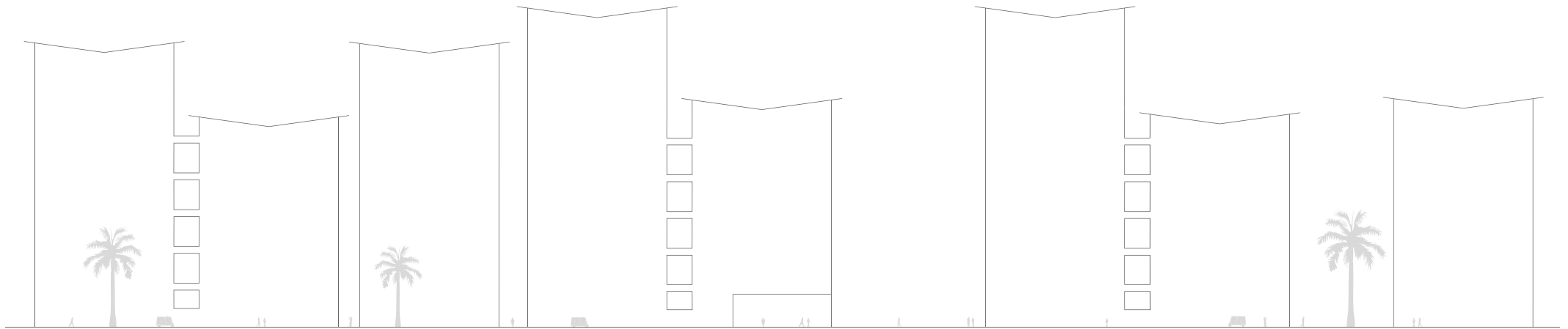


Vertical Mumbai

Development of qualitative social housing in a highly dense city



Willem Piethaan
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TU Delft | Faculty of Architecture and the Built Environment

Department of Architecture | Chair of Architecture & Dwelling

Graduation Studio:

