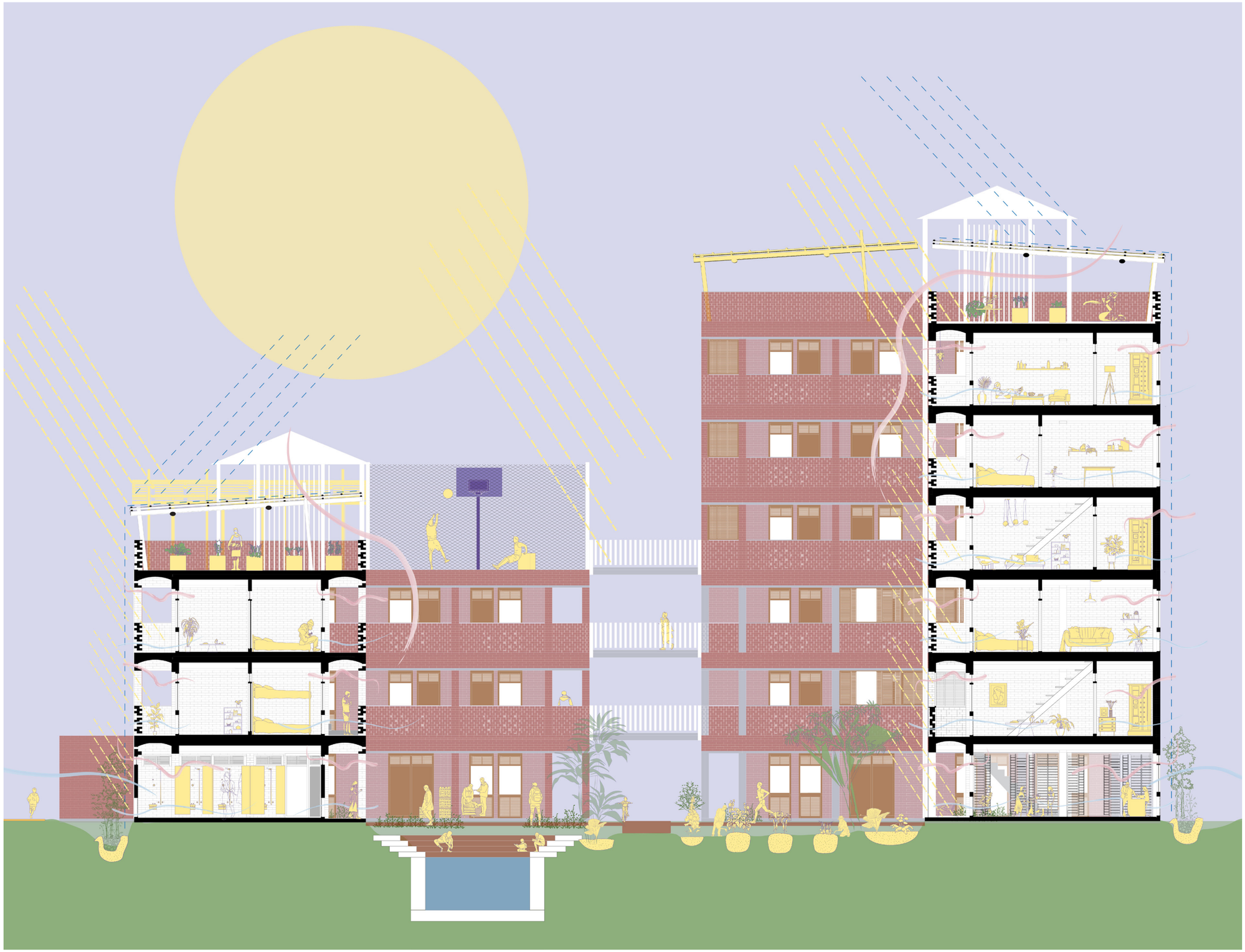
Type 2 - East Elevation

Building Technology

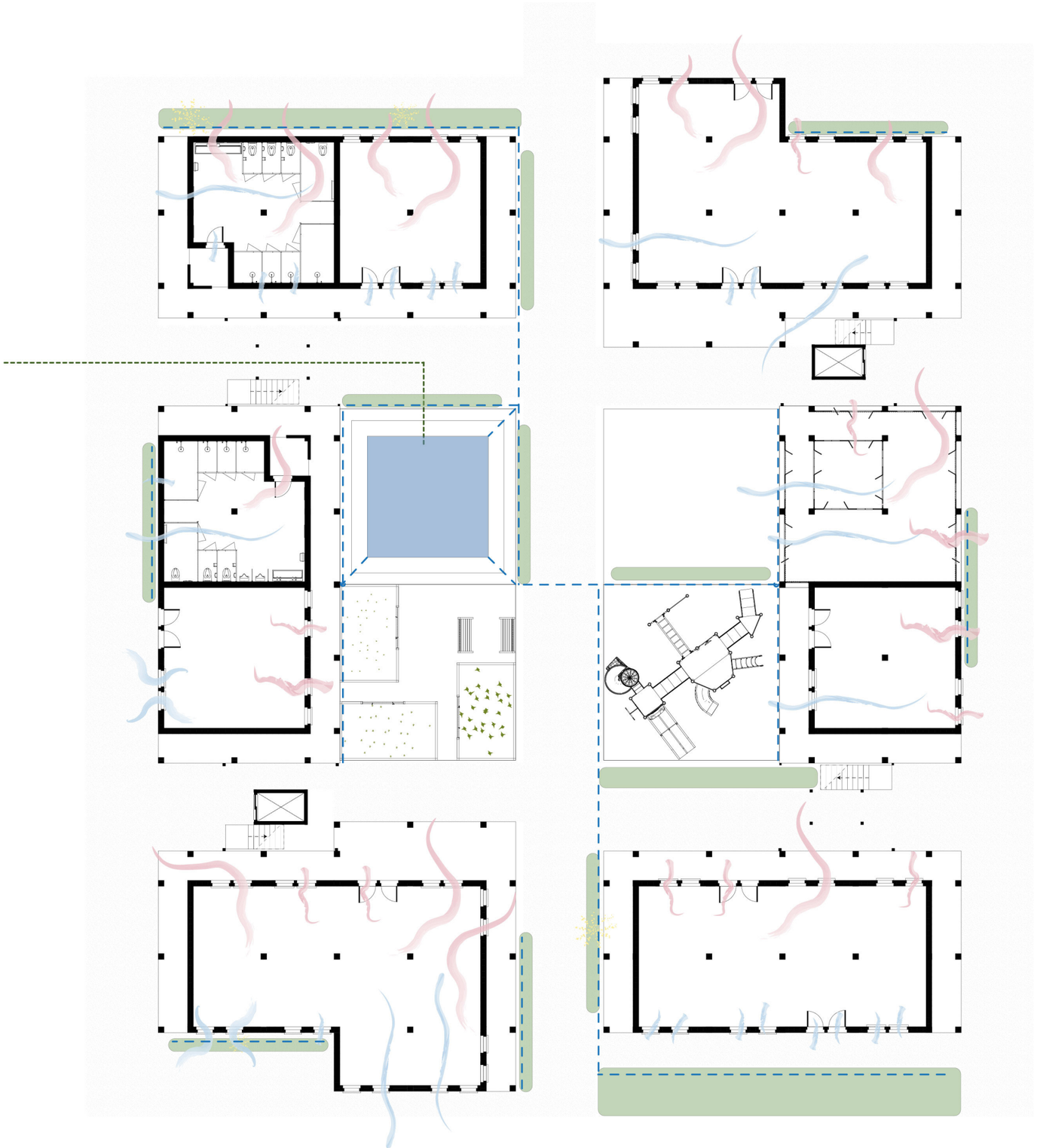
axonometric building block



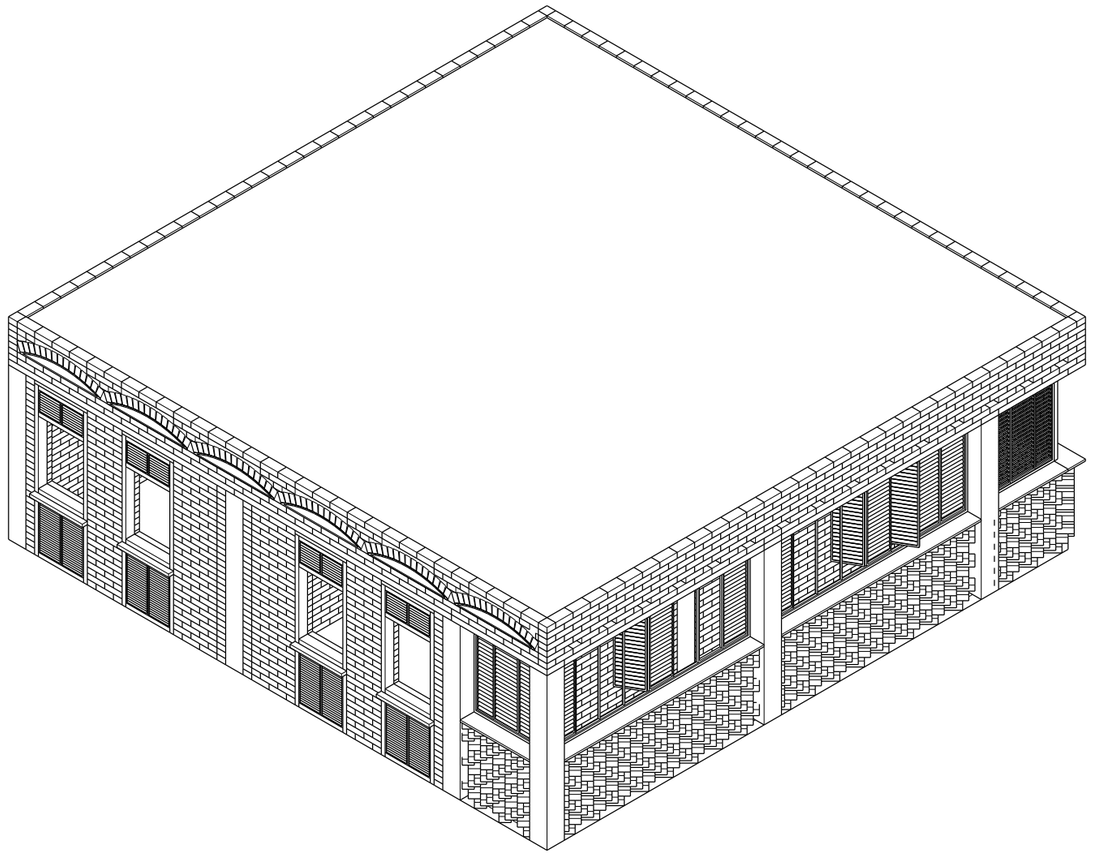
Climate design - vertical section



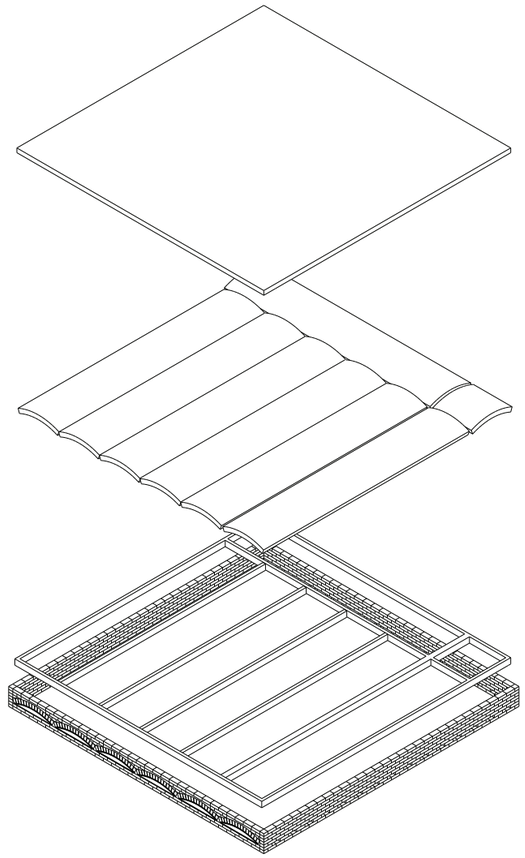
Climate design - horizontal section

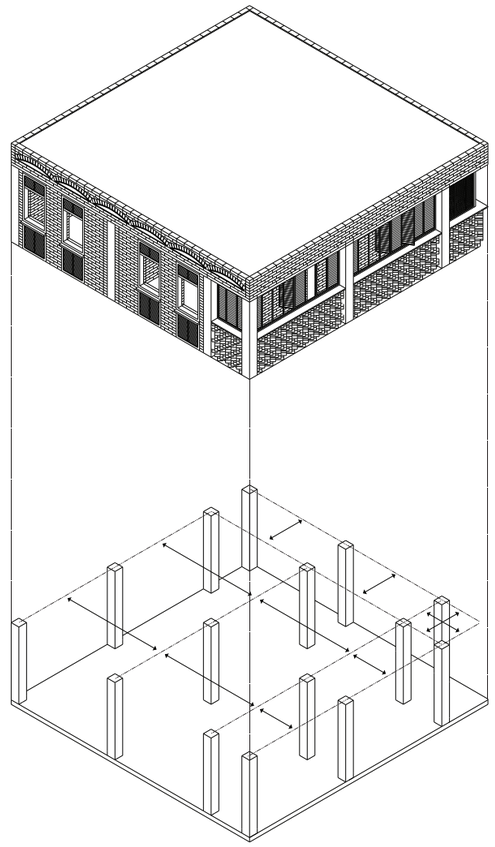


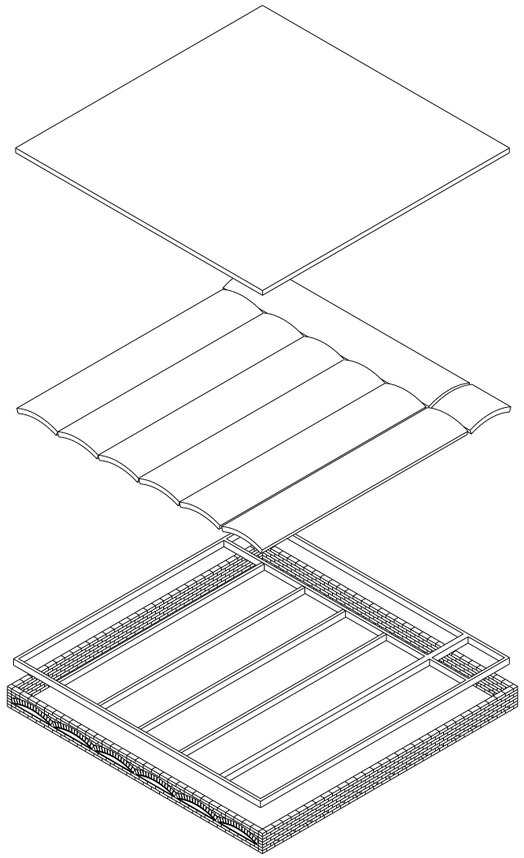
axonometric one floor



exploded view materials & structure



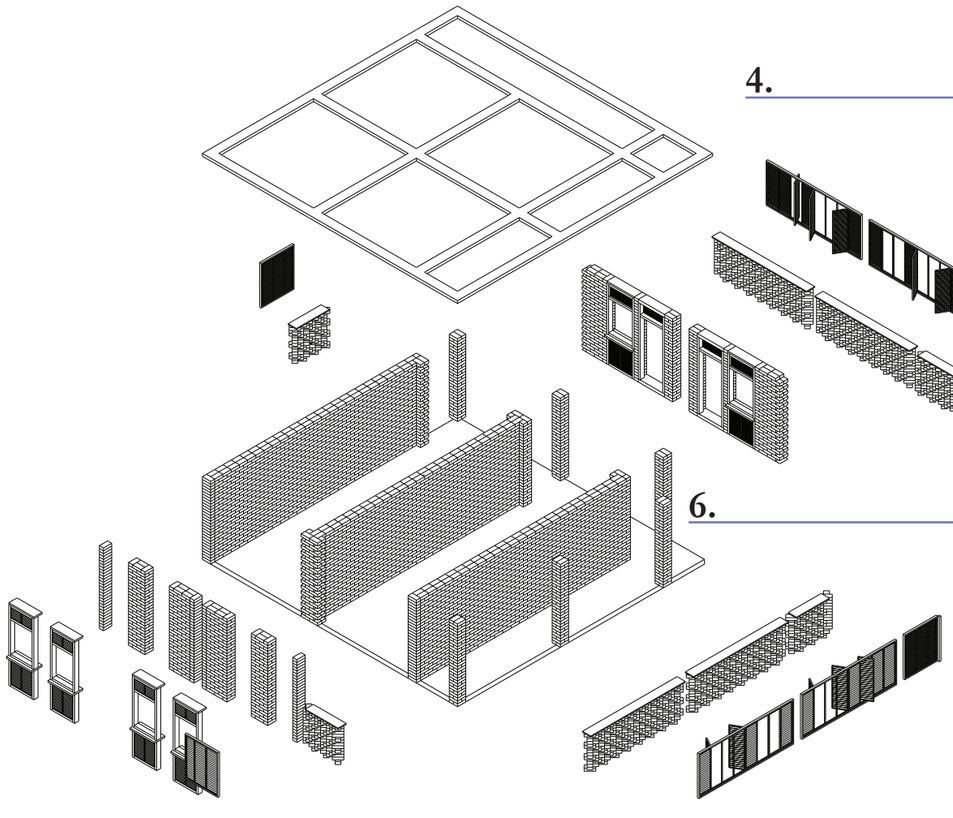




1. Floorfinishing & screed

2. CSEB/compressed stabilised earth block jack arch floor

3. Concrete beams and CSEB brick work as plint

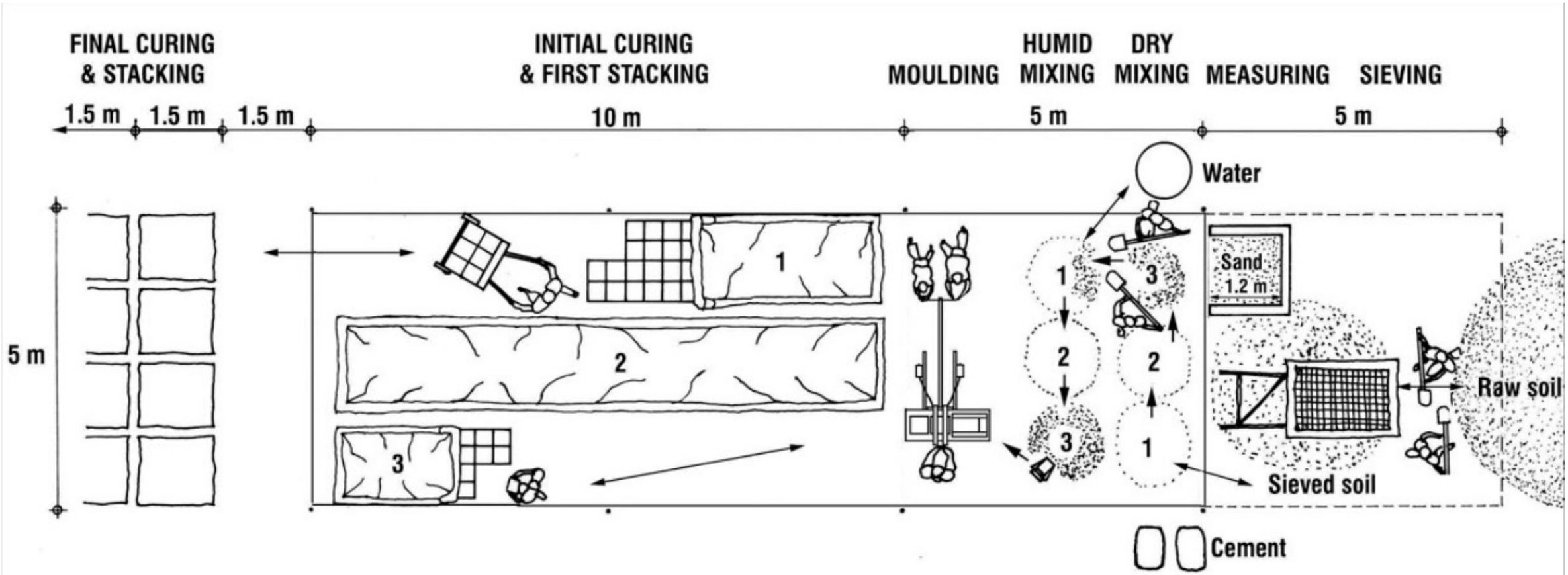


4. Concrete ring beam

5. Open removable wooden louver shutters

