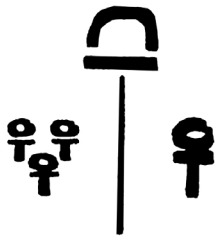
Open Building Approach
Toward
Inclusive Urban Space



P5 Presentation
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MSc4 GRADUATION STUDIO (AR3AD132)

4-07-2018

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Reflection

Aspect 1
The relationship between research and design

The process of carrying out the research includes different methods which consist of Typology and Praxeology to provide perspectives for collecting and analyzing information. Dwelling chair approaches are the study of typologies and practices of inhabitations, and patterns of cohabitations. Dwelling chair conducts also research in close relation with context and regional studies. Within this study context, a solution for the research question demands enhancement in the existing solution for the housing crisis in Mumbai.

The slum redevelopment scheme of Mumbai is known as a building type which is also called the low rise high density blocks. Different factors like construction regulations, governmental policies, cost efficiency, and land ownership have affected the quality of this type under different conditions. This complexity of housing solutions in Mumbai opens the gates for further studies in the existing types with the goal of enhancing the current solutions as parts of the entity of the city. Appropriation of space in these settlements reveals inhabitants' reaction in front of the "natural setting" of these schemes. By studying praxeology, it is sought to understand how different elements of the slum rehabilitation schemes serve inhabitants.

The literature study revealed that there are adequate resources covering the topic of housing in Mumbai to start the initial research. These resources include the archive like books and peer-reviewed articles which contributed to understand the complexity of the topic. Synthesis of the resources also resulted in acknowledgment of the geographical constraints as well as the socio-spatial condition of the city, maps of settlements and amenities, and housing typologies. The site visit in Mumbai provided an opportunity to conduct qualitative research through observation, informal conversations with inhabitants, photography, and analytical drawing. In other words, "natural setting" of slum rehabilitation schemes were observed and analyzed as a component in the context of daily life within the framework of anthropological research.

In the proposed design, different aspects of the multifaceted topic of housing, which becomes more complex while aiming at being low cost, have been researched. The design is the synthesis of testing different approaches to provide a convenient unit for low-income people in the tropical climate of Mumbai. All different determining factors like form and shape of the blocks, urban layout, and appropriate techniques for being low cost have been studied during the design process. As the topic has been new to the author of this paper, research has been a vital part of the process. The evidence for this claim is that many initial ideas were improved or left aside after the field trip to Mumbai, but also based on further studies of the existing solutions and debates about the topic. For instance, incremental growth and self-help communities were considered initially as possible solutions to the problem, while further studies

have revealed that these are not necessarily applicable for the high demand of housing units in Mumbai whose land is quite sparse. Similarly, the initial idea of growth and change which was part of articulated design hypothesis were substituted for the growth in housing units. It is indeed observation of previous projects designed with this approach showed that no change or only minor changes took place after the inhabitants had occupied the unit. In contrast, growth of housing unit is quite common in Mumbai's low-income housing units which are visible as encroachments to different corners of the units and even outside of the units. Similarly, providing working spaces were initially one of the aims of the design hypothesis was confirmed by qualitative research and observations during the field trip which was showing intertwined occupation spaces and housing units as a value to keep. Further studies showed that, although occupation and housing are correlated in slum areas, it is impossible to bring them back to the height as these micro commercial units do not function in the height. On the other hand, the research about right of choice, although was considered as a solution for wealthier societies and middle class, resulted in finding a study which shows the similarity of chawls with linear scheme of support and infill of Habraken (1999). In 1983 Sanyal (1983)'s Doctoral dissertation at Massachusetts Institute of Technology was published. In this work named "Toward a Design methodology: a case of chawls in Bombay" the chawls blocks of Mumbai are investigated. This resulted in delving into the ideas of Habraken and comparing with the existing solution of low-rise high-density blocks.
The field trip was an important part of the research and considerably/significantly contributed/helped to revise the perception of the problem and its context. Collective research at Nallasopara, the area of design, with the help of KRVIA's students, surveying the local inhabitants, and qualitative research through the workshop at KRVIA contributed to gain knowledge about the topic which was channeled into the design.

Aspect 2
The relationship between the graduation (project) topic and the studio topic

The proposed system is the synthesis of different solutions for different aspects of affordable housing in Mumbai. The Proposed graduation topic is the improvement of ~~the existing solutions for low-cost housing in Mumbai. It is a metamorphosis of chawls~~ in the scale of the building, following the logic of clustering in order to make meaningful social spaces. The suggested scheme provides dense housing fabric without losing the quality of public space. This system is not based on a Tabula Rasa or a utopian scheme. It is designed to connect the existing fabric to valuable spots of the site to make a network of current potentially valuable social nodes. The adaptability of the designed scheme makes it appropriate to be generalized to other locations with different borderlines and existing fabric. The economy of the scheme is low cost

due to the size of dwellings, involves simple structures and uses conventional construction methods and vernacular or/and accessible materials.
Inclusive development is one of the main aims of this design assignment, as already suggested by the title of the Global Housing Studio, "Mixing Mumbai, Affordable Housing for Inclusive Development". In my scheme, inclusive housing has been studied in order to be applied. Providing mixed-income area, right of choice for inhabitants, social space, and public amenities are all answers to this assignment to help the low-income group of people to become more integrated into the society.

Aspect 3
Elaboration on research method and chosen approach

My approach is positioned between epistemes of typology and praxeology that involves typological study of slum rehabilitation system and its adjustment by people through the means of praxeology. In addition, the approach demands regional studies to cater for enough study of social context. Apart from typology, the way people inhabit the existing solutions is notable. Considering the social content of the city is inevitable that is covered by the archival study of existing literature about Mumbai and also qualitative research, which to some extent were done during a site visit by means of photography, sketching, and preparation of diagrams. This topic is partly covered in the analysis of typological researchers in the field of housing typology. Books such as "In the name of Housing, a study of 11 projects in Mumbai" (Padora, S. 2016) have been valuable resources of this category that is not only about the form of the housing types of the city but it is also related to the social content of the type and its surrounding. About the thinkers of the debate, I believe experimental research conducted by URBZ cannot lead to major changes and it is slow for the urgent housing crisis of Mumbai. Instead, I agree with P K Das's idea to change housing policy that is one of the major causes of housing problems in Mumbai. By mapping the slum settlements and different assumptions of land allocation on a bigger scale, designers would be able to come up with relevant responses for major changes questioned in this research.
Combination of Typological approach and Praxeology is the optimization of typology approach to accentuate how people act in front of the built environment and existing types. Borrowed from the context of Dwelling chair at TU Delft, I believe that the study of typology is a classification of building types to use them as starting point or as the precedents. Therefore, the adopted approach is considered relevant and praxeology alters the position of determining factors of the design, which do not include only the designer, but also covers the user within the context of the research. This would make the approach as a synthesis of Typology research method with the focus on anthropological research.
Archival study of In- Situ upgrading scheme reveals its scope as the upgrading of slum settlements. The typological study of different patterns of slum rehabilitation schemes also lacks consideration of social aspects of inhabitants' life. Relocation of slum dwellers causes social and financial problems for them, offering minimum housings which ignore the conditions of target groups. Synthesizing

these facts, lead to the development of new type that merges the advantages of different solutions, social consideration of In- Situ Upgrading, and potentials of slum rehabilitation schemes as different components of the city.

Aspect 4
The relationship between the graduation project and the wider social, professional and scientific framework, touching upon the transferability of the project results

The proposed design is applicable to the reality of Mumbai. In different aspects of the design, an extent of reality has been always considered. Techniques of construction have been selected through local techniques, like in cast reinforced concrete structure or clay pot filling ceiling. Due to the height of the blocks, a large amount of excavation of the ground is needed to build the foundation. Therefore, excavated soil can be used to make compressed stabilized earth blocks which create also occupation chances for people of the area during construction. Conventional material like corrugated metal sheets and vernacular material like bamboo, quite abundant in Mumbai, make the scheme feasible. As mentioned before, the proposal is the metamorphosis of existing solutions, keeping the advantages of current schemes like cross ventilation due to linear layout of the units. The large area of the design is not necessary to be built at once, because the clusters are designed in a way to make their own neighborhood. This feature makes it possible to develop the area gradually, even by different developers or real state agencies. The only aspect of the scheme that may seem less possible is building support following the idea of Open Building.

Aspect 5
The ethical issues and dilemmas you may have encountered in (i) doing the research, (ii) elaborating the design and (iii) potential applications of the results in practice

During the process of research, it was revealed that the problem of lack of affordable housing in India is not the issue of design, but the lack of larger intervention by the government. The role of policy in this topic makes one doubtful about the meaning of a well-developed scheme, while any decision is related to the profits of local developers.

References:

1. Habraken, N., & Valkenburg, B. (1999). Supports, an alternative to mass housing. [England]: Urban International Press.
2. Padora, S. (2016). In the Name of housing, a study of 11 projects in Mumbai (1st ed.). Mumbai: Urban Design research institute.
3. Sanyal, S. (1983). Toward a design methodology: a case of chawls in Bombay (Doctoral dissertation, Massachusetts Institute of Technology).

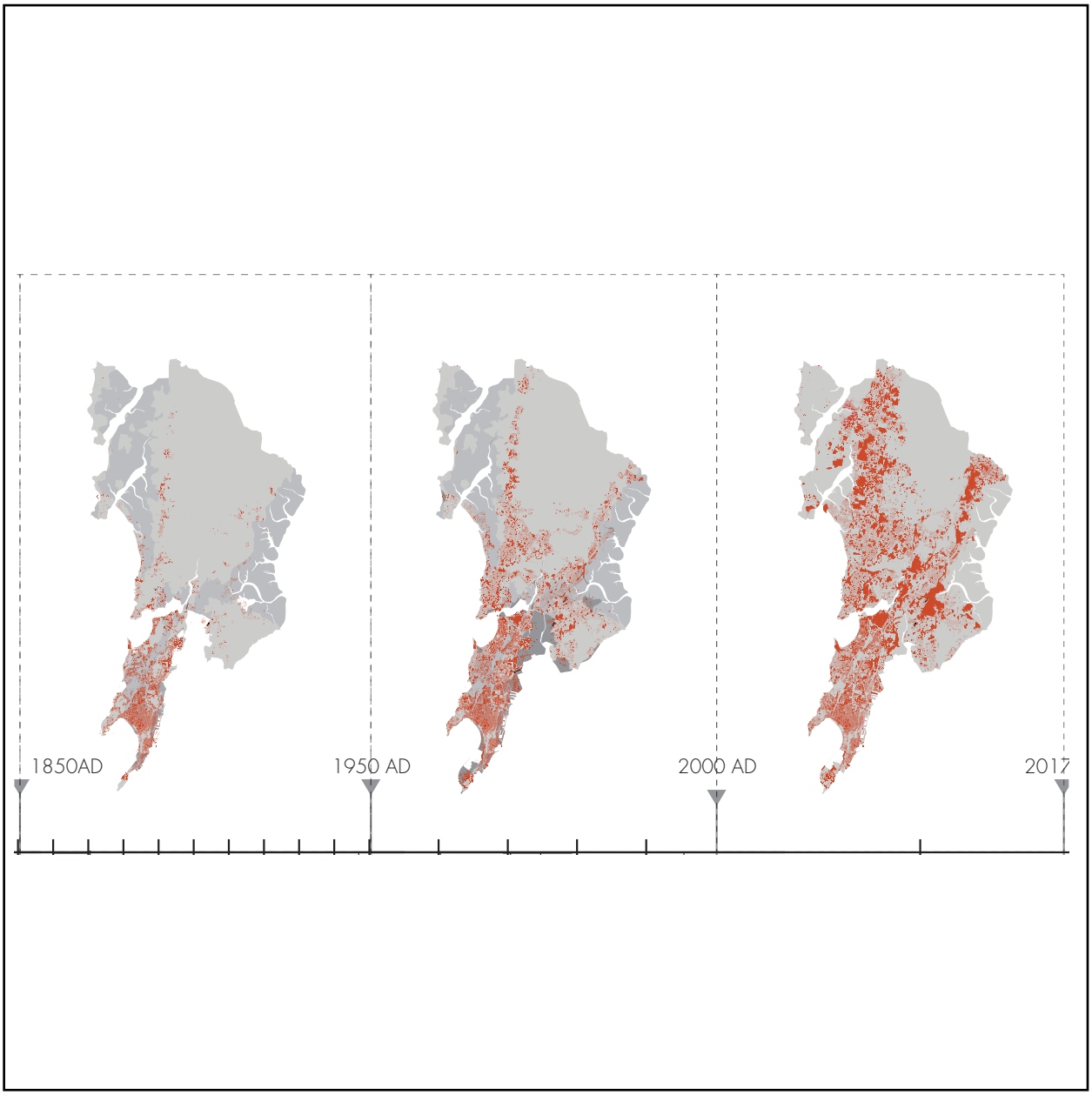
Prelude

Location

India
Mumbai
Vasai Virar

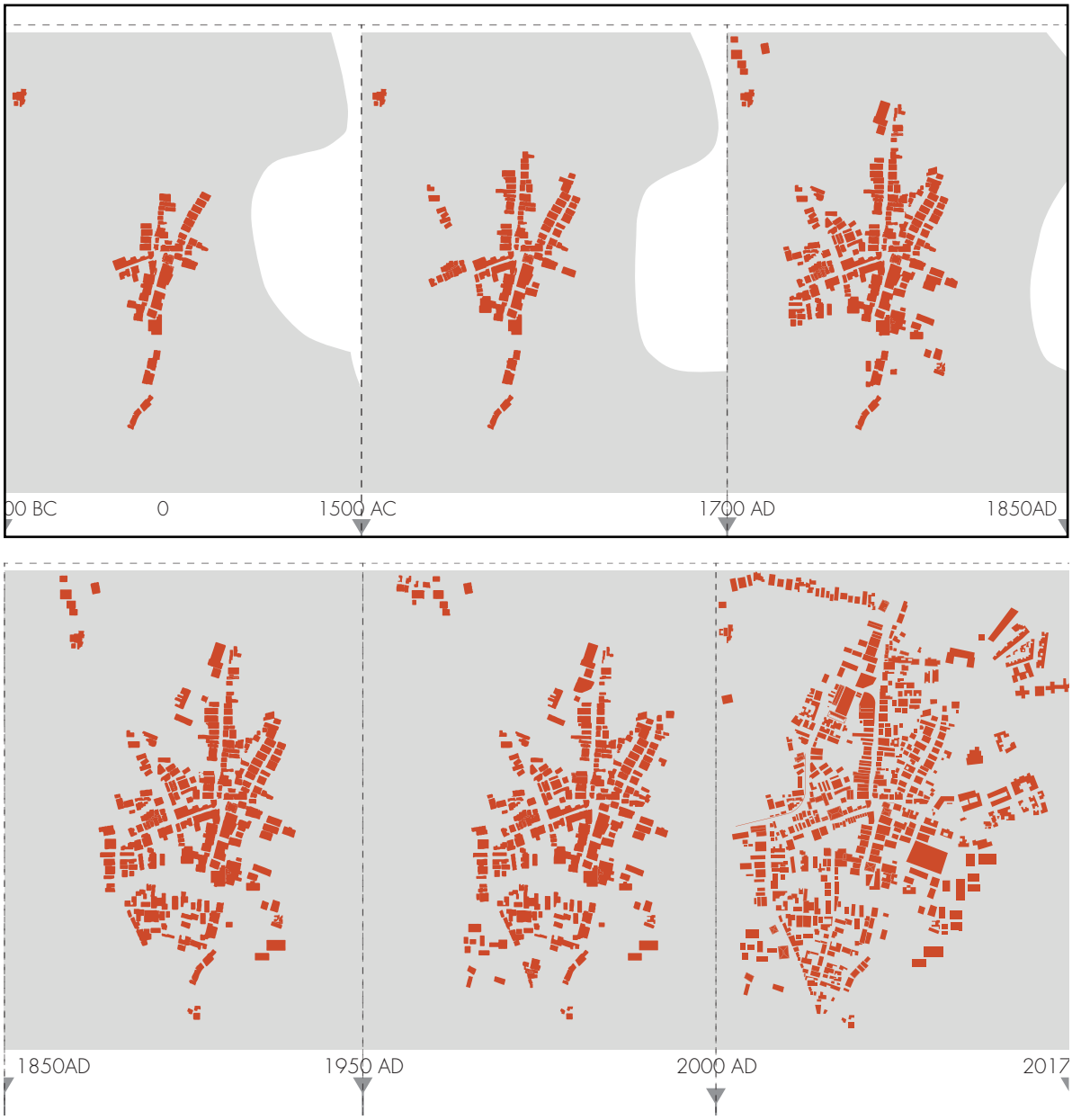
Mumbai was evolved as a port city for trading reasons throughout the history. Mumbai creation was never planned so its form was shaped incrementally. Mumbai was never prepared for growth. Mumbai is like a collage of different forms in term of urban fabric and also ethnic groups. Mumbai embeds many cities within its identity. Vasai Virar region is one of these cities within the city of Mumbai. Nalasopara, located between Vasai and Virar, has a history going as far back as the Portugese colonial times rooted in the small villages surrounding the lakes.

Mumbai Urban Growth



Mumbai urban growth has been mostly toward North. It is caused by natural constraints on the East and West. Arabian sea which is the reason of creation of Mumbai has also limited its Growth to sprawl toward North.

History of Nallasopara



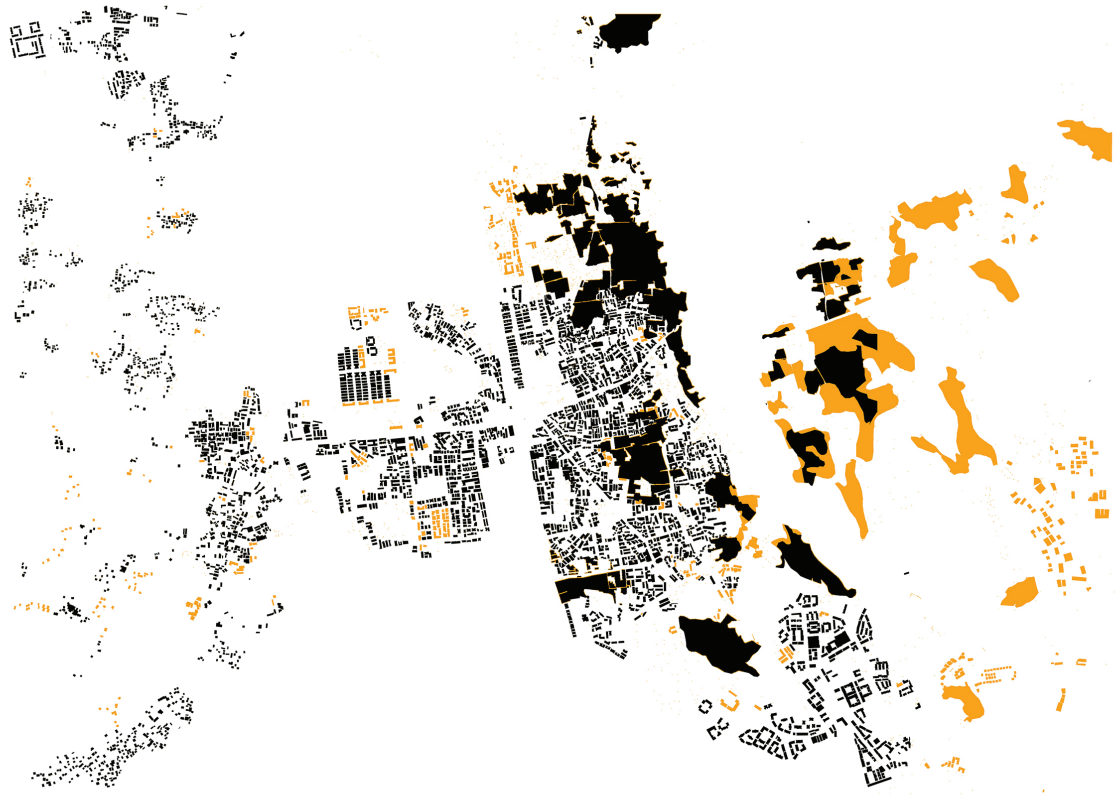
NallaSopara's Urban Transformation

Existing buildings & slums
New buildings & slums

2002

Nallasopara's urban transformation, similar to Mumbai has been toward North over the years. This evolution of urban pattern is stimulated in north-south direction due to railway track. Railways has been always a connecting hub, specially in crowded Mumbai of today with the population of 21 Mumbaikars.

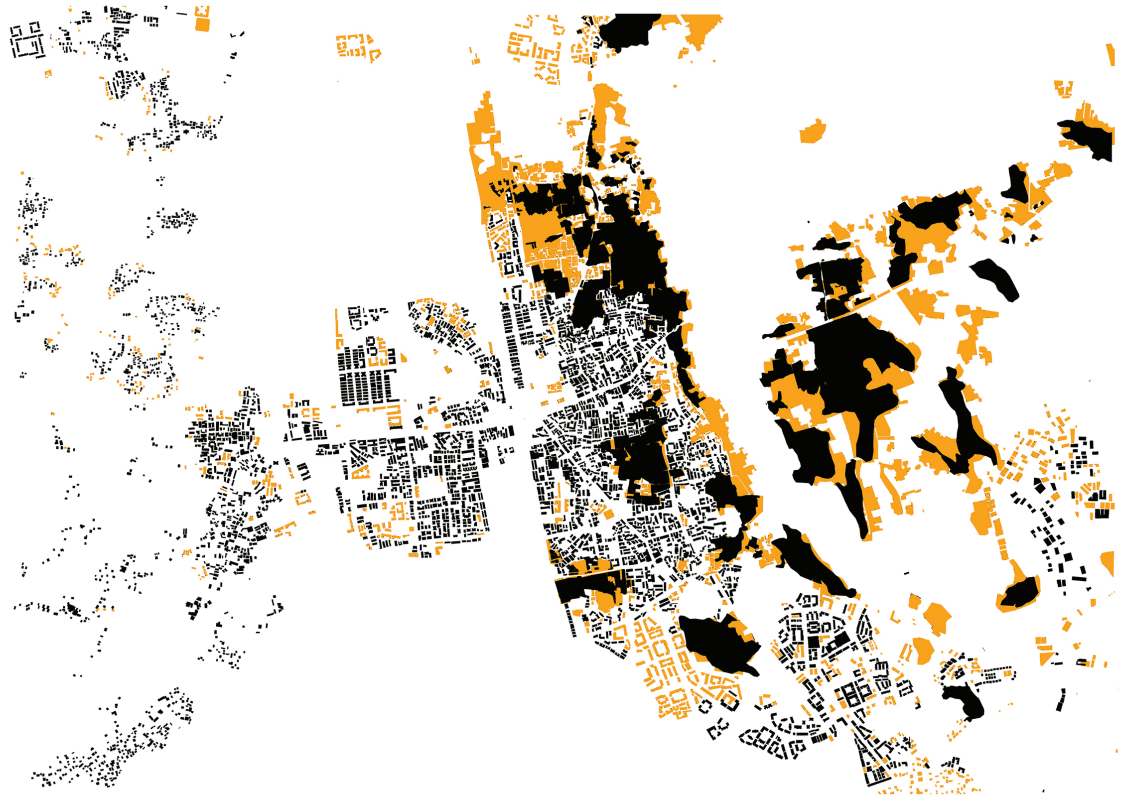
NallaSopara's Urban Transformation



Existing buildings & slums
New buildings & slums

2005

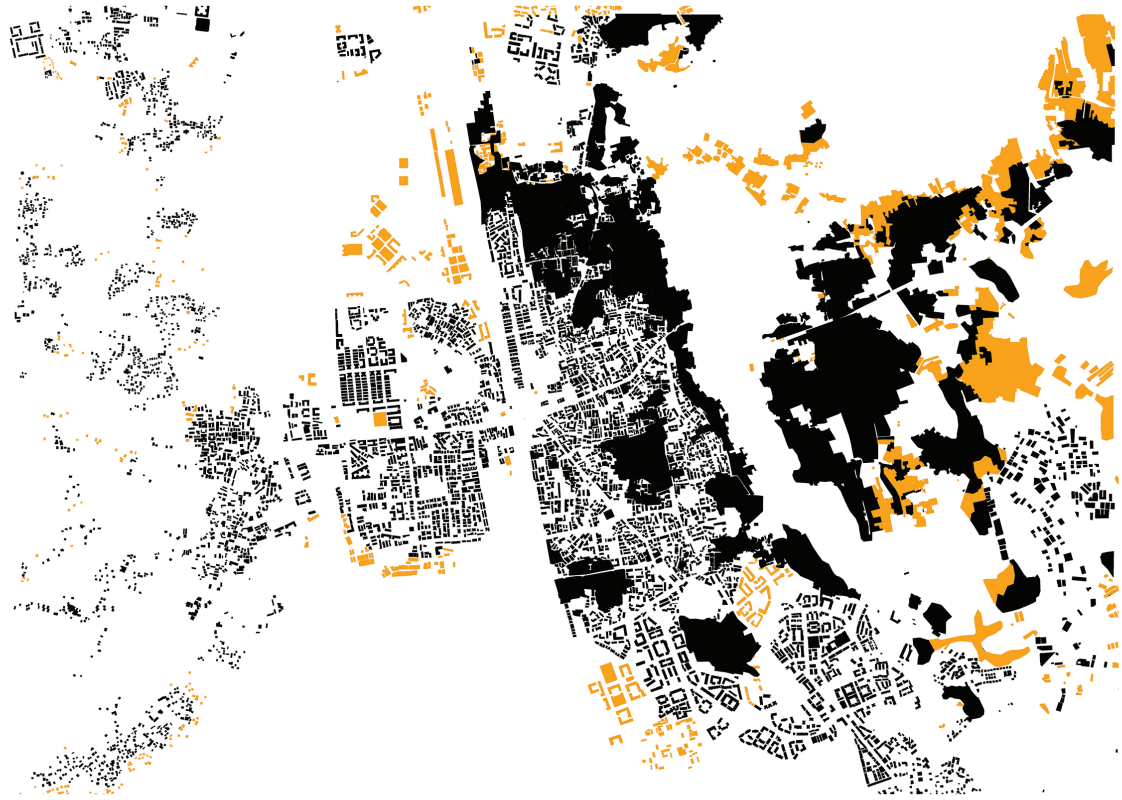
NallaSopara's Urban Transformation



Existing buildings & slums
New buildings & slums

2009

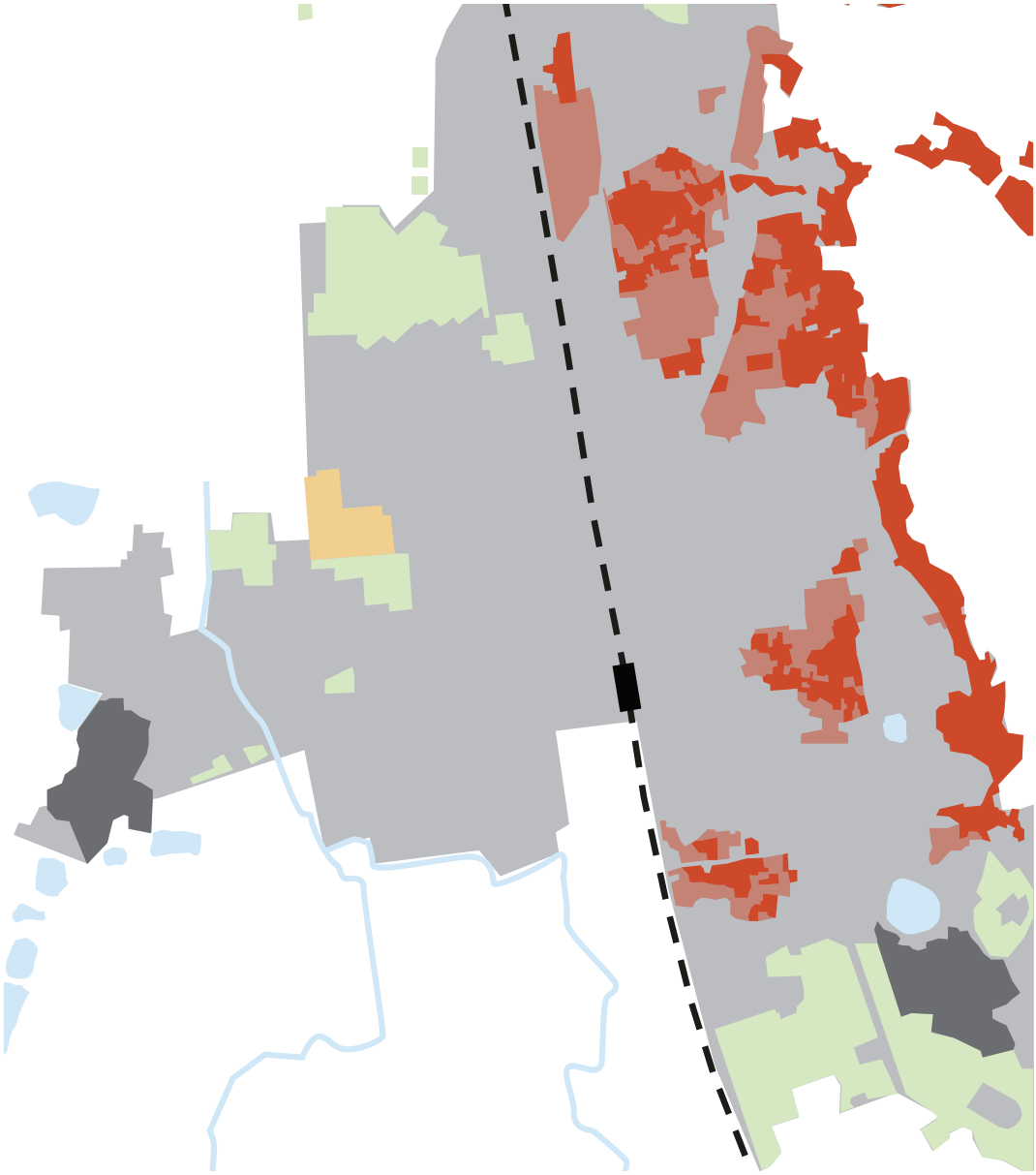
NallaSopara's Urban Transformation

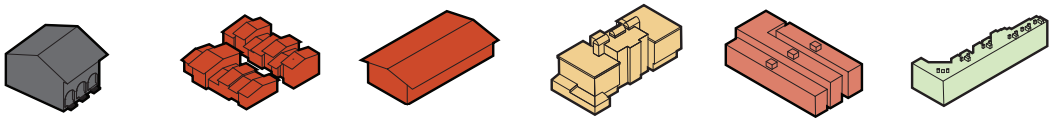


Existing buildings & slums
New buildings & slums

2013

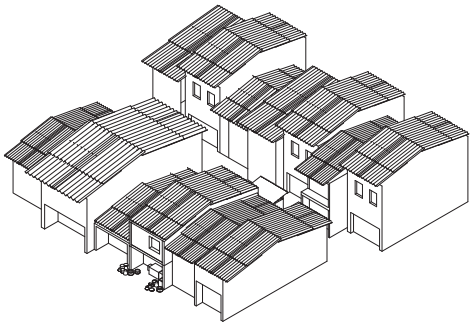
What Has Been Created on the East?

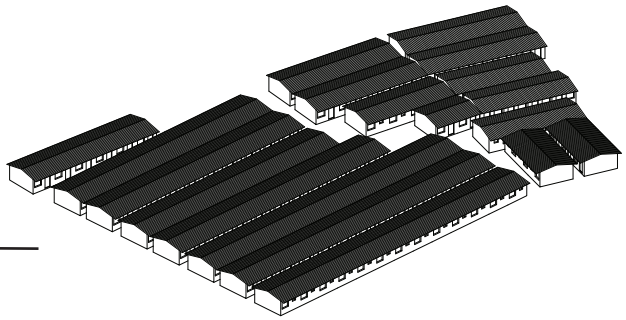


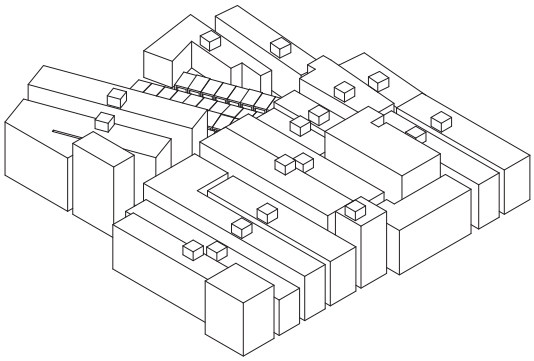


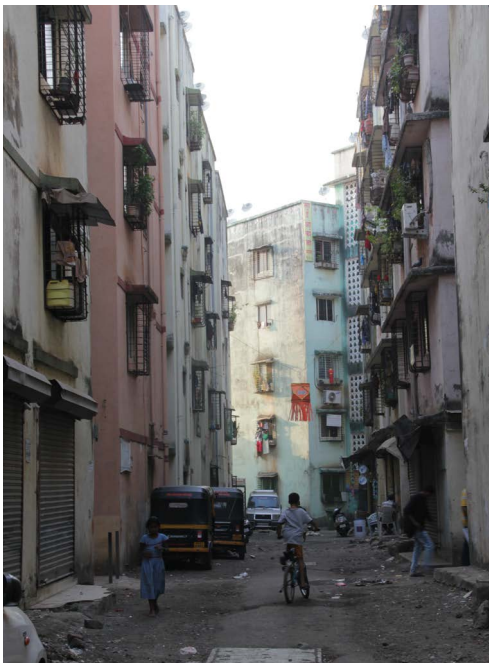
The Slum settlements are spread around different parts of east side of Nallasopara railway.
The Baithi Chawls are located on the east of Nallasopara, close to the hill and on the outskirts of the village. Baithi Chawls are packed very close to each other, built as long stretches. The urban pattern is formed of wider, central streets and narrower paths between the blocks. The dwellings can be accessed via these smaller paths. The front doors of the dwellings are all opposite to each other, so that the backs of the dwellings form a narrow 'back alley'
The slum redevelopment schemes are found on multiple locations in the east side of Nallasopara. Normally development take place on former slums - these schemes mostly have a physical connection to existing low rise slums.

What Has Been Created on the East?

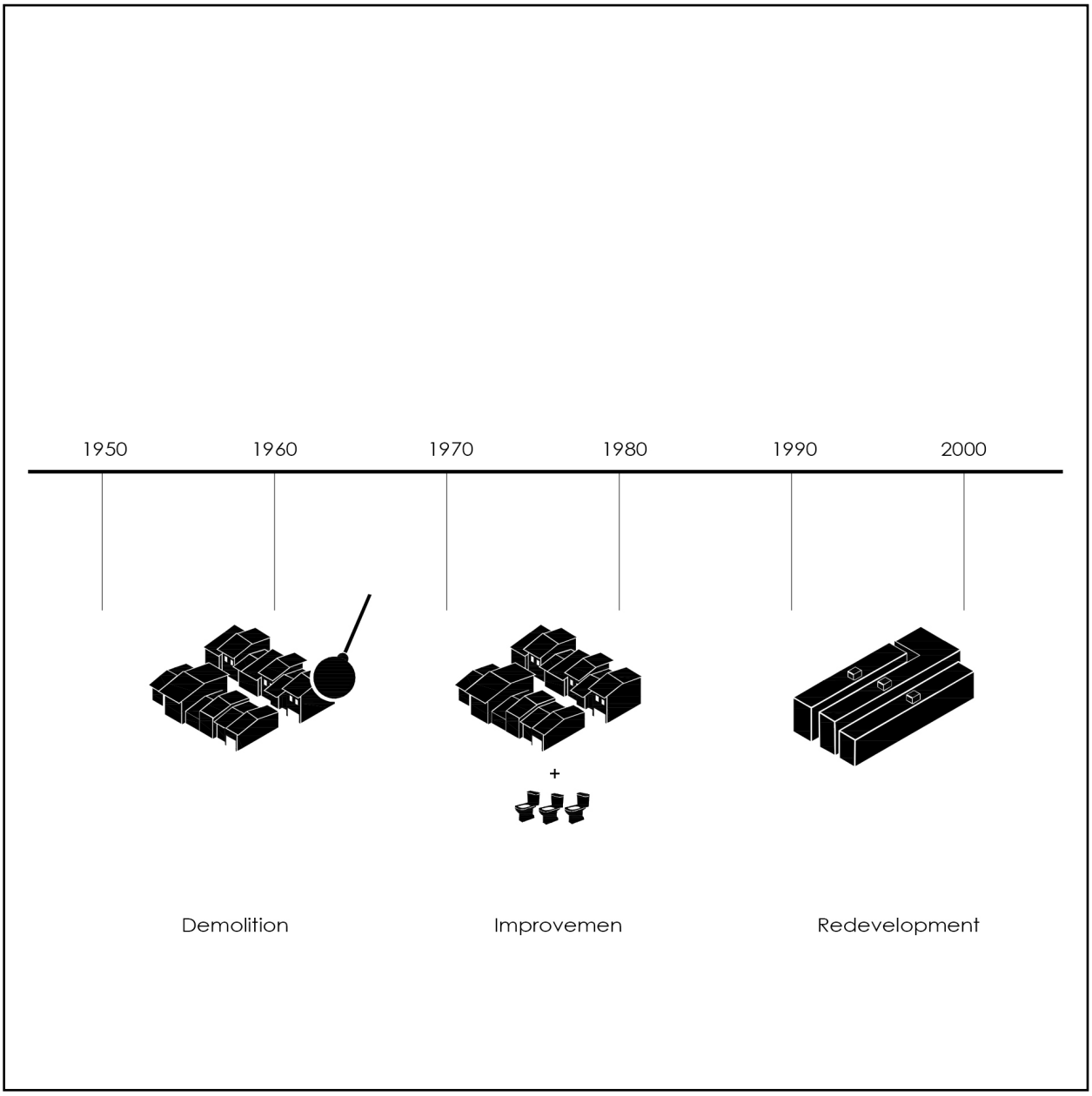








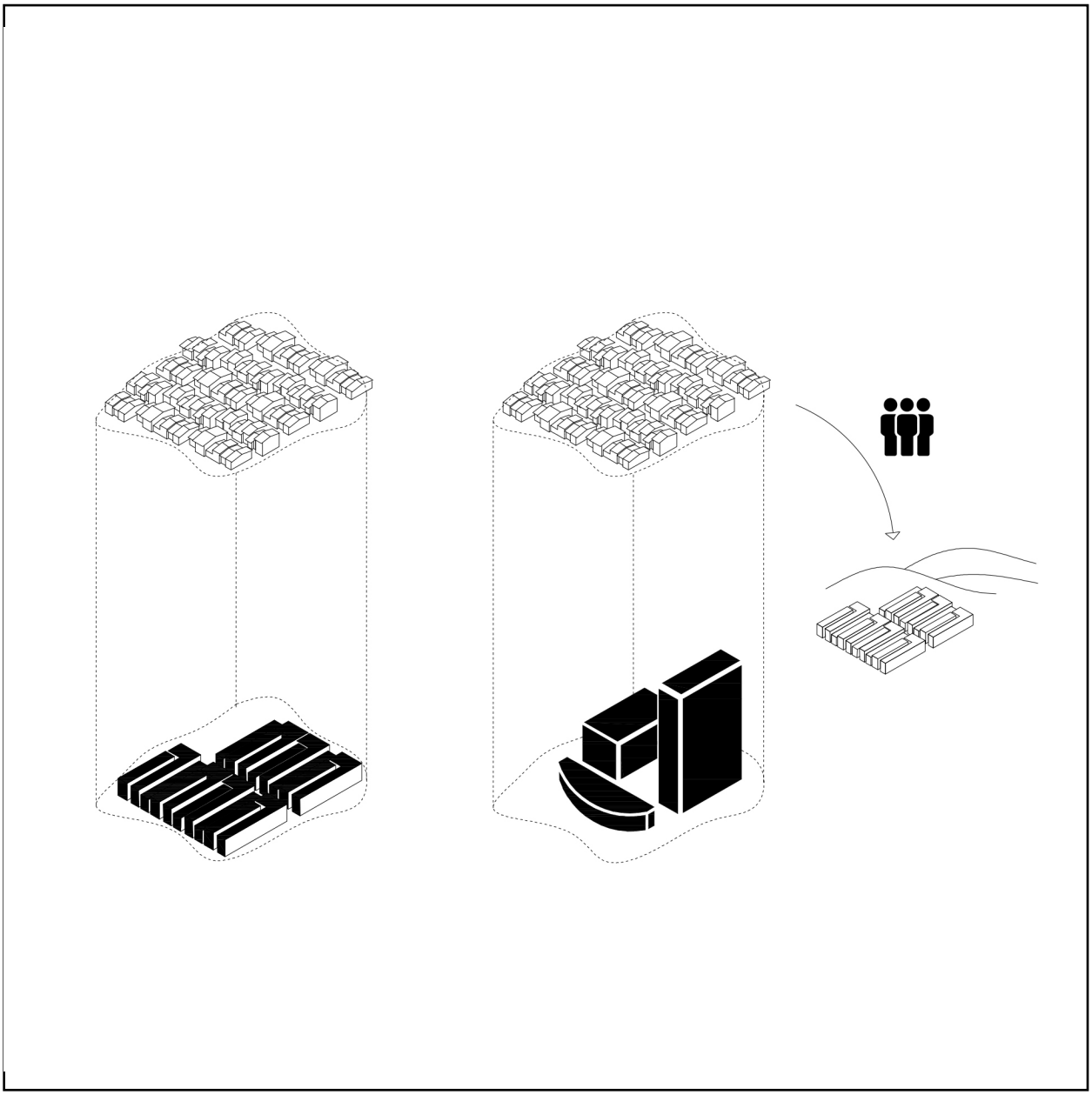
Addressing Slums in India



Slum Upgrading is defined as the provision of a clean water supply, disposal of sewage, and titling slum dwellers to the land they are occupying (Hindman et al., 2015). In the span of twenty years, national policies in India have moved from slum upgrading to ex-situ slum redevelopment, to in-situ redevelopment. In-situ redevelopment schemes, the current approach to the issue of squatter settlements, provide additional floor space index for redevelopment of slum areas. This causes vertical blocks, which frees up the land so that it can be used to make a profit for private developers. In-situ concept refers to the strategy of providing houses for people on the same land as their occupation without relocating them. Although there are many criticisms directed at these projects, like providing opportunities for corruption among developers and private sector, one of its successes is in its in-situ redevelopment, which minimizes the social cost of relocation (Hindman et al., 2015).