*Mixing Mumbai: Affordable Housing for Inclusive Development
2017/2018*

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Delft, November 2018

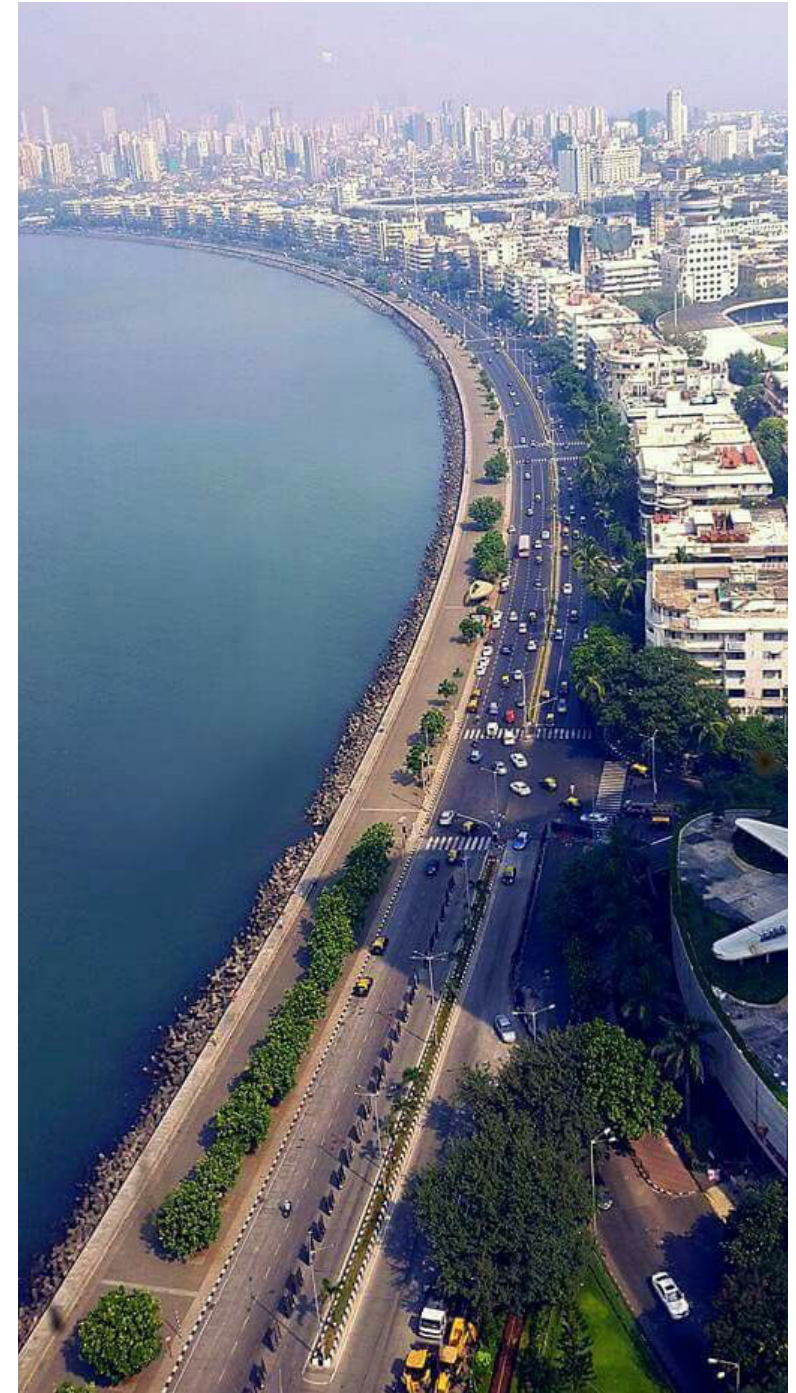




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- Architectural framework
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- Vasai Virar
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Introduction

Graduation Project 2017/2018

In the past decades Mumbai has experienced a huge increase of citizens who, drawn by the economic opportunities of the big city, come to Mumbai for chances of a better life. The city is struggling with the effects that this has on the city. A big part of its population resides in informal settlements, living under impoverished circumstances.

My projects revolves around improving these circumstances through the development of durable, affordable, qualitative social housing that is able to reach high densities while maintaining a qualitative level of living.

Mumbai; the Current Situation

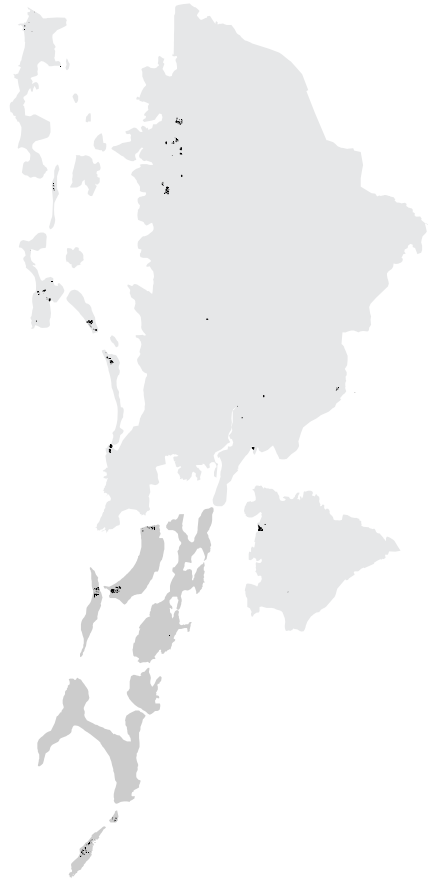
General Research on Mumbai



India - Mumbai



Mumbai Metropolitan Region



1500 AD



1850 AD



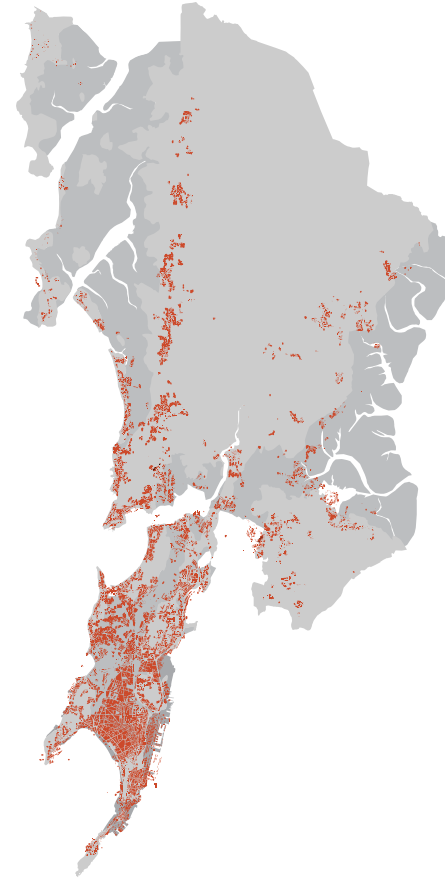
Colonisation by the Portuguese
and the British