6. CSEB structure or concrete framework with masonry infill

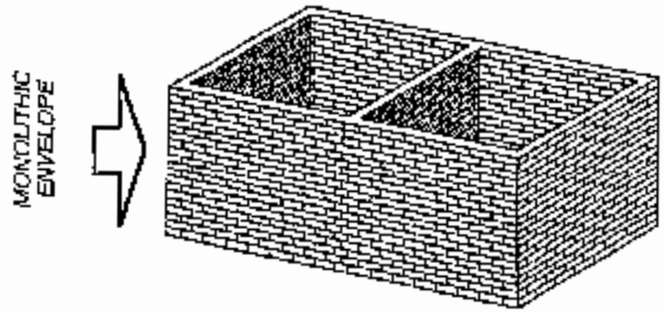
7. Perforated CSEB brick balustrade


FINAL CURING
& STACKING
INITIAL CURING
& FIRST STACKING
MOULDING
HUMID
MIXING
DRY
MIXING
MEASURING
SIEVING
1.5 m
1.5 m
1.5 m
10 m
5 m
5 m
5 m
Water
Sand
1.2 m
Raw soil
Sieved soil
Cement
1
2
3

WALLS

THE PLACING OF BASIC ELEMENTS ONE ON TOP OF THE OTHER USING A BONDING PATTERN RECONSTITUTES A HOMOGENOUS MASS. FOUR TYPES OF STRUCTURE CAN BE CONSIDERED.

BUILDING CONSISTING OF PERIPHERAL WALLS AND CONTINUOUS PARTITIONS: MONOLITHIC ENVELOPE.



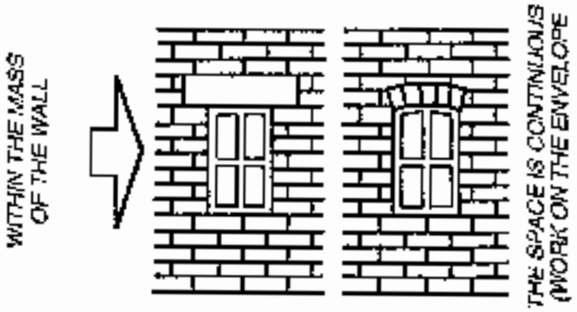
BUILDING CONSISTING OF INDEPENDENT, SELF-STABLE BLOCKS

LOADBEARING FRAME + MASONRY INFILL