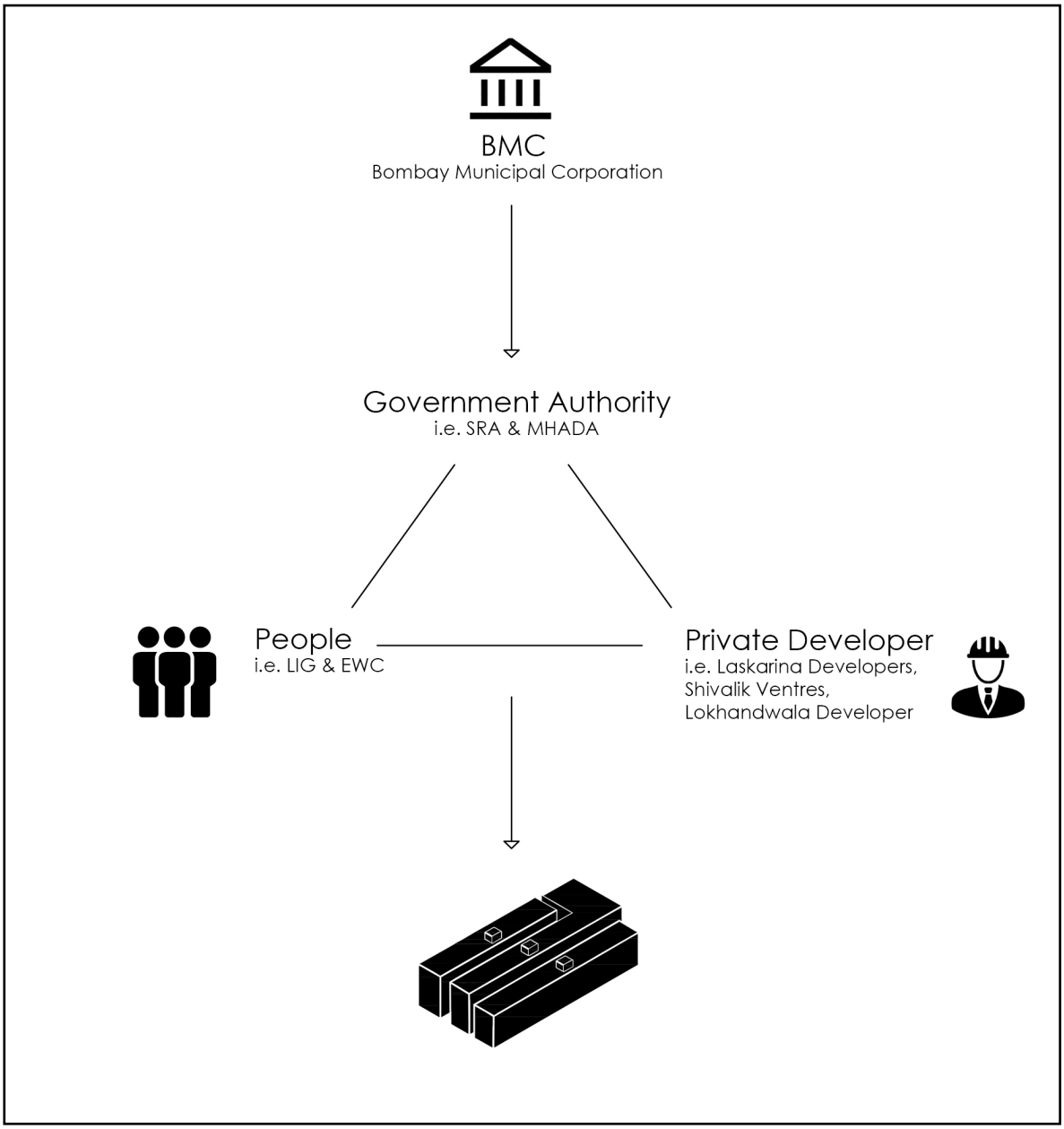
Source: • Hindman, M., Lu-Hill, O., Murphy, S., Rao, S., Shah, Y., & Zhu, Z. Addressing Slum Redevelopment Issues in India.

In-Situ Slum Redevelopment | Relocation

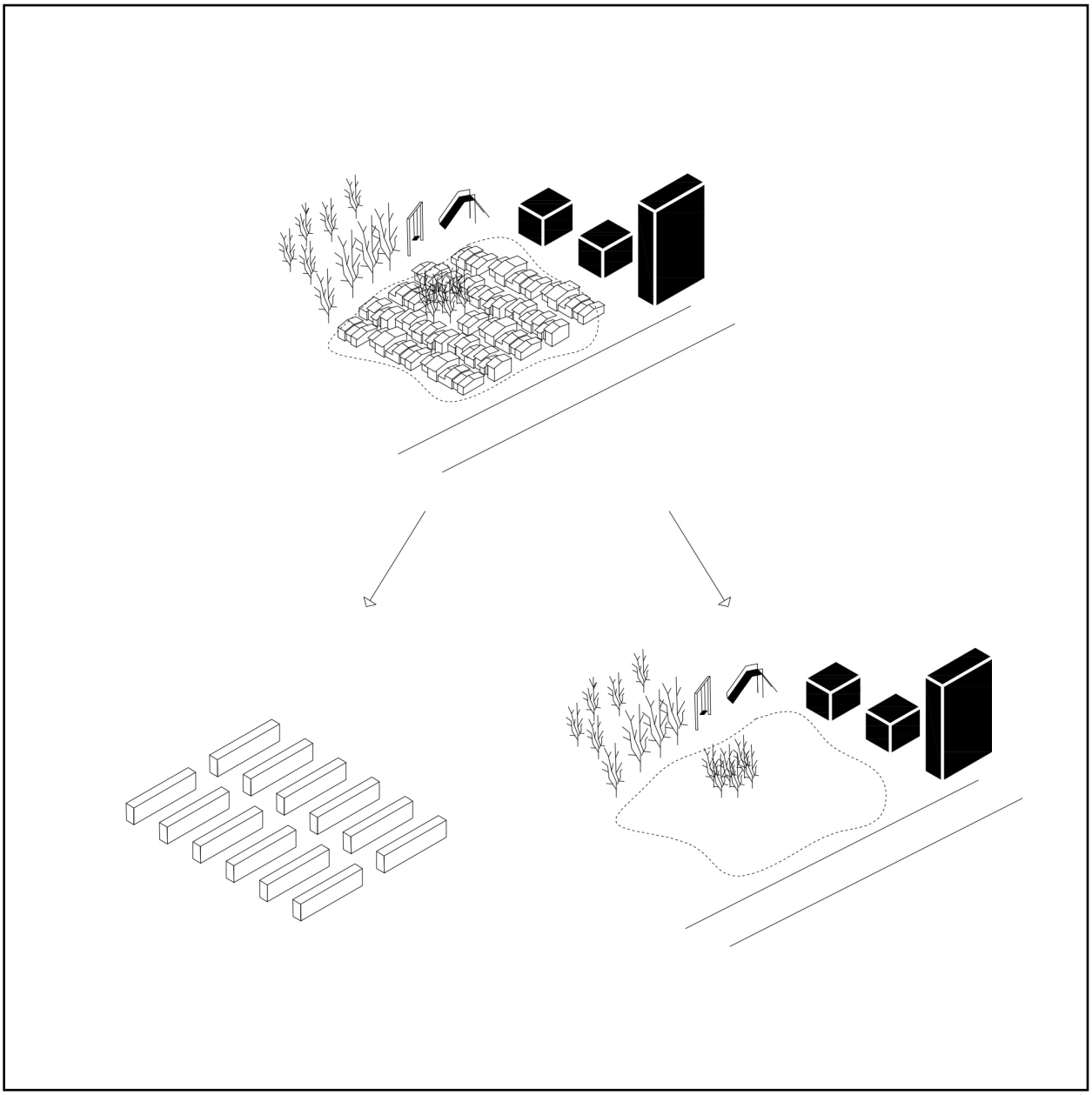


Depending on the context of slum area and its land use, redevelopment can result it in-situ or relocated housing.

SRS Political Economy

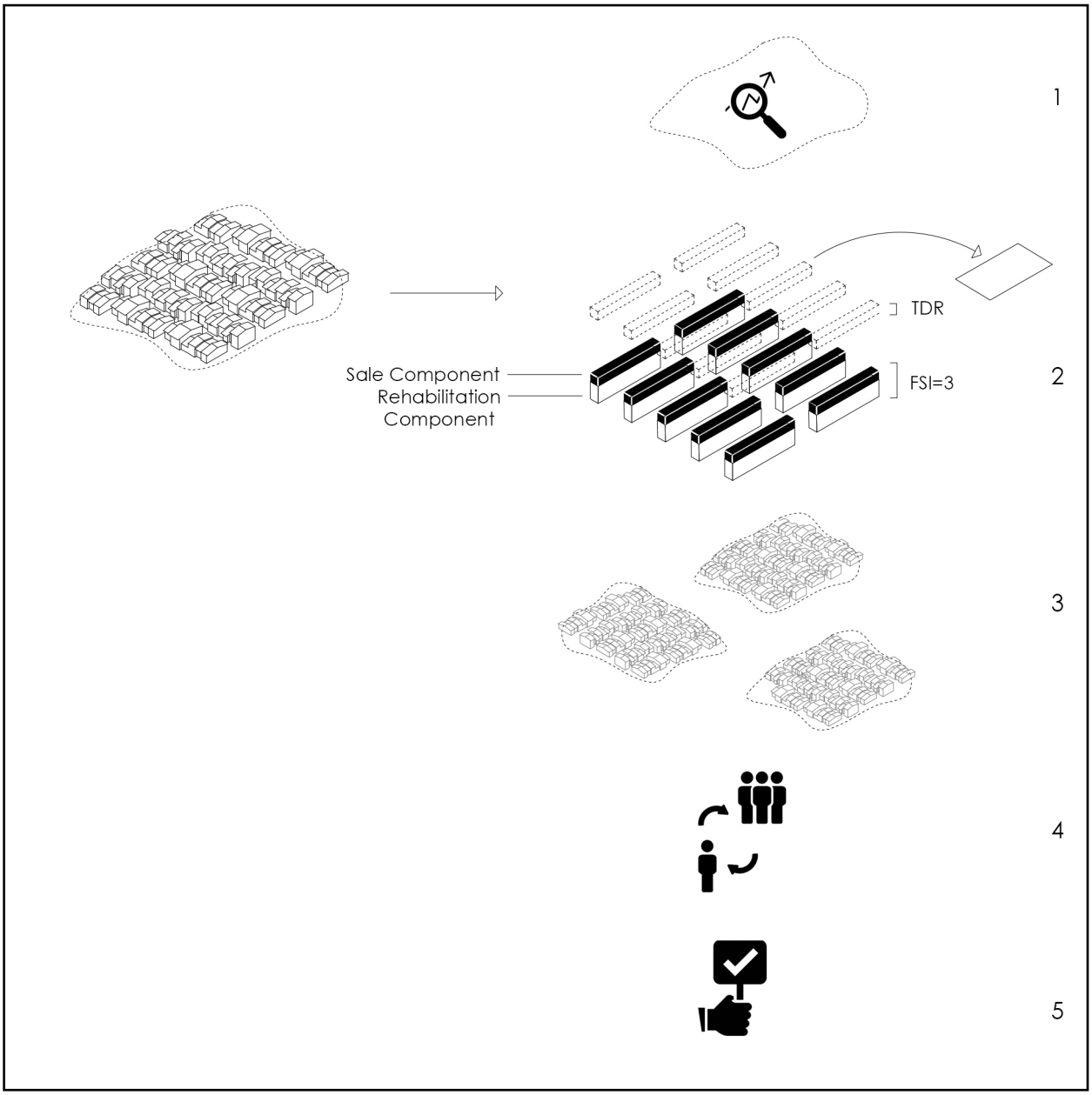


In-Situ Slum Redevelopment's Goals



In-situ slum redevelopment with private participation tries to unlock potentials of the land that is occupied by slums, providing housing for slum dwellers to make them legal urban settlements.

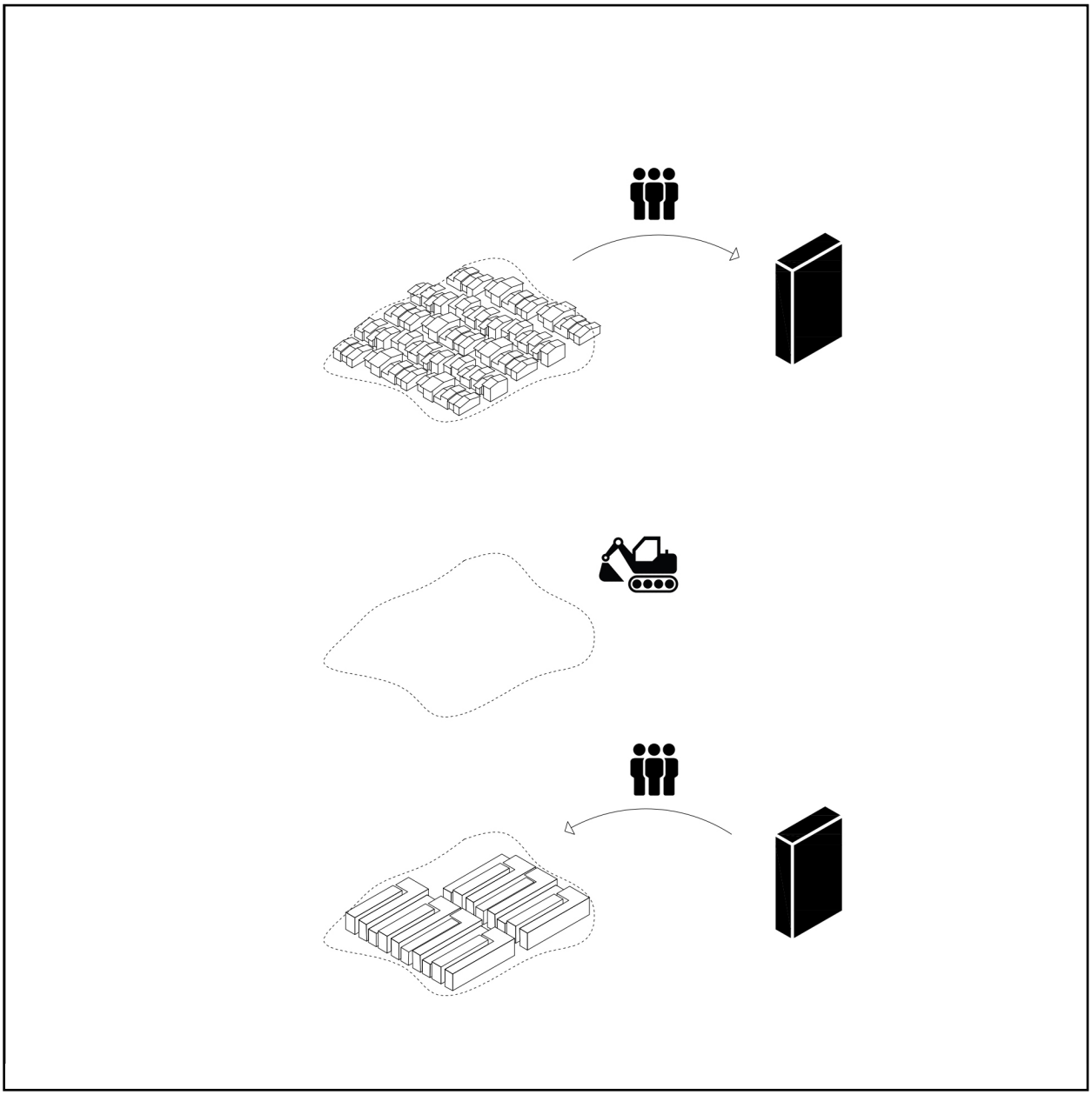
In-Situ Slum Redevelopment's Steps



1.The identified slum should be analyzed considering its location condition in order to recognize the number of slum dwellers, market potentials of the land, available FSI of the land and its applicable density.
2.Analysis shows government authorities if the land can be redeveloped by private developer or not. In order to finance project governments may use incentive FSI or TDR. Slum rehabilitation component and dree sale component are two components of slum rehabilitation projects. Sale component is available for developers in order to cross subsidize the project. If the area of slum is more than what is required for slum dwellers and free sale component, the remaining slum land should be allocated for slum dwellers of other areas and urban poor.
3."Clubbing of Slums" is a term which is used to describe identifying slums in proximity of each other to redevelop them altogether.
4.During design phase slum dwellers should be consulted through their associations.
5.A transparent bidding process is used to determine the private developer who execute the slum redevelopment project.

Source: https://pmc.gov.in/en/in-situ-slum-redevelopment-using-land-resource

In-Situ Slum Redevelopment's Steps

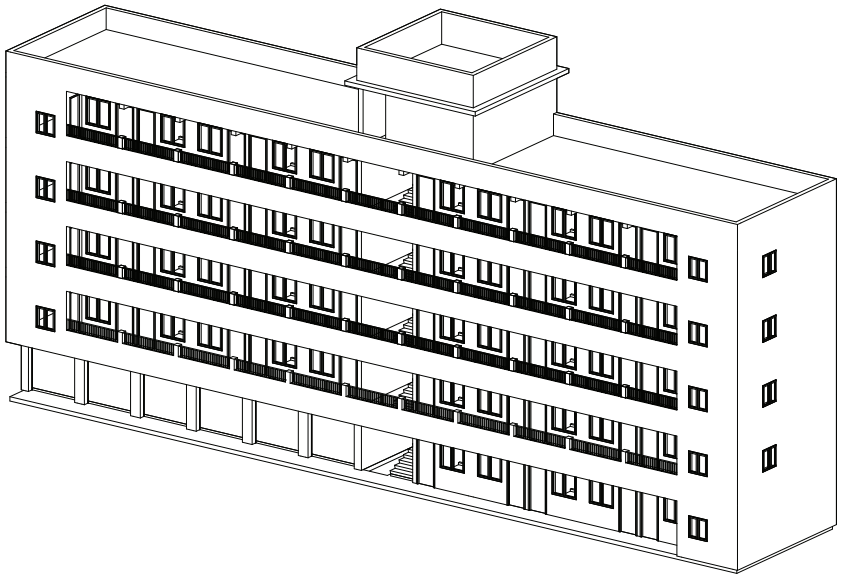


The project developers would be responsible for providing transit accommodation to the slum dwellers during the construction period.

Source: https://pmc.gov.in/en/in-situ-slum-redevelopment-using-land-resource

Problem Statement

Low-rise High Density Blocks



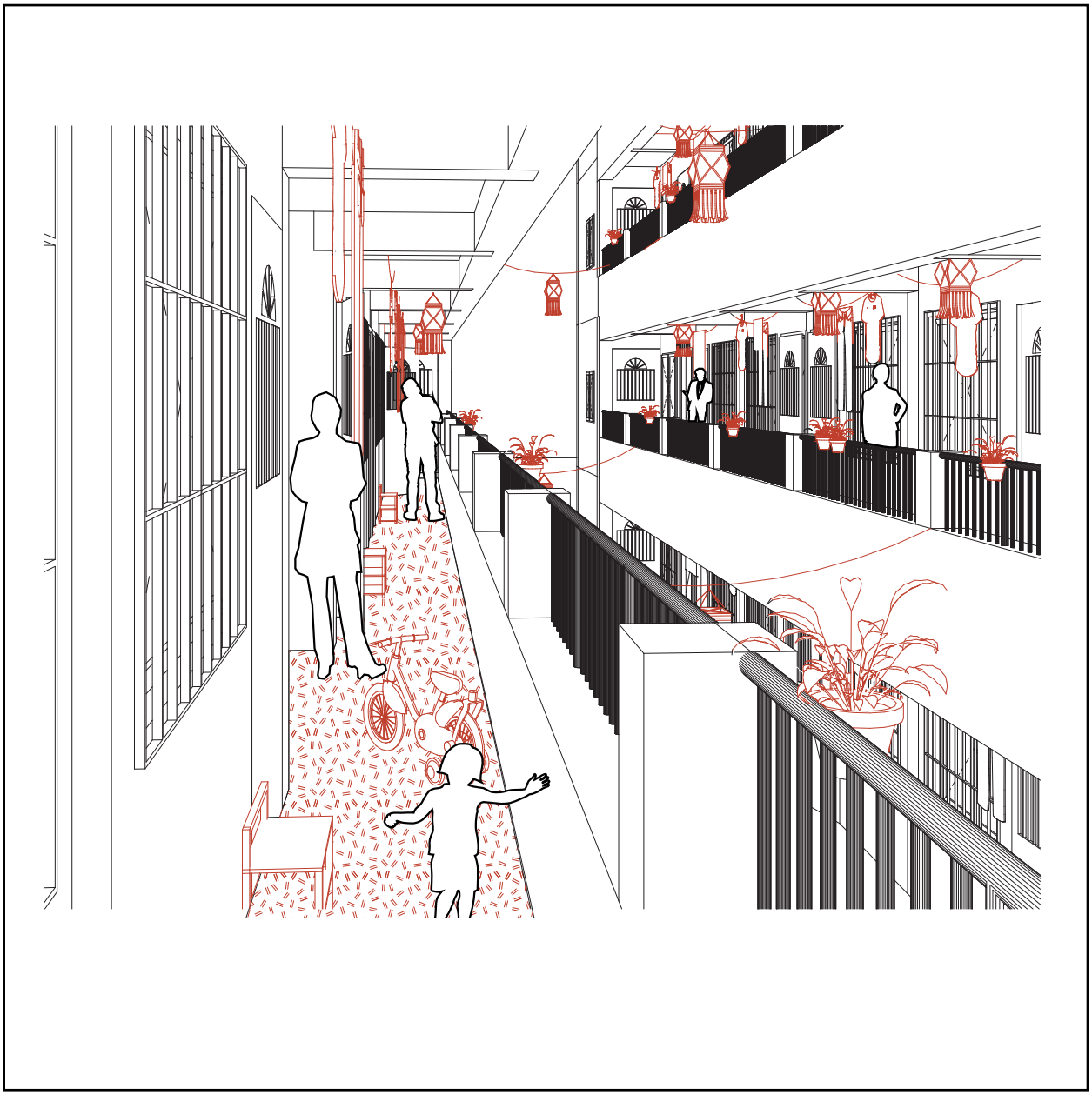
The "Low-rise high density block" is used to describe the redevelopment schemes. This is also the most common building type for local developers. Simply describing, it is the extruded form of Baithi chawls. Developers offer Baithi chawls inhabitants new apartments in exchange for getting permission to rebuild the plots. The high density of urban fabric is one of the characteristics of this building type. This building form is used for the redevelopment schemes as well as being the most common building type for local developers. Simply describing it is the extruded form of Baithi chawls. Developers offer Baithi chawls' inhabitants new apartments in exchange for getting permission to rebuild the plots. The high density of urban fabric is one of the characteristics of this building type.

The building form consists of stacked floors which are a row of dwelling units facing access corridors. There is normally a staircase in the middle of the block. The Low-rise high density block has a main façade which is the same side of thr corridors, and also the back side which always creates a narrow alley in between every two back side of the blocks.

Plinth

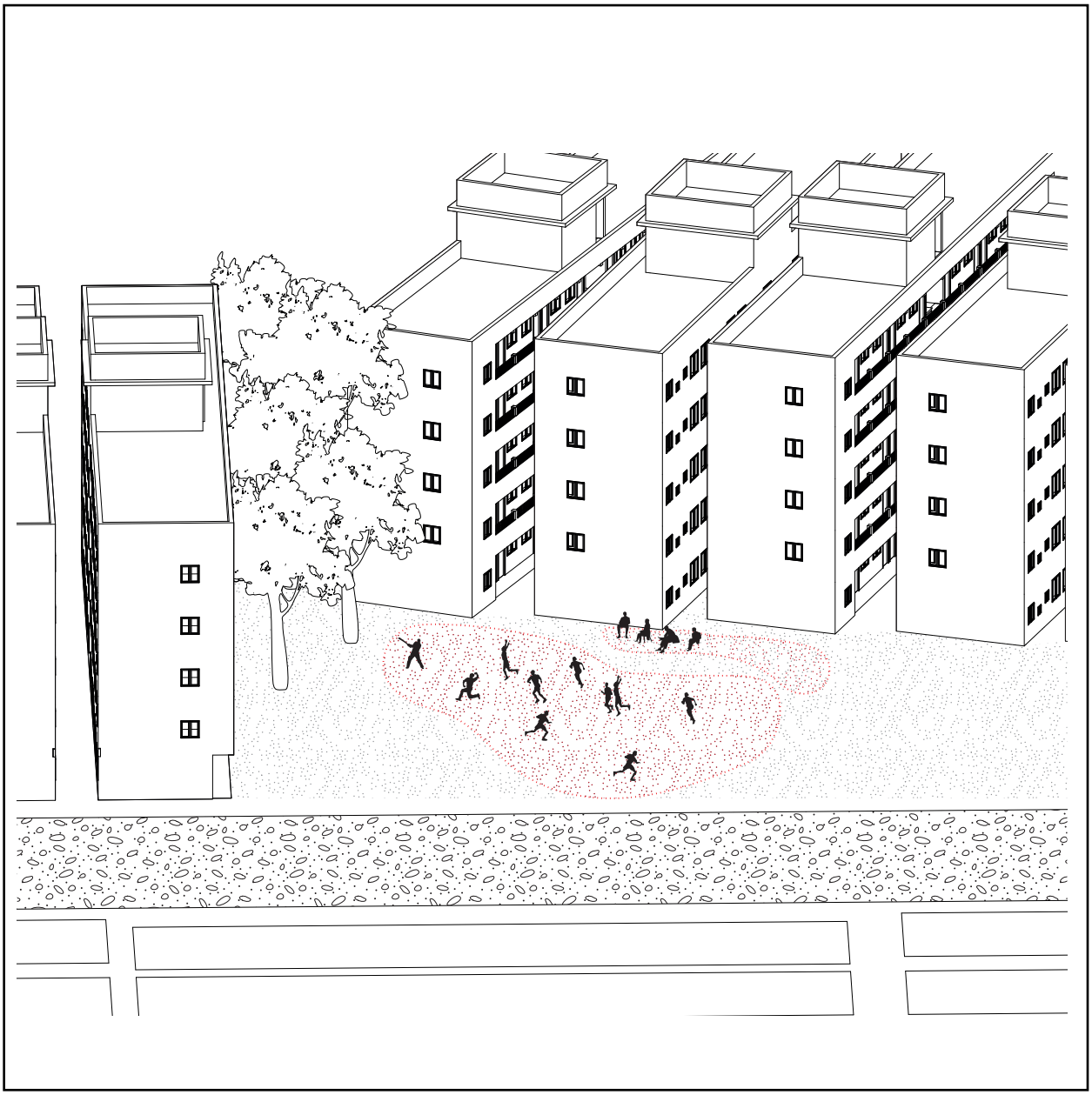
One of the qualities of the low-rise high Density blocks is its mixed use quality that is due to the commercial plinth. In almost all building blocks there are shops and workshops facing the street or the alley.

Corridor



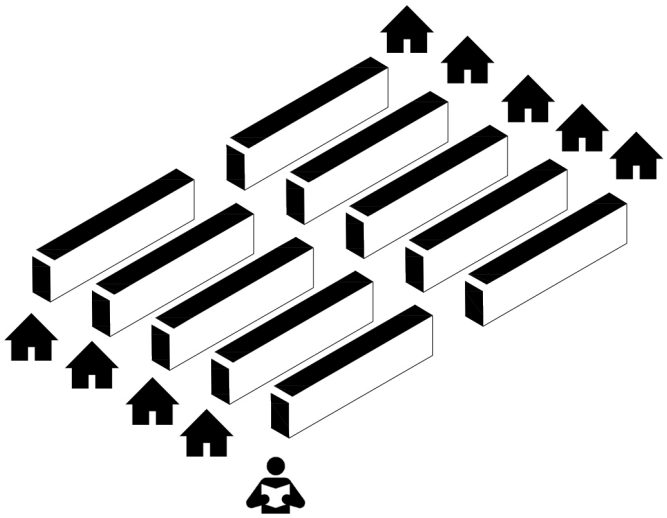
Corridors are the other quality of low rise high density blocks. The Corridors are not only the access corridors, but are the extension of the housing units. The place that is sometimes encroached by dwellers at the end of the corridors, and also used for hanging the clothes or socializing with the neighbors in the shade.

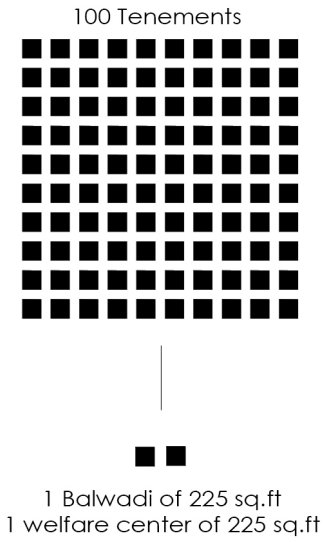
Random Open Space



One missing quality of the low-rise high density blocks is the quality of open space. The is no allocated open space due to lack of urban planning. This is also related to the intention of maximizing the profit for private developers which is an inevitable result of privatization of the process of affordable housing in Mumbai, India.
In the area of study which will be introduced in the following pages the open space is limited to in between space of the building forms which are some random open spaces.

Lack of Public Amenities

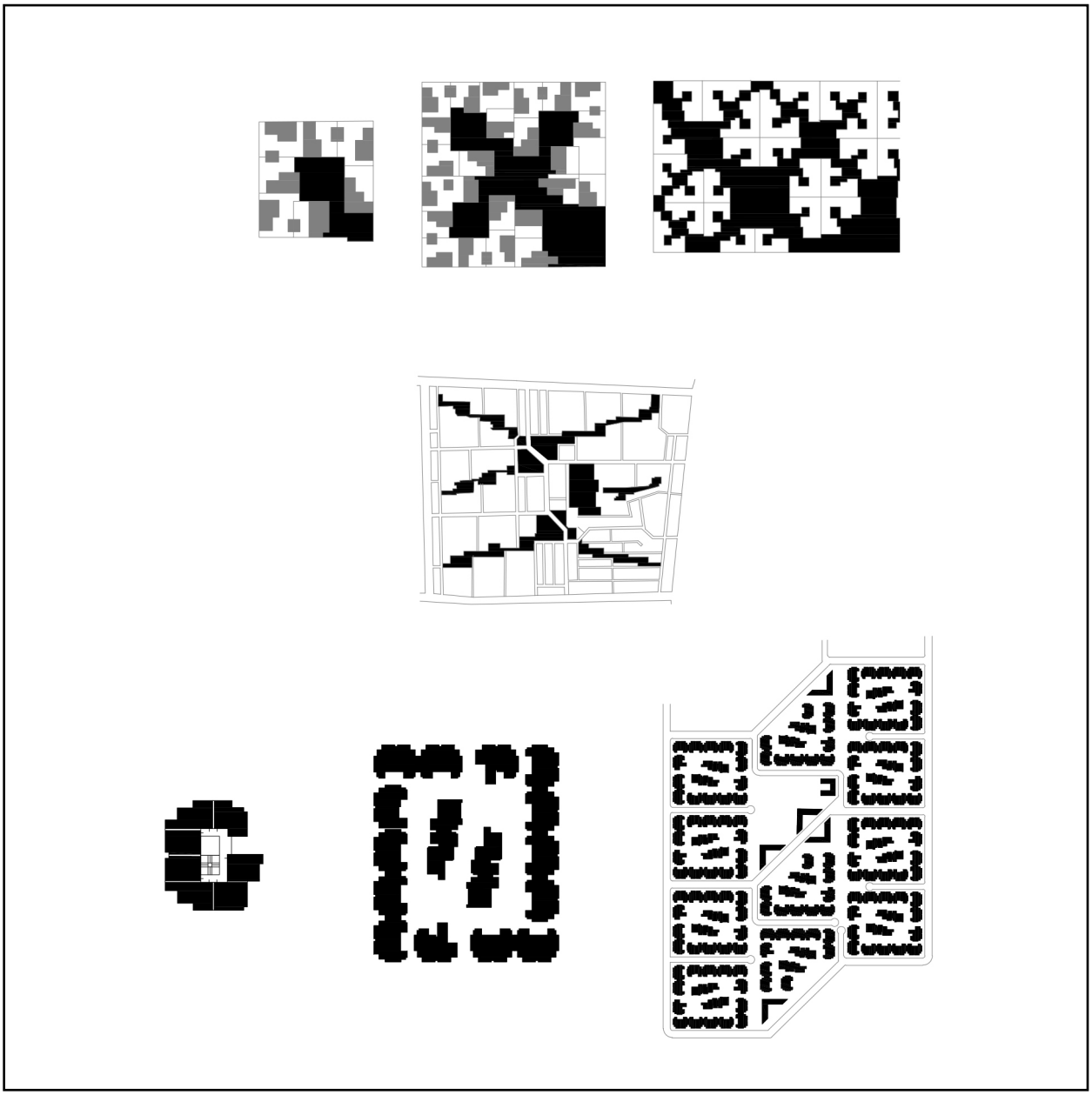




In redevelopment schemes the quality of social space is not taken into account, along with public amenities, which are usually not provided. During the site survey, it was recognized that apart from shops on the plinths of some of the blocks, there was no other space allocated specifically as public amenities. Schools situated in buildings that are initially built for the open market by developers with the same type of vertical block as in-situ redevelopment blocks, are evidences of this lack of public amenities.. Additionally, the only public amenity that SRS regulations ask from developers is the little amount of one Balwadi and one welfare center of standard size of 225 sq.ft (about 20 sq.m) for every 100 tenements.

Source: Slum Rehabilitation authority. Retrieved from https://www.slideshare.net/harshjain123/slum-rehabilitation-authority

Clustering and Hierarchy of Open Space



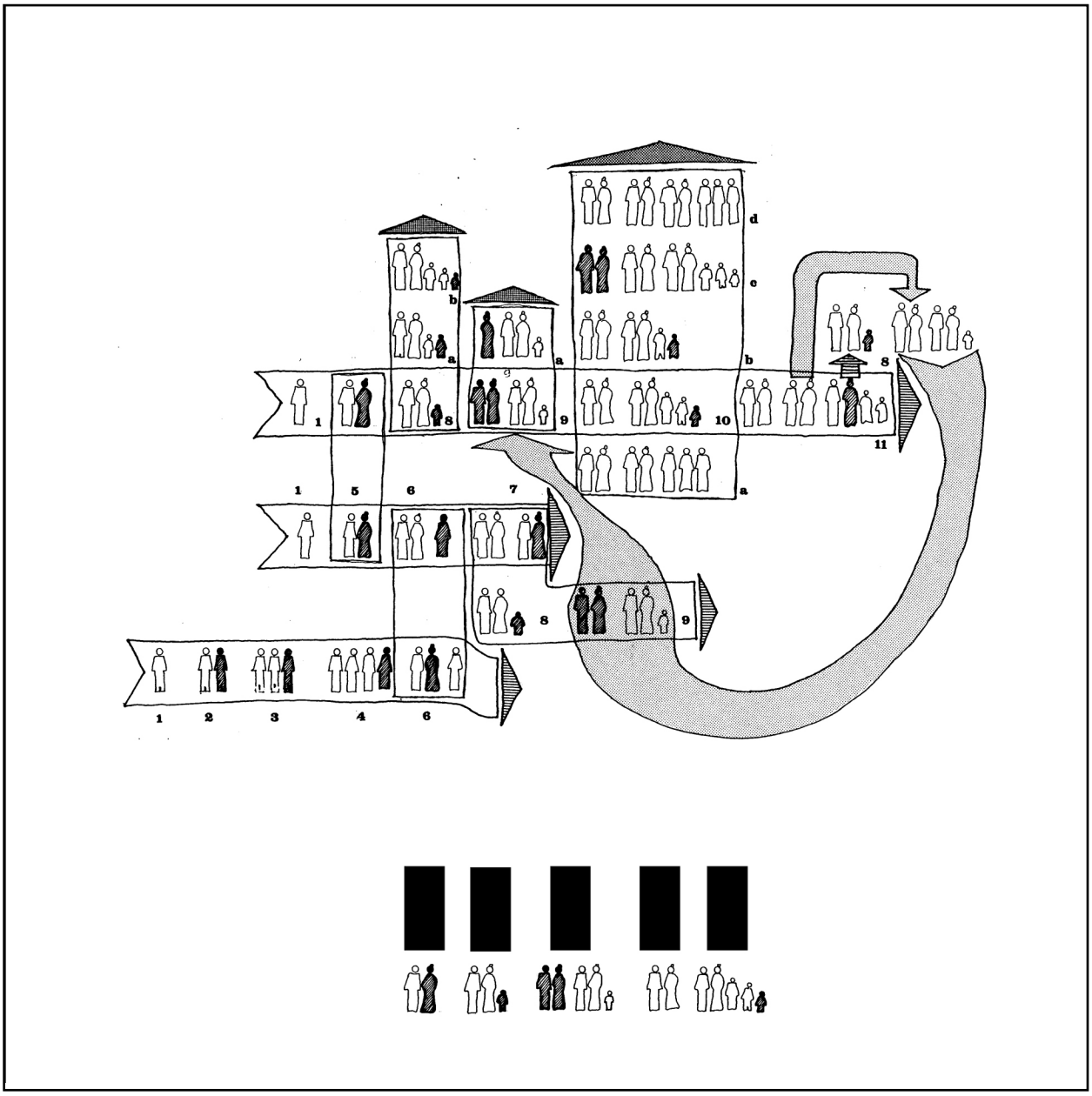
The illustrated Projects are from above:

1. Belapur Housing by Charles Correa- Navi Mumbai, India
2. Aranya Community Housing by Balkrishna Doshi– Indore, India
3. Sangharsh Nagar Housing by P.K Das-Mumbai, India

Hierarchy of open space is a tool for clustering of above-mentioned projects. In Sangarsh Nagar Housing for example, apart from collective space of corridors and staircase in each housing block combination of some of these blocks has created Pada or cluster. Every three clusters have created a car free Wadi or sector. The sectors surrounds Maidan or the large open space.

Source: Varma, R. (2015). Sangharsh Nagar Mumbai, DASH, 12/13, 270-279.

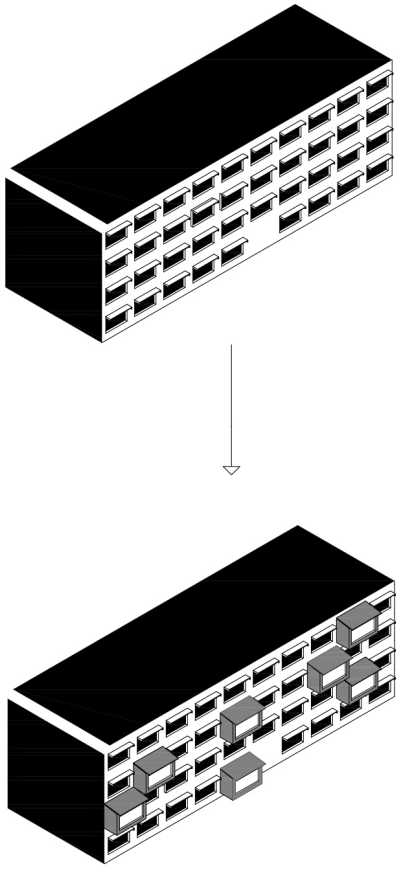
Ignoring Dynamic Nature of Life



The scheme ignores the dynamic nature of slums, which respond to the changing character of informal settlements. While dwelling units in slums can grow and change in order to make space for other functions, to adapt to the family growth, and to rent out the added space, this incremental growth is hardly possible at in-situ redevelopment schemes. By minimizing the size of the units to lower the construction costs, the result is repetition of units of minimum size of 1 BHK. This approach does not address the varying needs of different families, nor does it allow appropriating the size of the units.

Source: Family Structure by Shubhankar Sanyal
Sanyal, S. (1983). Toward a design methodology: a case of chawls in Bombay (Doctoral dissertation, Massachusetts Institute of Technology).