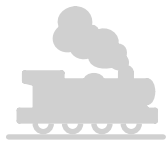
Establishment of Mumbai
as a Port City



1500 AD



1850 AD



Opening of the first
Indian Railway



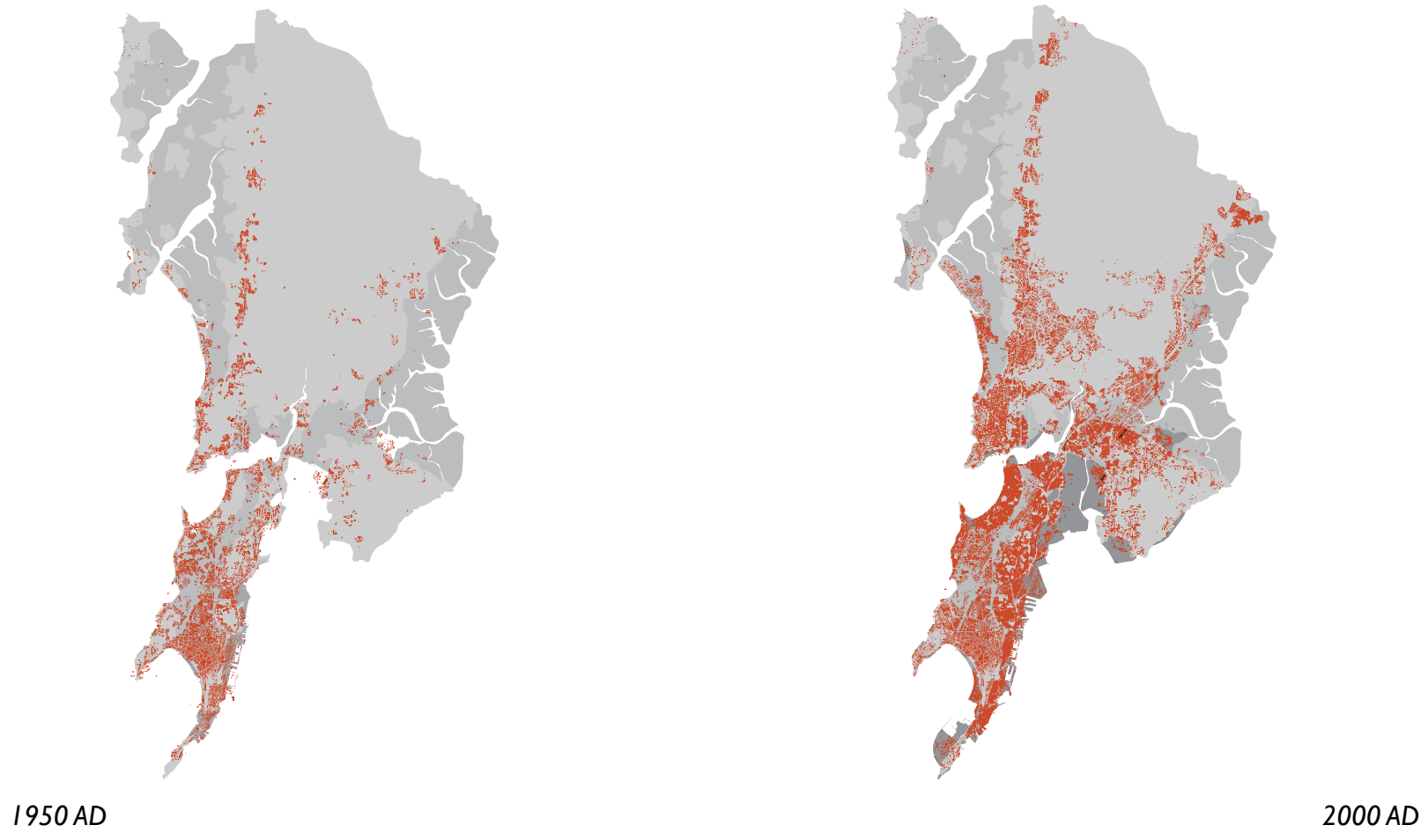
Opening of
the Suez canal



The Cotton Boom



Independency
of India



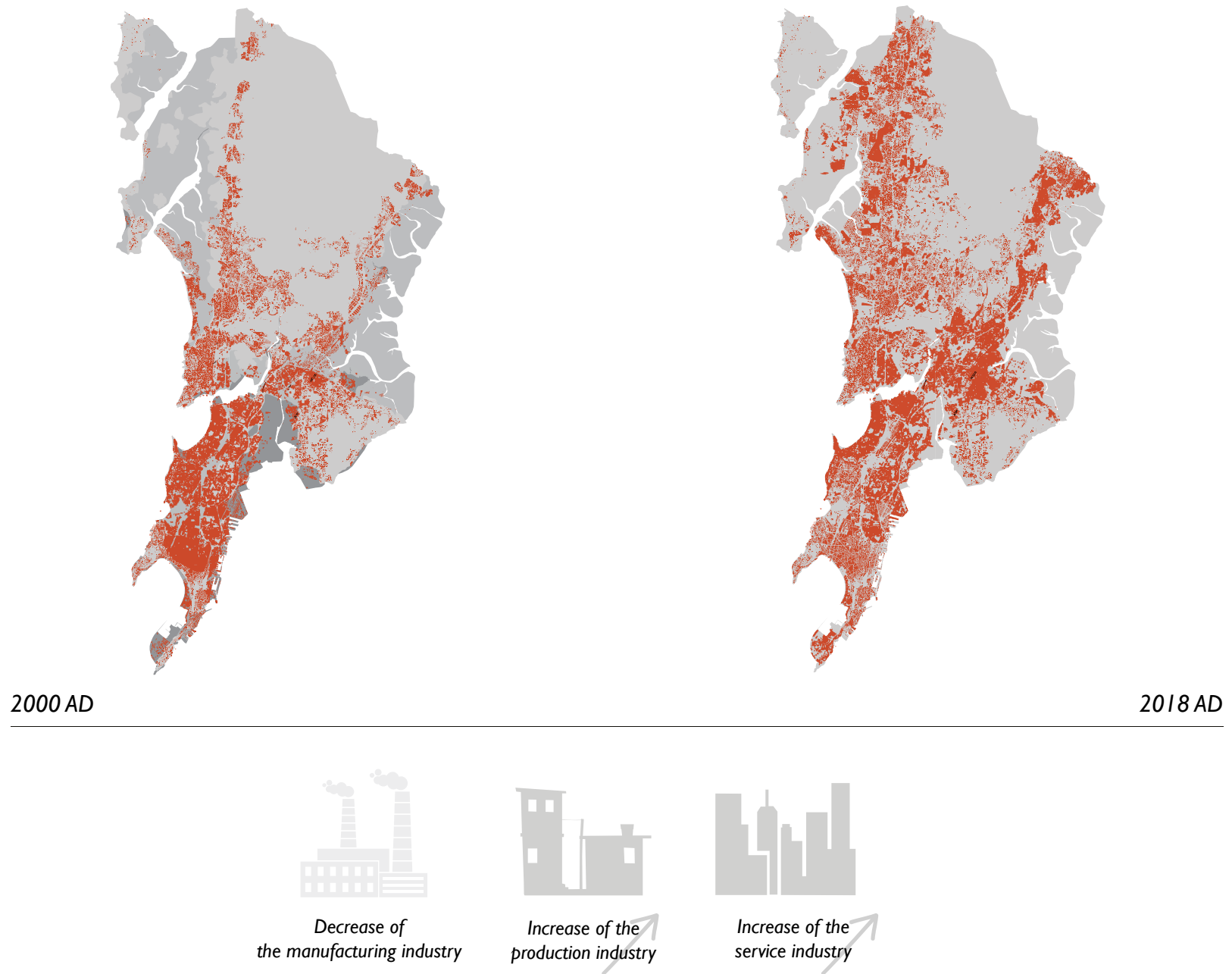
*Plan Navi Mumbai