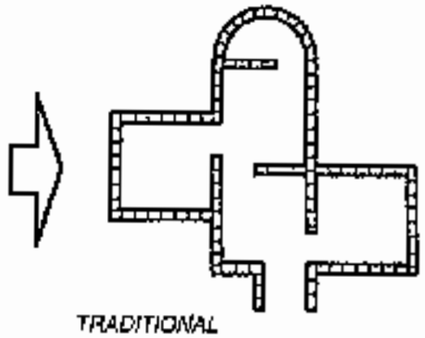
BRICK LOADBEARING FRAME + INFILL

OPENINGS

THERE ARE TWO WAYS OF PROCEEDING: WITHIN THE MASS OF THE INFILL MATERIAL, OR USING AN EXISTING GAP BETWEEN TWO MASONRY STRUCTURES.



PLAN RESOURCES



TRADITIONAL

L. KAHN

LE CORBUSIER

SUSTAINABILITY AND ENVIRONMENTAL FRIENDLINESS OF CSEB

- Earth is a local material and the soil should preferably be extracted from the site itself or not transported from too far away
- Labour costs for CSEB production amount to 40 to 45% of the total cost. This promotes endogenous development.
- It is a cost and energy effective material.
- The embodied energy of CSEB is 10.7 times less than country fired brick.
- Carbon emissions of CSEB are 12.5 times less than country fired brick.