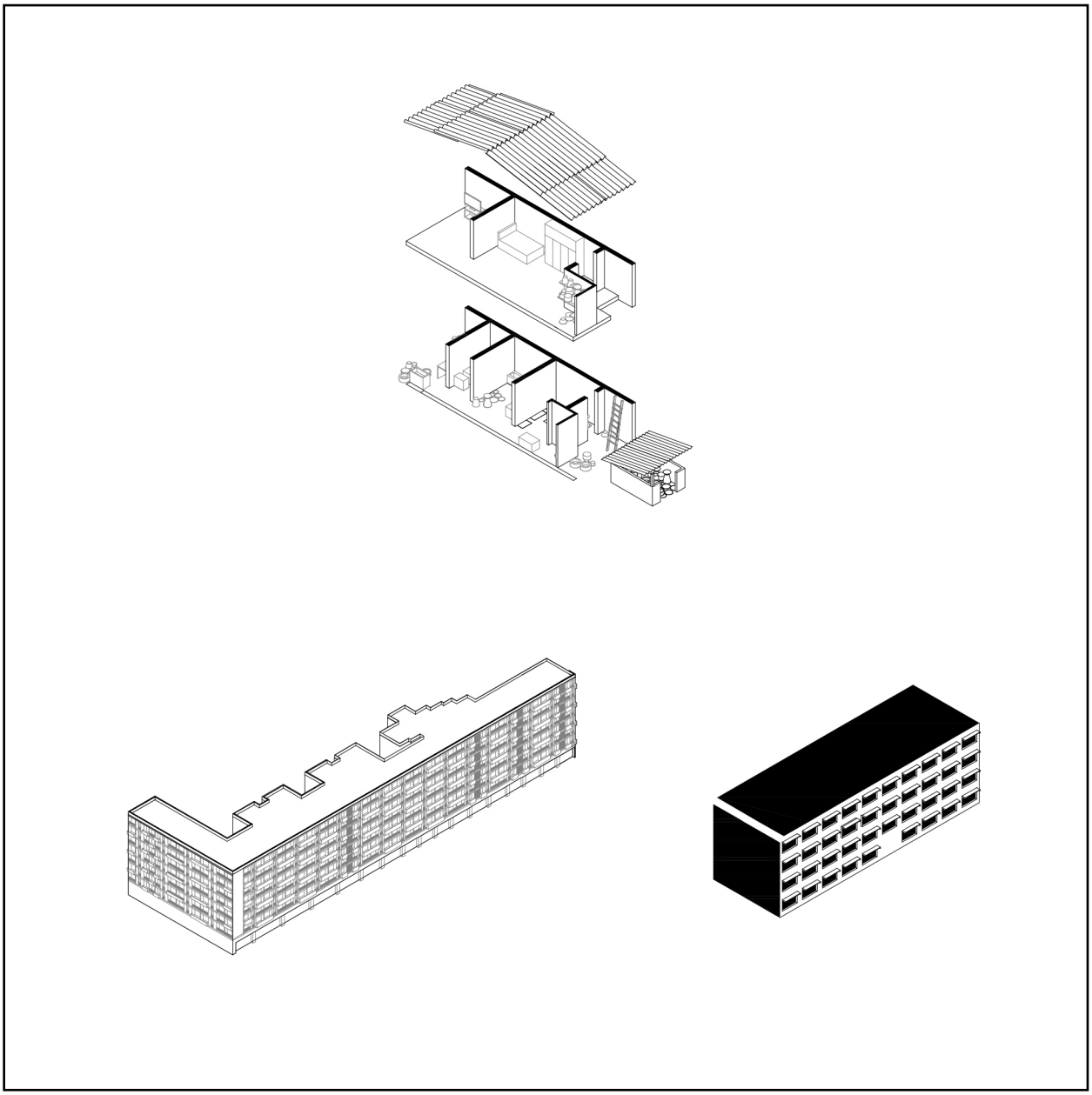
Encroachment in BDD Chawls of Mumbai



The encroachment from living space toward outside is inevitable while the living space is too small for the inhabitants. This is also due to the dynamic nature of life which changes the condition of living space and demands more space.
The metal boxes that are attached to BDD chawls in Mumbai, shows that ignoring the dynamic nature of growth in family units is not the best solution while people encroach the space anyhow in the time of the scarcity of living space.

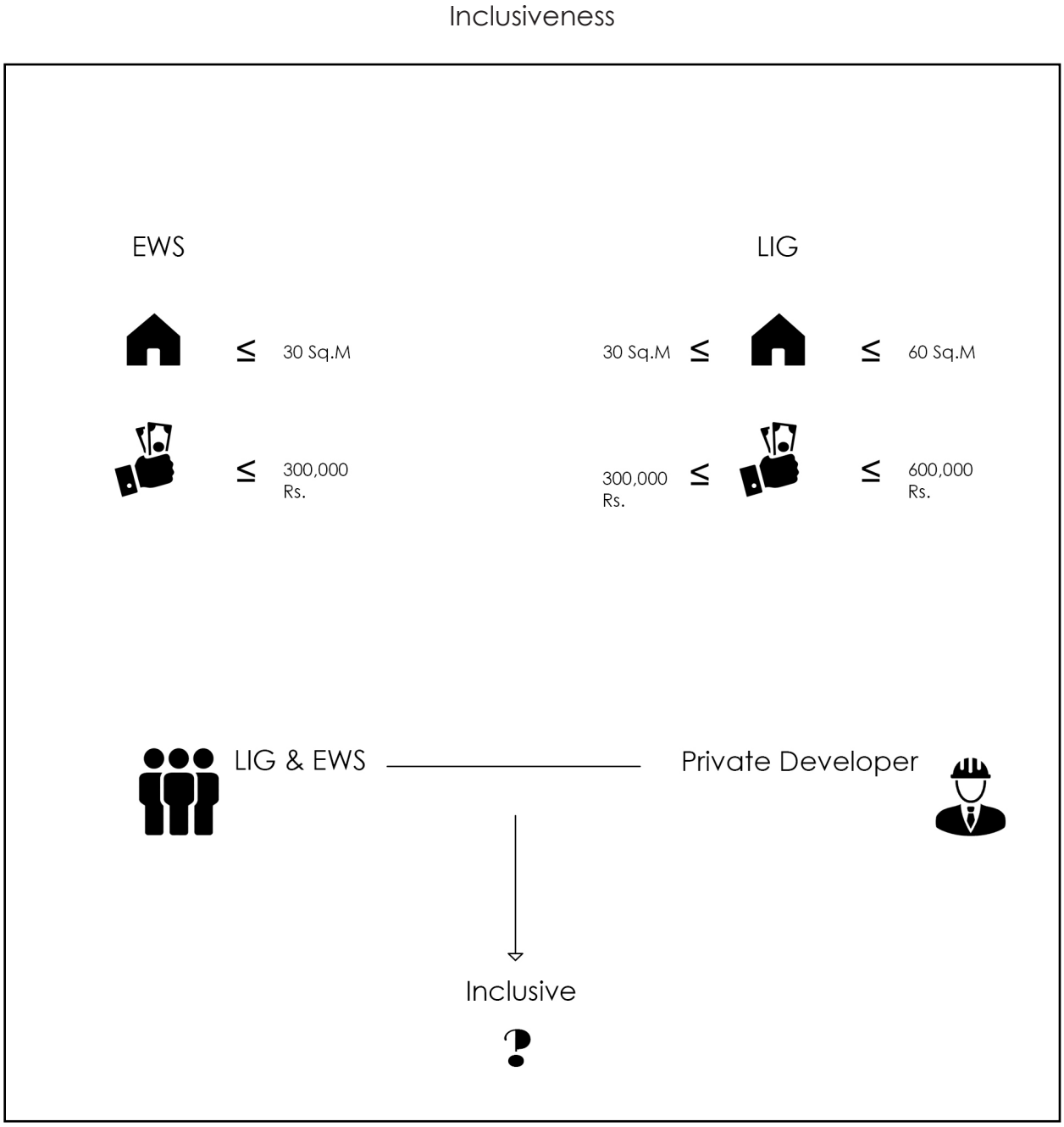
Source: Photo by Roza Derakhshan Alavijeh

Is Living Space Intertwined with Working Space ?



new schemes do not allocate much space for working. Slum settlements are normally intertwined with small businesses, so working and living is frequently integrated. These small business spaces serve the neighborhood, as places for its inhabitants to earn money from their own businesses. In addition, in elevated apartment blocks where businesses may lose connection with the ground level, it becomes difficult to run small businesses in upper levels.

Source: https://pmc.gov.in/en/in-situ-slum-redevelopment-using-land-resource

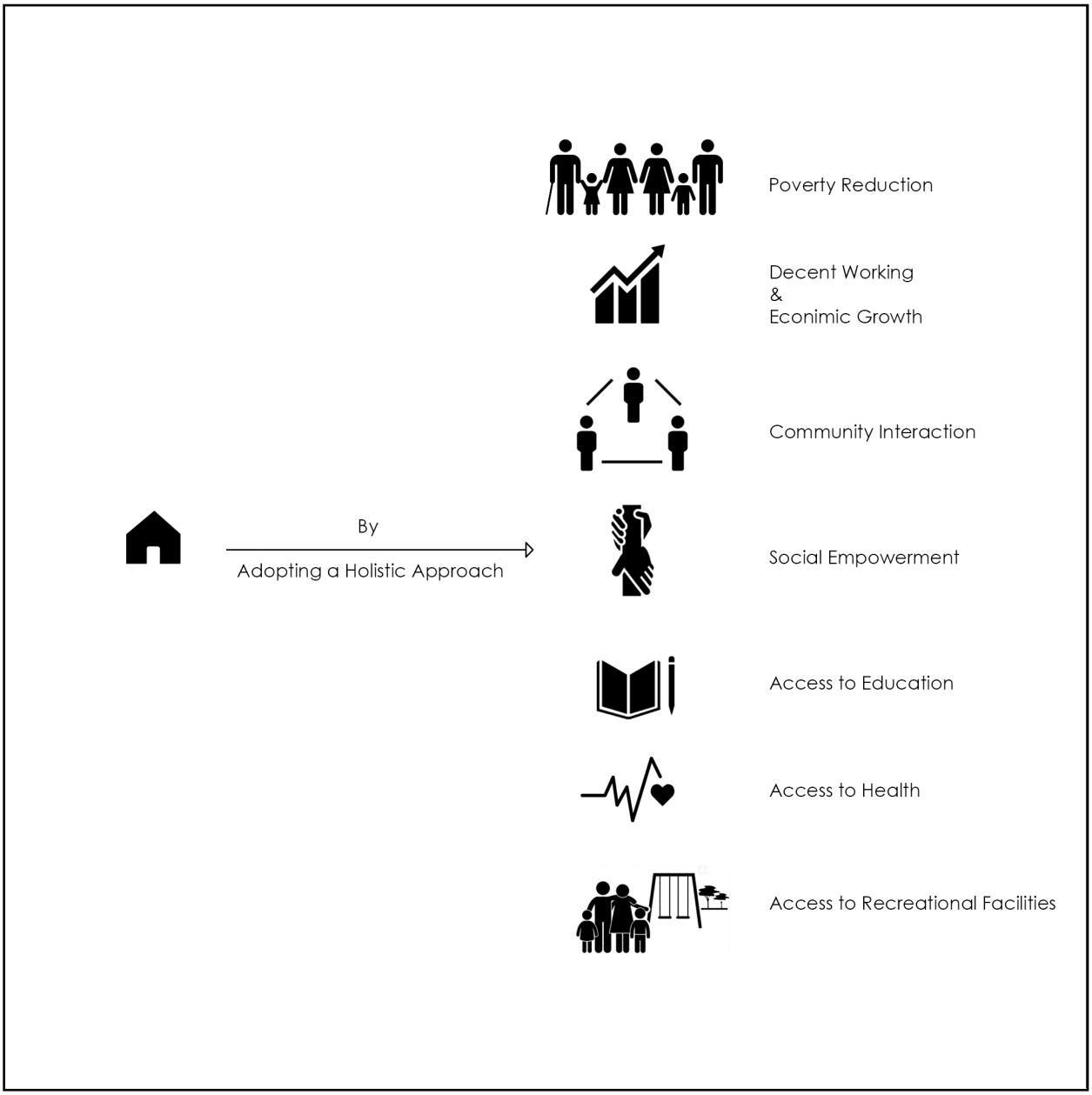


According to van Gameren and Varma (2015) the shift in India from socialist economy to capitalist economy of today has changed the housing condition enormously. While the government is not the client of affordable housing, private sector is also uninterested in issues if equality and social inclusiveness.

The Pradhan Mantri Awas Yojana (2015) aims to provide housing to all by 2022. According to this mission an affordable housing project shall have a minimum of 35% of the houses for EWS category. EWS has an annual income of up to Rs. 300,000 and a dwelling with a carpet area of up to 30 square meter, while LIG is defined as having an anual income between R6.300,000 up to Rs. 600,000 and a dwelling unit of up to 60 square meters Jain, 2016).

Sources: VanGameren, D. Varma, R. (2015). Sangharsh Nagar Mumbai, DASH, 12/13, 4-19.
Jain, A.K. (2016). Housing for All. Shelter. Volume 17, No 1. 2-8

Inclusive Housing

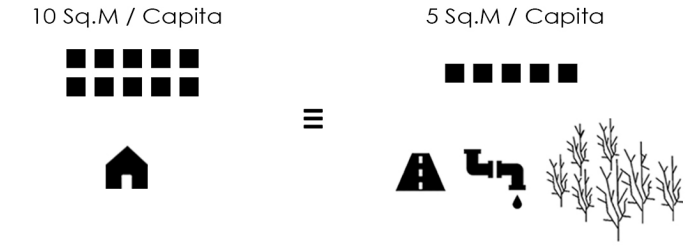


According to Jain (2016) housing for the poor must provide with them empowerment support which has many facets like socio-cultural, environmental, and financial dimensions. Housing for the poor requires a holistic approach which make housing as a tool for poverty reduction, social empowerment, community interaction, and access to health, educational and recreational facilities.

A housing cluster is not only defining a minimum house (30 sq.m minimum dwelling unit or 10 sq.m per capita). It should also provide a minimum space of 5 sq. m per capita each for greens/open space/play area, social infrastructure and transport and utilities.
Housing is closely interlinked with local community, health, livelihood, natural resources, climate and culture.

Source: Jain, A.K. (2016). Housing for All. Shelter. Volume 17, No 1. 2-8

Is Living Space Intertwined with Working Space ?



Greens, Open space, Play area, Infrastructure, Transport

Mixed Income Development

A housing cluster is not only defining a minimum house (30 sq.m minimum dwelling unit or 10 sq.m per capita). It should also provide a minimum space of 5 sq. m per capita each for greens/open space/play area, social infrastructure and transport and utilities.

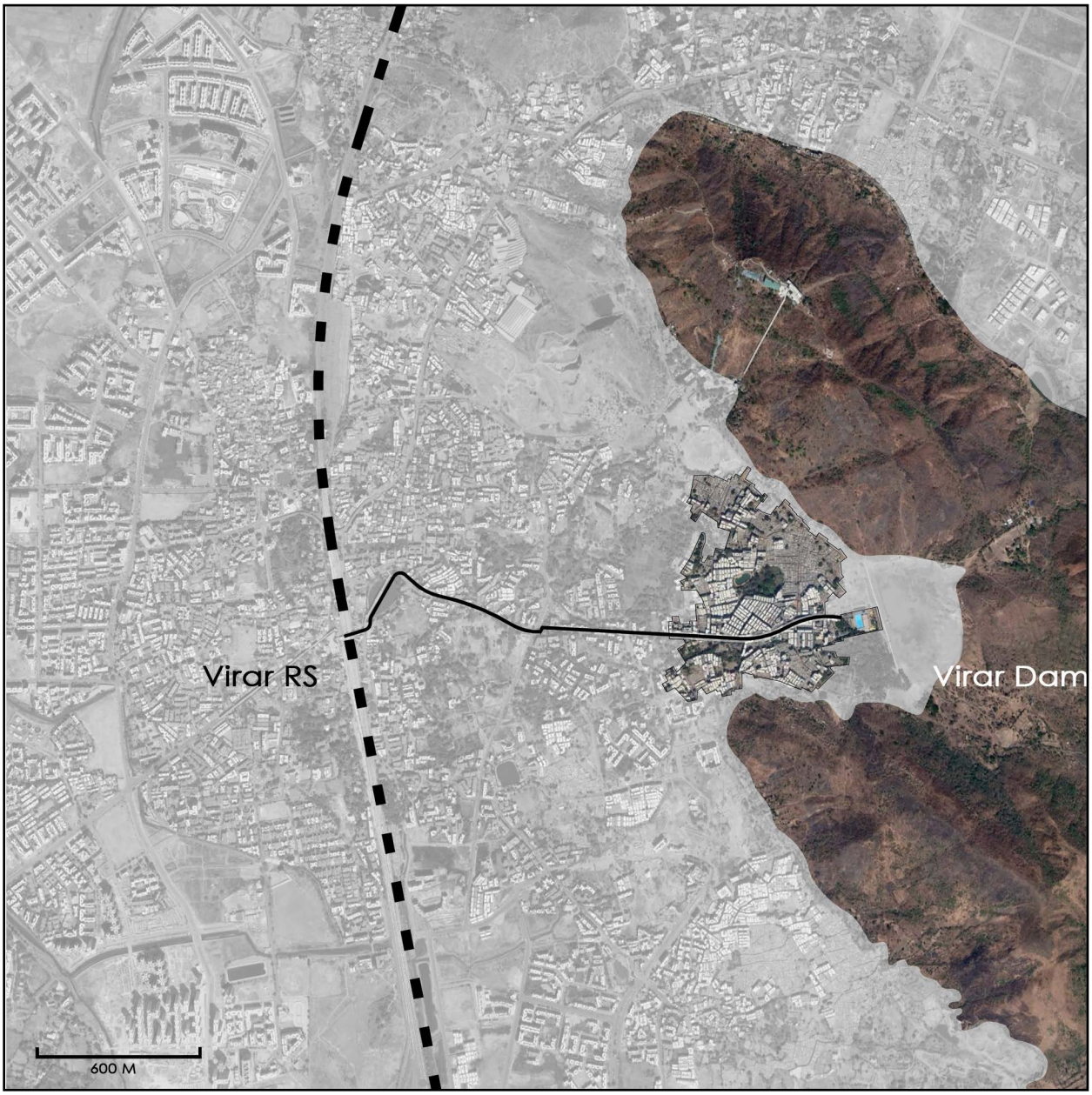
Housing is closely interlinked with local community, health, livelihood, natural resources, climate and culture.

To promote mixed income development, all types of dwelling units should be accommodated. It helps to development for heterogeneous group of people. Including commercial activities also retain the vitality of the areas.

Source:
Jain, A.K. (2016). Housing for All. Shelter. Volume 17, No 1. 2-8
Sanyal, S. (1983). Toward a design methodology: a case of chawls in Bombay (Doctoral dissertation, Massachusetts Institute of Technology).

Location

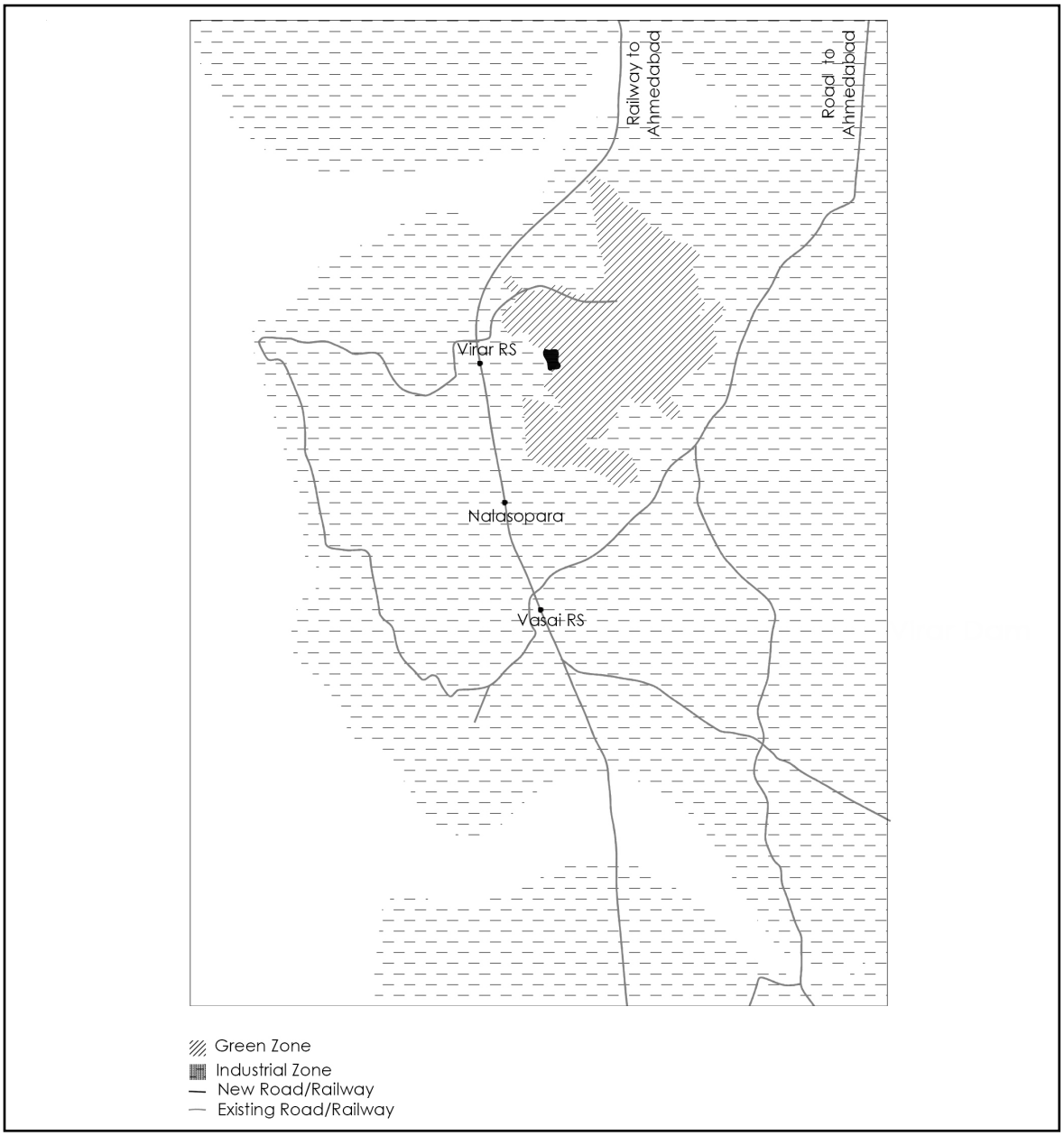
Virar Dam



Virar Dam is located on the east side of railway track. It is about 2 kilometers far from Virar railway station. Virar Dam is surrounded on the east by Forest Zone as it is determined in the Land Use Plan of MMR.

Source: www.maps.google.com

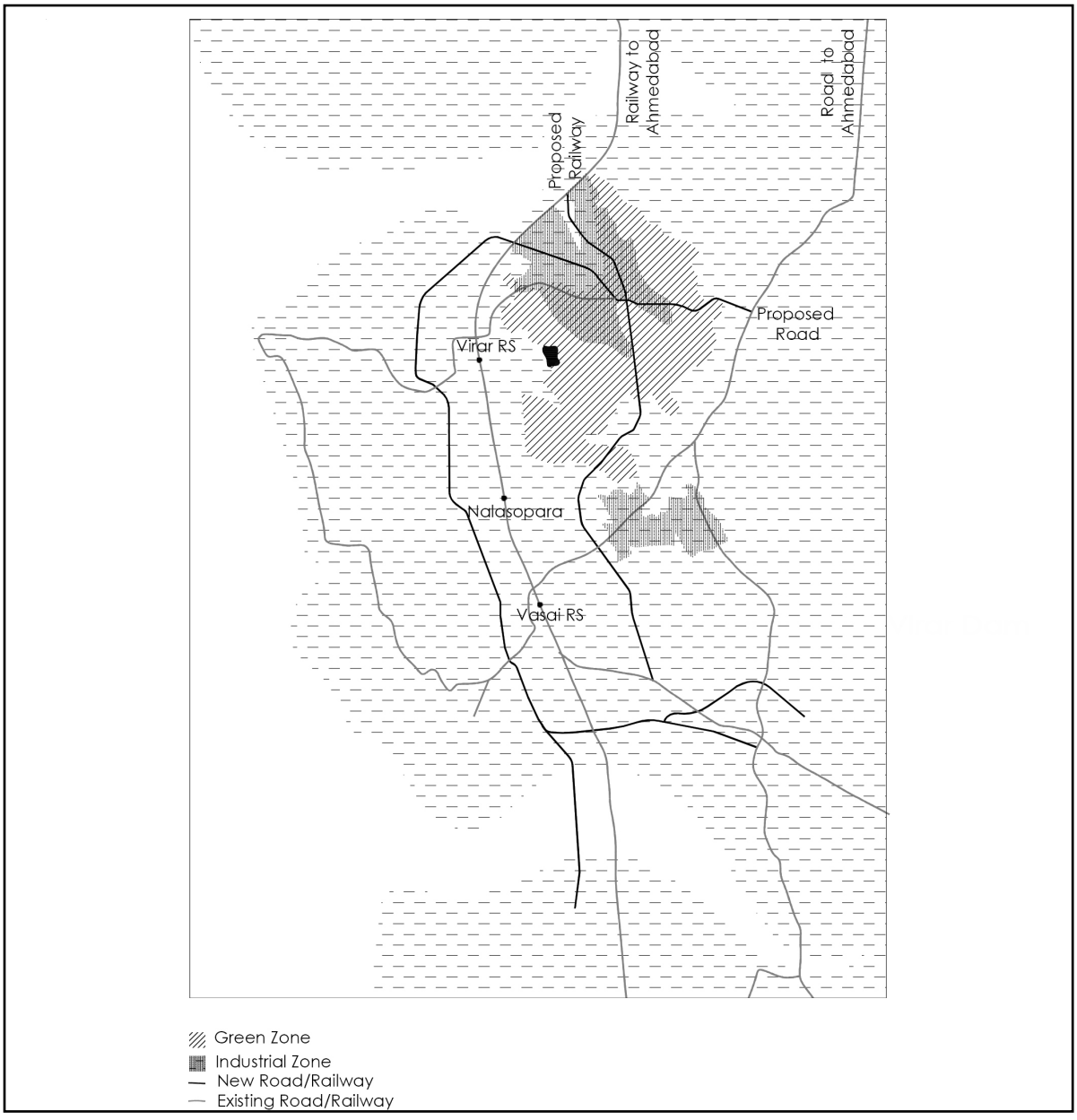
Existing Land Use Plan for MMR-2016



Virar Dam area is between railway track on the west and a road on the east side of the forest that leading toward Ahmedabad in north.

Source: Mumbai Metropolitan Region Development Authority Regional Map. Retrieved from https://mmrda.maharashtra.gov.in/regional-plan

Proposed Land Use Plan for MMR-2036



Virar Dam area by 2016 will be located between two new arterial infrastructures which are a new railway track and a new road, making new industrial zones well connected to existing network.

Source: Mumbai Metropolitan Region Development Authority Regional Map. Retrieved from https://mmrda.maharashtra.gov.in/regional-plan

Virar Dam Area's Social Spine

2

The main road in the area functions as an urban spine that brings different facilities together and facilitates socializing.
1. The Bus stop functions not only as a transportation hub but also as a social hub.
2. The Cricket Field

Source: Photo of Bus Stop by Roza Derakhshan Alavijeh. Photo of Cricket Field by Liza De Jong.

Virar Dam Area's Social Spine

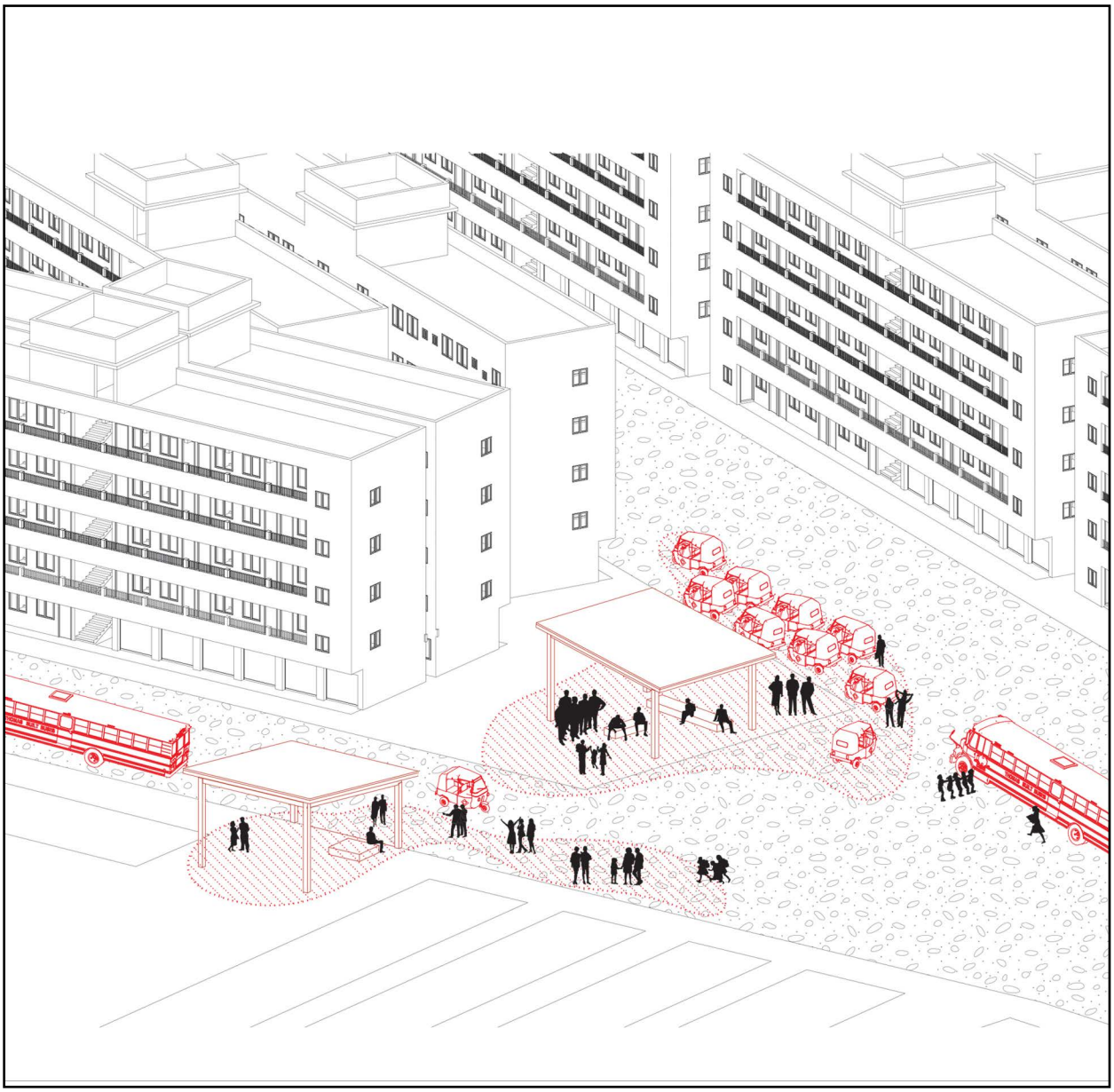
3

4

The main road in the area functions as an urban spine that brings different facilities together and facilitates socializing.
3. The School
4. The Residential Blocks with corridors overlooking the street and commercial plinth.

Source: Photos by Roza Derakhshan Alavijeh.

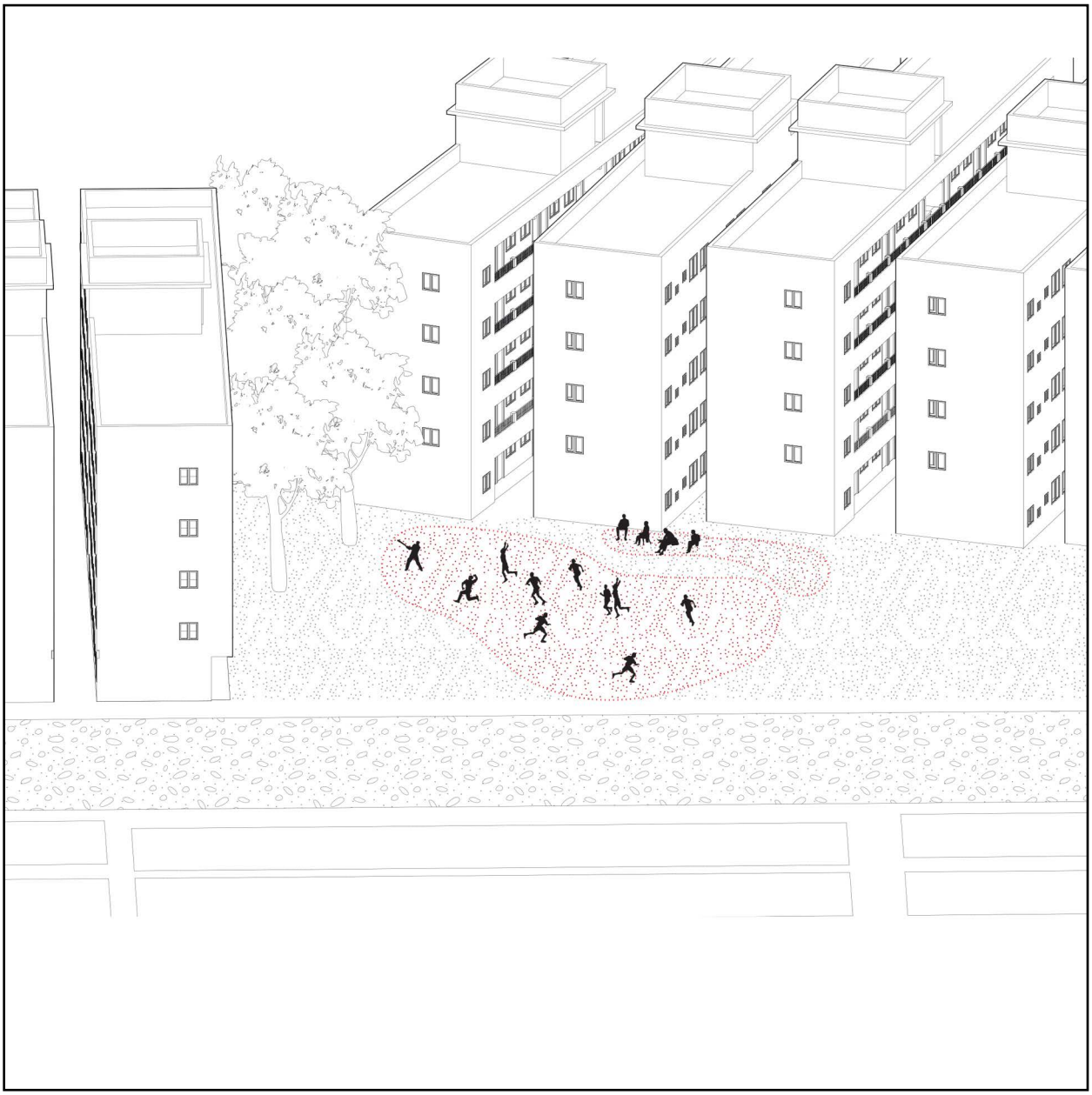
Virar Dam Area's Social Spine



The place that connects the neighborhood to the rest of the area. Women are chatting and kids are playing while waiting for the schoolbus to pick up their kids. Auto rickshaws drivers are waiting for their next costumer.

Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Virar Dam Area's Social Spine



Left over spaces are used to play an informal form of cricket; Galli cricket. Spectators gather around the game to watch and chat.

Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Virar Dam Area's Social Spine

5

6

The main road in the area functions as an urban spine that brings different facilities together and facilitates socializing.
5. Front Alleies are socializing spaces for neighbours.
6. The Intersection of two of the streets has shaped a gathering corner that become crowded in the evening.

Source: Photos by Roza Derakhshan Alavijeh.

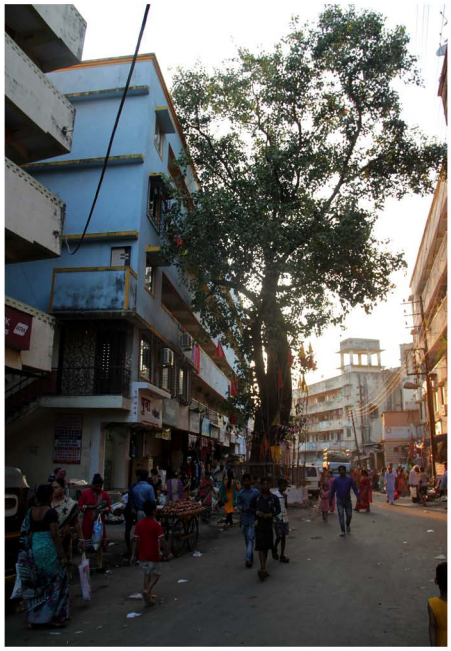
Virar Dam Area's Social Spine

The front alleys are a gathering place for all the people from the adjacent buildings. This is where everybody crosses when arriving home; where people stop for a moment to chat.

Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Virar Dam Area's Social Spine

7

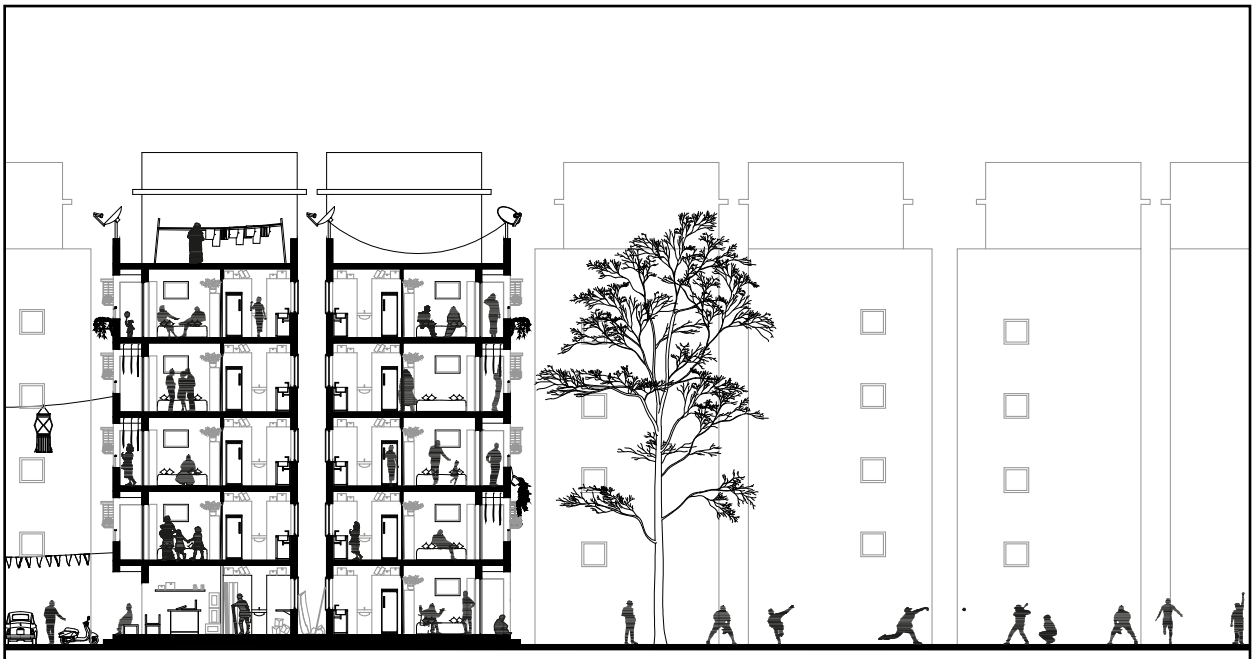


8

The main road in the area functions as an urban spine that brings different facilities together and facilitates socializing.
7. There is an alley on the area of baithi chawls and slums that is commercial on both side.
8. In the middle of the street there is an old decorated tree that we called holy tree. Street vendors sit around it and people chat while standing or sitting beside it.

Source: Photo by Roza Derakhshan Alavijeh.