approved*

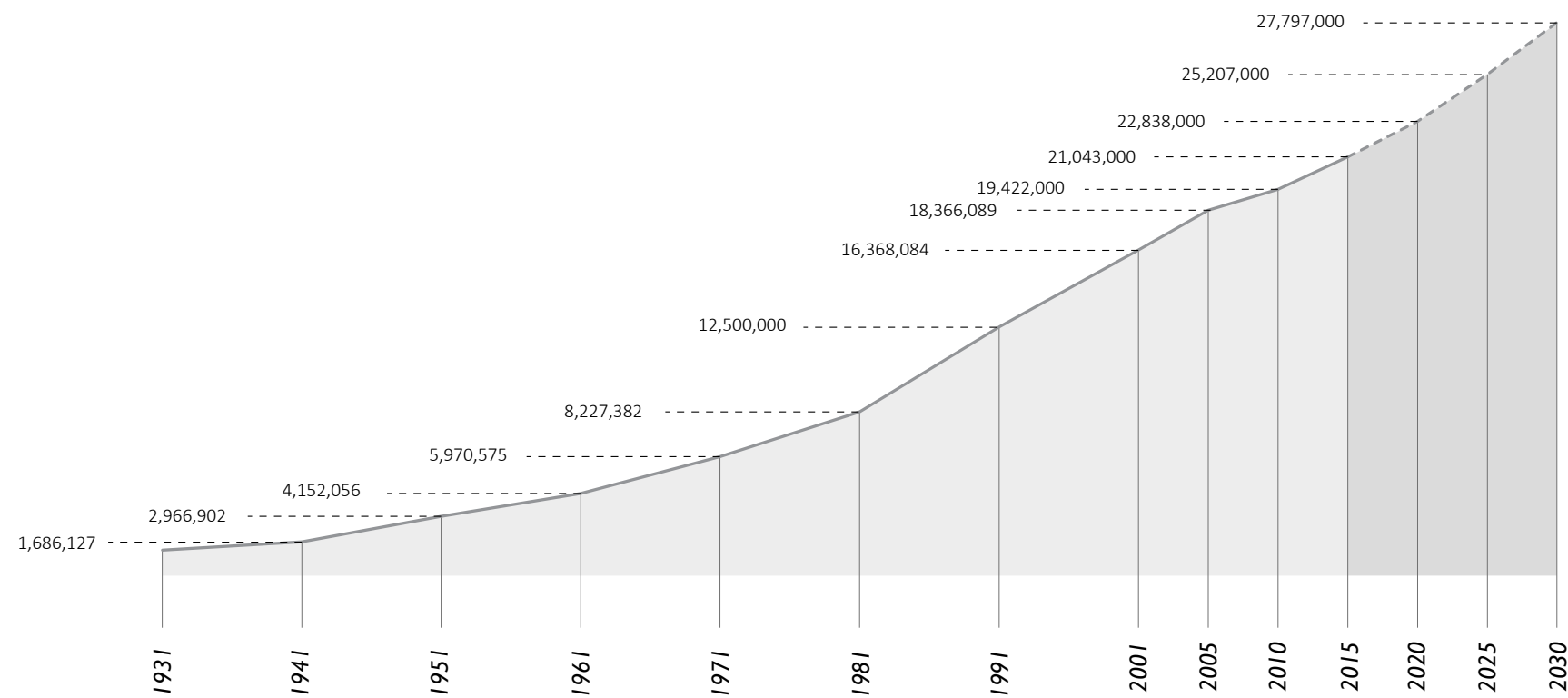


*Emerge of the Mumbai
Metropolitan Region*

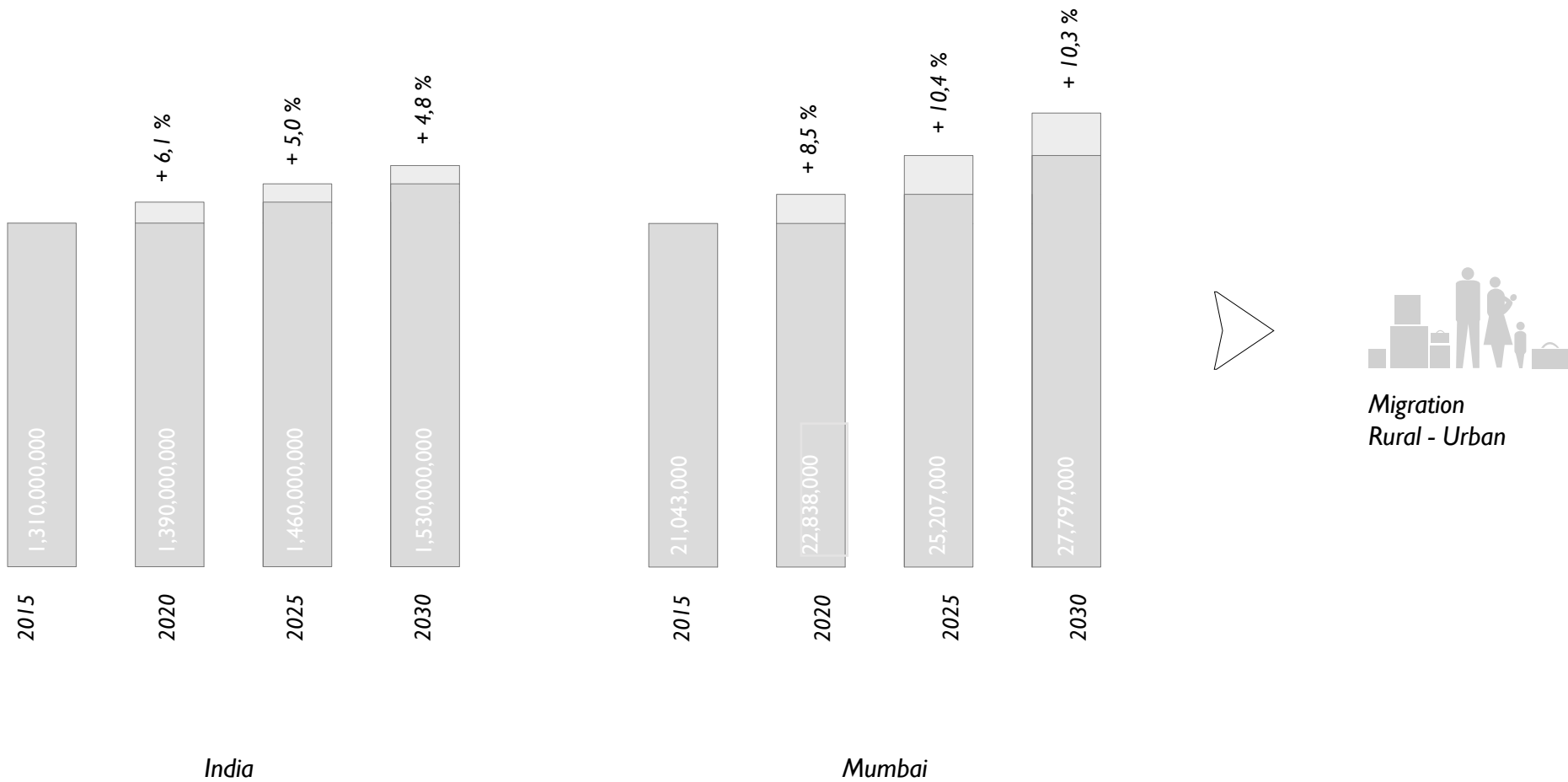