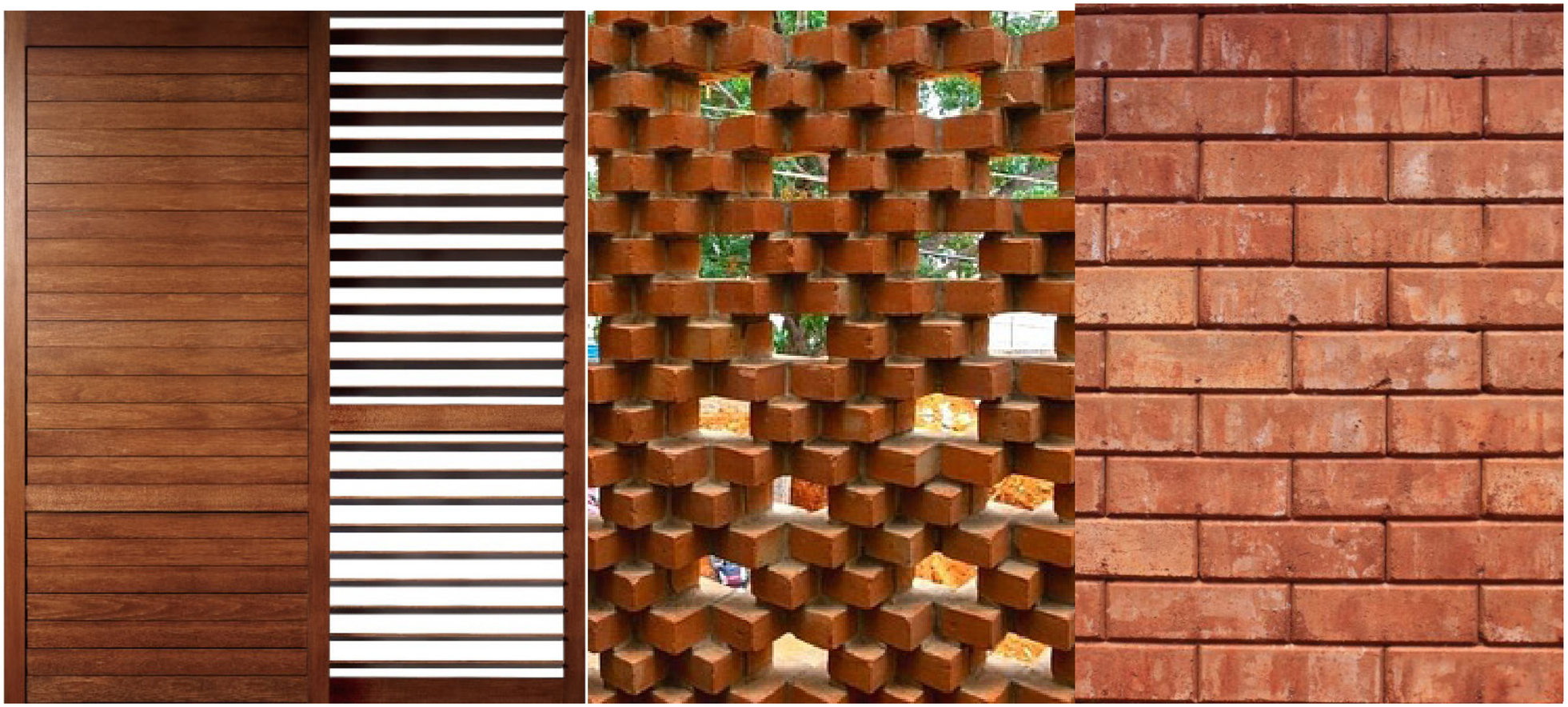
INITIAL EMBODIED ENERGY PER M^3	CARBON EMISSIONS (Kg of CO_2) PER M^3
CSEB = 572.6 MJ / m^3 Country Fired Brick (CFB) = 6,122.5 MJ / m^3	CSEB = 51.5 Kg / m^3 Country Fired Brick (CFB) = 642.9 Kg / m^3

Note: Data for Auroville and Pondicherry, India, 2005.