Socio-Spatial Practices in the Area of Virar Dam

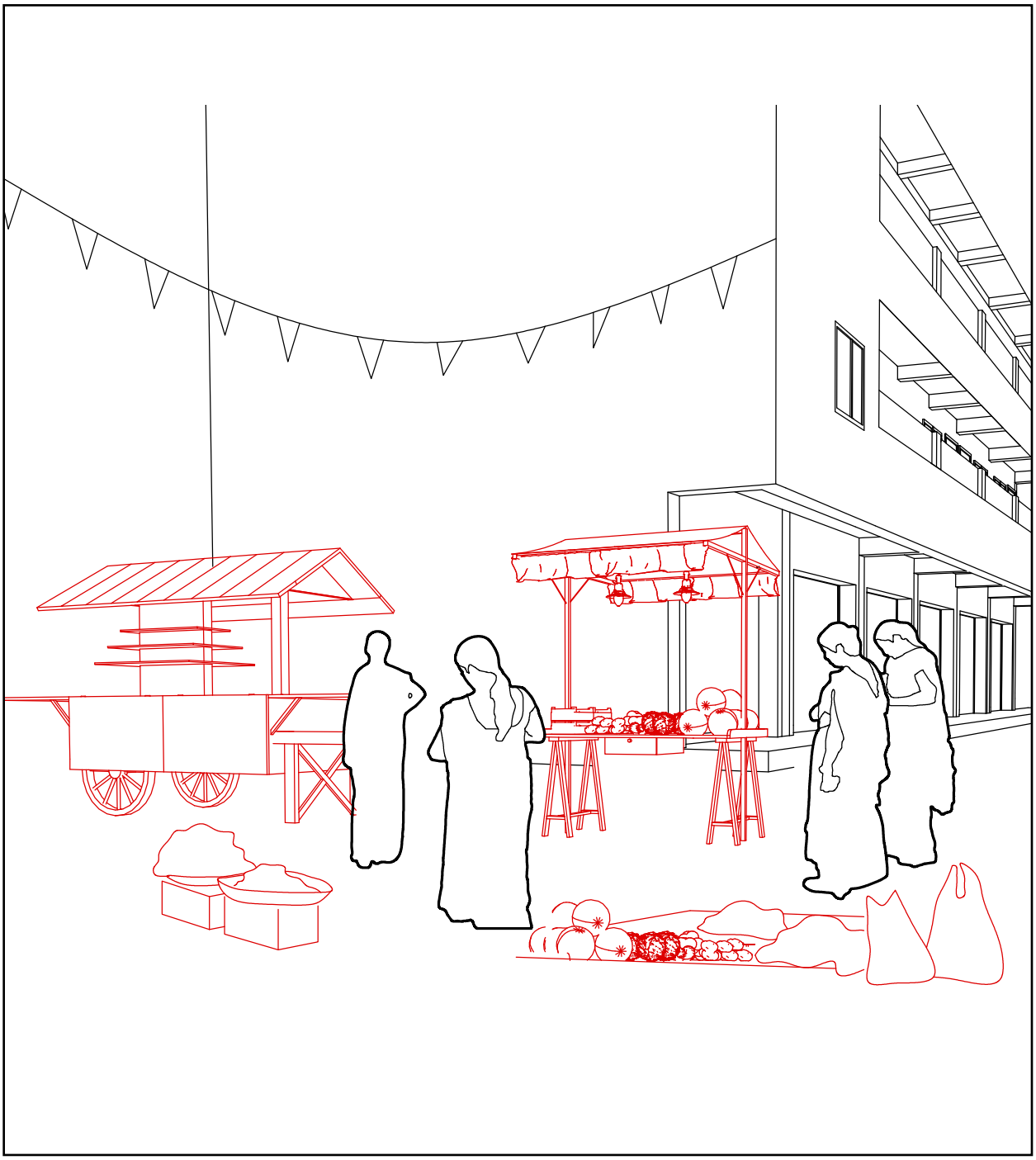


ROSA DERAKHSHAN // THOMAS FELL RUBIO // LIZA DE JONG

In the following pages the patterns of inhabitation in the area of Virar Dam is shown. This collective research is done in a group of three after the excursion to Mumbai. This group work depicts four categories of inhabitation which are Income Generation, Borders, Social Spaces, and Building Techniques. The result was used during design process and is done by Thomas Fell Rubio, Liza de Jong, and Roza Derakhshan Alavijeh.

Source: Photo by Roza Derakhshan Alavijeh.

Income Generation |Street Vendor

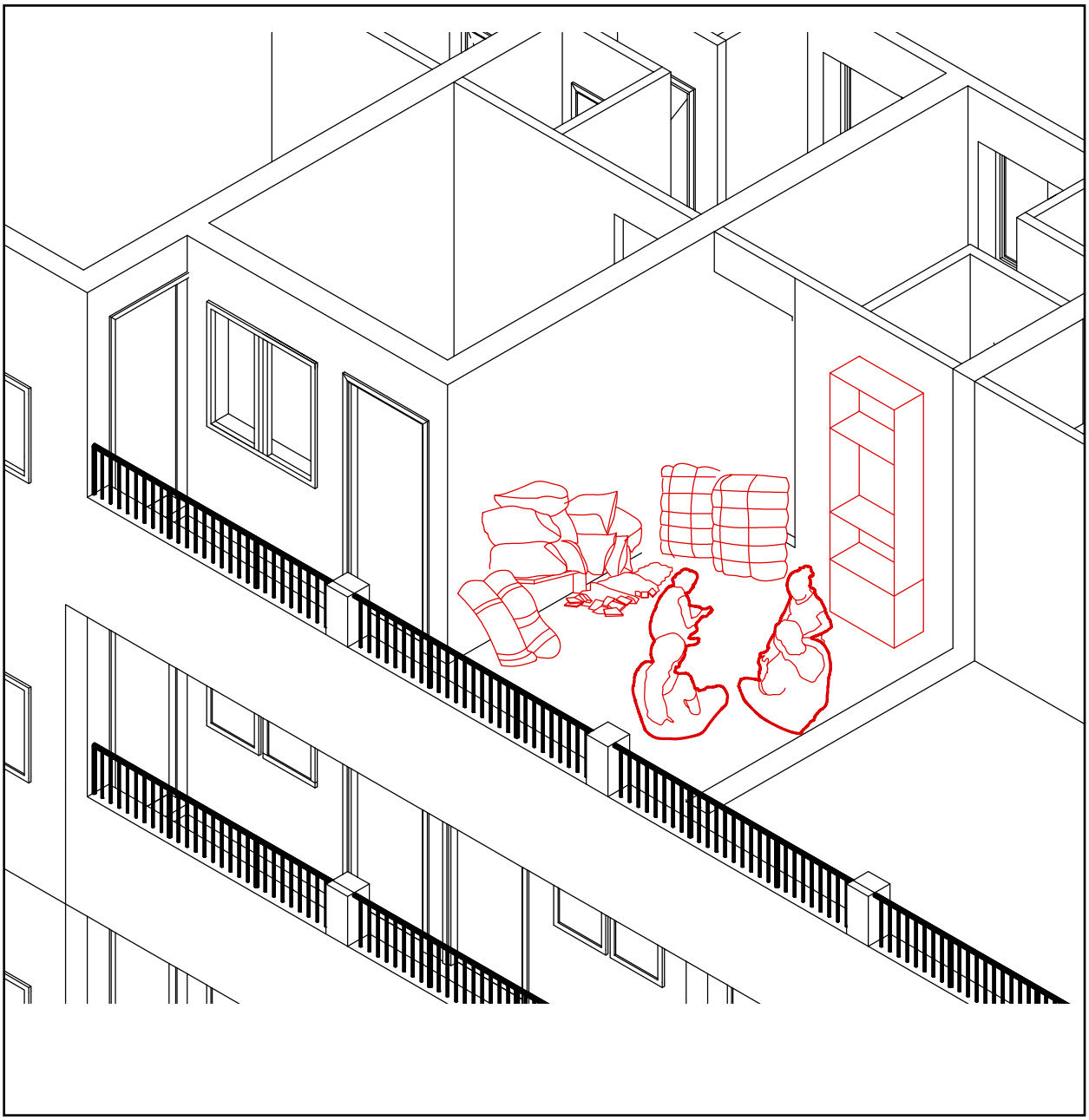


Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Income Generation | Commercial Plinth

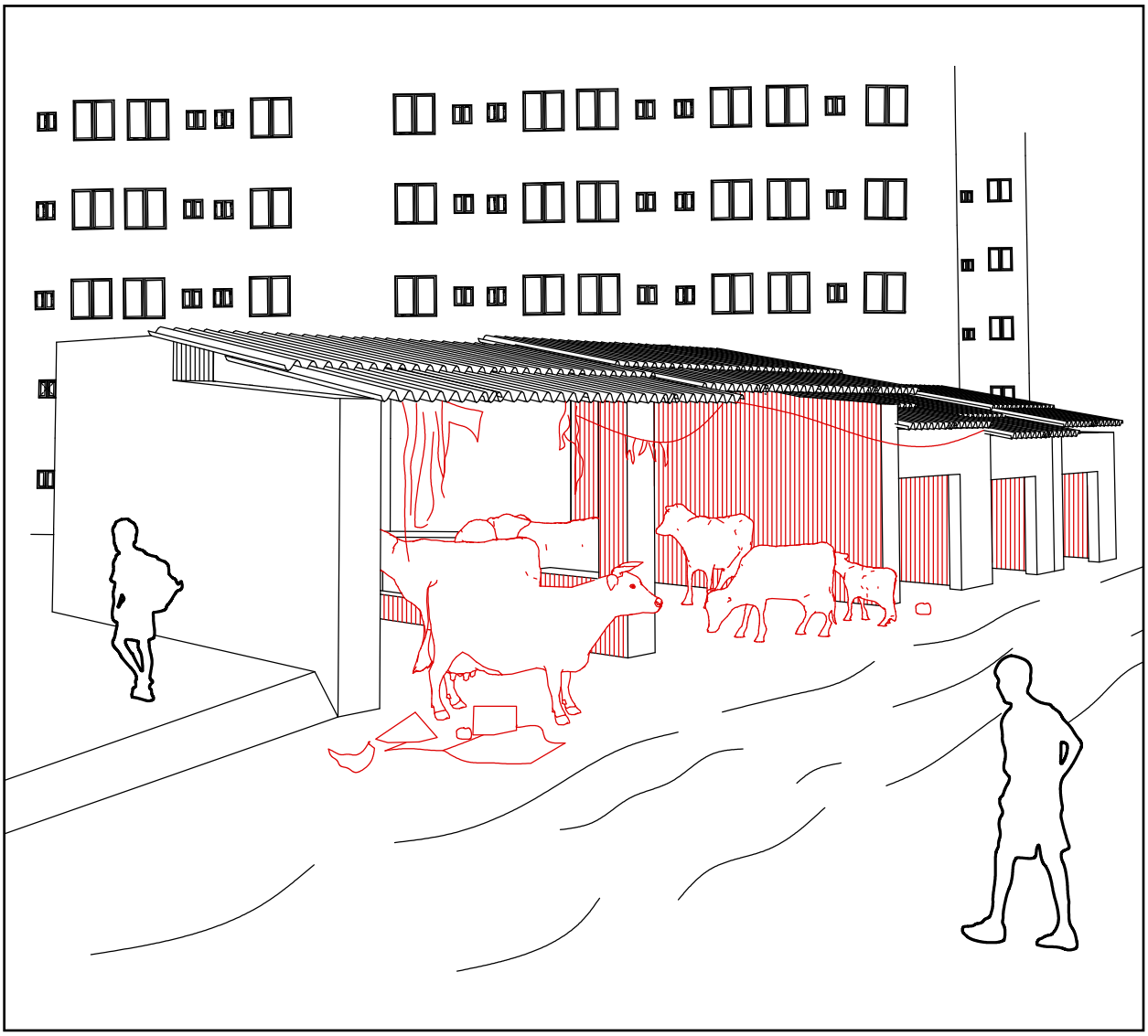
Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Income Generation |Home-Based Business



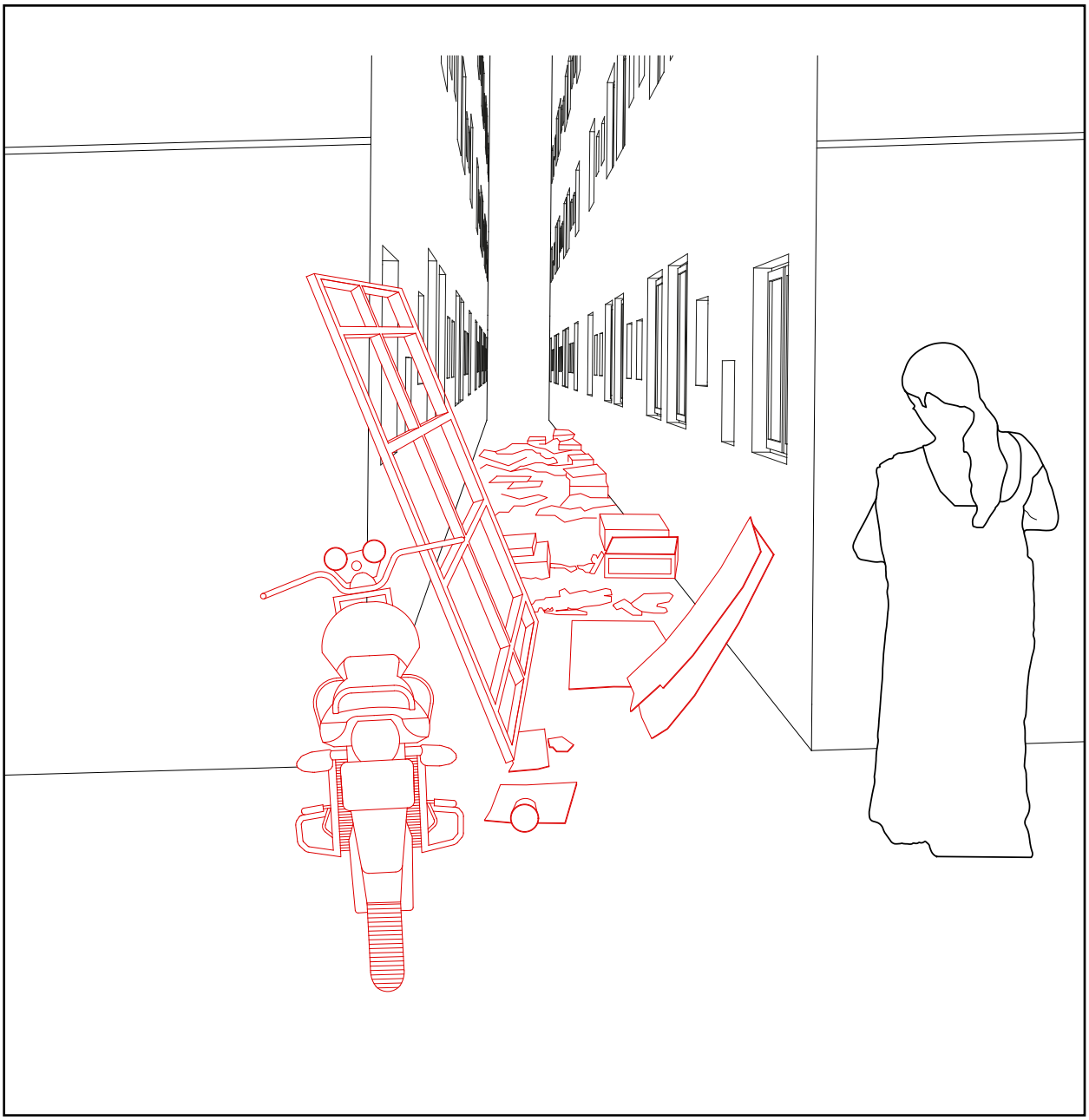
Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Income Generation | Cow Shed



Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Borders | Back Alley

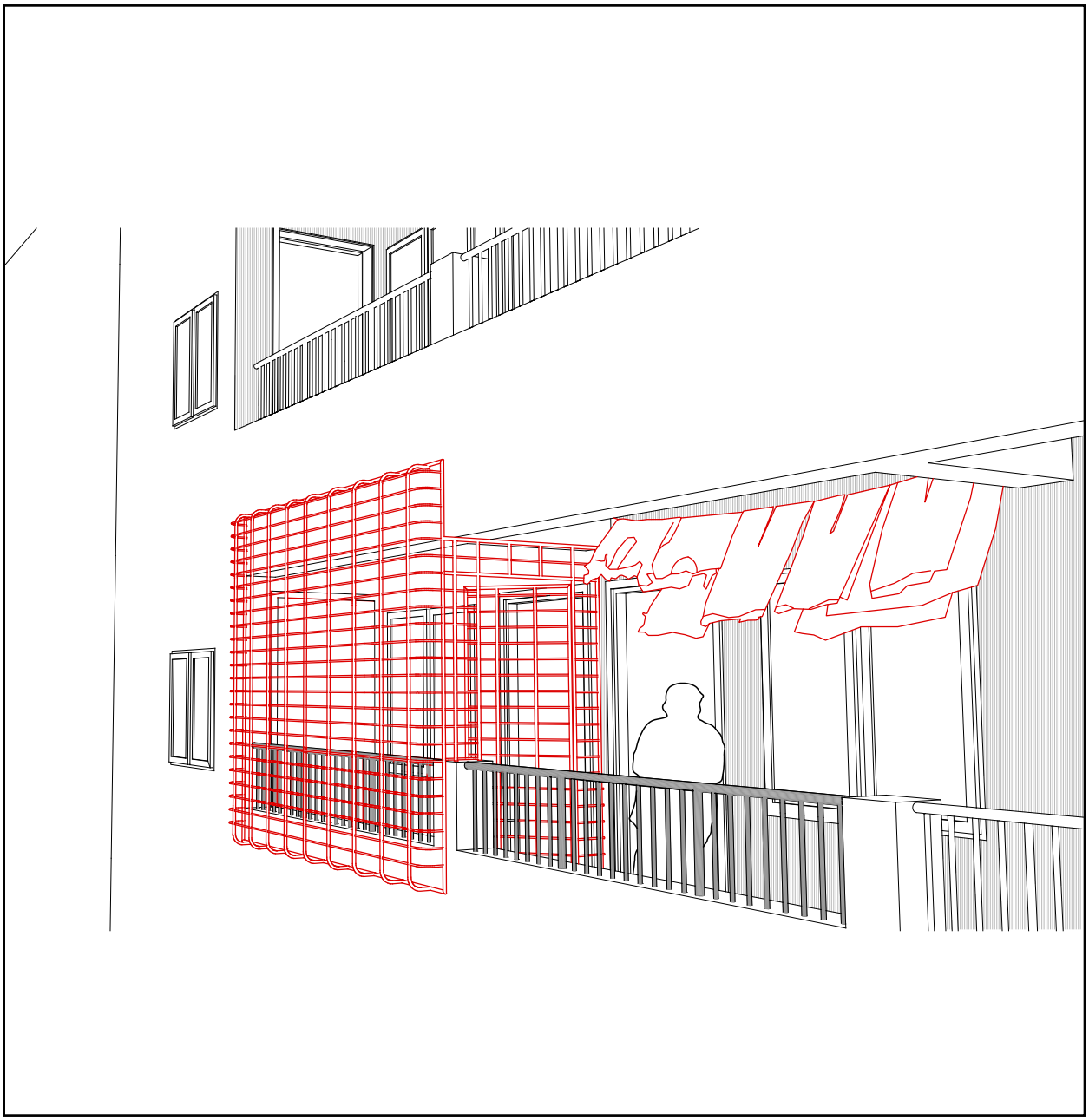


Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Borders | Raised Ground Floor

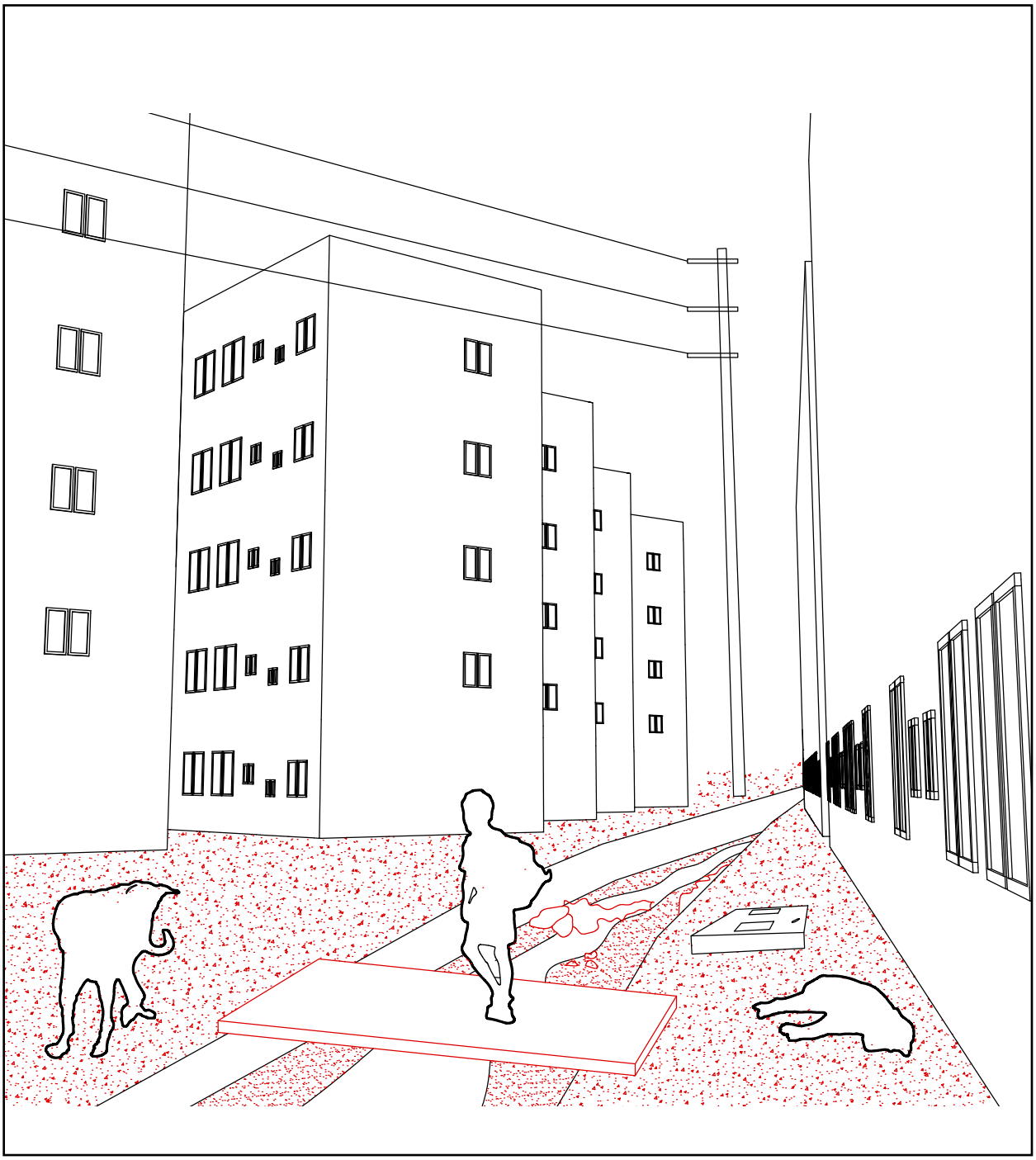
Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Borders | Appropriated Gallery



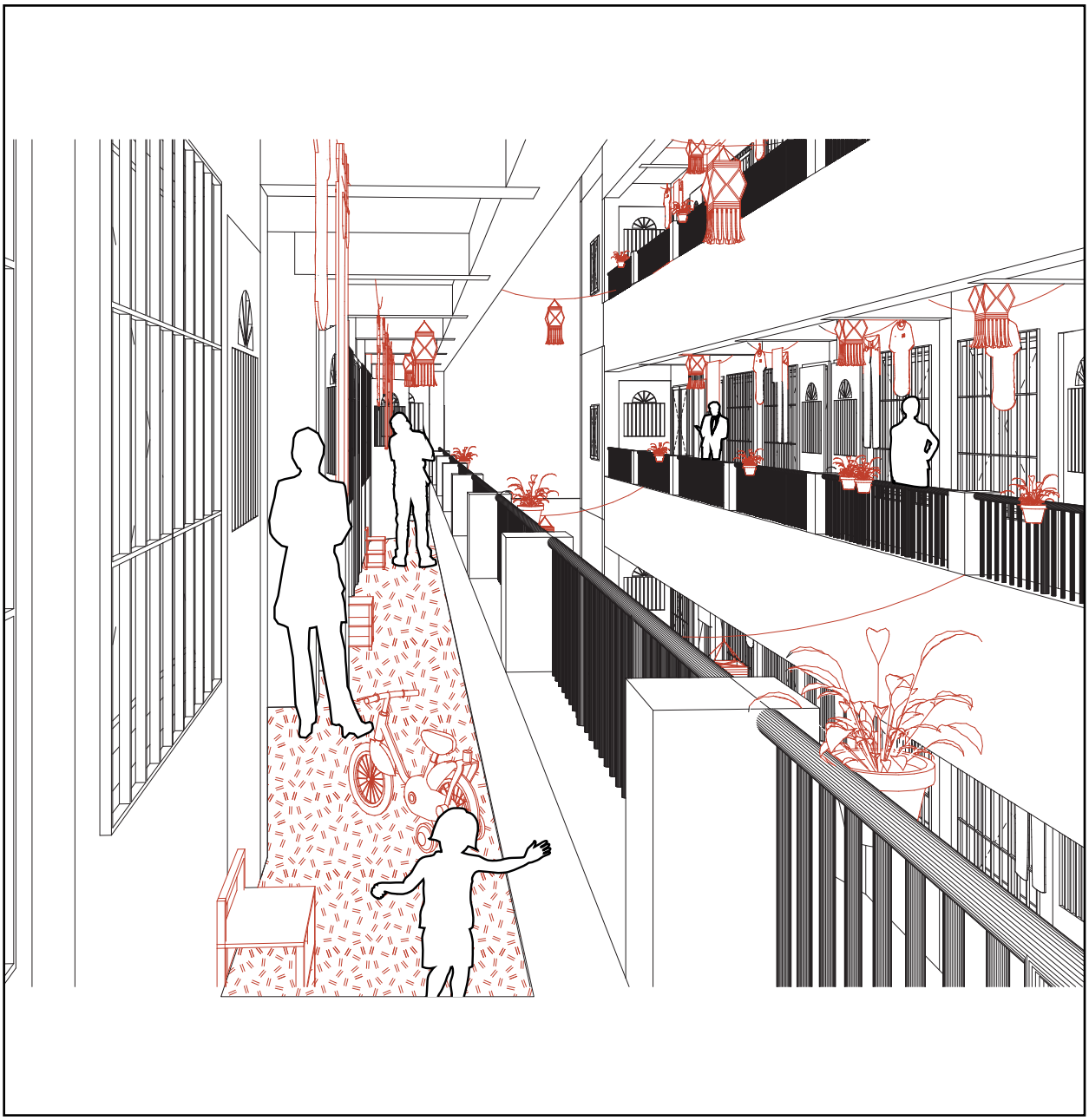
Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Borders | Sewage Canal



Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Social Space | Circulation Gallery

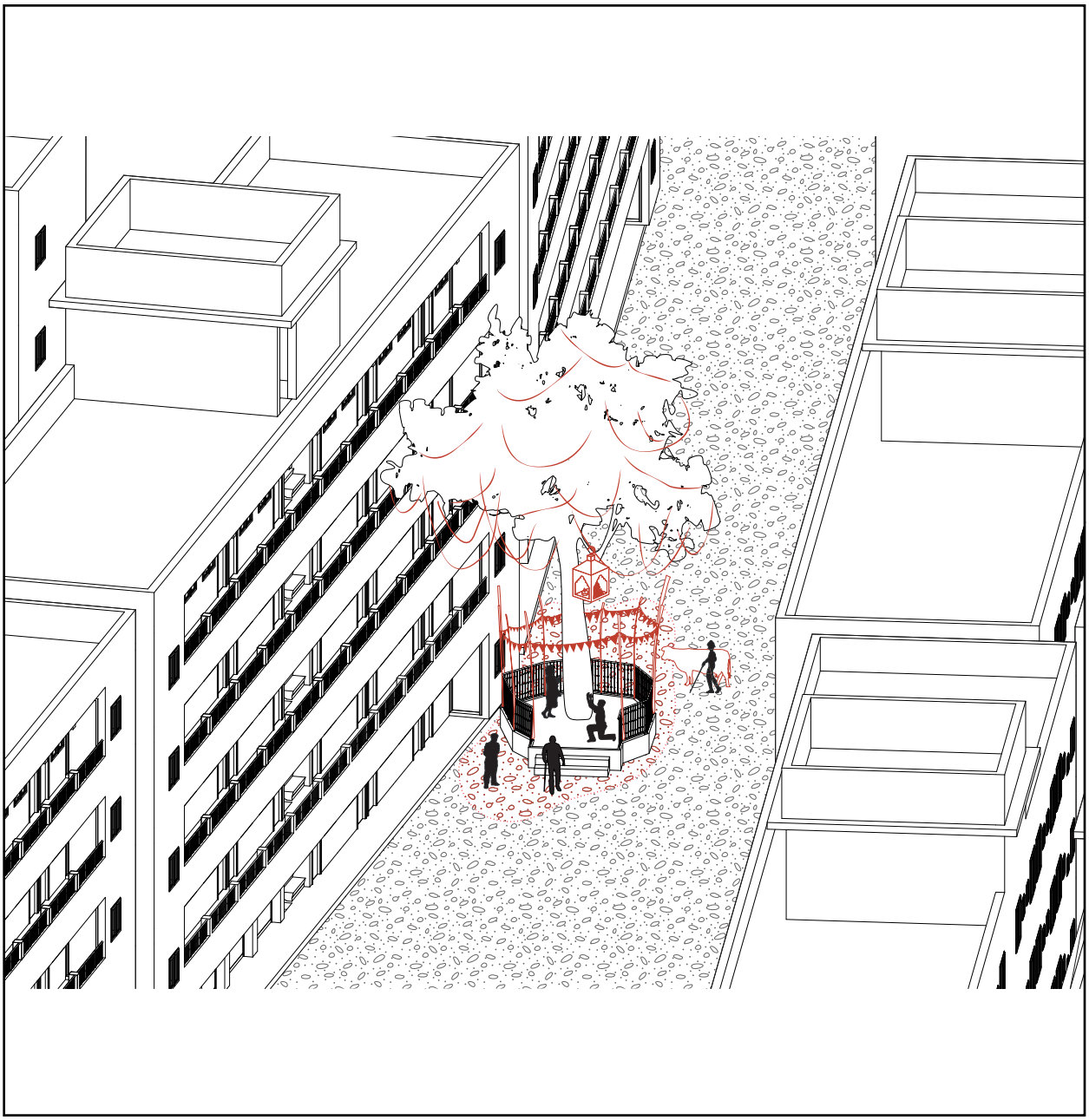


Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Social Space | Front Alley

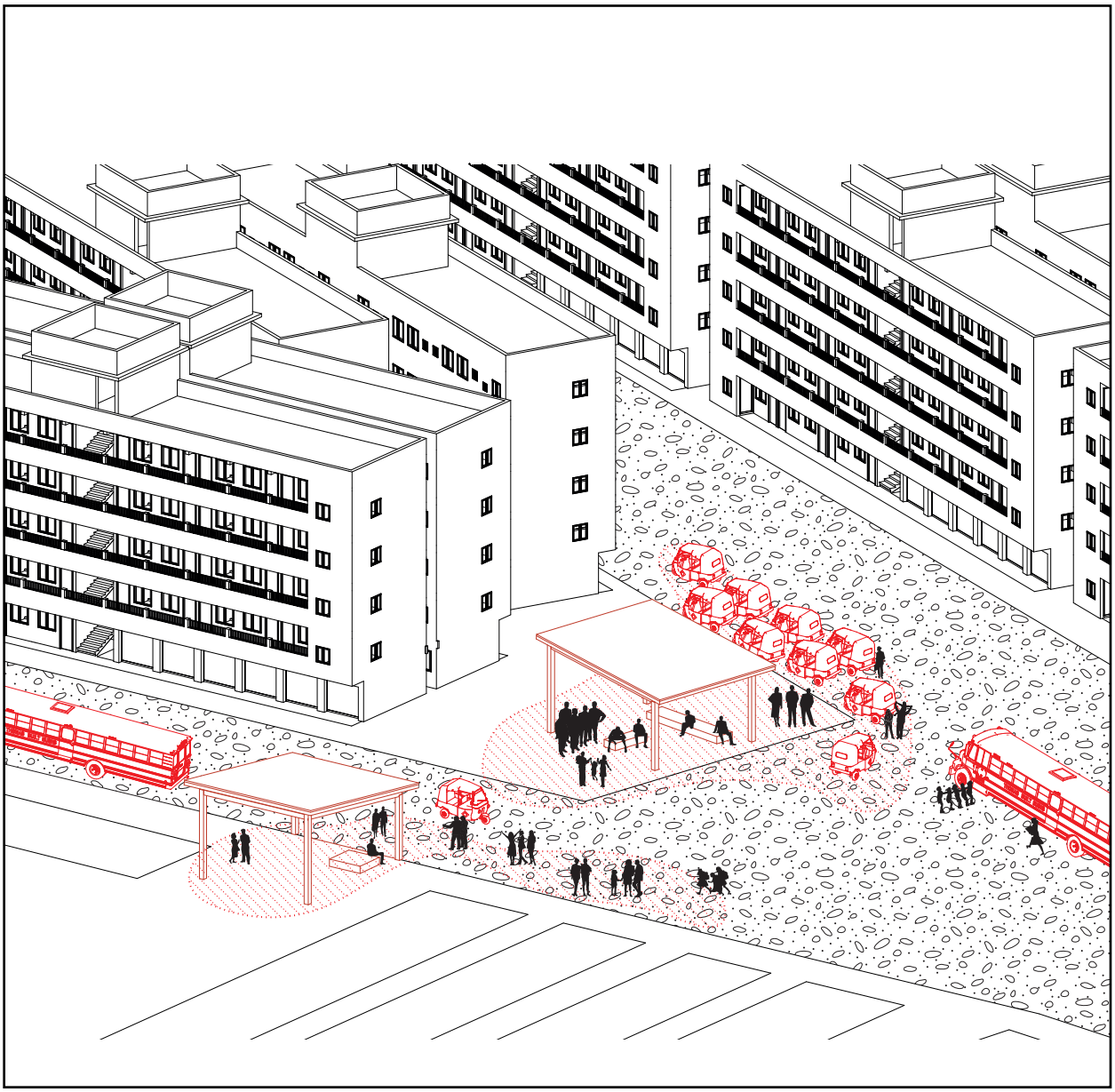
Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Social Space | Holy tree



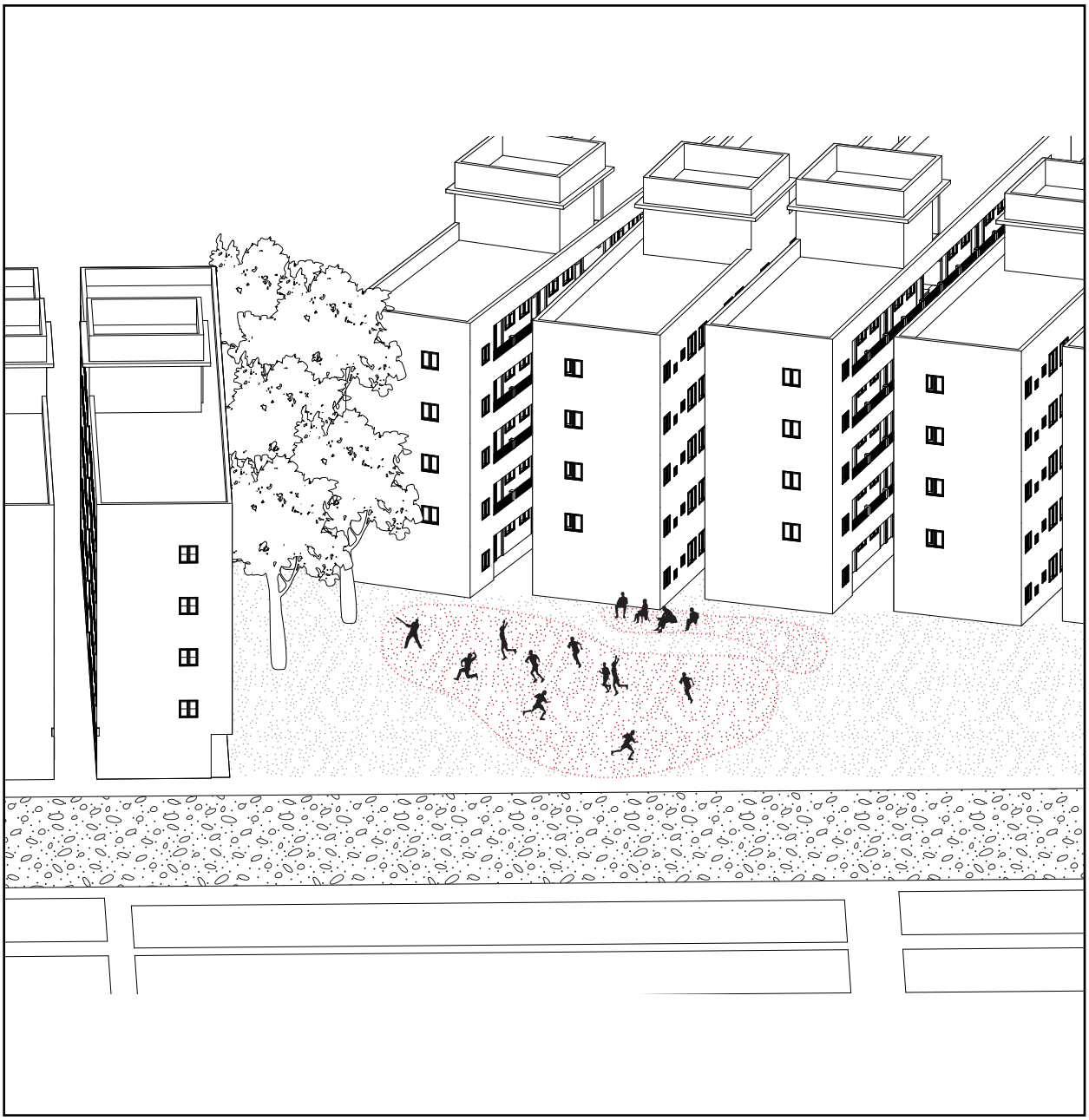
Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Social Space | Public Transportation Hub



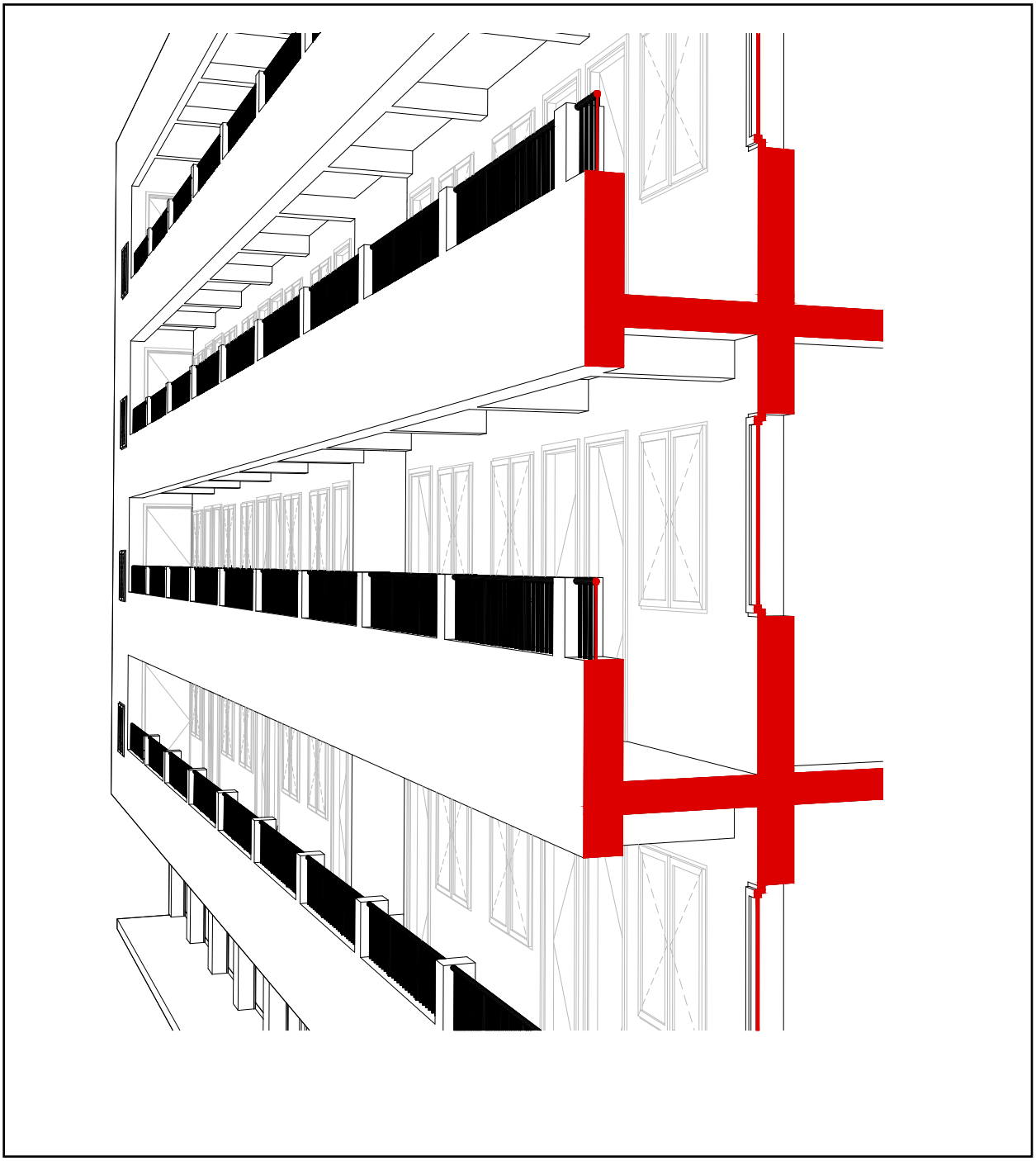
Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Social Space | Galli Cricket