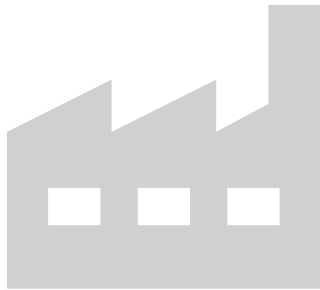
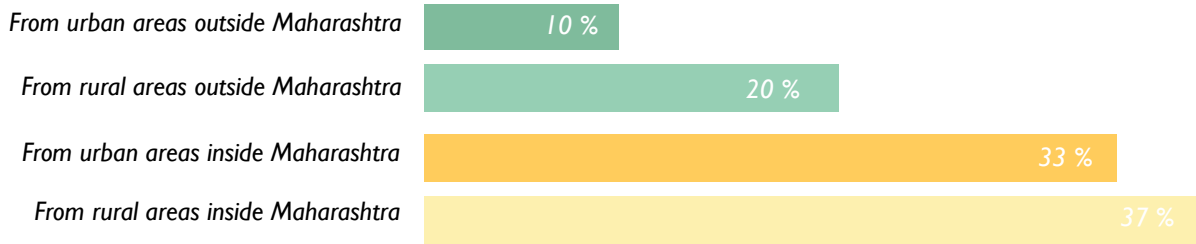
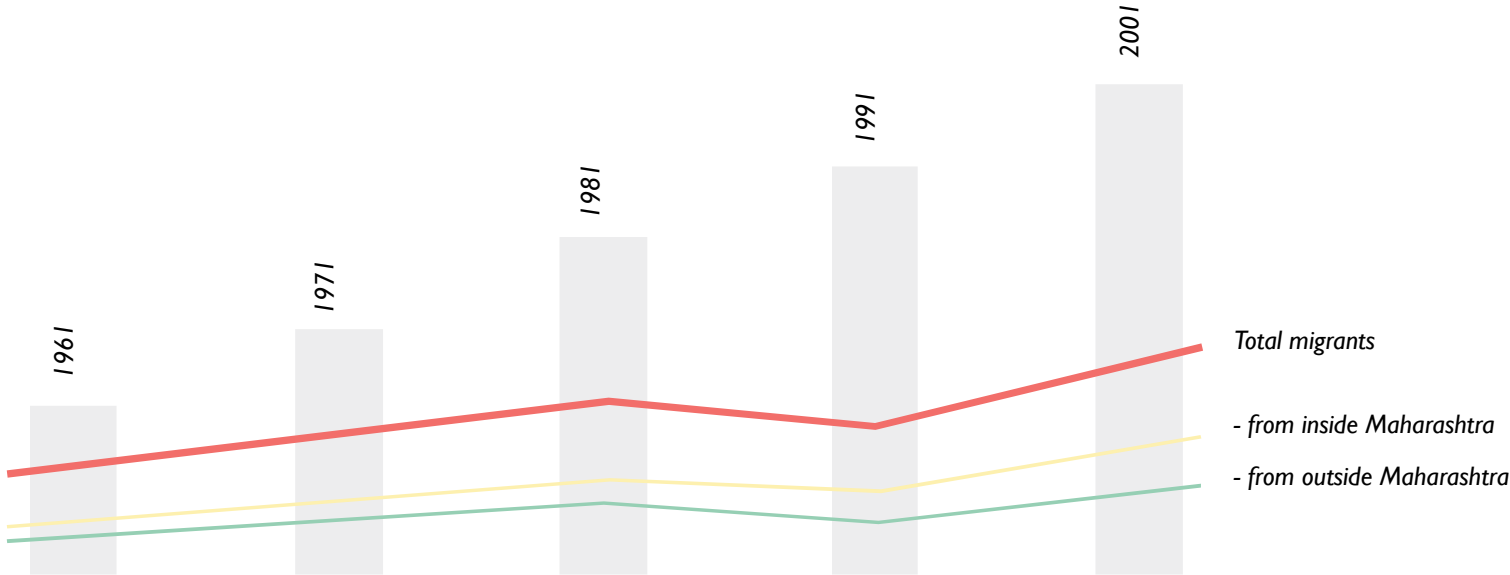
*National launch of
the New Economic Policy*