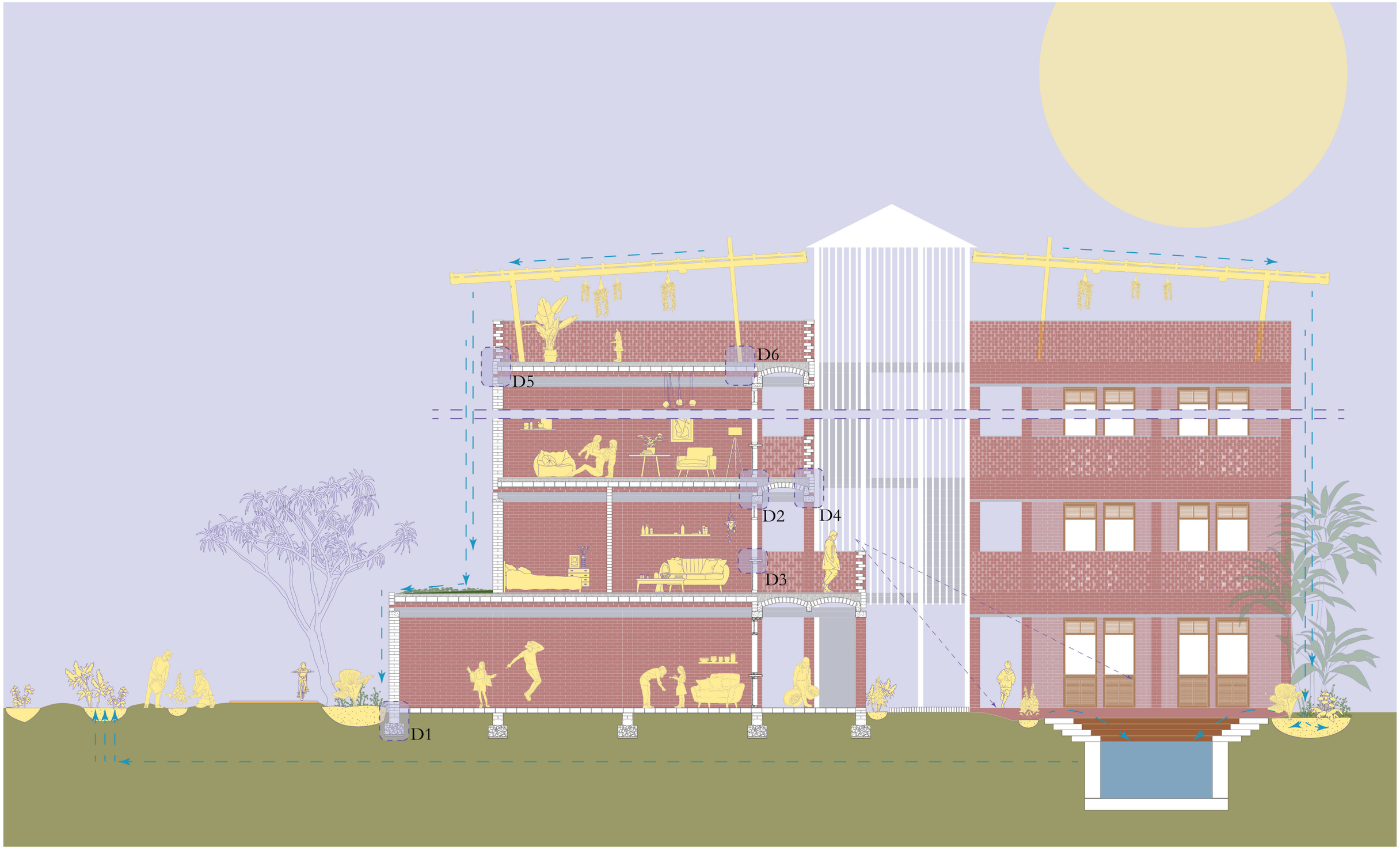
Red soil in Navi Mumbai

suitable for compressed stabilized earth blocks stabilized with cement or lime

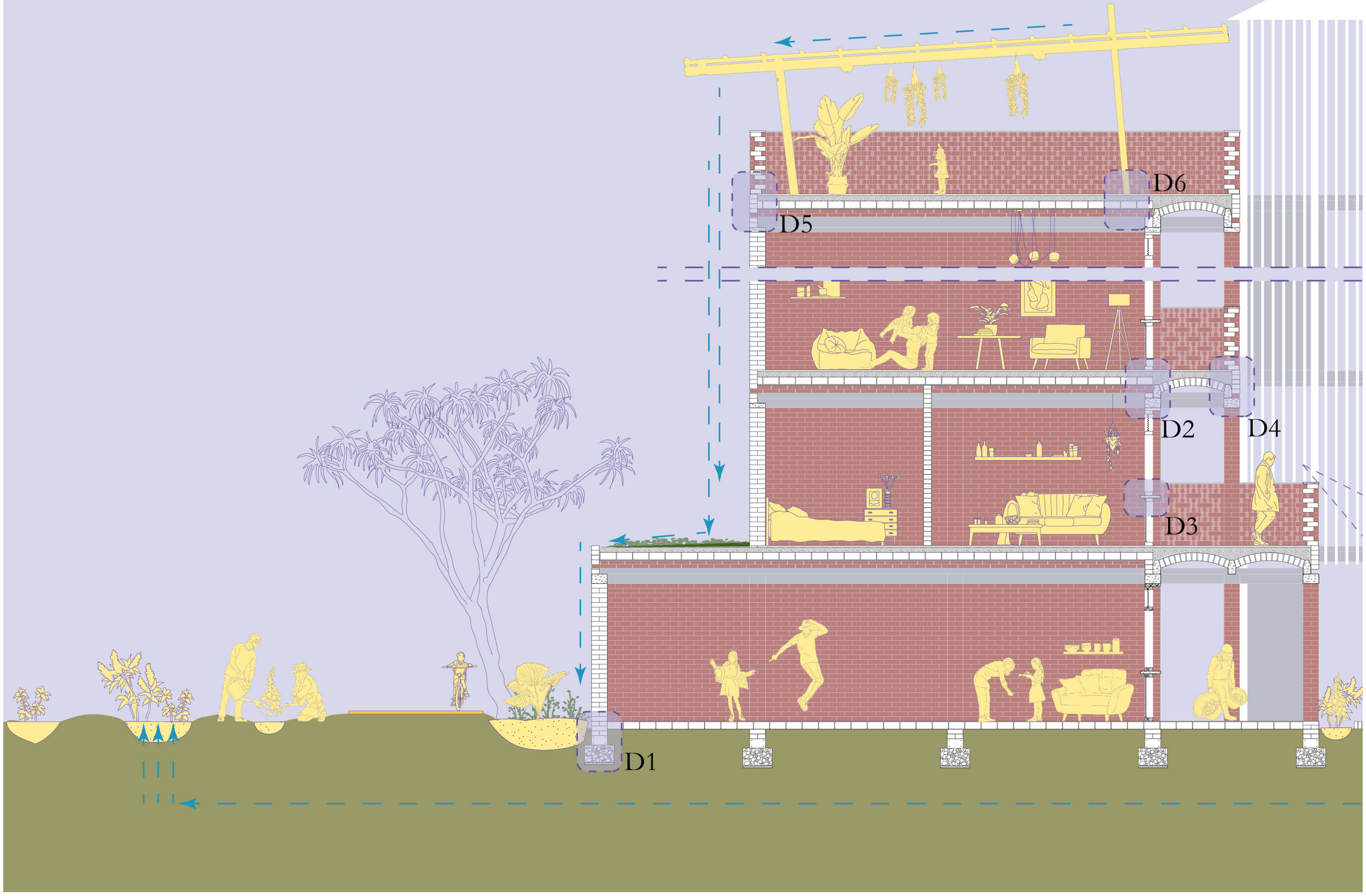
producing CSEB is labour friendly and has environmental benefits compared to fired brick