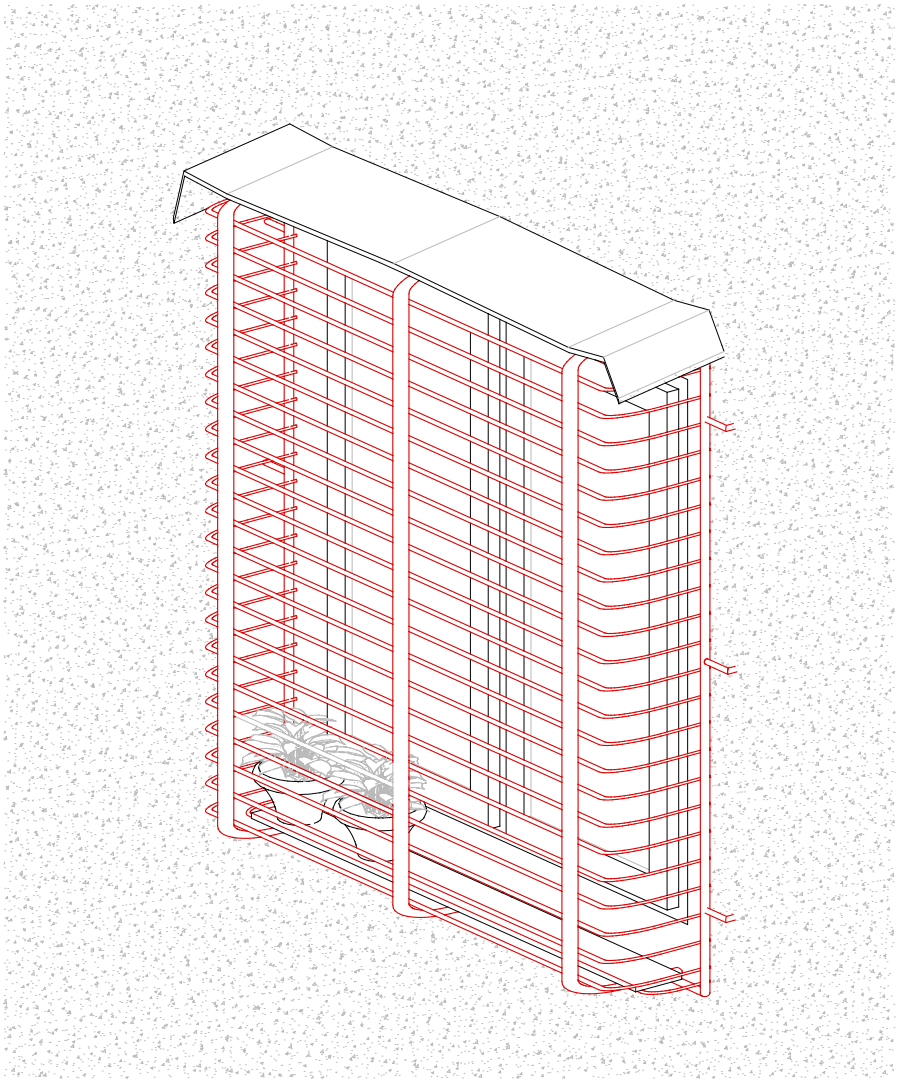
Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Building Techniques | Cantilever Gallery



Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

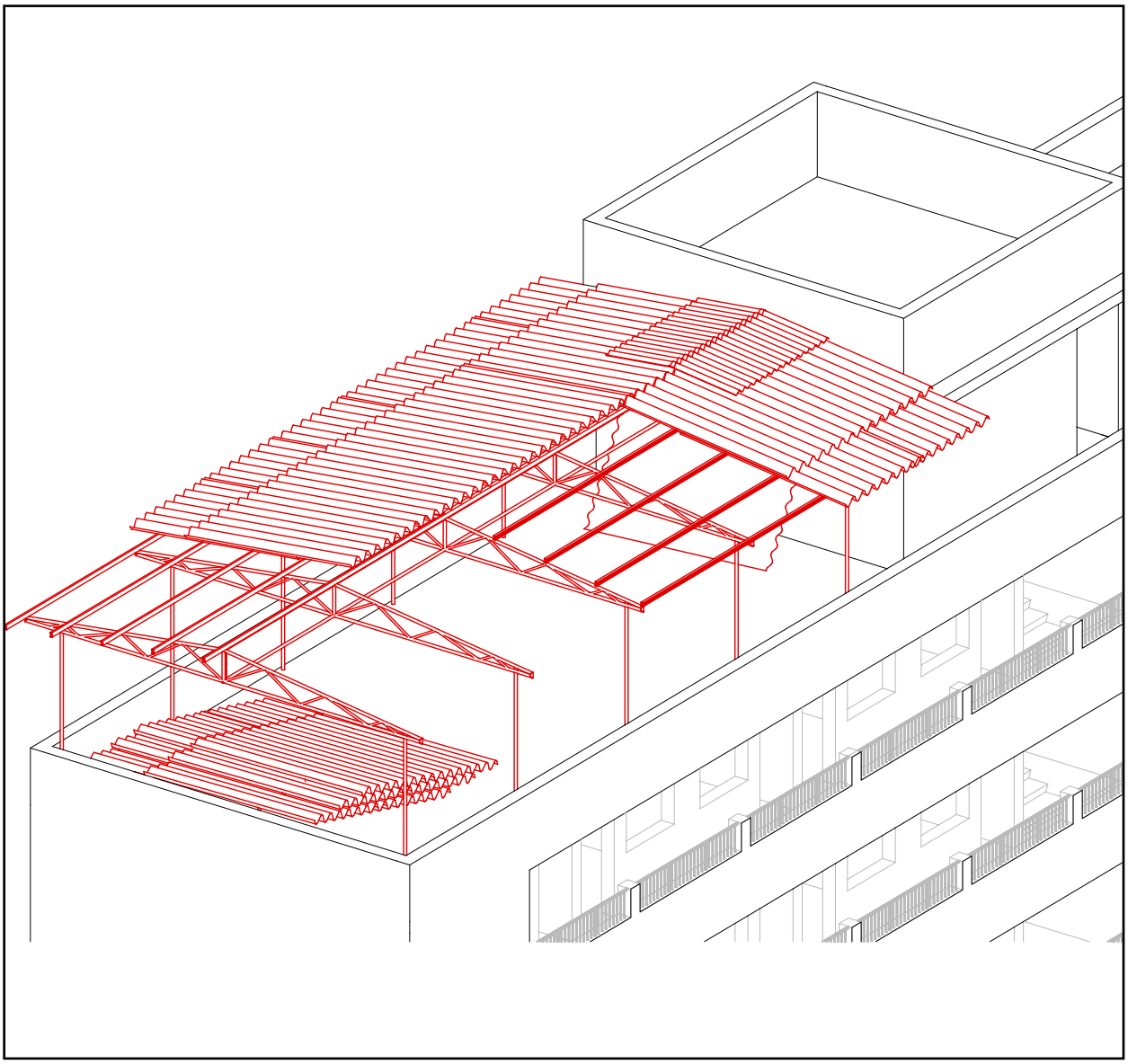
Building Techniques | Window Cage



Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Building Techniques | Roof Extension



Source: Book of Pattern By Roza Derakhshan Alavijeh, Thomas Fell Rubio, and Liza de Jong.

Sc 1:2500

Mass
Green Area
Water Body
Cricket Field
Road

Sc 1:2500

Mass
Green Area
Water Body
Cricket Field
Road


Sc 1:2500
2005
Baithi Chawls &Slums
Chawls
Green Area
Water Body
Cricket Field
Road

Sc 1:2500
2009
Baithi Chawls &Slums
Chawls
Green Area
Water Body
Cricket Field
Road


Sc 1:2500
2012
Baithi Chawls &Slums
Chawls
Green Area
Water Body
Cricket Field
Road

Cricket Field

Unaccessible Green

Commercial Street

Lake / Virar Dam

Swimming Pool

Transportation Hub

Research Question

To what extent/How can an in-situ redevelopment scheme be used to generate an inclusive urban space?

The other questions that have arisen in this research are:

To what extent/How could an in-situ redevelopment scheme, as a solution for existing squatter settlements, be used to provide meaningfull social space and other public amenities, be adaptive to the existing context , and to change the determining factor of affordability by providing right of choice for the inhabitants and flexibility for future growth in housing units?

Considering the architect as a design factor with a limited amount of authority to change existing policies, how can the architect redefine the existing solution of in-situ redevelopment schemes in order to contribute to major developments?

Goals and Objectives

To what extent/How can an in-situ redevelopment scheme be used to generate an inclusive urban space?

Social Aspect

1. **Social Space** >>>>> Social /Open Spaces , considering Hierarchy of it

2. **Public Amenities** >>>>> How to finance public amenities? If design provide a density that is more than the amount that conventional design approches provide, then the profit of selling extra units can compensate the costs for public amenities.

3. **Social Mix** >>>>> Unlocking the borders
>>>>> Redevelopment

Right of Choice

1. **Growth** >>>>> Considerations of Design

2. **Initial Role of inhabitants**>>>>> Providing people freedom of defining their living spaces
>>>> Open Buildings, Jahn Habraken Ideas

Economic Aspect

1. **Location** >>>>> Site's proximity to industrial zones

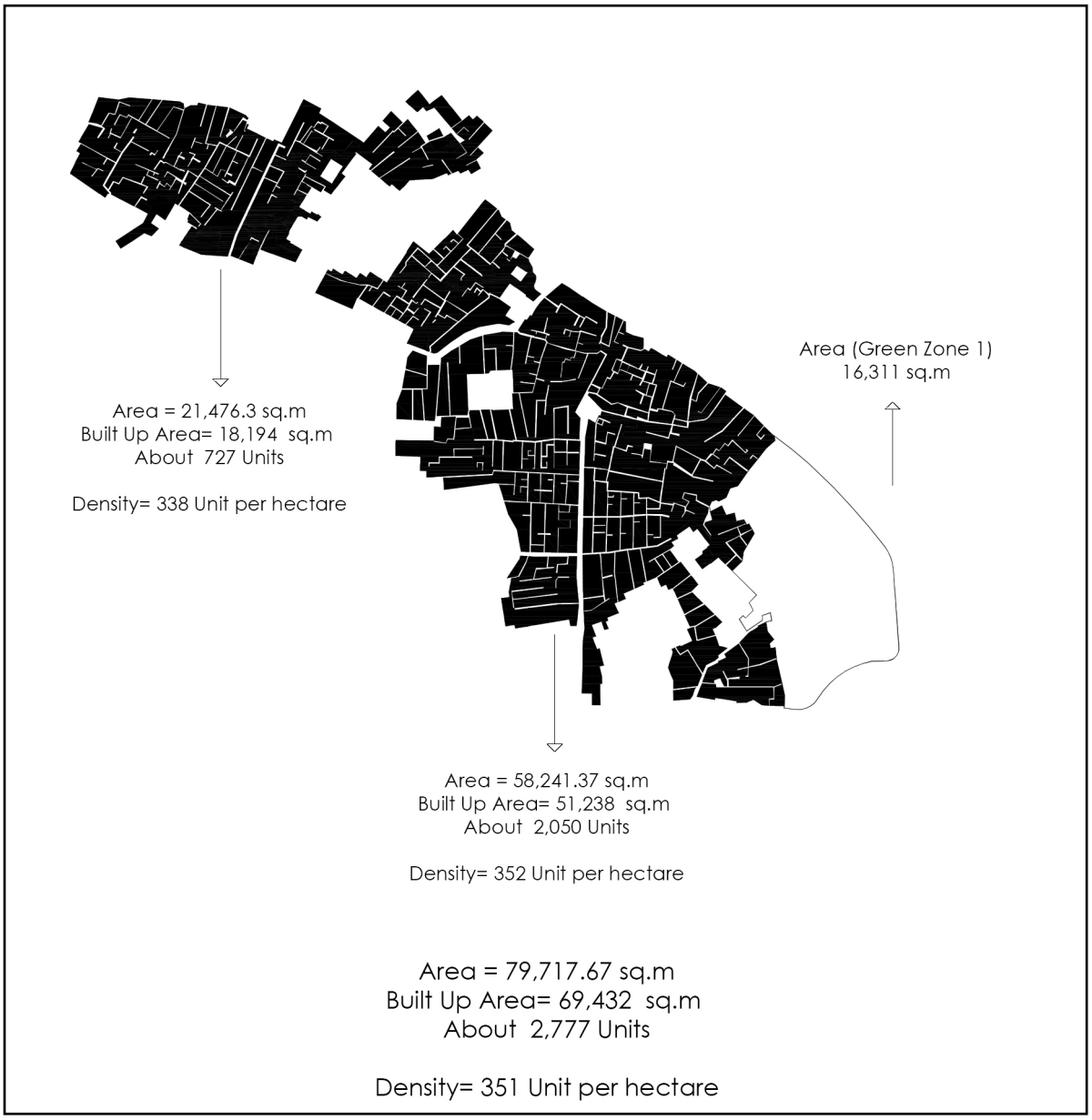
2. **Stimulating Small Businesse** >>>>> Considerations of Design
>>>> Defined business spaces
>>>> Undefined business spaces
(Pilottis, Open Plazas, etc.)

Site Specific

1. **Protecting Forest Zone**
>>>>> Redevelopment Stops enchroachment of Forest
>>>>> Making a Developed Wall

Proposal
Urban Strategy

Current Density of The Land

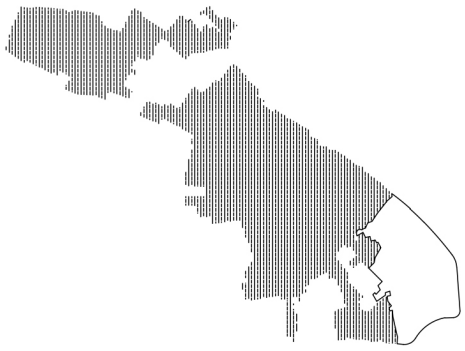


The area of study is consisted of two different types of land. One is already built up and is covered by baithi chawls and slums, while the other part is empty. Although the entire area in considered under the category of Green Zone-1 in proposed land use plan of Draft Mumbai Metropolitan Regional Plan 2016-36, the built up area can be redeveloped. SRA scheme can be implemented for slums occupying more than 25% of non-buildable area. Building regulations about Green Zone-1 is shown in following pages.

As density of the area is less than 500 tenements per hectare so PAP (project affected people) tenements should be included in the area to accommodate people who are displaced because of public projects.

Source: Slum Rehabilitation Authority
Retrieved from:
https://www.slideshare.net/harshjain123/slum-rehabilitation-authority

Tenement Calculation



Rehabilitation

2777 Units x 25 sq.m (269 sq.ft)= 69,425 sq.m

Additional Component= 27.77*21 sq,m (225 sq.ft)=583.17 sq.m

According to regulation for each 100 tenements 1 Balwadi and 1 Welfare center of standard size of 225 sq.ft should be built.

Rehab Component = 70,008 sq.m

Additional FSI granted

Salable Component = 1.5x 70,008 sq.m= 105,021.25 sq.m

BUA Permissible= 174,432.25 sq.m

Maximum Permissible FSI

Maximum Permissible FSI In-Situ is 2.5 so:

Maximum FSI= 79,717.67x 2.5= 199,294.175 sq.m

As redevelopment in this plot in less than maximum FSI of In-Situ Scheme, there is no TDR.

Salable Component= 75 % affordable housing + 25 % open market i.e. HIG housing

Salable component= 105,021.25 sq.m

Salable affordable housing portion = 78,765.93 sq.m

Open Market portion= 26,255.31 sq.m

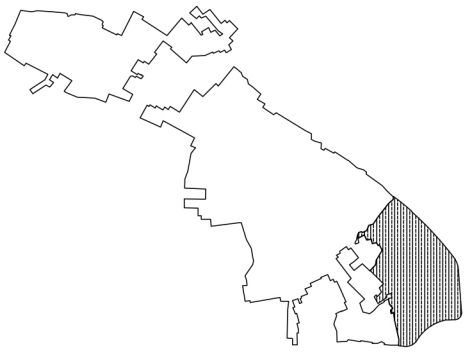
Rehab Component = 70,008 sq.m

In the schemes approved under the provisions of Development Control Regulation (DCR) the slums are rehabilitated on the same site. In this regulation an owner of the land is allowed to consume FSI potential of the land. The additional potential of 1.5 for suburbs is granted under this scheme. Assuming Vasai-Virar as suburb additional potential of 1.5 is granted to the land as well.

The abovementioned calculation shows the required amount that is needed to be provided for different purposes in the land of project.

Source: Slum Rehabilitation Authority
Retrieved from:
https://www.slideshare.net/harshjain123/slum-rehabilitation-authority

Green Zone



Some of the related parts of Draft Development Control Regulations for Mumbai Metropolitan Region 2016 – 2036 about Green Zone-1 land use is extracted in below. As there is a limit of height for construction in this area, it seems reasonable to allocate this piece of land, if including it, for public uses as it is mentioned in permissible land uses of Green Zone-1, such as school and health centers.

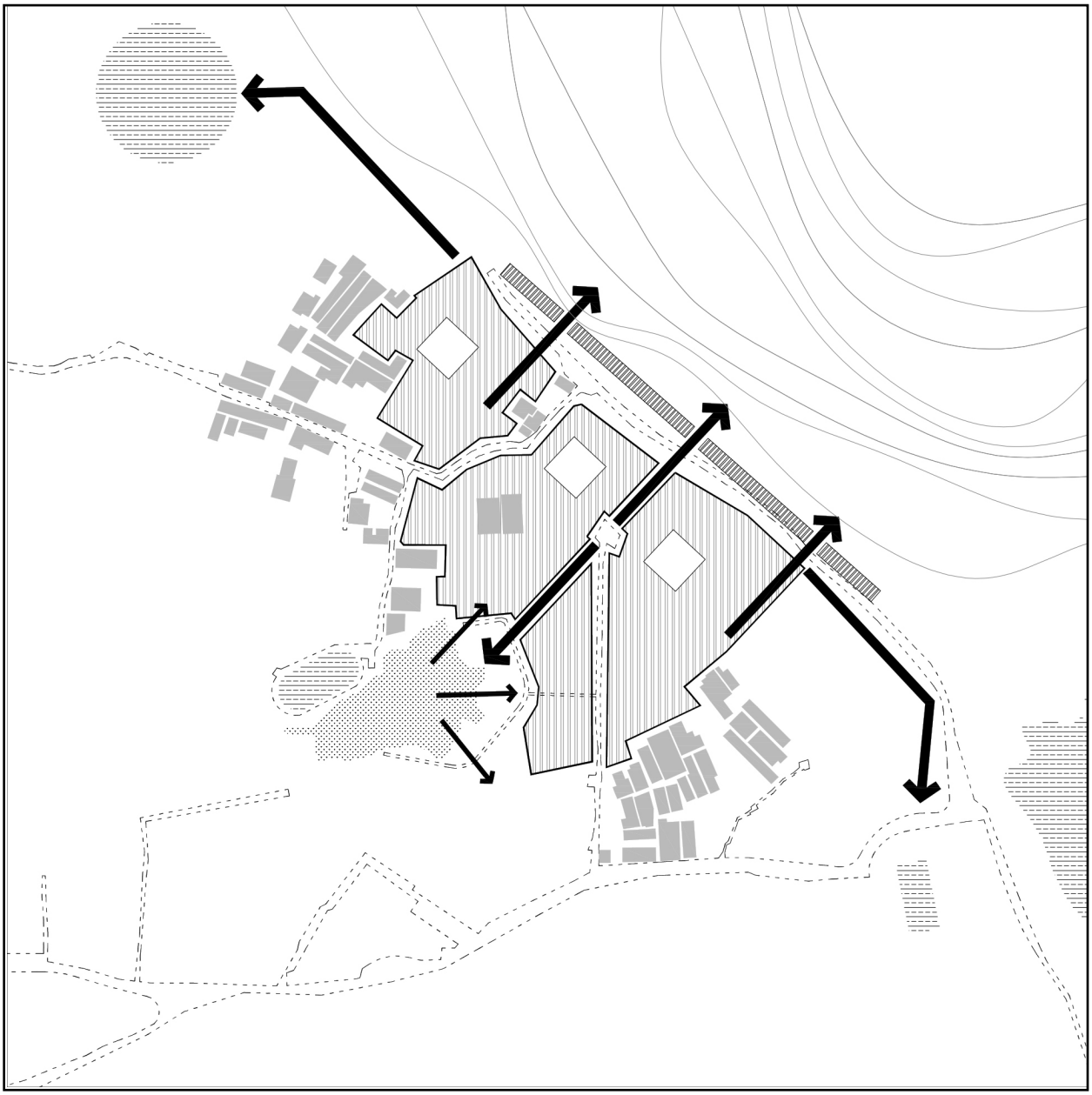
Green Zone-1 (G1)
A maximum building height of 15 meters
Single family house on plot not less than 2,000 sq.m.
Home based economic activities
Offices of Government, local authorities and public utility concerns
Hospitality
Retail shopping, Restaurants and Banks
Film and allied Production Activities, subject to condition that the permanent built up facilities shall not cover more than 15% of the gross land area
Entertainment - Art Galleries, Exhibition Centers, Convention
schools and health centers on plot not less than 0.4 ha.
Recreation - Parks and Playgrounds, Gardens, Golf Courses, Swimming pools,
Stables, Race courses, Shooting ranges, Amusement Parks and Theme Parks

Source: Draft Development Control Regulations for Mumbai Metropolitan Region 2016-2036 Retrieved from: https://mmrda.maharashtra.gov.in/documents/10180/8037279/3.+Draft+DCR+English/a56cea1f-7f25-4e3a-8f88-522fc6287517

Existing Constraints

The existing constraints in the area of Virar Dam consist of the green zone, existing low-rise High density blocks, and the existing roads' pattern. The green zone should be preserved and protected from any construction or informal urban sprawl. In the area some parts are rebuilt into concrete low-rise high density blocks which should be conserved as those are already functioning living spaces. The existing urban fabric must be kept as much as possible. The reason is that the redevelopment of the area is possible if it will be done gradually. The existing roads systems must be kept to make gradual redevelopment feasible.

Urban Concept



The main road in the area functions as an urban spine that brings different facilities together and facilitates socializing.
5. Front Alleies are socializing spaces for neighbours.
6. The Intersection of two of the streets has shaped a gathering corner that become crowded in the evening.

Source: Photos by Roza Derakhshan Alavijeh.

Open to Sky Network

The open to sky space comprises of open public space and also collective courtyard in between the building blocks. The public space has different forms related to its location. The form of Entrance space to the cluster is different characteristically from Open space of the middle of the clusters that are intended for open local markets.

Traffic Circulation

In the proposed design it is intended to create a pedestrian friendly space. To achieve this goal, the clusters are accessible from the periphery. The Parking space for vehicles are considered on the sides of the roads. It is because allocating any space to parking garage in the ground level will be converted to commercial space. So The roads are considered large enough to accommodate the cars and two-wheelers.

Traffic Circulation | Main Road

Traffic Circulation | Collectors

Traffic Circulation | Local Roads

Amenities

To every cluster a certain amount of public amenities is allocated. Apart from each cluster there are several plots allocated for the amenities of the entire area. The average amount of public amenities per person in the redeveloped area is 4.8 square meter per capita, that is shown in Figure and Comparisons chapter.

Amenities

Apart from public amenities, the plinth of all the building blocks are considered as shops and workshops to stimulate more mixed-use area to thrive small businesses.
The number of small business areas are 413 that means for every six housing unit there will be one unit of shop or workshop. These figures are shown in Figure and Comparisons chapter.

Managing Moonsoon Rainwater

In order to prevent flood during moonsoon, a couple of detention basins should be excavated at the base of the hill beside Virar Dam. Collected water could recharge the aquifer and/or be used for domestic water use during dry season.

1st Phase of Redevelopment

2nd Phase of Redevelopment

3rd Phase of Redevelopment

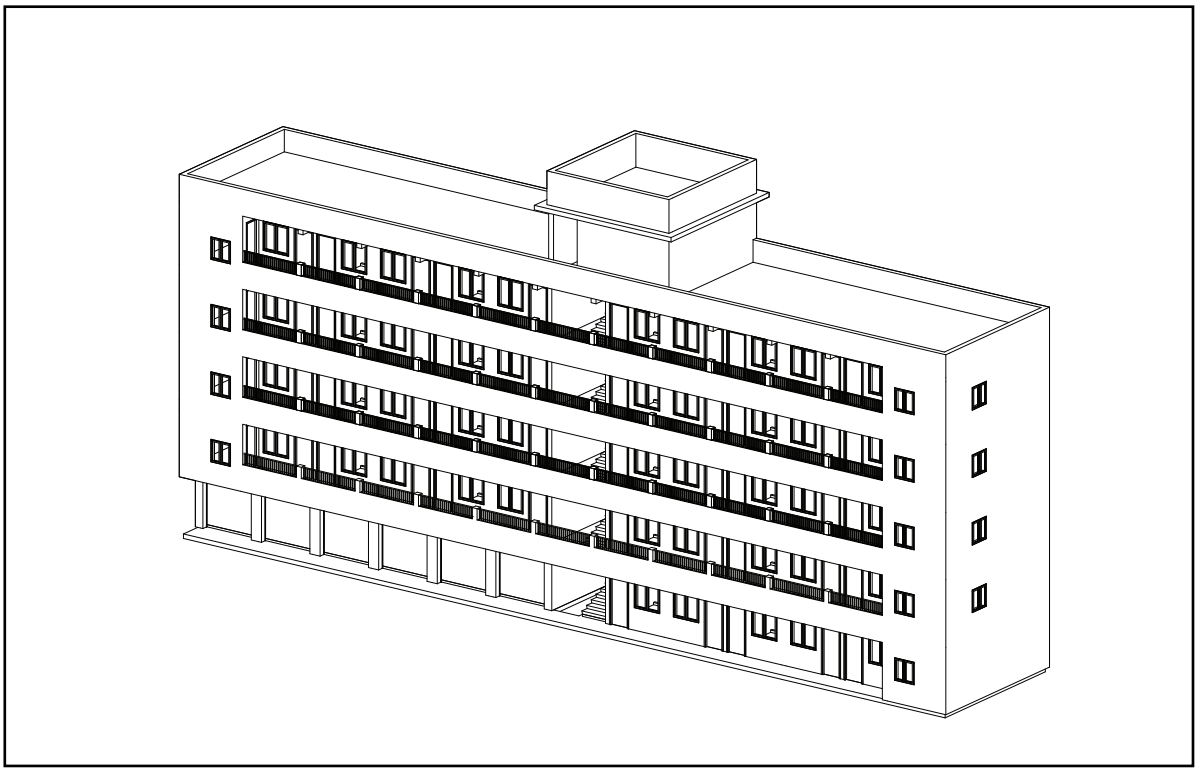
4th Phase of Redevelopment

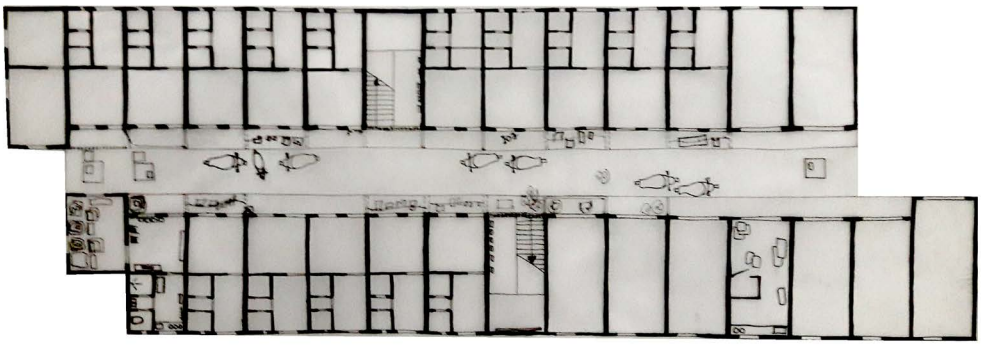
5th Phase of Redevelopment

6th Phase of Redevelopment

Proposal
Building Types

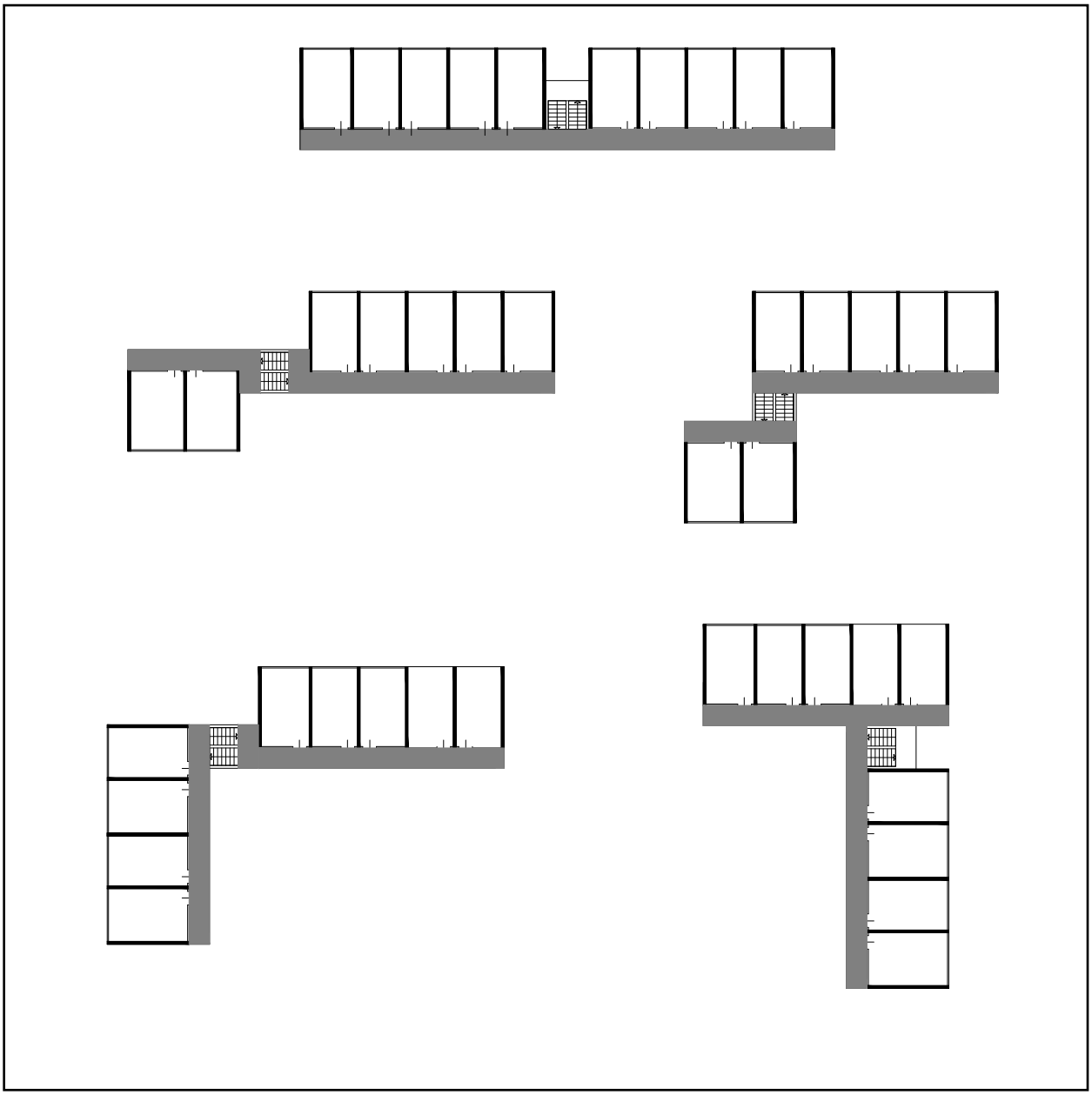
Low Rise High Density Blocks





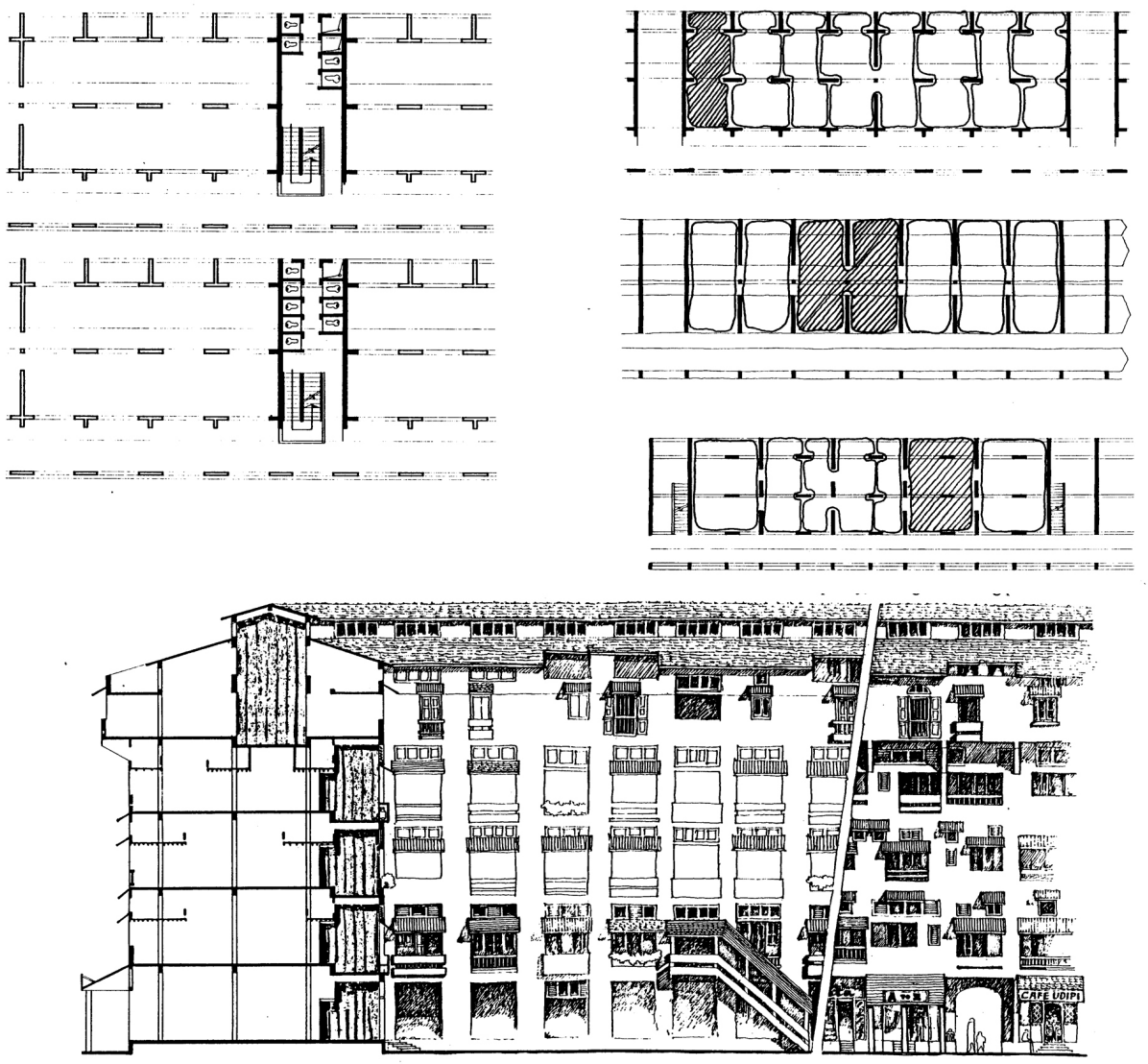
Two strong qualities of the Low-rise High density blocks are the linear layout of the units and the galleries.
The linear layout of the units is quite simple to construct while allowing a lot of ventilation. The galleries also work as social space and elevated streets for neighbors.

Staircase as Joint



Staircase can be used as a joint for creating different layouts of building blocks.

The Margin of Fluctuation In Affordablity

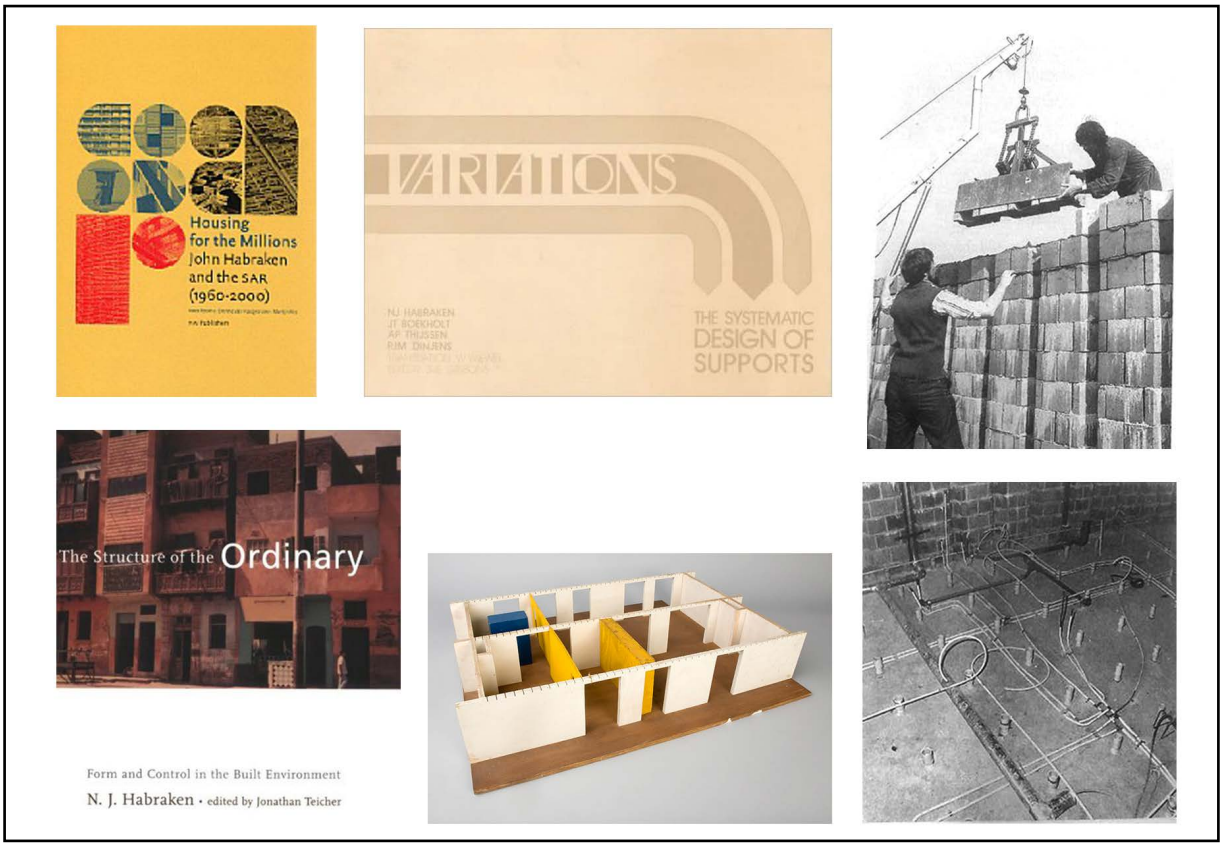


Finally, something deep down reminds me that even while writing this study, there are hundreds of chawls awaiting their final verdict from the authorities on their future - will they survive another monsoon, or .....?

Shubhankar Sanyal in his thesis under suppervision of Prof. N. John Habraken and Prof. Nabeel Hamdi the case of chawl in Mumbai. As he mantions: " Also, since the chawls comprise of minimum dwelling units, I am also interested in introducing the concept of an evolutionary housing principleas it applies in the context, and incorporating it as a part of my design methodology." (Sanyal, 1983)
To me iit is a real survey to investigate the content of mentioned dissertation to see how Habraken metholdology is applied in the case of chawls in Mumbai.

Source: Photos extracted from Doctoral dissertation by Shubhankar Sanyal
Sanyal, S. (1983). Toward a design methodology: a case of chawls in Bombay (Doctoral dissertation, Massachusetts Institute of Technology).

Design of Supports



John Habraken talks about maximum flexibility, Vertical and horizontal. He uses the phrase Building Land for a light weight support structure with minimum number of closed vertical surfaces and no fixed floors.

According to the book about about Habraken, Housing for the Millions, Habraken discovered democratic decision making on housing construction.