Population Growth





Employment



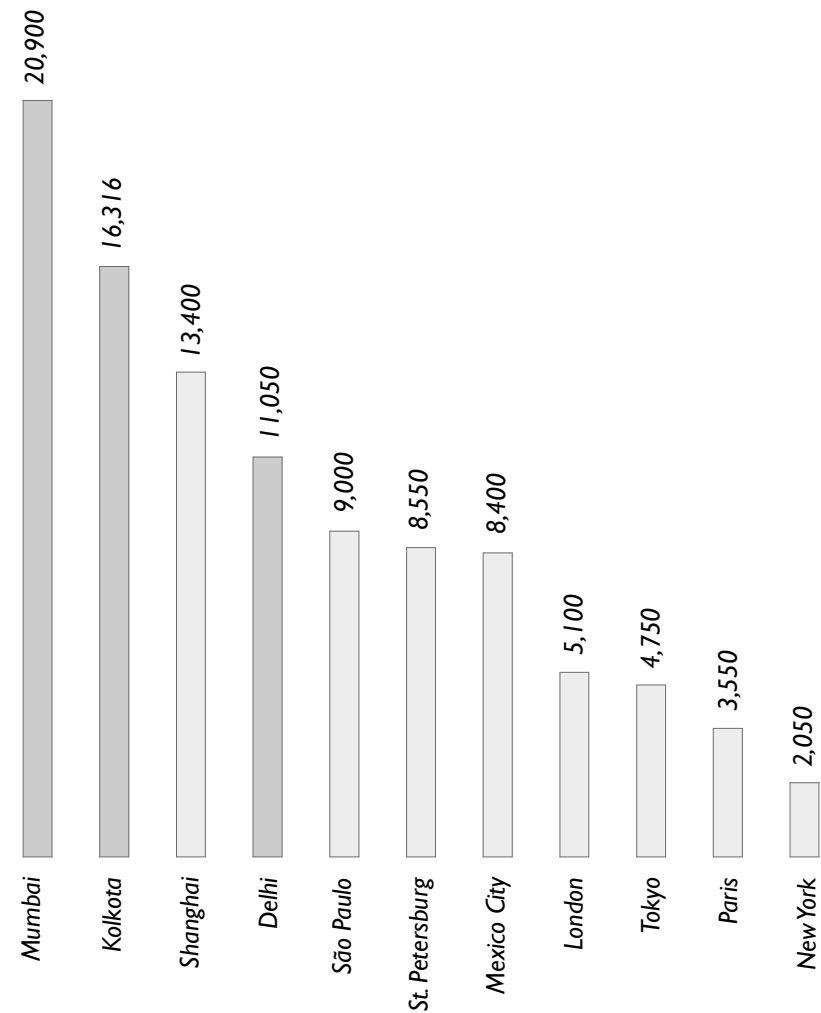
Education



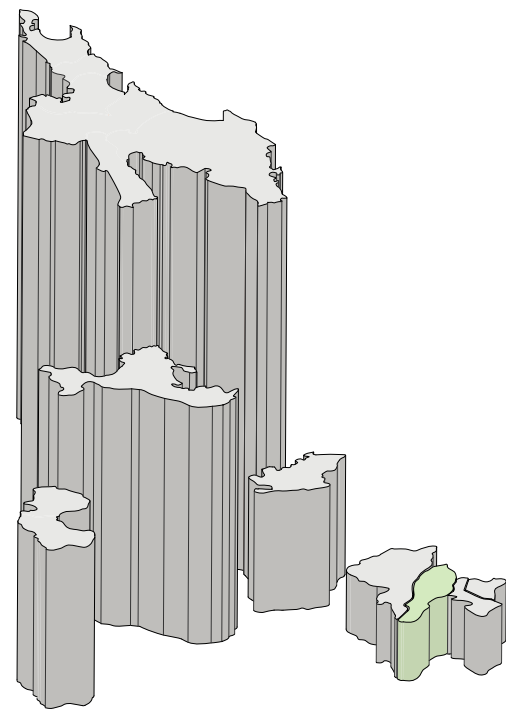
Health Facilities



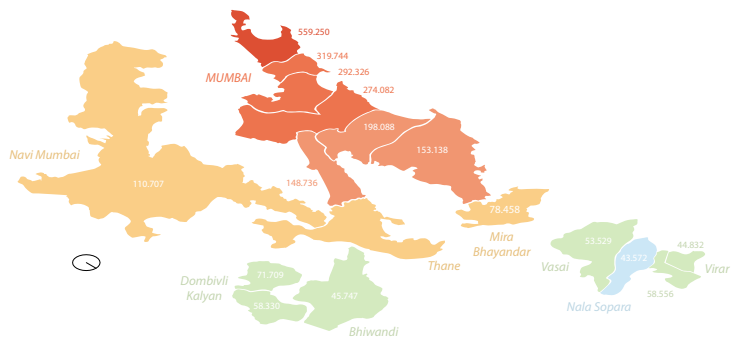
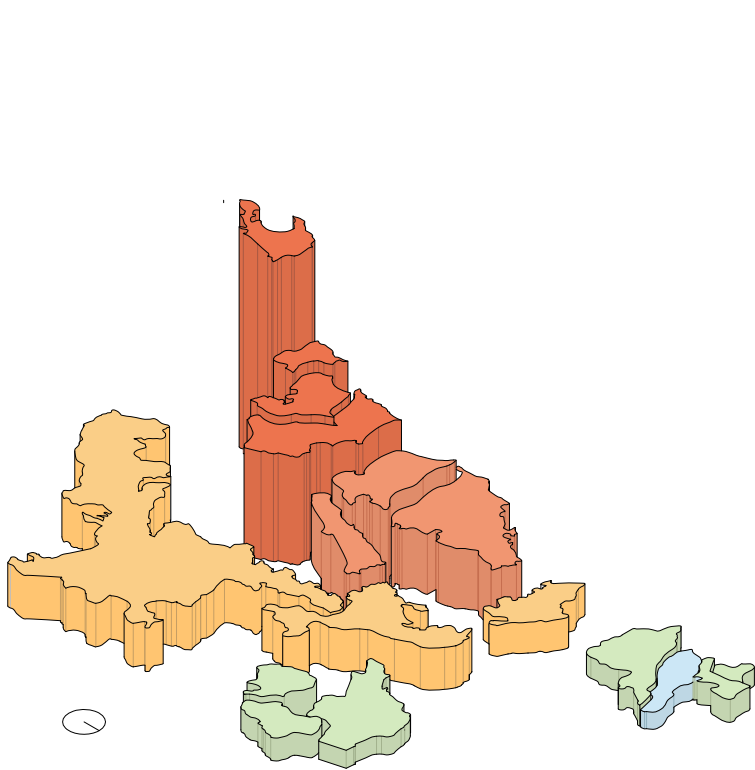
Marriage