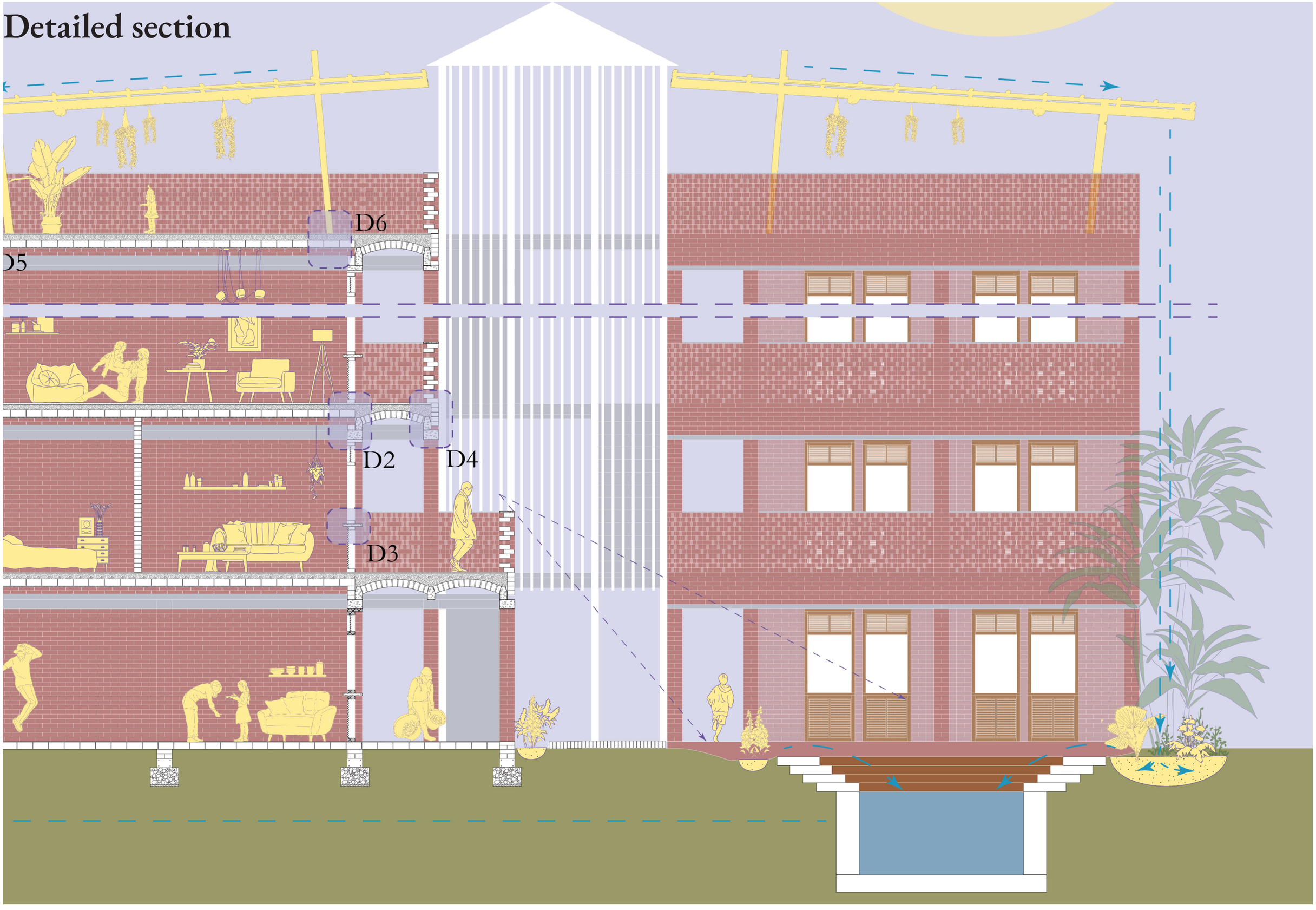
Detailed section



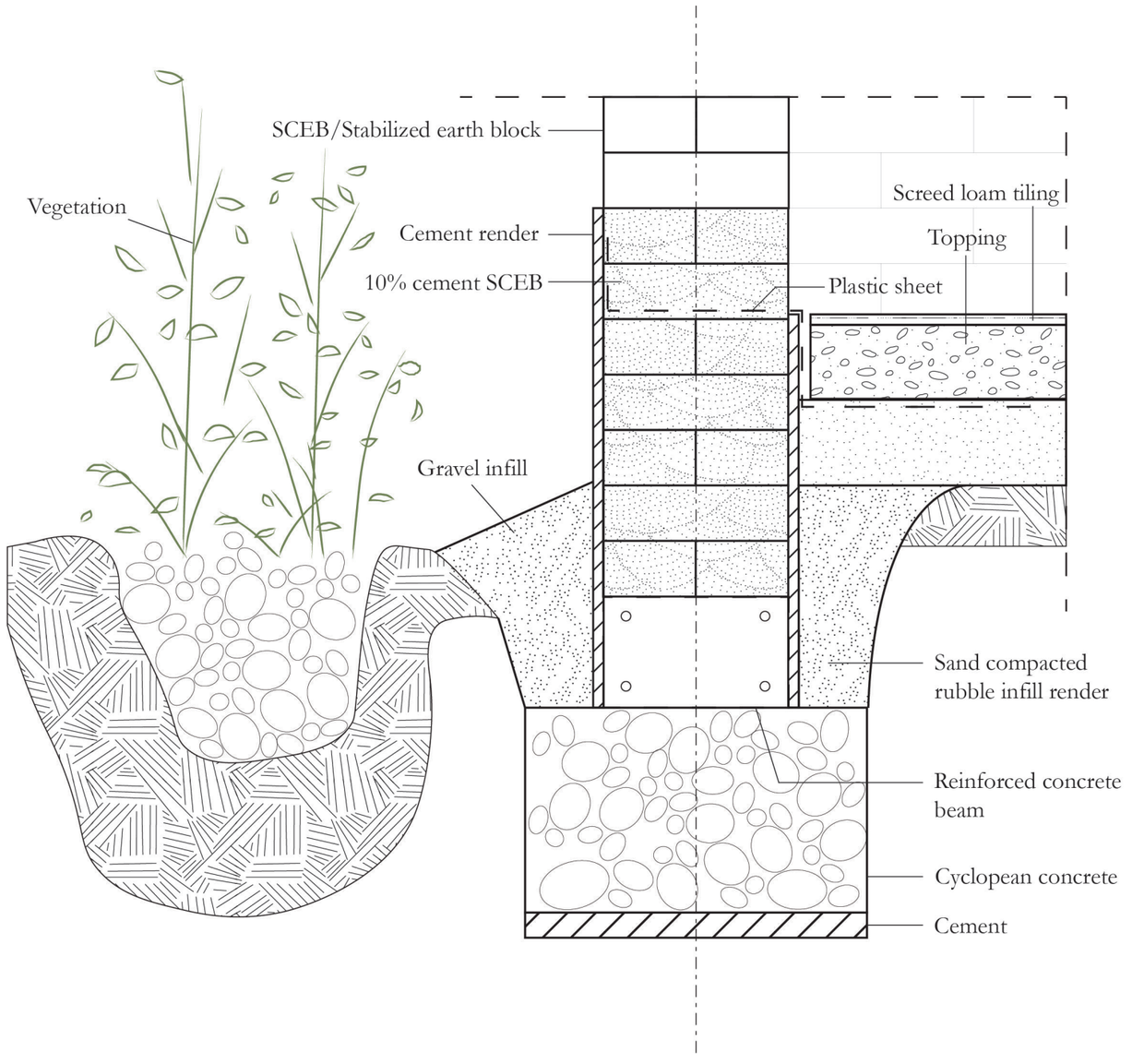
Detailed section

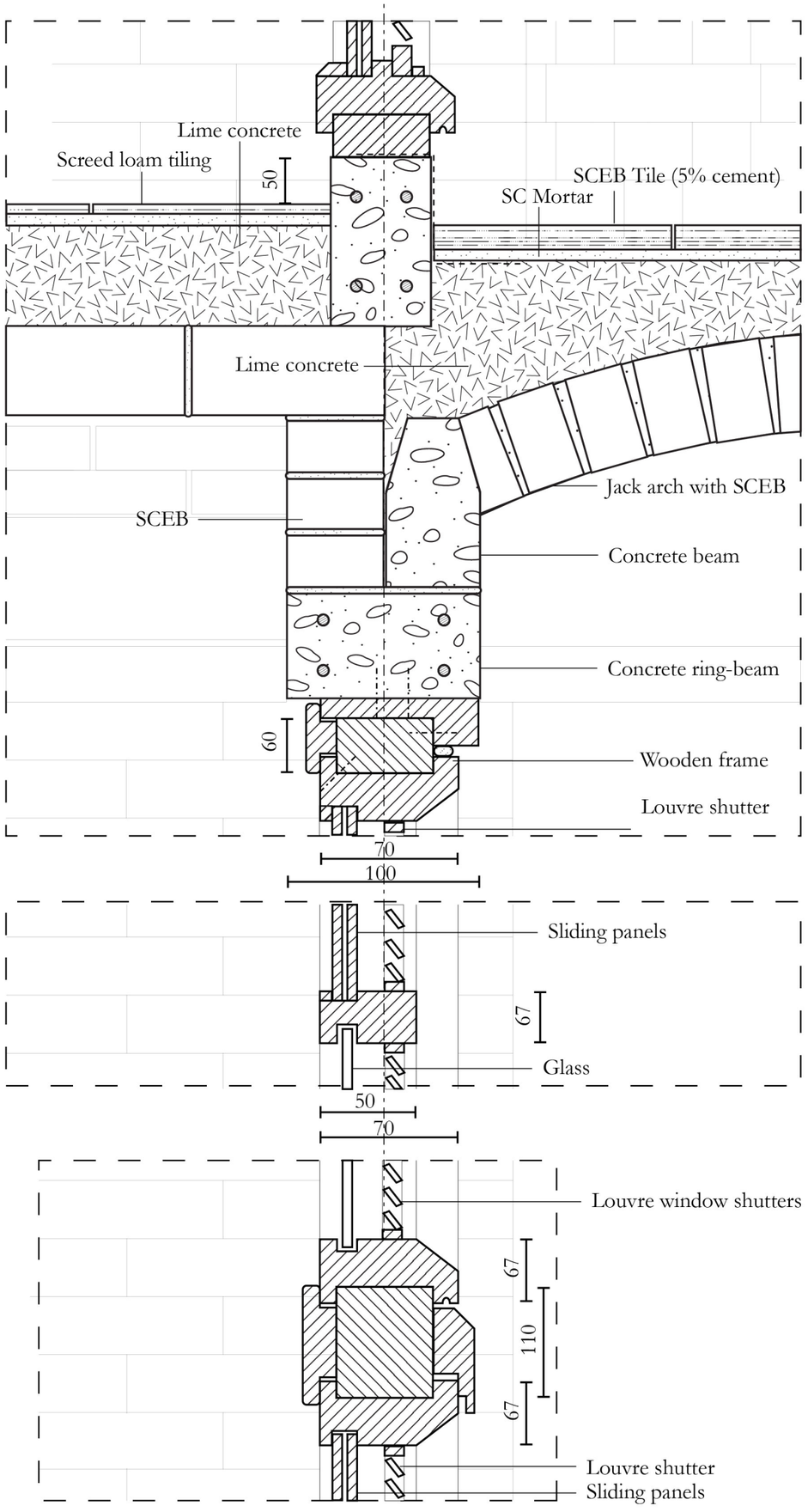


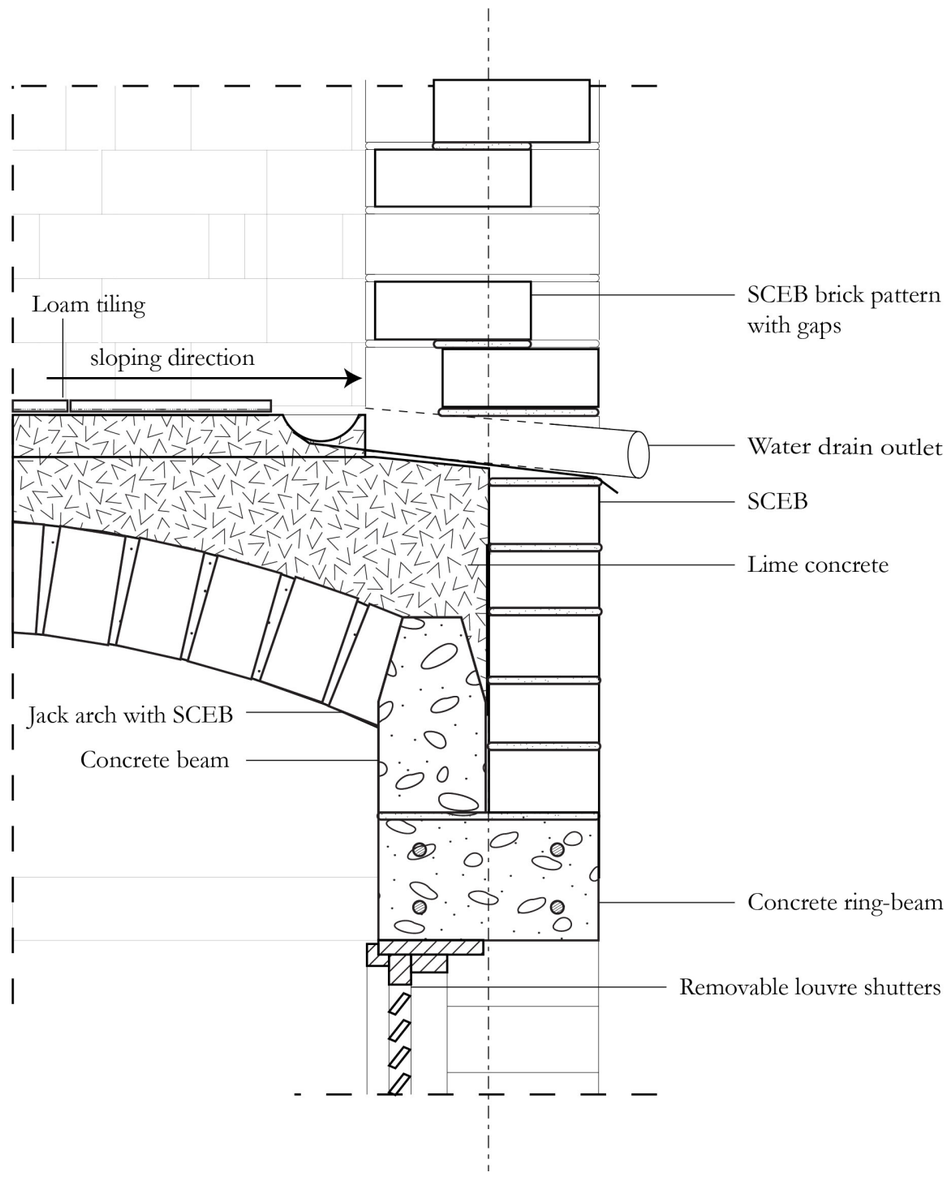
Detailed section



D1 - Groundfloor Detail

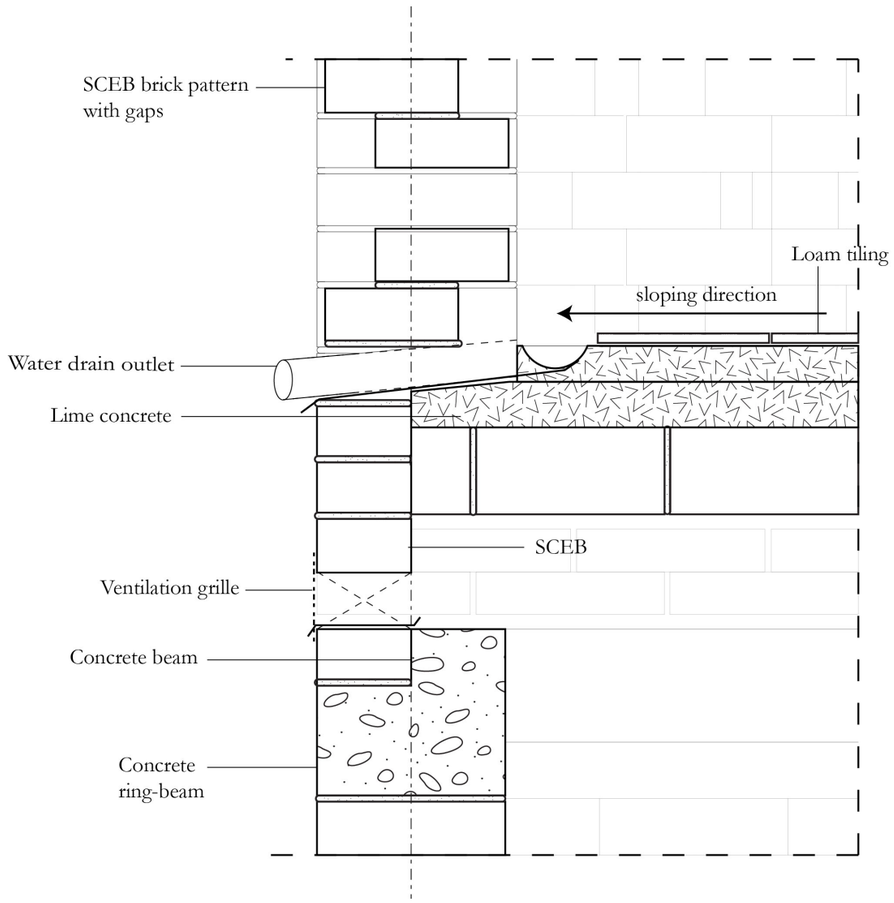


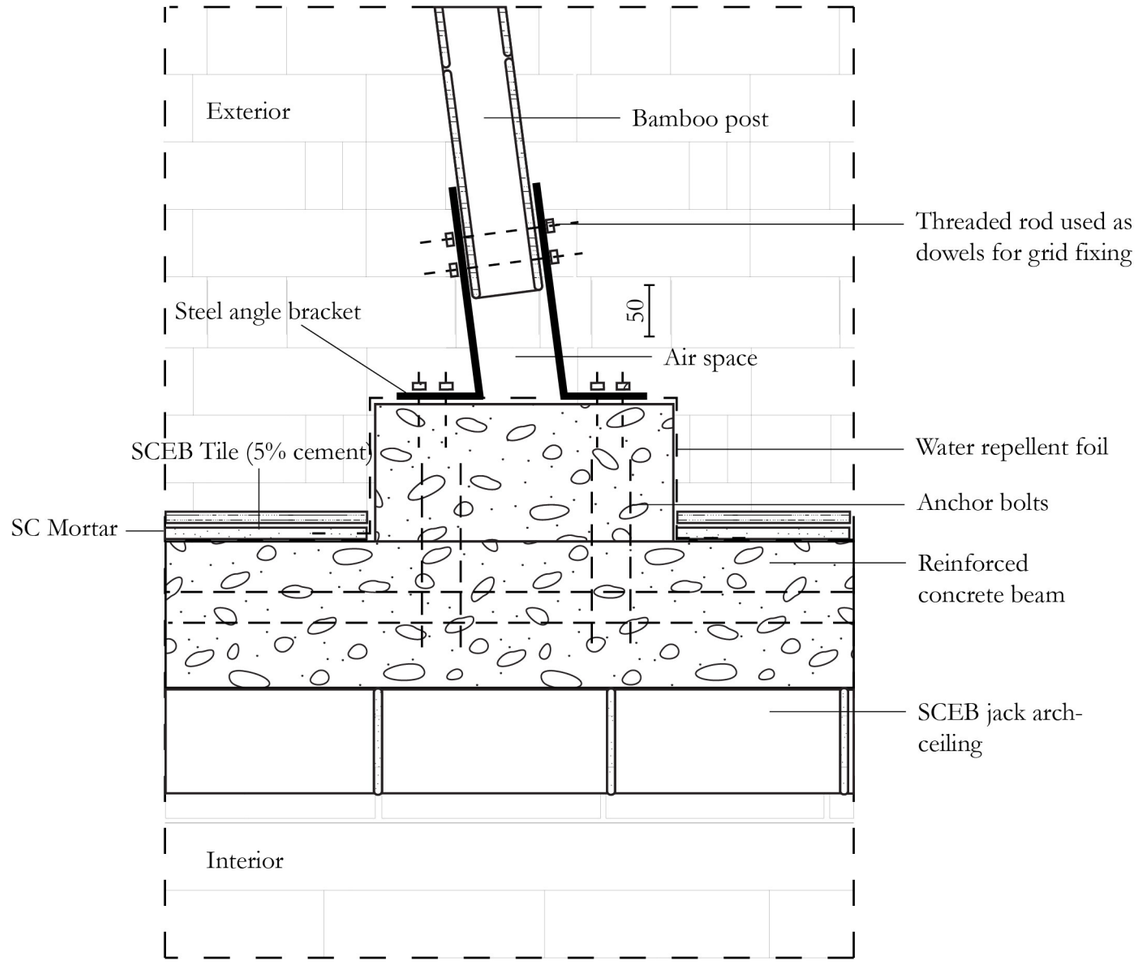




D2, D3 & D4 - Floor and window Detail

D5 - Roof Detail





V. Reflection
Salutogenic Homes

Master of Architecture

Student information
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5262089

Global Housing Graduation Studio
Mixing Navi Mumbai
AR3AD105

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Dr. Nelson Mota

Research plan instructor
Dr. Rachel Lee

2021/2022

Reflection

Introduction

The studio Global Housing - Mixing Navi Mumbai addresses the residential housing shortage in India. Navi Mumbai a planned city with a goal to decongest Mumbai city and provides space for the existing city to expand. Thus creating opportunities for new housing projects to develop like affordable mass housing projects.

The housing shortage in Navi Mumbai is addressed by the government with the CIDCO mass housing scheme. CIDCO Mass Housing Scheme is a funded project and part of the Pradhan Mantri Awas Yojana - Urban (PMAY-U), a project aiming to address the urban housing shortage among the EWS/LIG and MIG categories including the slum dwellers. The mission is to house them in a pucca house by the year of 2022. The CIDCO Mass Housing Scheme is advertised to create 89.771 houses at several nodes of Navi Mumbai.