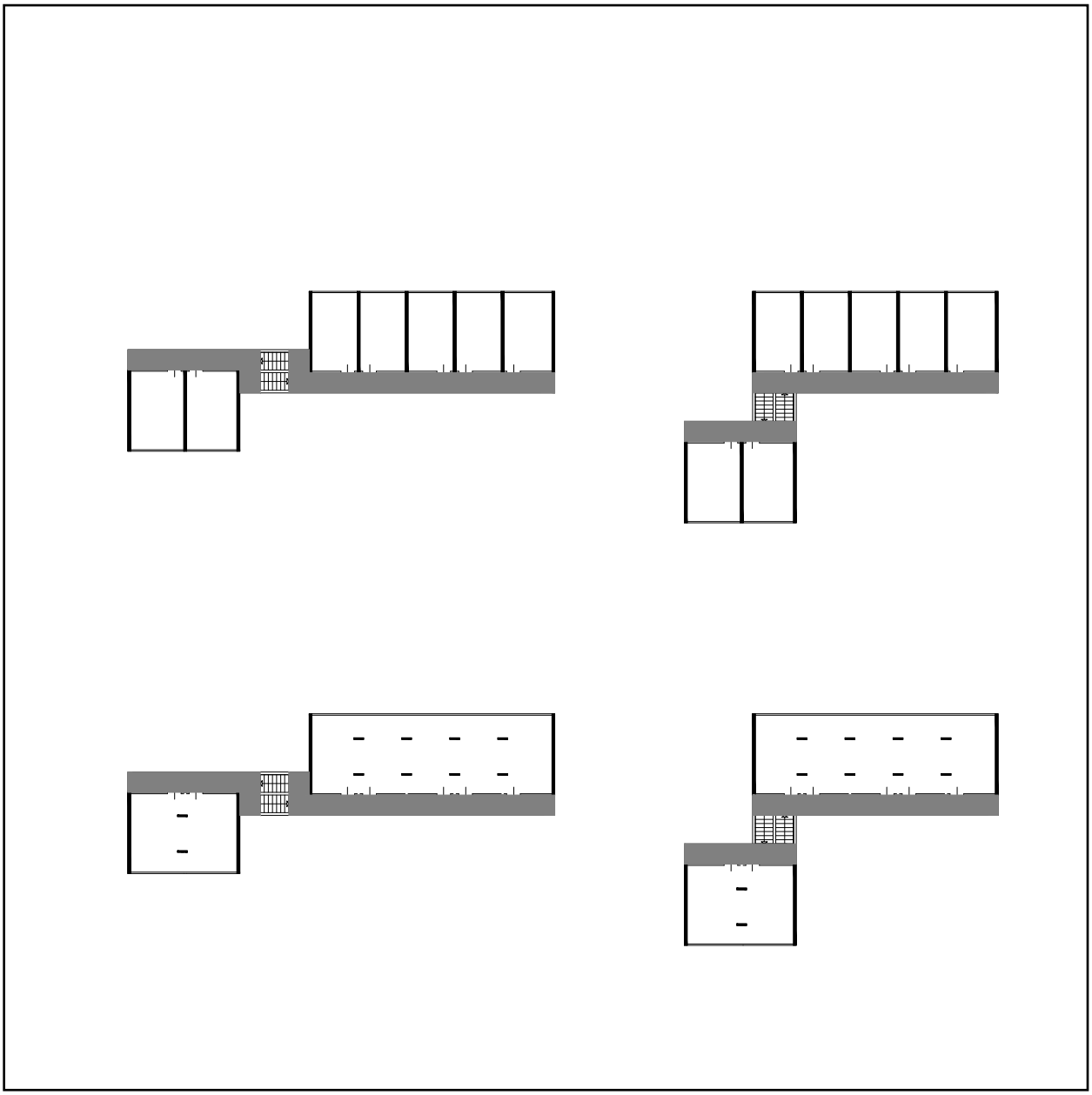
Jahn Habraken introduce the idea of Support, and he sees support structure as building land in the air. "Habraken does not discuss the supports in an aesthetic sense. Housing is not about form but about process that leads to the act of Dwelling and the distribution of power with that process" (Bosma, 2000)

Habraken defined Margins and Zones that causes various amounts of floor plans. In Ommoord Pilot Project a flexible support principle was investigated: Longitudinal structure with bearing wall parallel to exterior walls. The occupants could make their own dwellings as wide as they wished, because they did not have to rely on bearing elements positioned at right angle to an exterior wall. In Ommoord's support, many interior walls were permanent feature while kitchens and bathrooms could be positioned in any number of ways. The method that is defined by SAR, Habraken investigation group consists of Dura-Dip floor and wall. The Floors should contain cabling and it has some jacks which made them raised. Tiles cover the jacks. The walls are masonry cavity walls with cavities at every 60 cm.

Source:

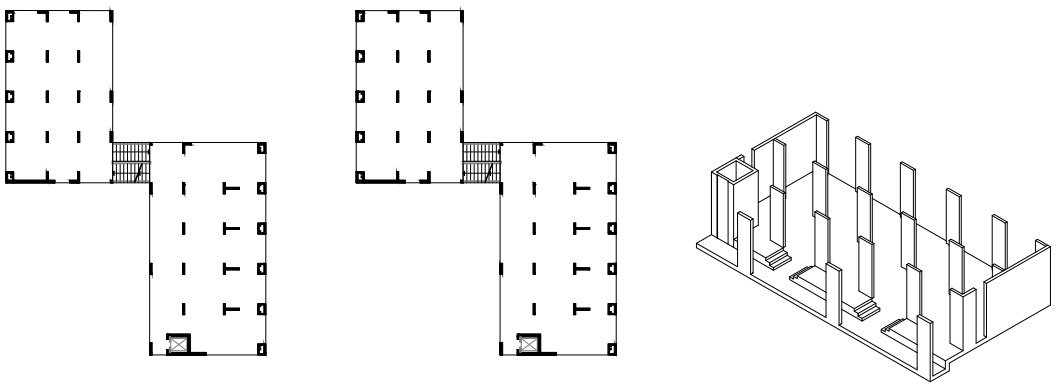
Bosma, K., Van Hoogstraten, D., & Vos, M. (2000). Housing for the Millions: John Habraken and the SAR (1960-2000). Nai Uitgevers Pub.
Photo of Support model from Wikimedia Commons retrieved from : https://commons.wikimedia.org/wiki/File:Dragermodel_-_Support_model_(8345052153).jpg
Photos of Ommord pilot project are extracted from the book, Housing for the Millions p. 232 & 242.

Open Building Style

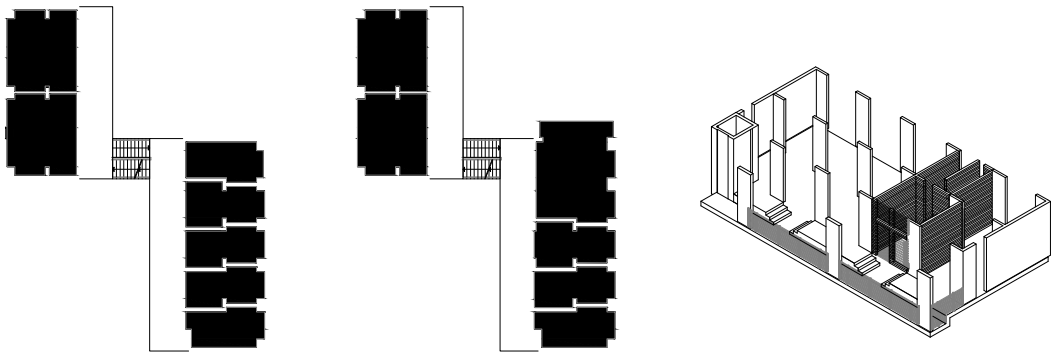


Instead of vertical divisions of the apartments that make the layout fixes and rigid, following Open Building approach, result in more flexibility in the layout of the houses. In this case inhabitants can ask for exact amount of budget and get a dwelling unit according to their budget in the initial pre-sale during the process of lottery.

Support and Infill



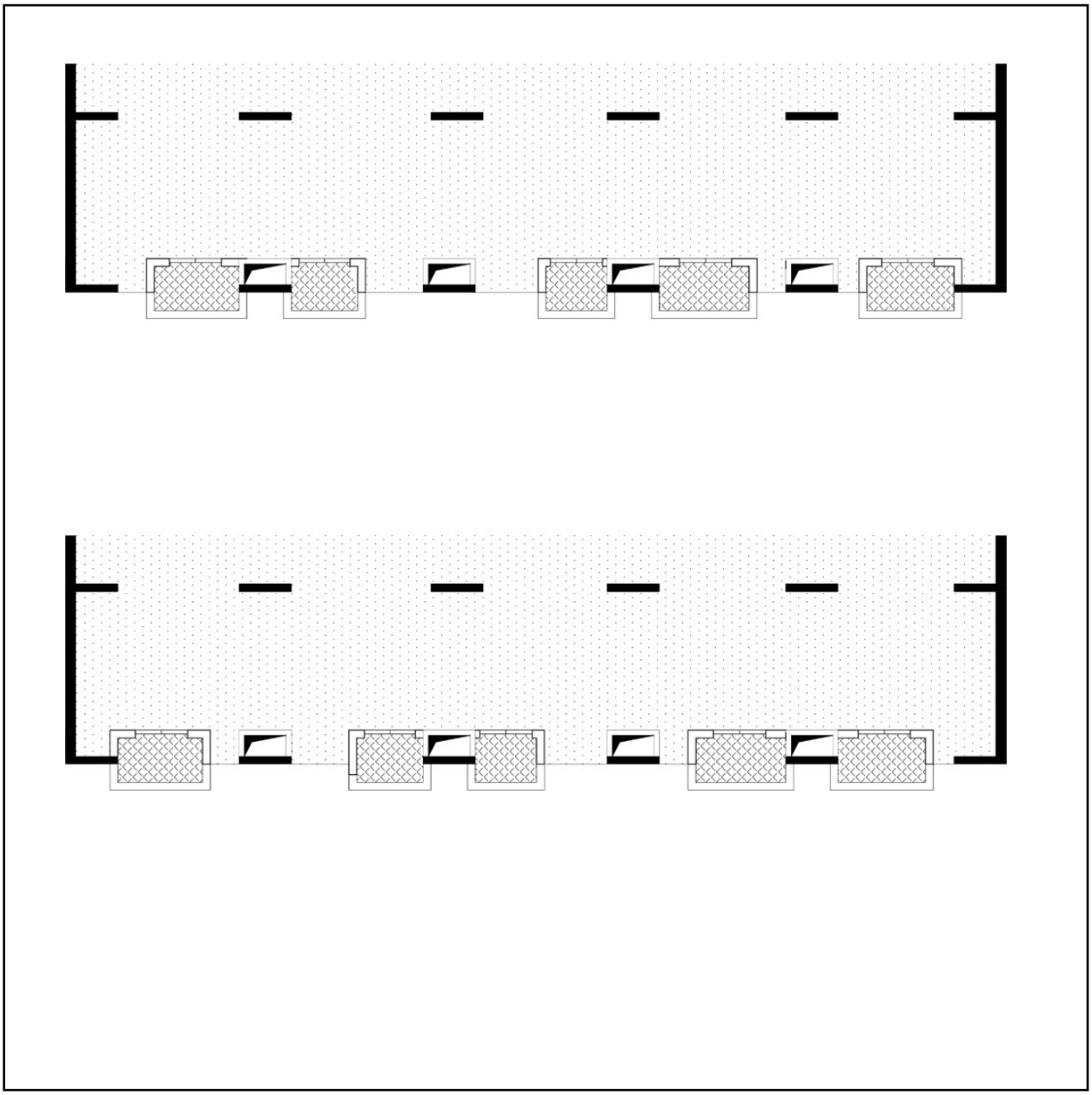
Support



Infill

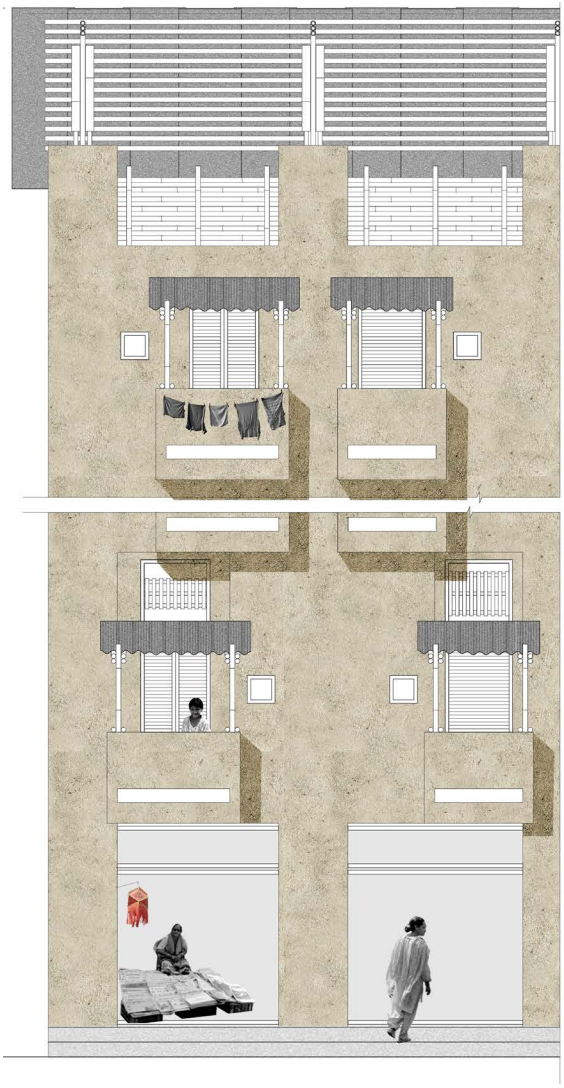
One of the advantages of implementing Open Building approach is the social mix. In this condition there will be different unit size in every floor.

Mechanical Shaft

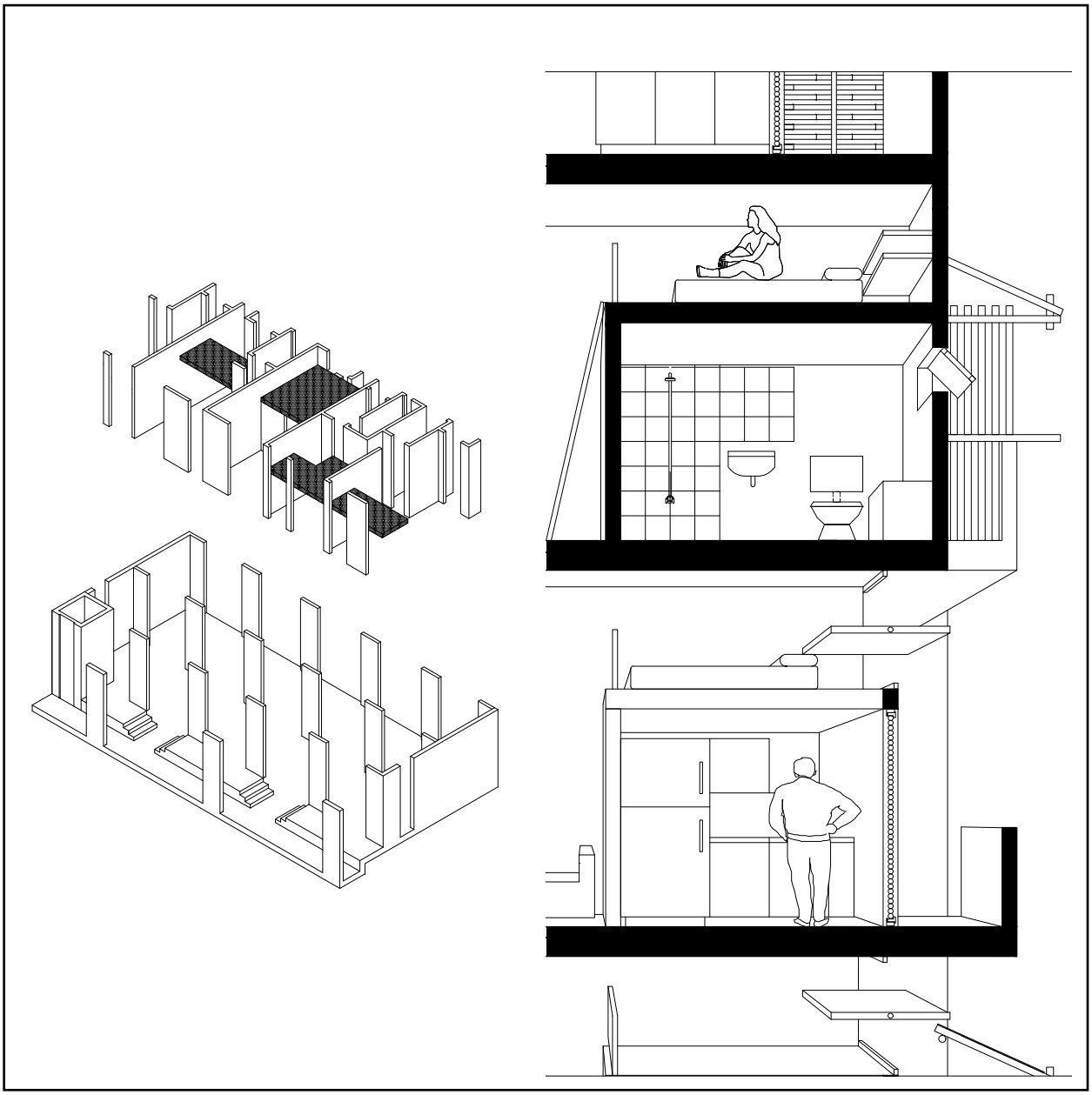


Mechanical shafts on the facade allows flexibility of layout of the balconies. The location of the balconies can be shifted between every two mechanical shafts, which results in less monotony in the facades.

Windows' Position

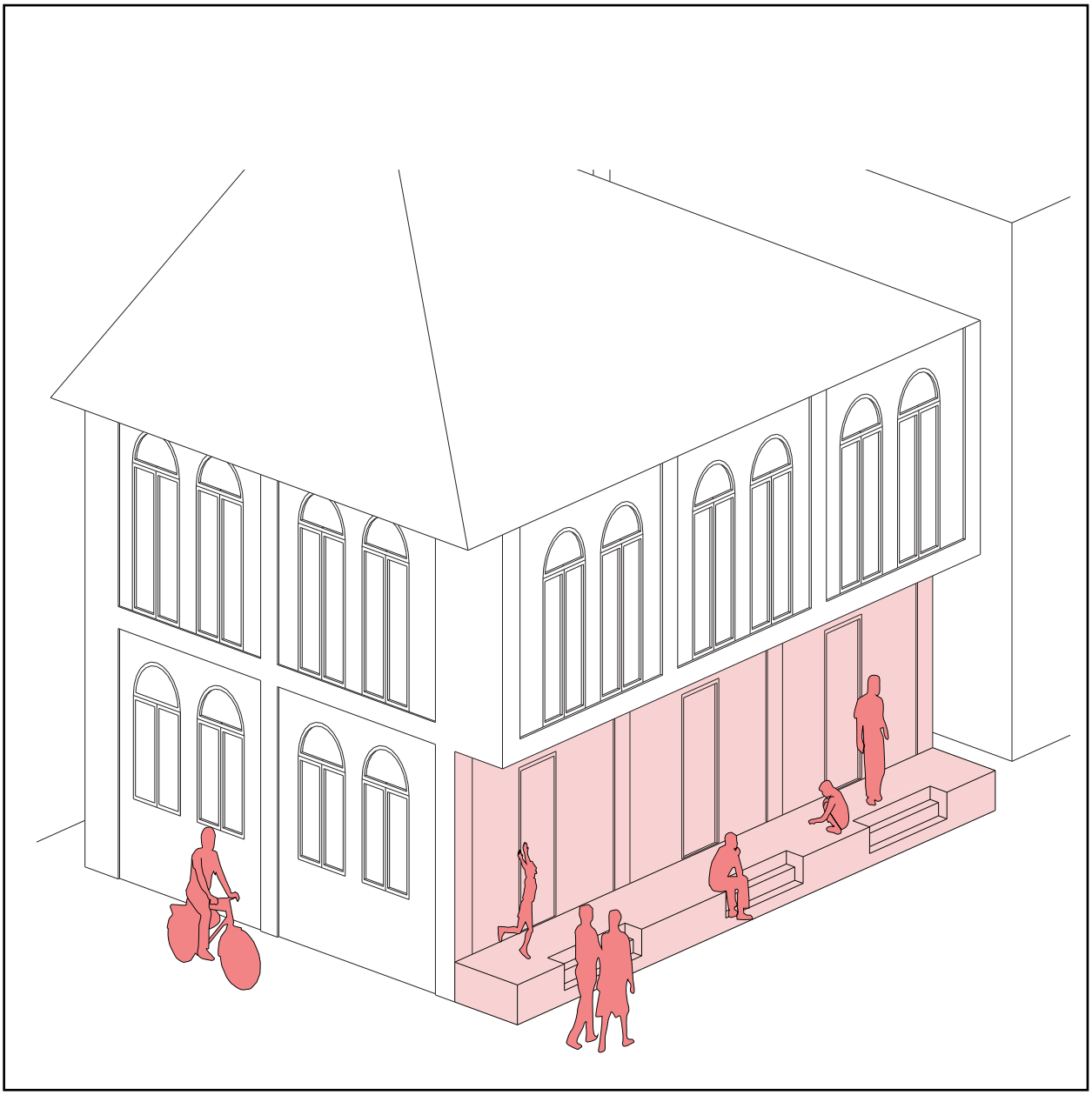


Vertical Growth



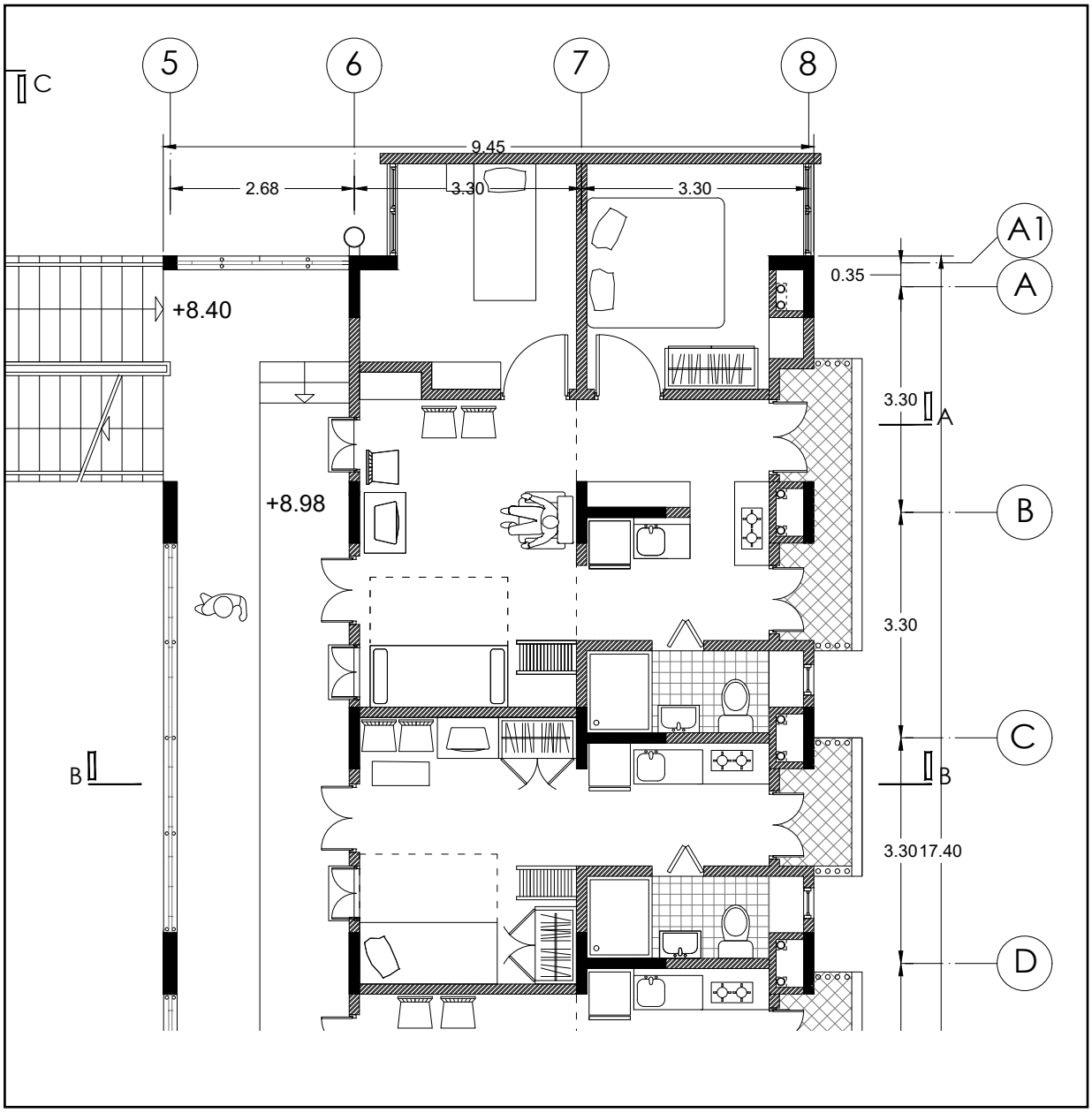
The height of dwelling units is considered as 3.6 meter which allows for a loft area of 1.2-meter height which is located in the top of the toilet and the kitchen. Adding ceiling is a possible future growth in the housing units that can happen anywhere else apart from on the top of kitchen and toilet. The layout of the windows is considered in a way that allows enough ventilation and air even if the entire space will be covered with loft.

Ottla



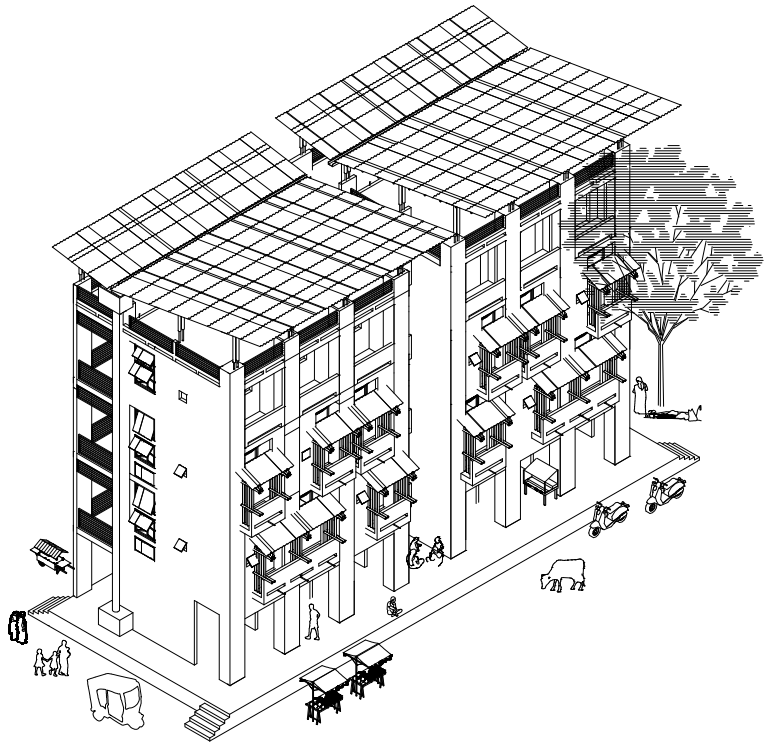
In the patterns of inhabitation that is done in the area of Nallasopara, Ottla is found as an element which works as the extension of living area toward the street.
It is aimed to bring back this quality to the galleries in the height.

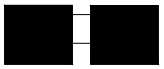
Floor Plan Layout



The quality of Ottla is visible in the floor plan. The layout of the units are quite simple. The living area which is more public is located close to the Ottla and gallery while the balcony in in the more intimate side of the house where toilet and kitchen are located.

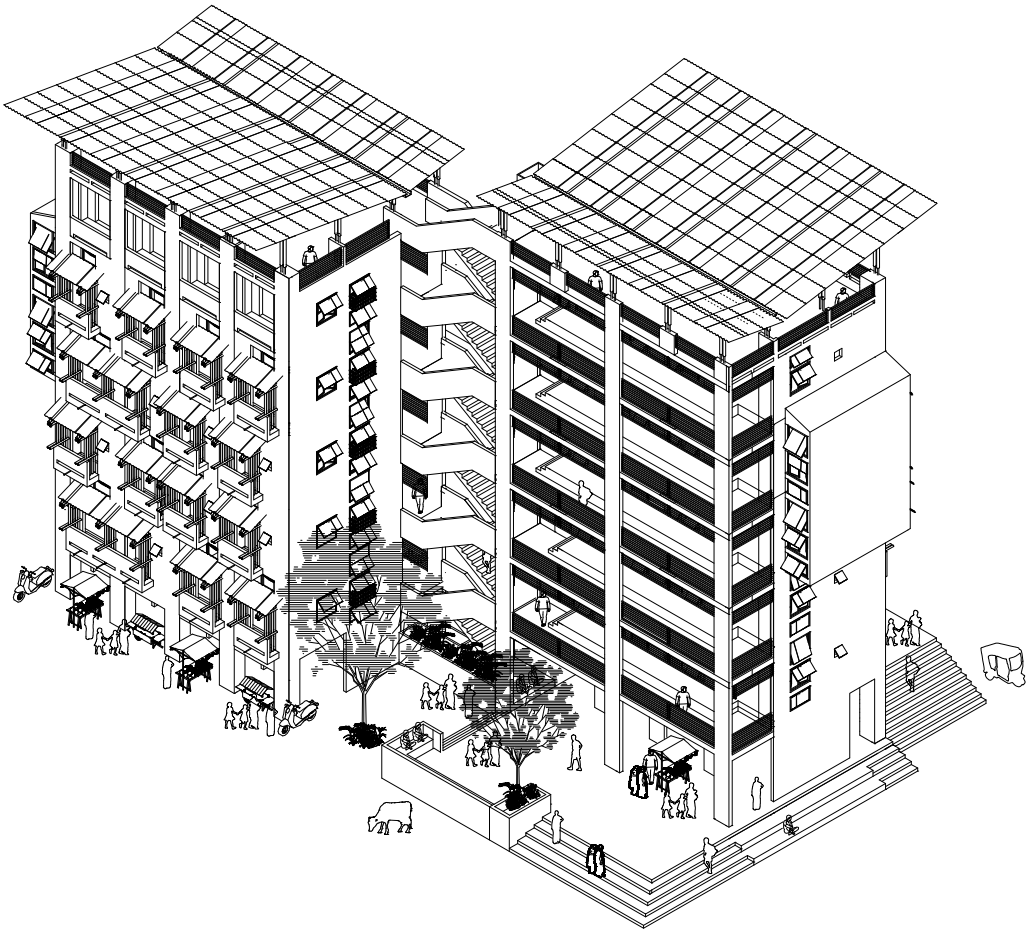
Buildings' Shape



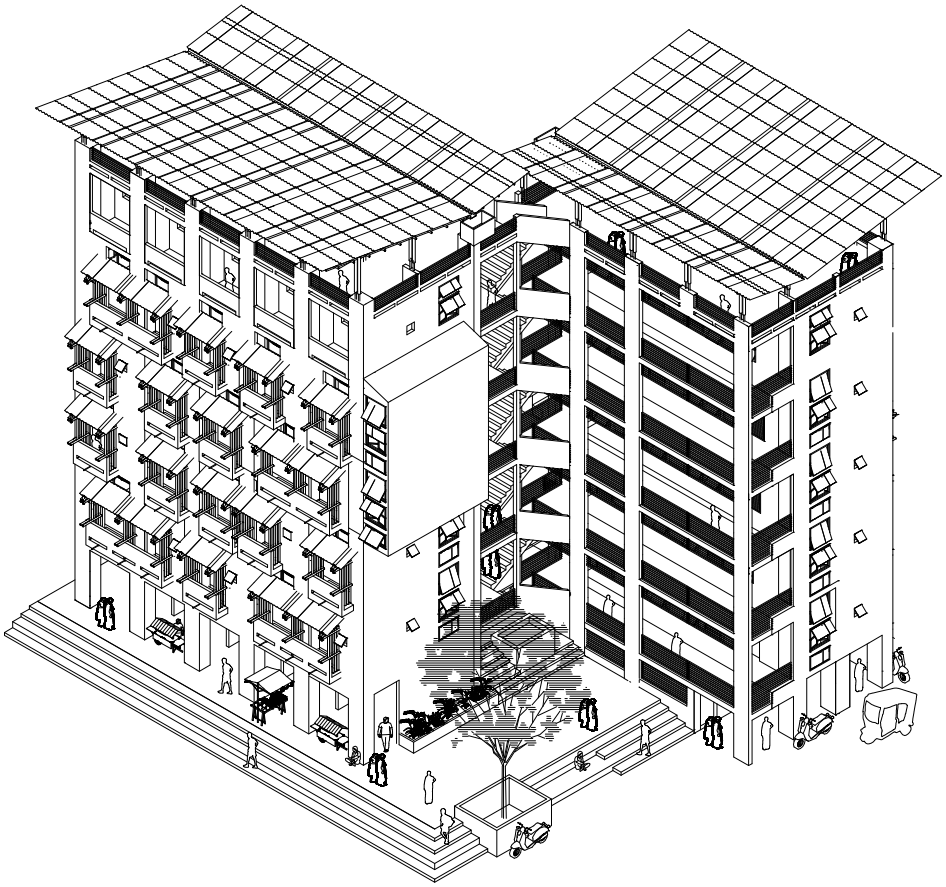


This system brings a variety of building forms due to the height difference and the position of the staircase that is normally shared between two apartment blocks.

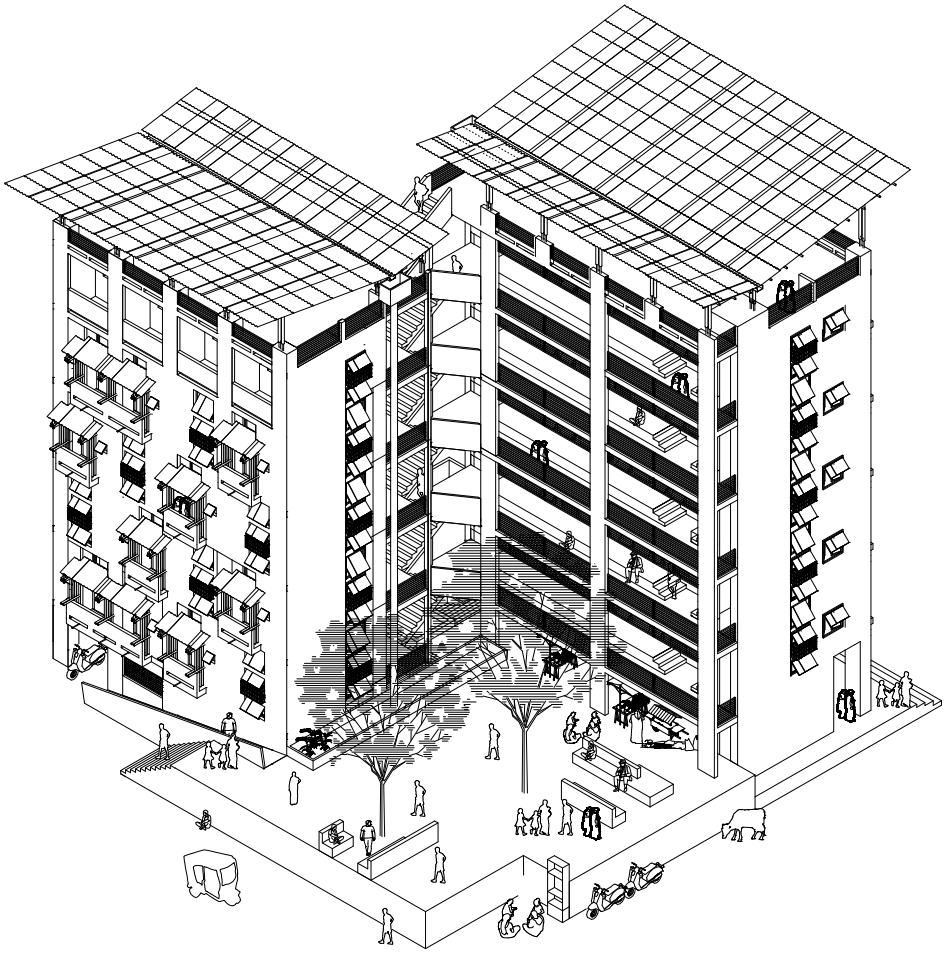
Buildings' Shape



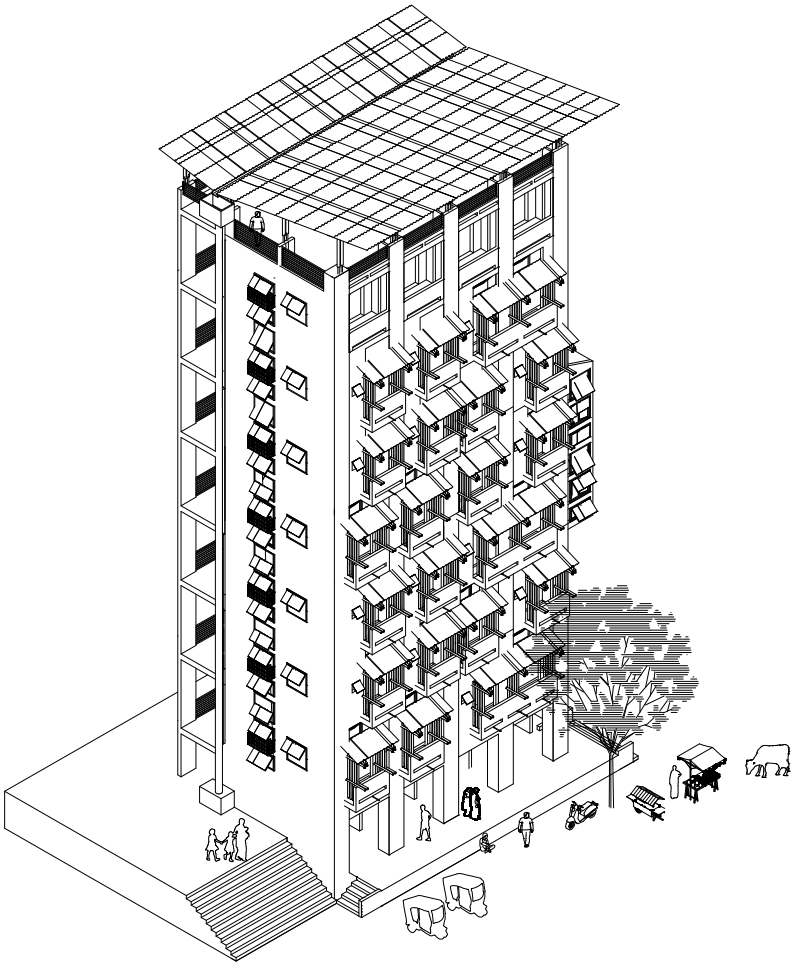
Buildings' Shape



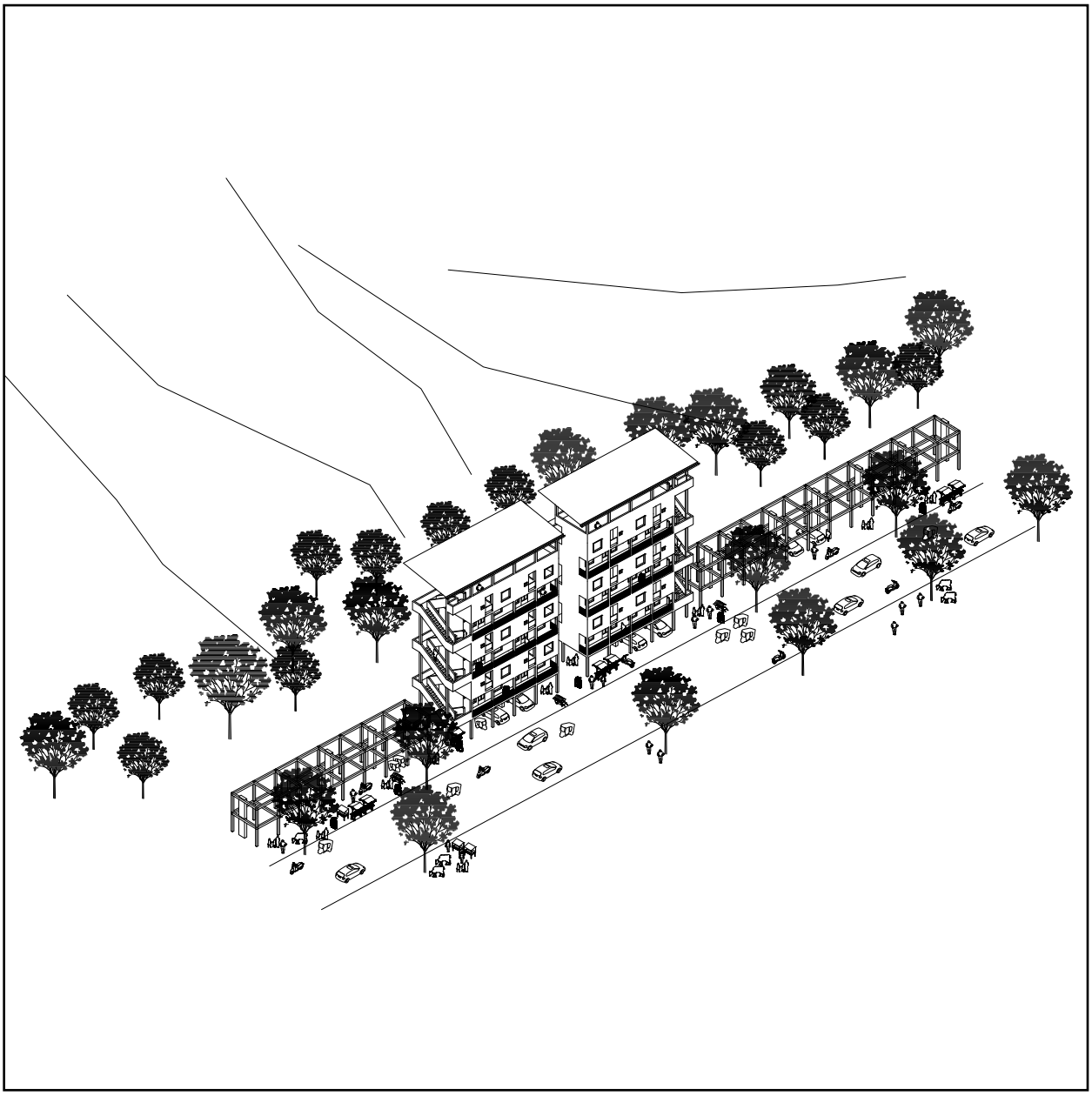
Buildings' Shape



Buildings' Shape



Building As a Barrier



This type of building is more site-specific because of its particular position. The Block which is on the edge of the hill is designed to stimulate more usage of the hill as a gateway toward the recreational pathway on the hill. This slender type comprises of a row on units of 20 square meters along the galleries which flip in every either floor to use the view of the street as well as view of the hill. This type which is named as Wall functions as the transit camp for people whom their houses are under construction in the redevelopment area.