After an analysis of the CIDCO Mass Housing Scheme, I wanted to make my goal of the graduation project to focus on the qualities of health. The project from CIDCO provided an efficient way to build housing fast and affordable, but it was mainly focused on housing the people. Which made me question how it would be to live in such circumstances, especially during the pandemic. As this graduation project took place when the pandemic was still ongoing and it was clear from research that the people in Navi Mumbai had also suffered from the effects of Covid-19. This became one of my motives to design healthy housing which can improve the overall health of residents and enhance the formation of communities in neighborhoods.

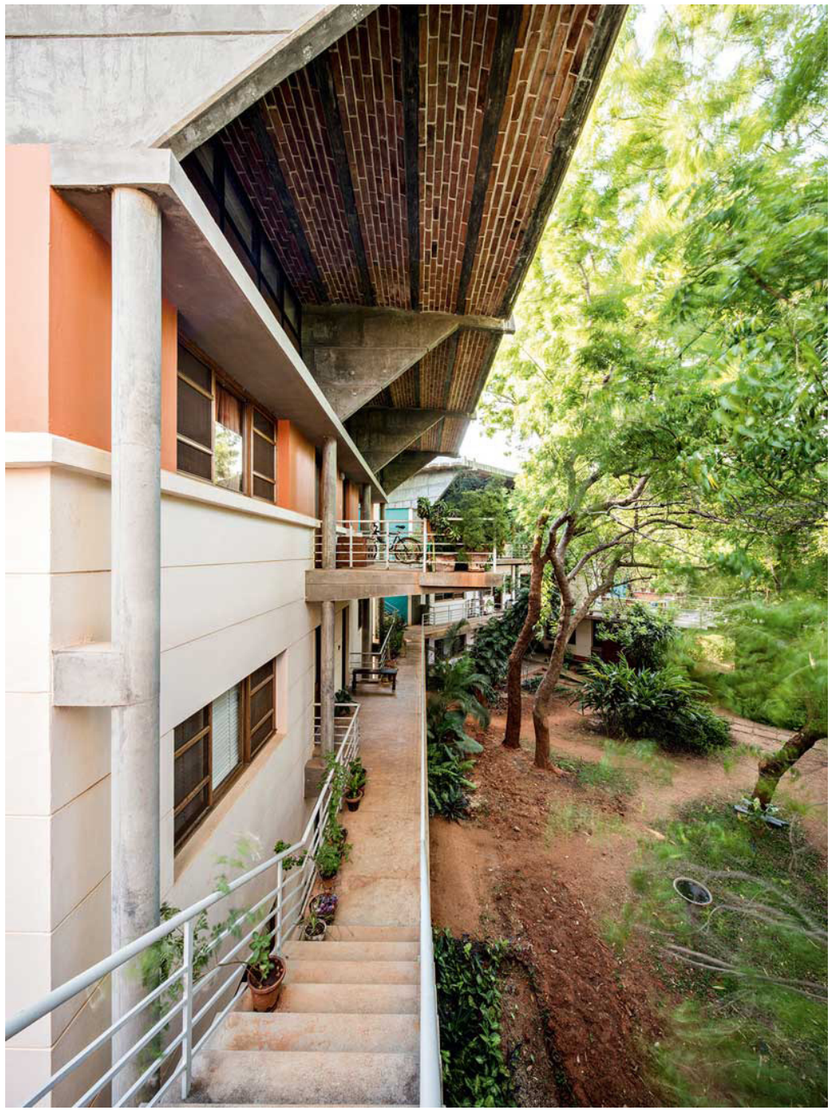
Reflection

Research and Design

In the studio Global Housing mixing Navi Mumbai, research has been done collectively in Phase 1 and Phase 2. Phase 1 consisted of contextual research of housing and nation building projects in post-independence India. Every student did research on one project, I learned in this phase about the project from Anupama Kundoo – Creativity Co Housing. Which has been an important reference to connect the community living in the design approach. During this phase the benchmark project from CIDCO mass housing provided the information of how projects usually look like at the moment. Providing a crucial understanding of the context in India.

The aim of my graduation topic is to improve the overall wellbeing of the users, which means I needed research to decide my design choices. Research is actually the underlaying factor on how my design concepts originated. From the research it became clear how important community connections are to a healthy living environment. Social cohesion was a strong result in chawl communities, but this is disappearing in the newly developed cities. The chawl communities were able to arise because of the shared hallways and interconnected living patterns throughout the floorplans. Also from a guideline of WHO on healthy housing, vulnerable income groups are even more dependent on social connections. Which is why in the design there is space for communities to gather and opportunities are created to make social connections between different households.

By using research which could give a direction on what the results on health will be for the users, I was able to know what kind of design choices I should make. How a healthy living environment could look like in Navi Mumbai and why this design could work to improve to wellbeing of the users and thus decreasing sickness.



Reflection

Graduation topic/Studio topic/Master track/Master programme

My graduation topic on how to improve the qualities of health in the current architectural environment in Navi Mumbai became an interest because of the research in phase 1 and the design research in phase 2: Housing as Healthcare. Also in my past internships I have been in contact with Architecture and Health. During my Msc 1 technical design phase my design approach was also on how to calm the mental state of the user in a court. Concluding that health in architectural design and cultural aspects have been a reoccurring interest of mine during the course of the study.

Also one of the reasons on why I choose the Global Housing studio is, because I wanted to challenge my own opinion on housing projects. I originally believed and felt like housing projects were not in my interests, because of it's repetition, building regulations and budgets. In the studio I found a new interest for designing housing and the challenges which come with the project. The puzzle of housing different households, while providing them with their different needs. This gave me also a better understanding of what kind of direction I would want to go in after my studies and where my interests are in the architectural field.

Research Method

I approached the project with a salutogenesis approach with research on healthy environments. This gave me a better understanding of design choices and health consequences. Although it is unclear in how far the approaches work in the cultural context of India, since the project will not really be realized. A salutogenesis approach did mean the design will focus on raising the wellbeing and overall health of the users.

The research was done with an integrative interdisciplinary approach by combining the research in healthy environment and affordable architecture in Navi Mumbai. Focusing on the problems of health in existing projects in Navi Mumbai and using research on health environments to prevent sickness in an affordable architectural design. Which is relevant to present a different approach to housing design and to prove a how housing design can enhance social community and overall health of the people.

During the research the feedback of my mentors helped me to stay on track and when to zoom in and out of certain parts of the project. Especially when I am working individually it becomes easier to become obsessed on certain parts which may not be that important for the end goal. The guiding of the mentors was very helpfull and the additional references and tips helped me to stay inspired and motivated throughout the whole project.

Reflection

Transferability of the project results

The project is designed using interdisciplinary research from epidemiology, impacts of the building environment on health, architecture projects for healthcare etc. Making the project relevant for other fields besides architecture. The project tries to incorporate different income groups and households which introduces a different social dynamic from the existing one in Navi Mumbai. Where there are gated communities all from the same income group and living conditions.

Furthermore, the project focuses on enhancing the qualities of health in mass housing design. Bringing the field of health and architecture together. The science on how our build environments influences social cohesion in communities, could increase the individual health and how greenery in the area impacts the environment are all qualities addressed in the project which can be further explored in other fields.

In the managerial framework the project tries to use the profits on a salutogenesis approach to gain economically, giving healthcare providers a motive to invest in healthier neighborhoods where sickness is reduced. Healthier neighborhoods enables a more productive and efficient society. Which gives the residents and the economy benefits in the long run.

The design concept began with a modular approach, which means the units are interchangeable. Also the structural framework of the project is the same for nearly every unit, this makes the design very flexible and the transferable. Allowing the project to be implemented on different locations. Additional changes will be needed according to the urban context and cultural context.

Ethical issues and dilemmas

The graduation project started during the Covid-19 Pandemic, which made it not possible to visit the project location. The issue it creates is, it was impossible to talk and see how the locals live and what the living circumstances are from up close. Making the research entirely dependant on the sources which are available online and the information people from India provide.

This makes it especially difficult to understand the cultural context of the project. Personally I do not have any knowledge prior of the project about Indian culture, which makes it difficult to understand the socio-cultural conditions in India. During the process I tried to be as respectful and thorough with the research I could do online and by asking Indian friends for a better understanding. Although efforts were made, it does not mean misunderstandings for the needs of the user are ruled out.

If a visit to the project location was made and it was possible to have conversations with the users. The design would have been significantly different and in all probability better suited to the users. Only the qualities for the health of the user will be the same, because they are not dependant on cultural nuances and more focused on the human body in general.