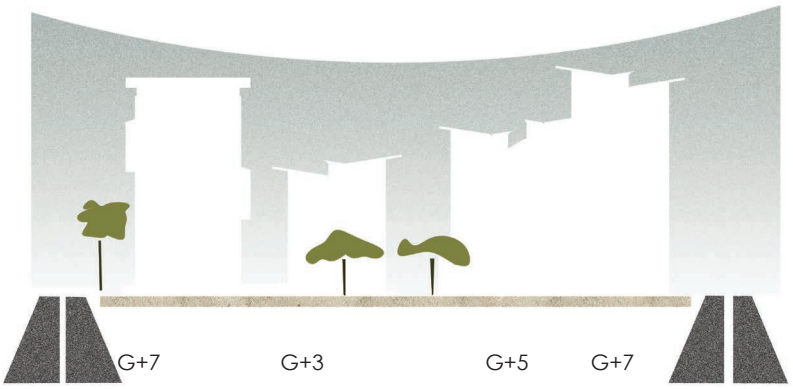
Beside the gateways, a bare structure of two floors with infrastructures are built to prevent future encroachment toward the hill. People should pay for the structure and infrastructures to get the permission of building their own house inside that bare structure.

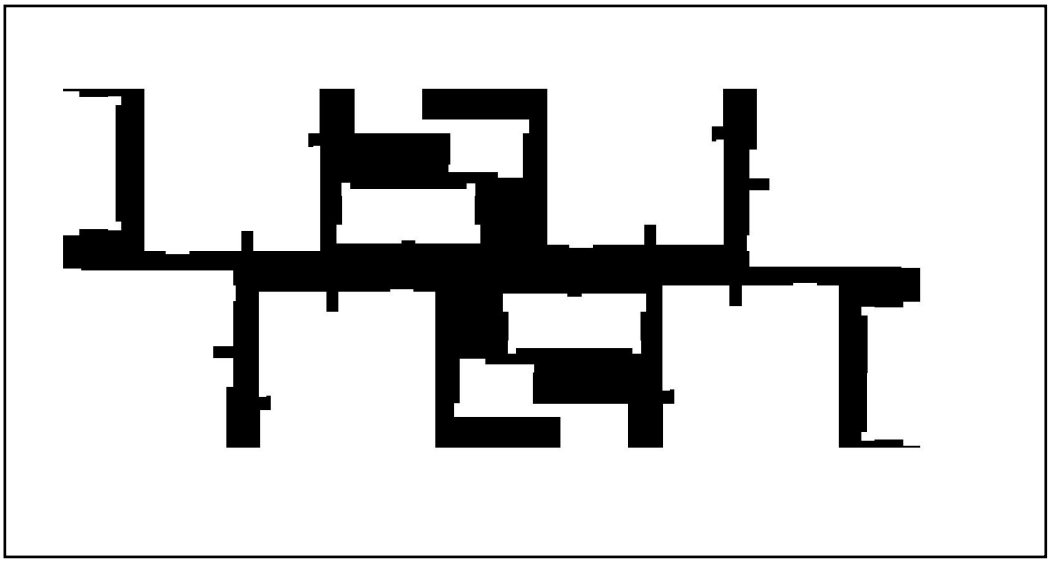
Building As a Barrier

Proposal
Clustering

Cluster Types

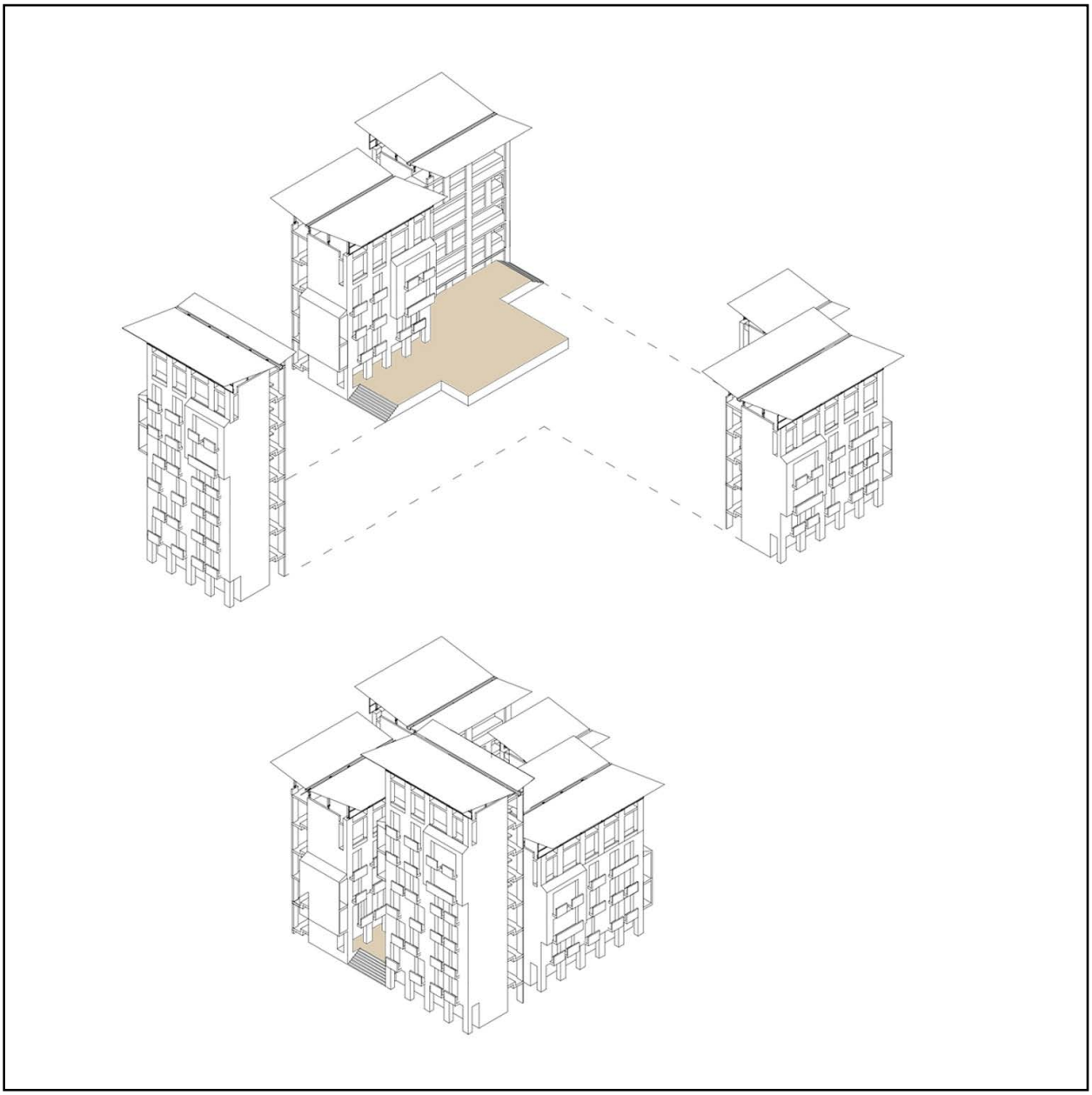
Clustering Principles



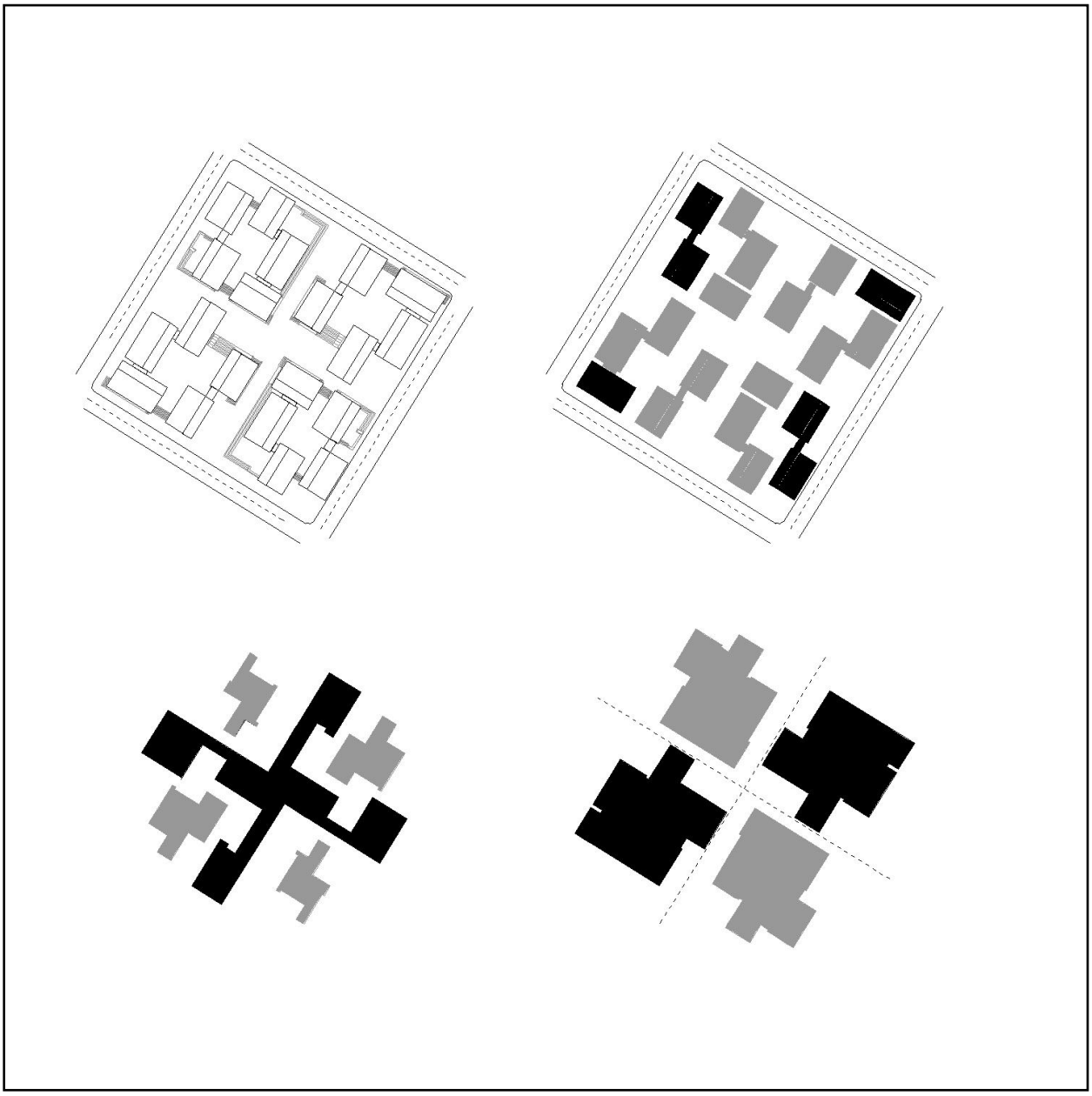


Height of the blocks and the quality of open space are two determining factors in design of clusters.

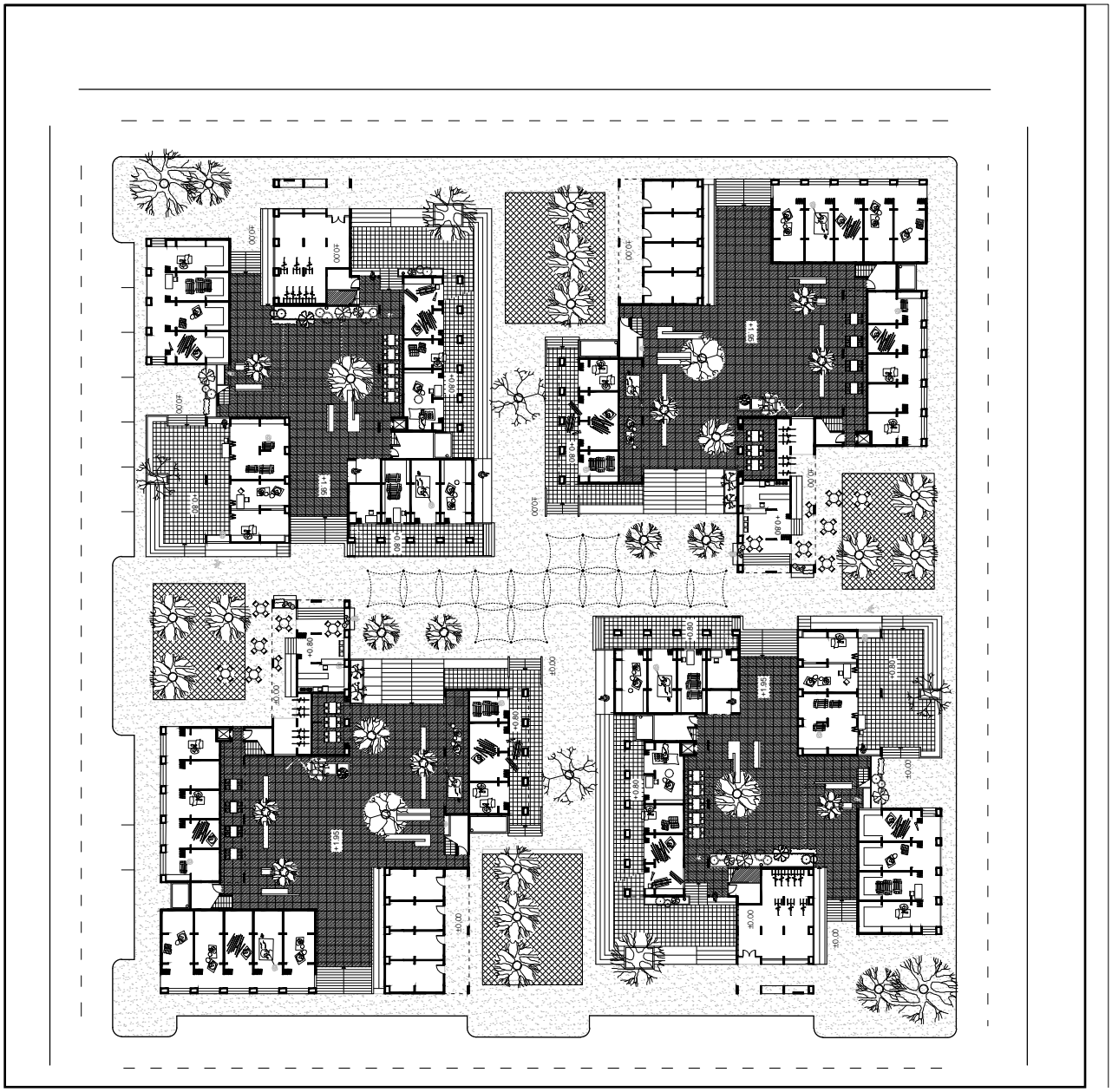
Building Block



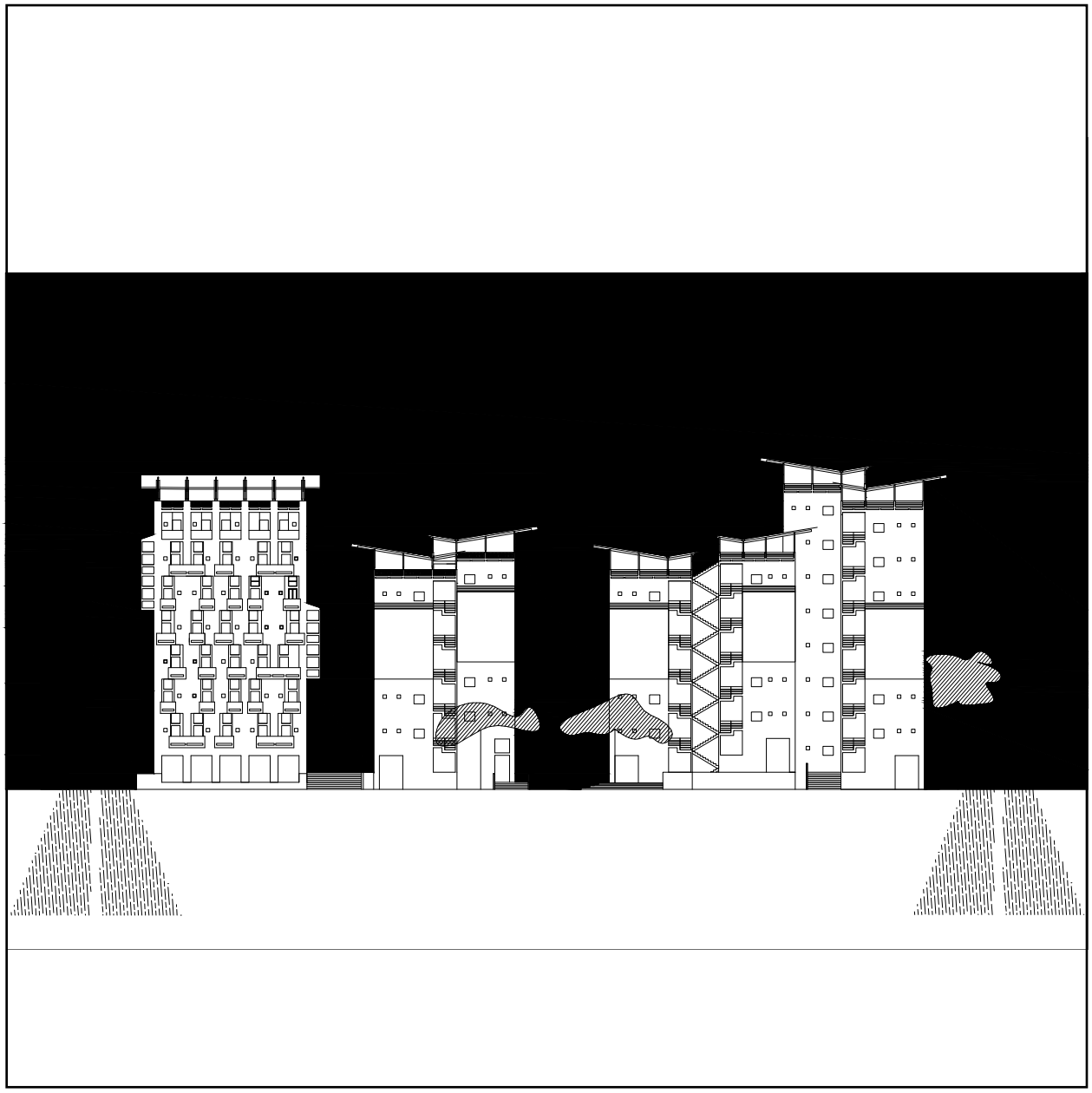
Cluster Type A



Cluster Type A

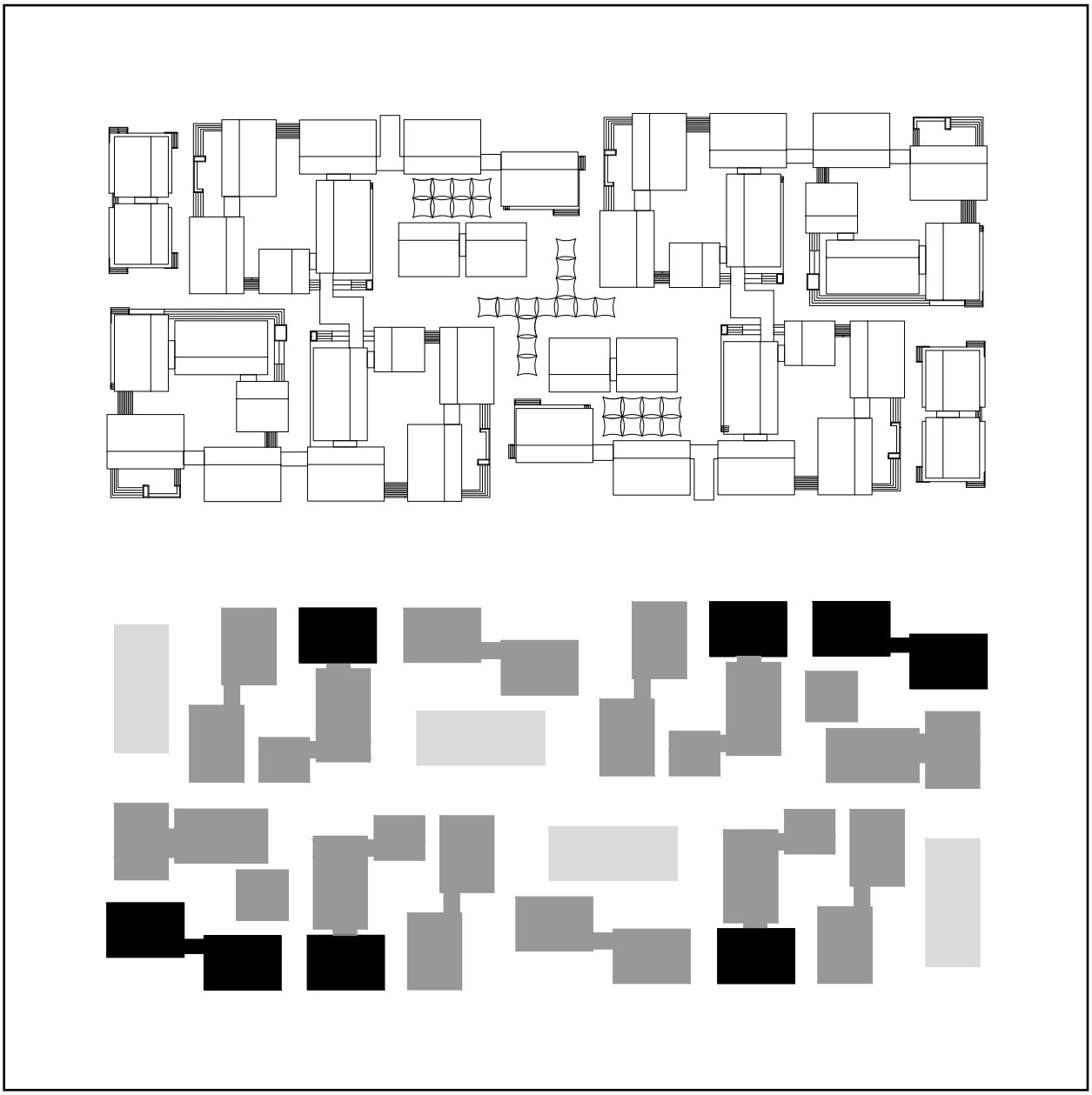


Cluster Type A

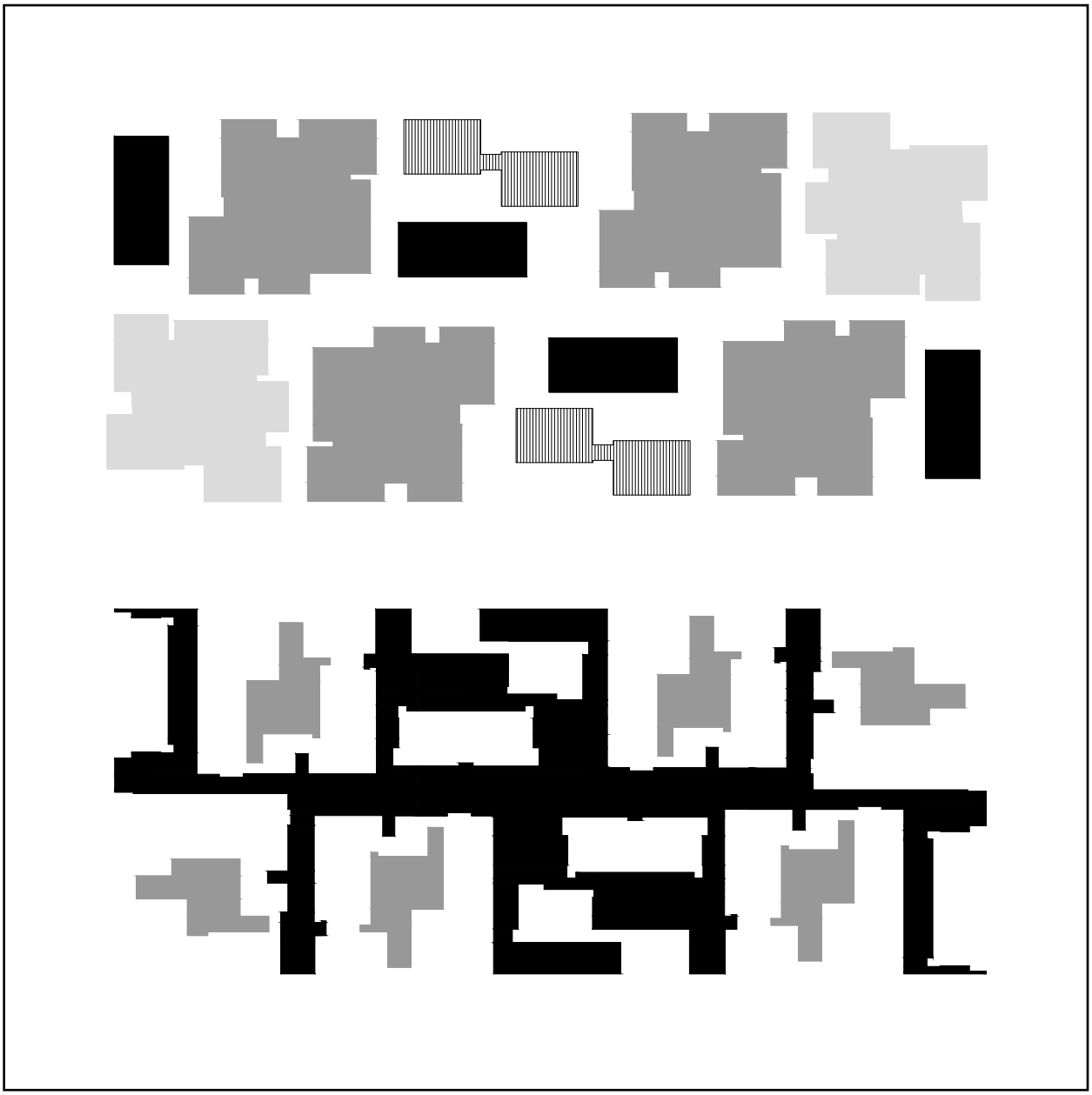


Cluster Type A

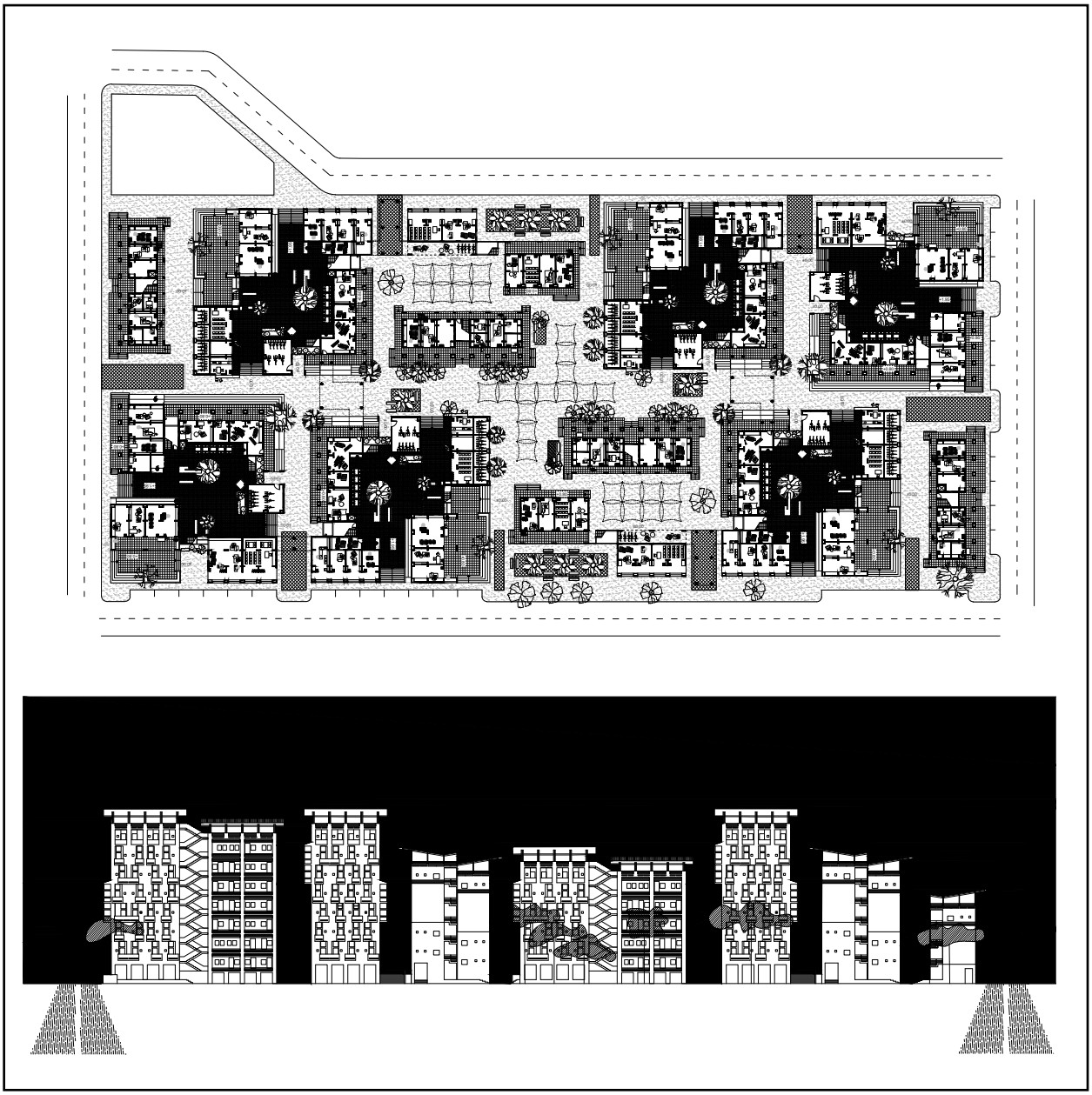
Cluster Type B

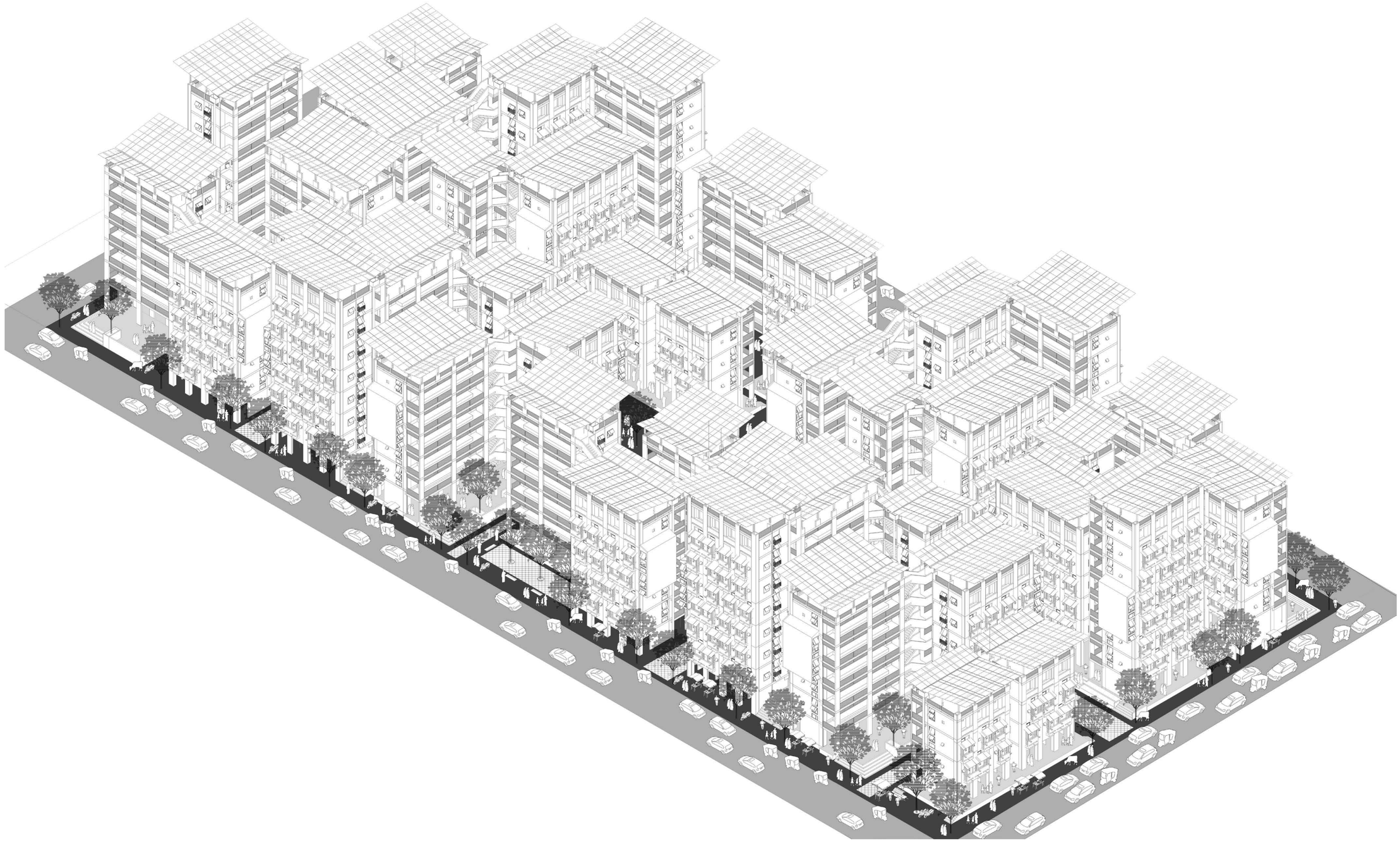


Cluster Type B

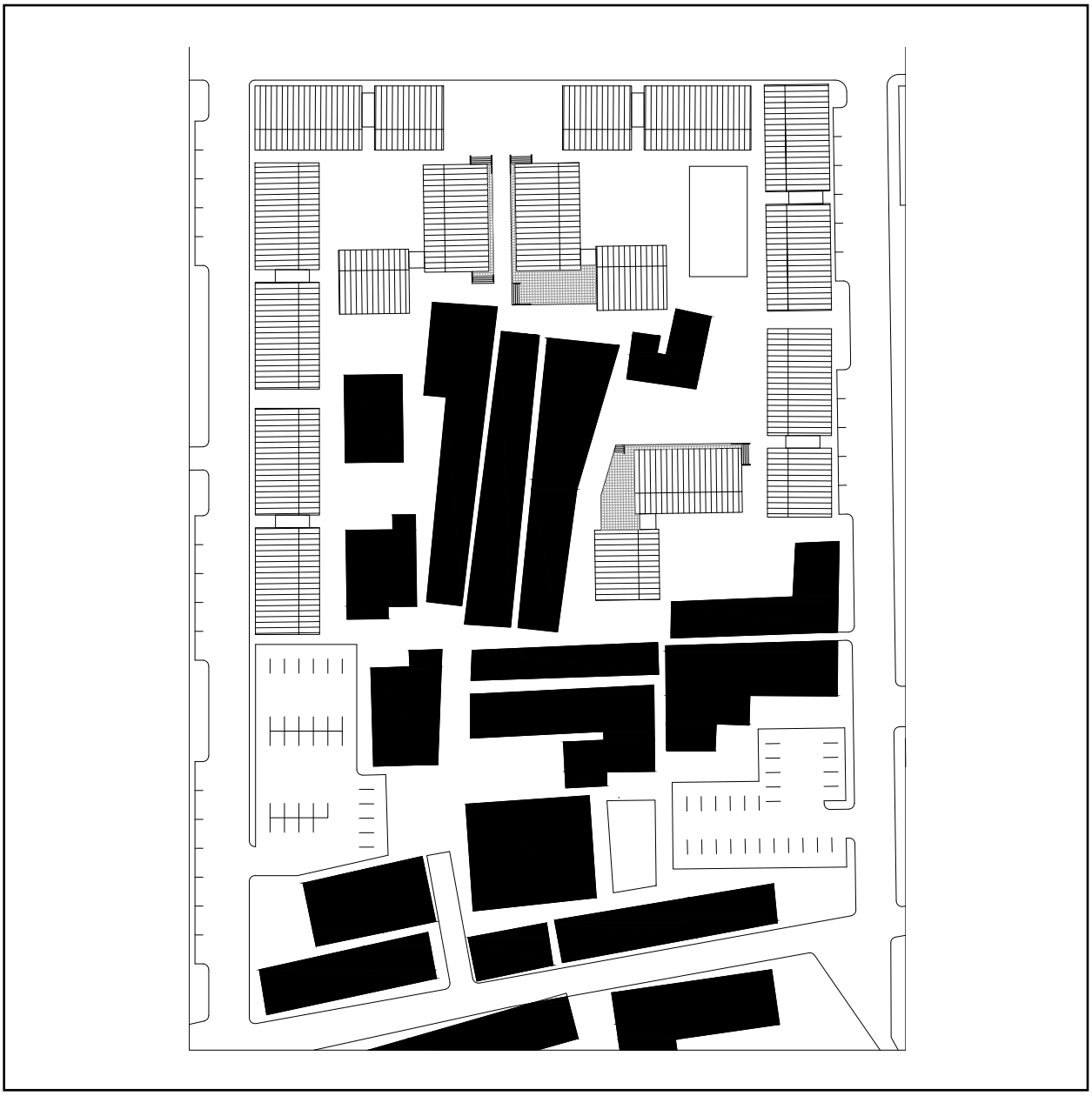


Cluster Type B

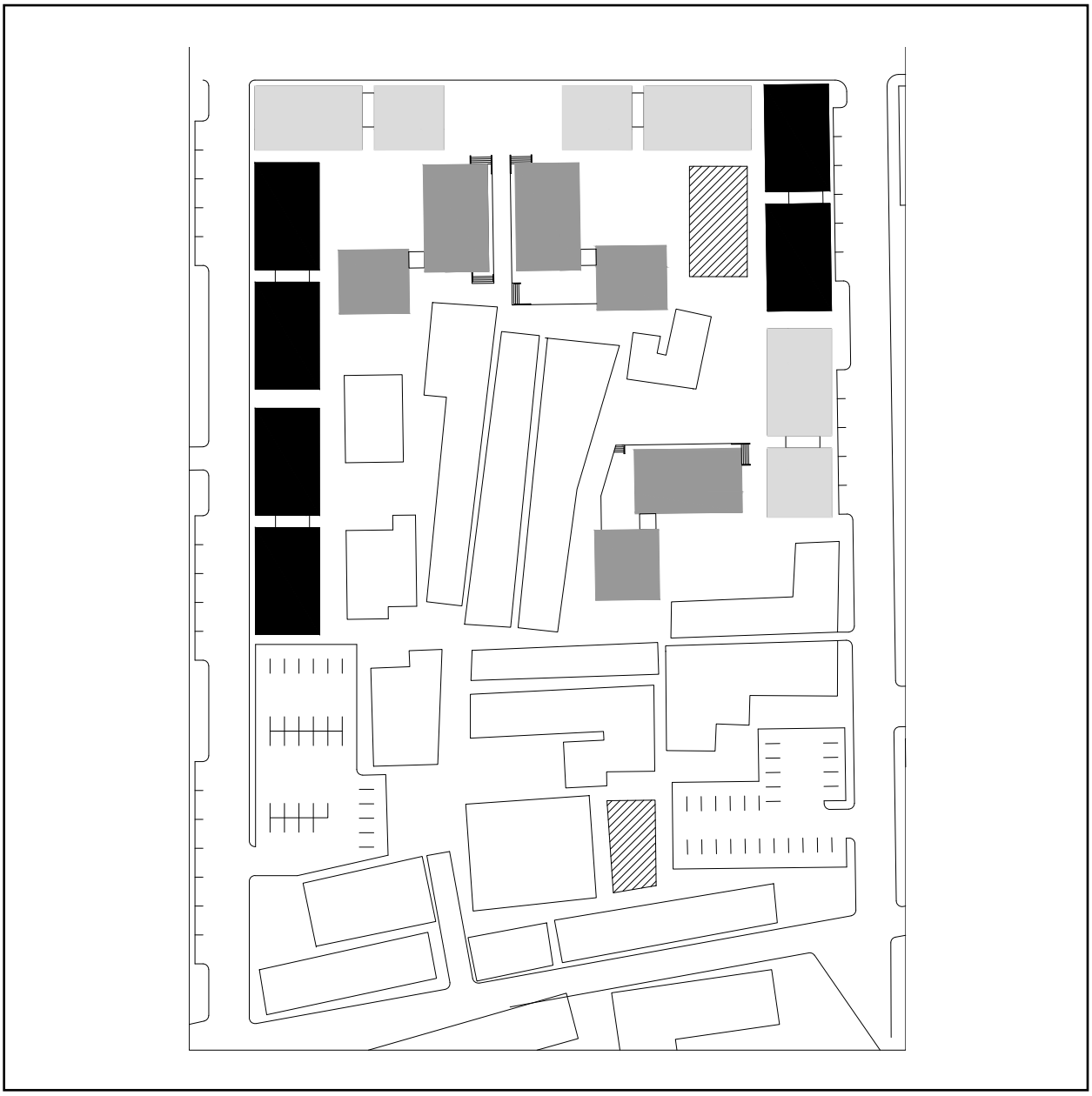




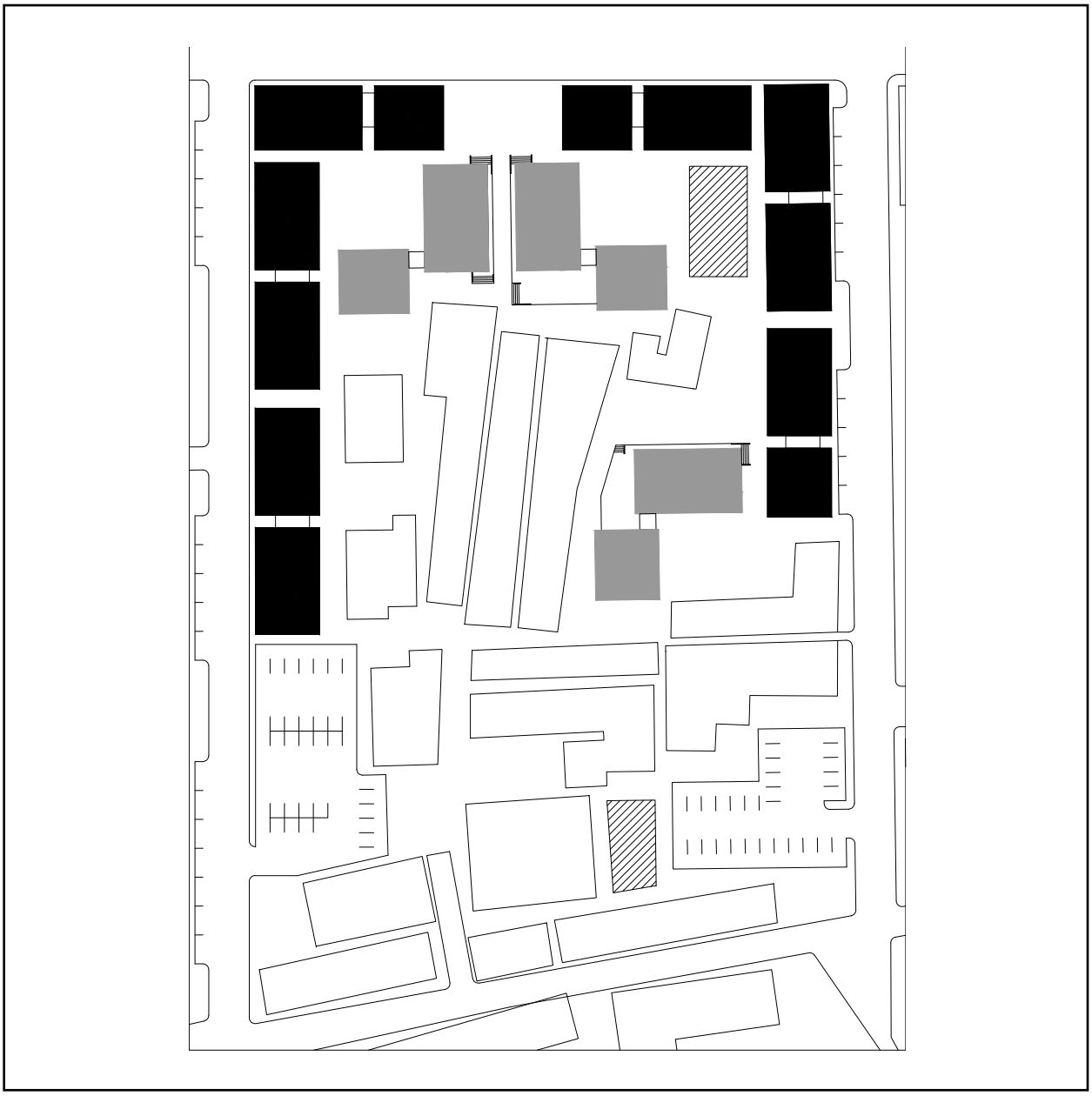
Cluster Type C



Cluster Type C

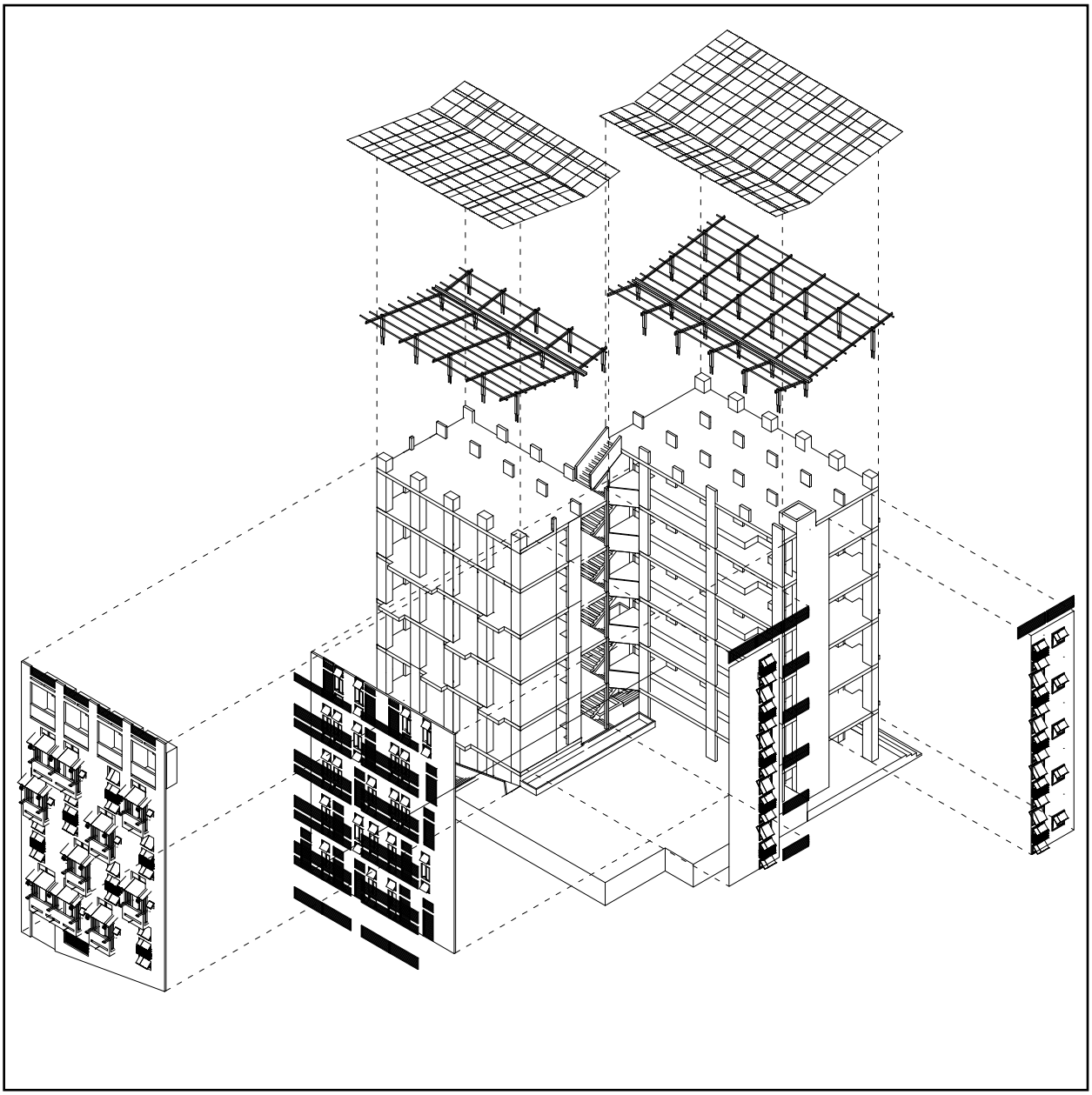


Cluster Type C

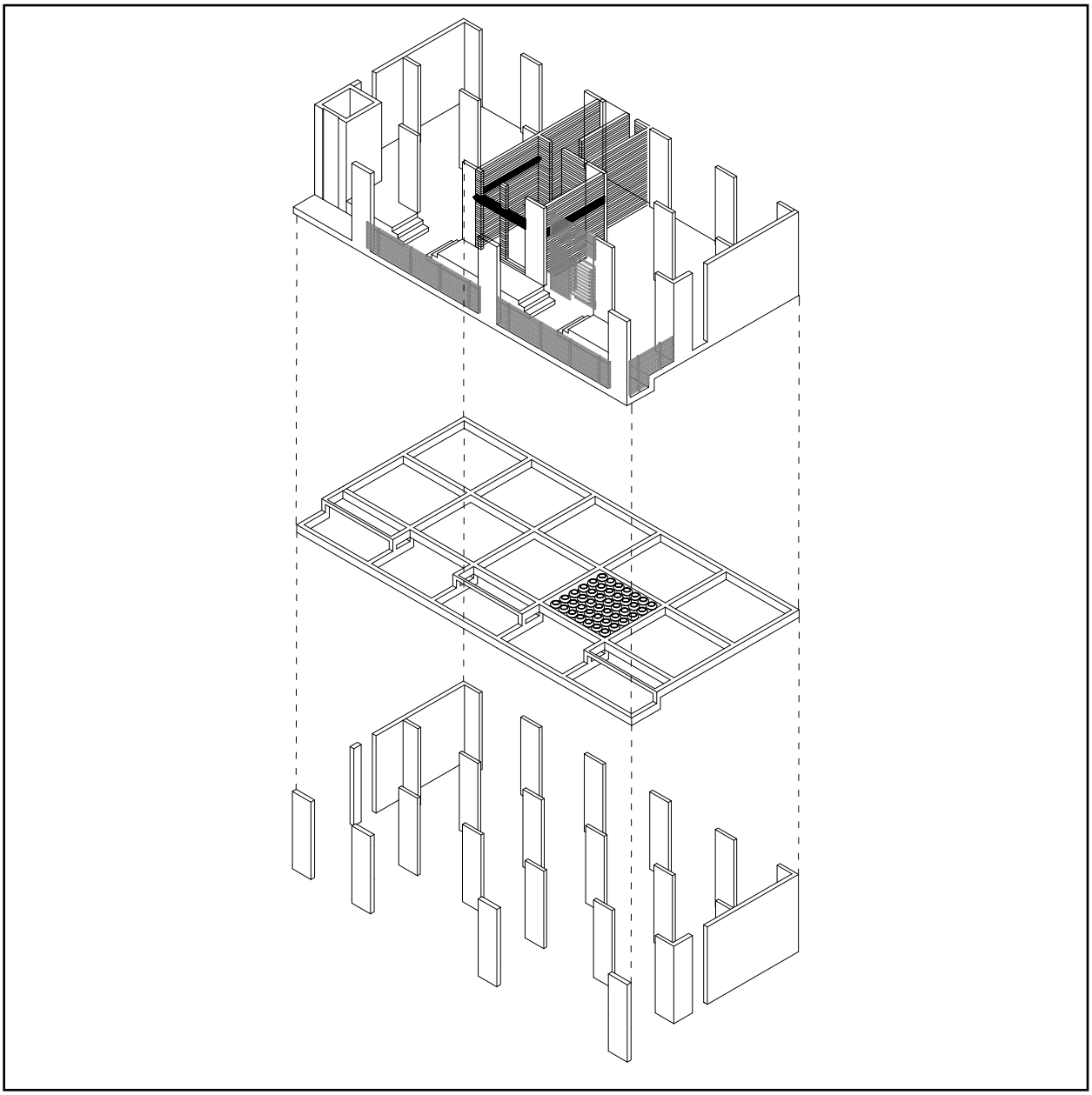


Proposal
Building Technology

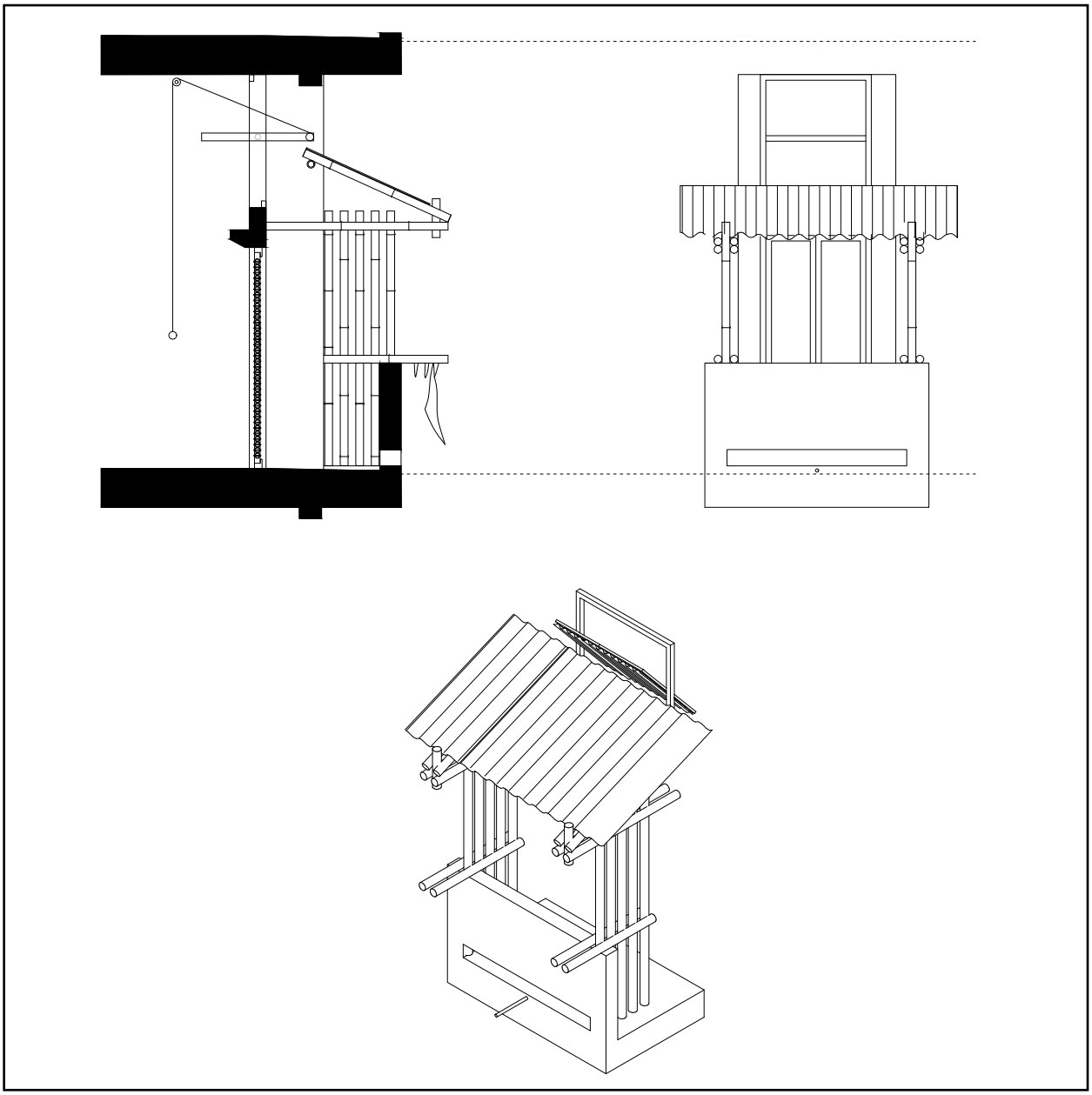
Building's Elements



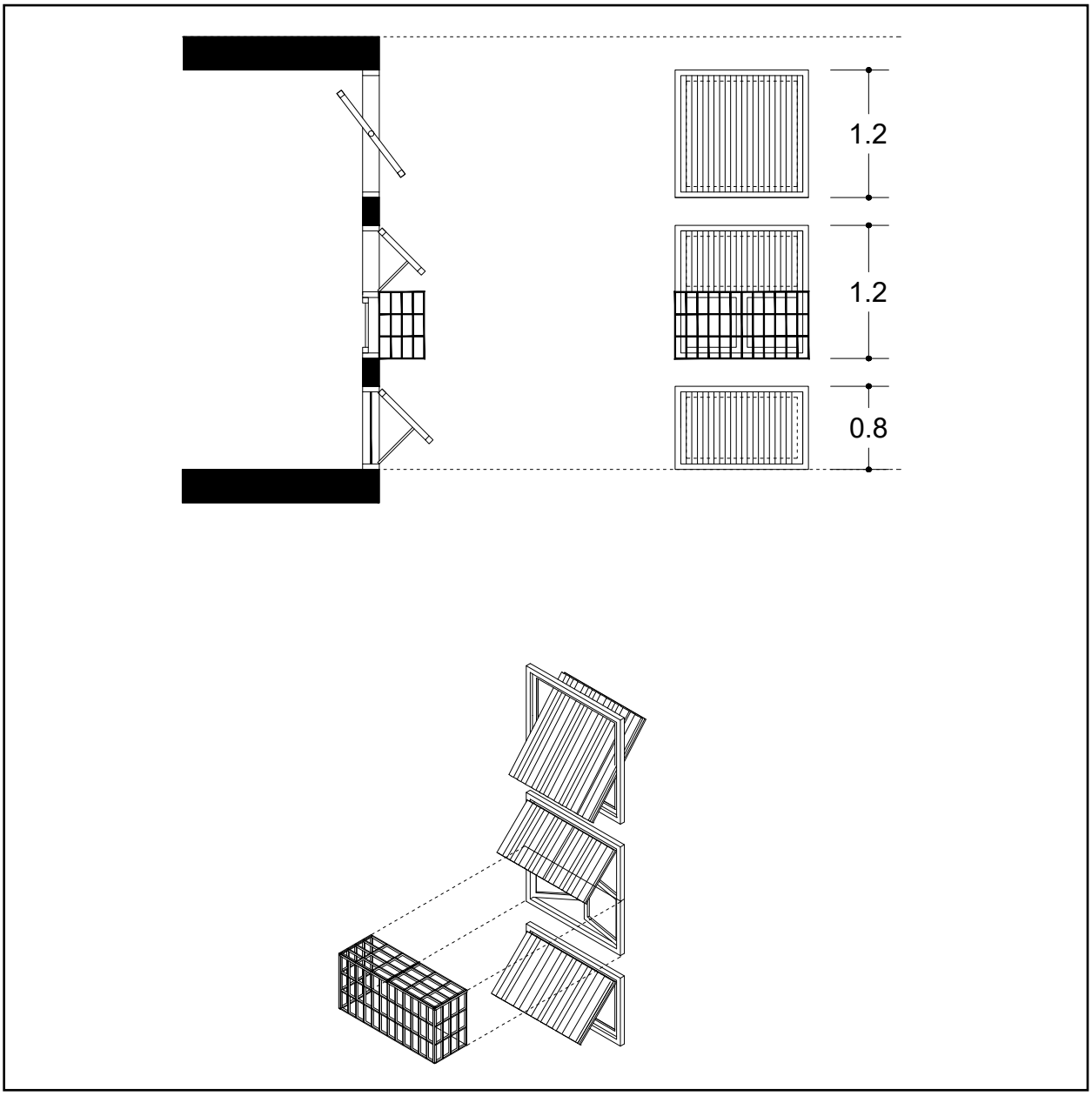
Building's Elements



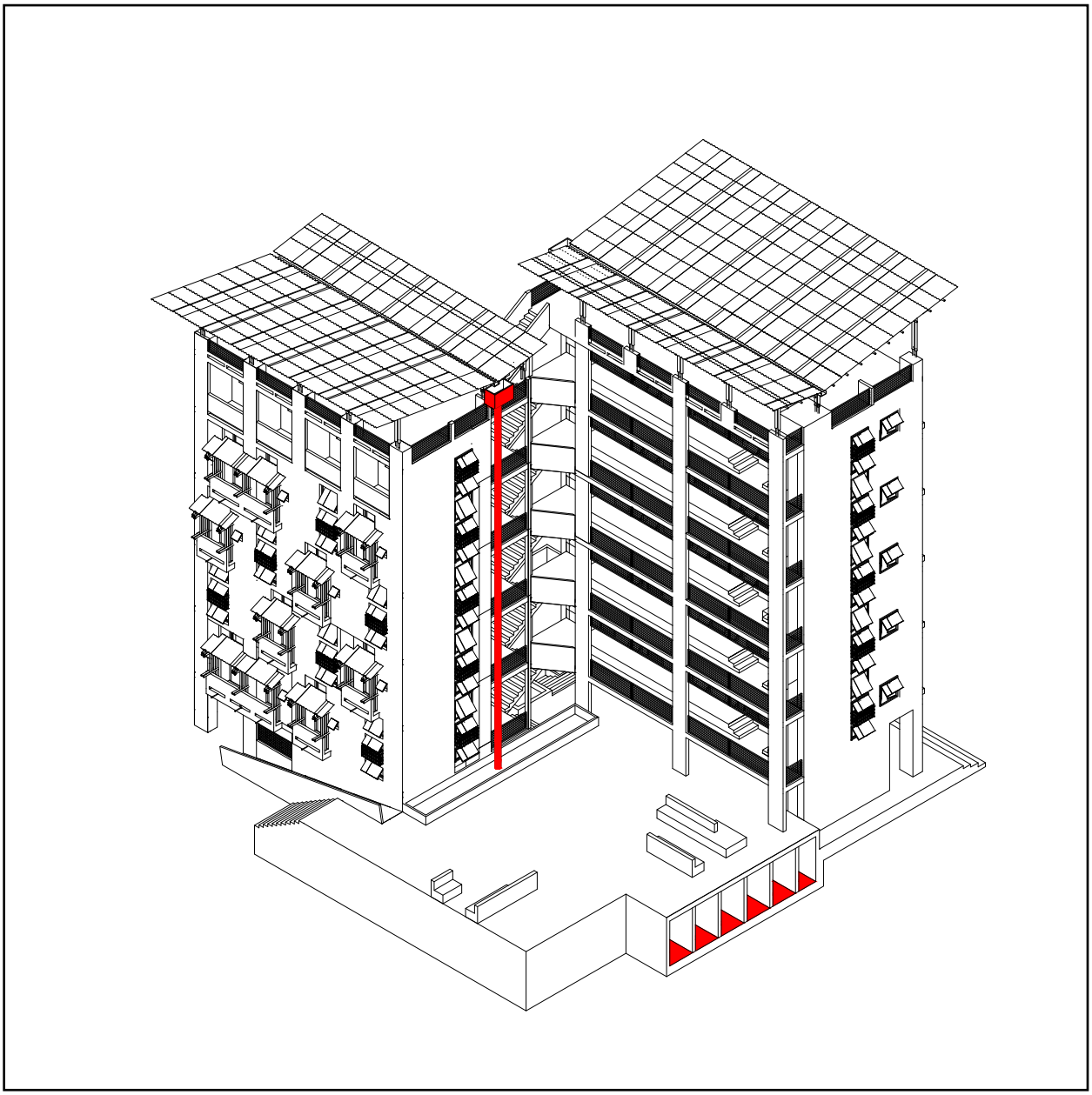
Building's Elements



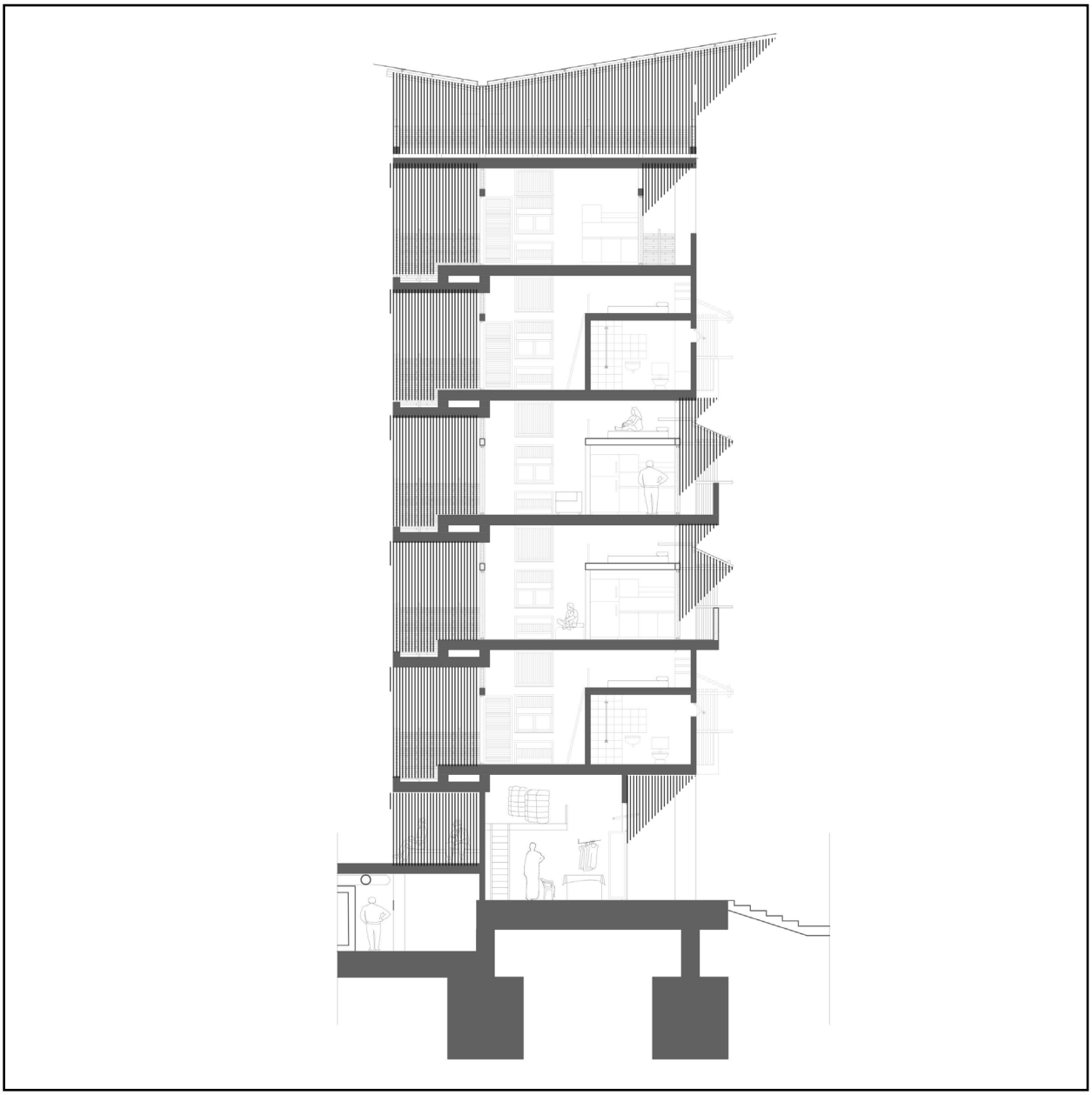
Building's Elements



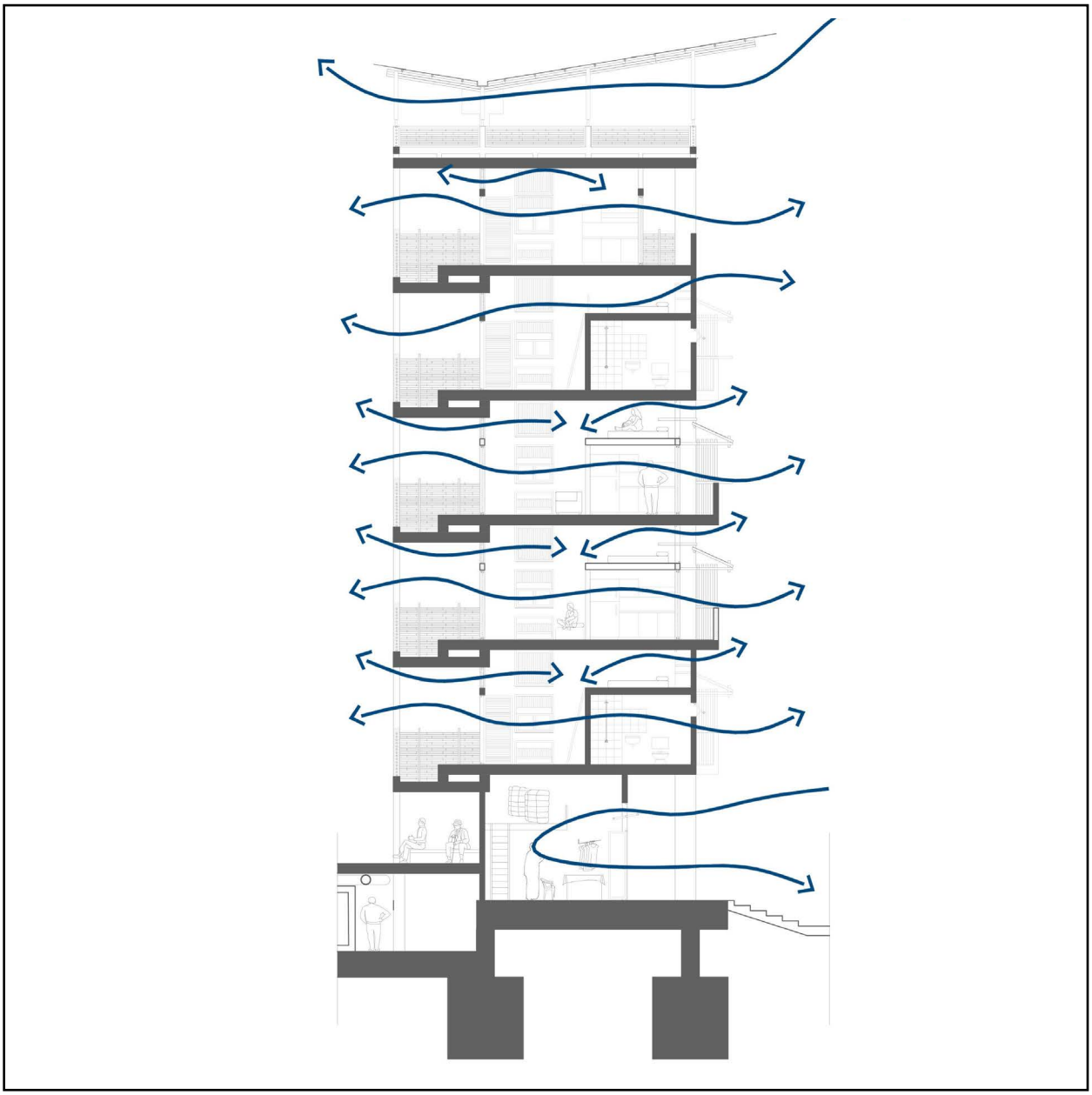
Building's Elements



Shaded Area



Natural Ventilation



Figures & Comparisons

Density and FSI

Proposed Height Mix	Number of Dwelling units	Number of Shops/Workshops	Population	Built up Area (sq.m)
Integrated into context Cluster	472	38	1888	21791.6
Cricket Field Cluster	526	76	2104	14021
Rectangular shaped Cluster	706	138	2824	38792
Square shaped Cluster	492	88	1960	23578
Wall	216	36	864	9412.2
Bare Structure	61		244	1220
Filling Blocks	594	65	2376	23110
Amenities				46835
Total	**3067 units**	**441**	**12260**	**178760**

Height of G+7 for all	Number of Dwelling units	Number of Shops/Workshops	Population	Built up Area (sq.m)
Integrated into context Cluster	472	38	1888	21791.6
Cricket Field Cluster	500	80		24223.7
Rectangular shaped Cluster	600	136	2400	43743
Square shaped Cluster	496	76		24223.7
Wall	216	36	864	9412.2
Bare Structure	61		244	1220
Filling Blocks	594	65		28937
Amenities				65177
Total	**2939 units**	**431**		**217630.2**

	Height as proposed	Height of G+7 for All the blocks
Area of the site (sq.m)	85680	85680
Open space (sq.m)	35942	35942
Population	9696	12012
Roads (sq.m)	22760.6	22760.6
Density (unit/hectar)	667	785
FSI	2.14	2.45

Cluster	Name	number	volume	Number of Units	Area of Unit (Sq.m)	Area of Corridors (Sq.m)	Number of floors	Dwelling Units	Area of Units (Sq.M)	Area of Corridors	shops/work shops	Built Up Area of Housing Blocks(Sq .M)	Built Up Area of cluster(Sq .M)	Plot Size (Sq.M)	FSI of plot	Dwelling per Hectar of Plot	Population (4 Person per Unit)
Cluster A	Block 1	2	Parallel	8.0	25.7	73.3	5.0	40.0	1028.0	366.6	8.0	1394.6					
			L shaped	10.0	23.0	87.0	5.0	50.0	1150.0	435.0	10.0	1585.0					
			Single Block	5.0	22.3	46.9	7.0	35.0	780.5	328.3	5.0	1108.8					
	Block 2	2	Parallel	8.0	27.0	87.0	7.0	56.0	1512.0	609.0	8.0	2121.0					
			L shaped	9.0	26.2	73.9	5.0	45.0	1179.0	369.4	9.0	1548.4					
			Single Block	4.0	20.0	35.3	5.0	20.0	400.0	176.3	4.0	576.3					
	Amenities	0							2827.0								
								492.0	12099.0		88.0	16668.0	19495.0	9137.0	2.1	538.5	1960.0
Cluster B	Block 3	4	Parallel	8.0	27.0	70.0	5.0	40.0	1080.0	350.0	8.0	1430.0					
			L shaped	7.0	35.6	53.9	5.0	35.0	1246.0	269.6	7.0	1515.6					
			Single Block	4.0	27.0	35.3	7.0	28.0	756.0	247.1	4.0	1003.1					
	Block 4	2	Parallel	8.0	27.0	66.0	7.0	56.0	1512.0	462.0	8.0	1974.0					
			L shaped	7.0	26.5	65.6	5.0	35.0	927.5	328.0	7.0	1255.5					
			Single Block	5.0	27.0	35.2	5.0	20.0	675.0	176.0	4.0	851.0					
	[redacted]	2	Central Block	6.0	26.4	54.0	5.0	18.0	792.0	270.0	6.0	1062.0					
		2	Border Block	6.0	26.4	54.0	7.0	18.0	1108.8	378.0	6.0	1486.8					
	Amenities	0							2496.0								
								706.0	22358.6		138.0	29053.4	31549.4	15338.0	2.1	460.3	2824.0
Cluster C	[redacted]	3	L shaped	10.0	23.0	87.0	5.0	50.0	1150.0	435.0	10.0	1585.0					
		3	Border Block 1	8.0	26.0	66.0	7.0	56.0	1456.0	462.0	8.0	1918.0					
		3	Border Block 2	7.0	26.0	62.0	7.0	56.0	1274.0	434.0	7.0	1708.0					
	Amenities	2							1583.0								
								486.0	11640.0		75.0	15633.0	17216.0	5773.0	3.0	841.8	1944.0
Cluster D	Block 5	2	Parallel	8.0	26.0	70.0	5.0	40.0	1040.0	350.0	8.0	1390.0					
			L shaped	7.0	35.2	53.9	5.0	35.0	1232.0	269.6	7.0	1501.6					
			Single Block	4.0	26.6	35.3	7.0	28.0	744.8	247.1	4.0	991.9					
	Block 6	2	Parallel	8.0	26.7	66.0	7.0	56.0	1495.2	462.0	8.0	1957.2					
			L shaped	7.0	26.0	65.6	5.0	35.0	910.0	328.0	7.0	1238.0					
			Single Block	4.0	26.0	35.2	5.0	20.0	520.0	176.0	4.0	696.0					
	[redacted]	2	L shaped	7.0	25.3	65.6	7.0	49.0	177.1	459.2		636.3					
	Amenities	3							3680.0								
								526.0	12238.2		76.0	8411.0	12091.0	7400.0	1.6	710.8	2104.0
Wall	Block 7	9	Wall	4.0	20.0	39.0	6.0	24.0	480.0	234.0	4.0	714.0					
	Amenities								2235.0								
								216.0	4320.0		36.0	714.0	2949.0	1568.0	1.9	1377.6	864.0
								2426.0			413.0				2.1	785.8	9696.0

Cluster	Name	number	volume	Number of Units	Area of Unit (Sq.m)	Area of Corridors (Sq.m)	Number of floors	Dwelling Units	Area of Units (Sq.M)	Area of Corridors	shops/work shops	Built Up Area of Housing Blocks(Sq. M)	Built Up Area of cluster(Sq. M)	Plot Size (Sq.M)	FSI of plot	Dwelling per Hectar of Plot	Population (4 Person per Unit)
Cluster A	Block 1	2	Parallel	8	25.7	73.3	7	56	1439.2	513.2	8	1952.4					
			L shaped	10	23.0	87.0	7	70	1610.0	609.0	10	2219.0					
			Single Block	5	22.3	46.9	7	35	780.5	328.3	5	1108.8					
	Block 2	2	Parallel	8	27.0	87.0	7	56	1512.0	609.0	8	2121.0					
			L shaped	9	26.2	73.9	7	63	1650.6	517.1	9	2167.7					
			Single Block	4	20.0	35.3	7	28	560.0	246.8	4	806.8					
	Amenities	0							2827.0								
								616	15104.6		88	20751.4	23578.4	9137	2.6	674.2	2464
Cluster B	Block 3	4	Parallel	8	27.0	70.0	7	56	1512.0	490.0	8	2002.0					
			L shaped	7	35.6	53.9	7	49	1744.4	377.4	7	2121.8					
			Single Block	4	27.0	35.3	7	28	756.0	247.1	4	1003.1					
	Block 4	2	Parallel	8	27.0	66.0	7	56	1512.0	462.0	8	1974.0					
			L shaped	7	26.5	65.6	7	49	1298.5	459.2	7	1757.7					
			Single Block	5	27.0	35.2	7	35	945.0	246.4	4	1191.4					
	[redacted]	2	Central Block	6	26.4	54.0	7	42	1108.8	378.0	6	1486.8					
		2	Border Block	6	26.4	54.0	7	42	1108.8	378.0	6	1486.8					
	Amenities	0							2496.0								
								980	27995.8		138	36301.2	38797.2	15338	2.5	638.9	3920
Cluster C	[redacted]	3	L shaped	10	23.0	87.0	7	70	1610.0	609.0	10	2219.0					
		3	Border Block 1	8	26.0	66.0	7	56	1456.0	462.0	8	1918.0					
		3	Border Block 2	7	26.0	62.0	7	49	1274.0	434.0	7	1708.0					
	Amenities	2							1583.0								
								525	13020.0		75	17535.0	19118.0	5773	3.3	909.4	2100
Cluster D	Block 5	2	Parallel	8	26.0	70.0	7	56	1456.0	490.0	8	1946.0					
			L shaped	7	35.2	53.9	7	49	1724.8	377.4	7	2102.2					
			Single Block	4	26.6	35.3	7	28	744.8	247.1	4	991.9					
	Block 6	2	Parallel	8	26.7	66.0	7	56	1495.2	462.0	8	1957.2					
			L shaped	7	26.0	65.6	7	49	1274.0	459.2	7	1733.2					
			Single Block	4	26.0	35.2	7	28	728.0	246.4	4	974.4					
	[redacted]	2	L shaped	7	25.3	65.6	7	49	177.1	459.2		636.3					
	Amenities	3							3680.0								0
								630	15199.8		76	10341.2	14021.2	7400	1.9	851.4	2520
Wall	Block 7	9	Wall	4	20.0	39.0	7	28	560.0	273.0	4	833.0					
	Amenities							0	2235.0								
								252	5040.0		36	833.0	3068.0	1568	2.0	1607.1	1008
								3003			413				2.5	936.2	12012