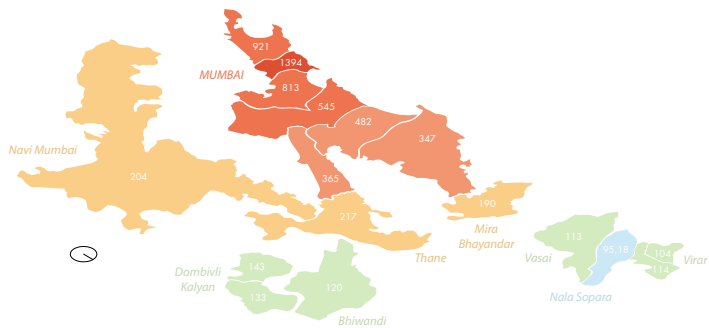
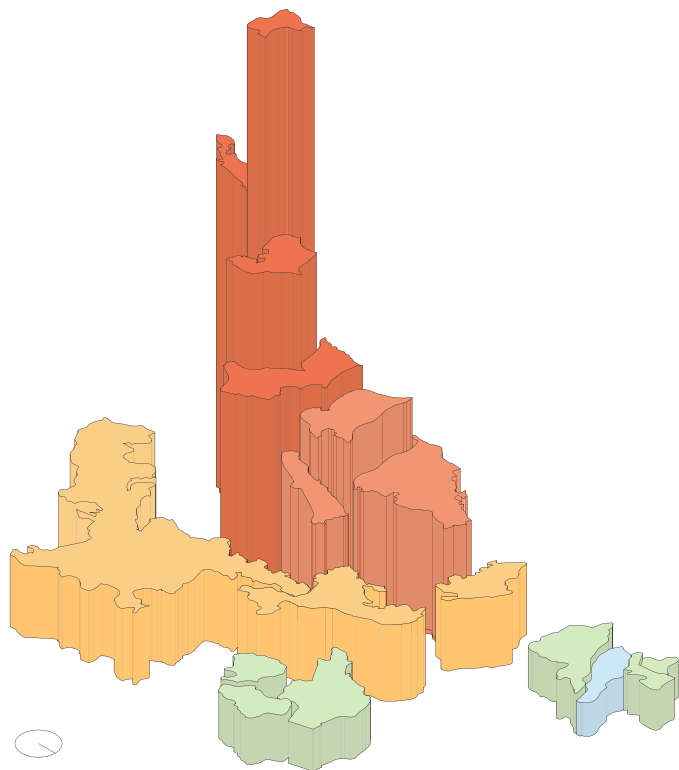
Population Density in different World Cities
persons/sqkm



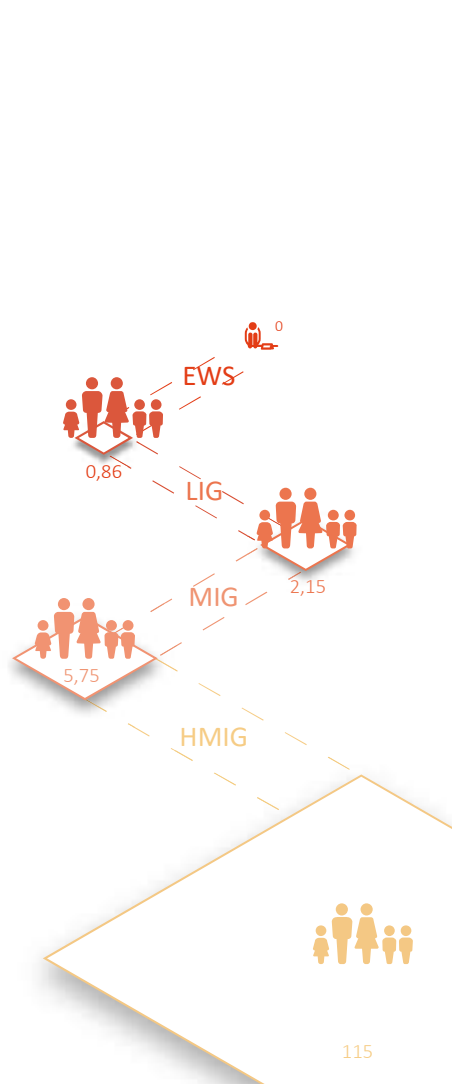
Population Density in the Mumbai Metropolitan Region
persons/sqkm



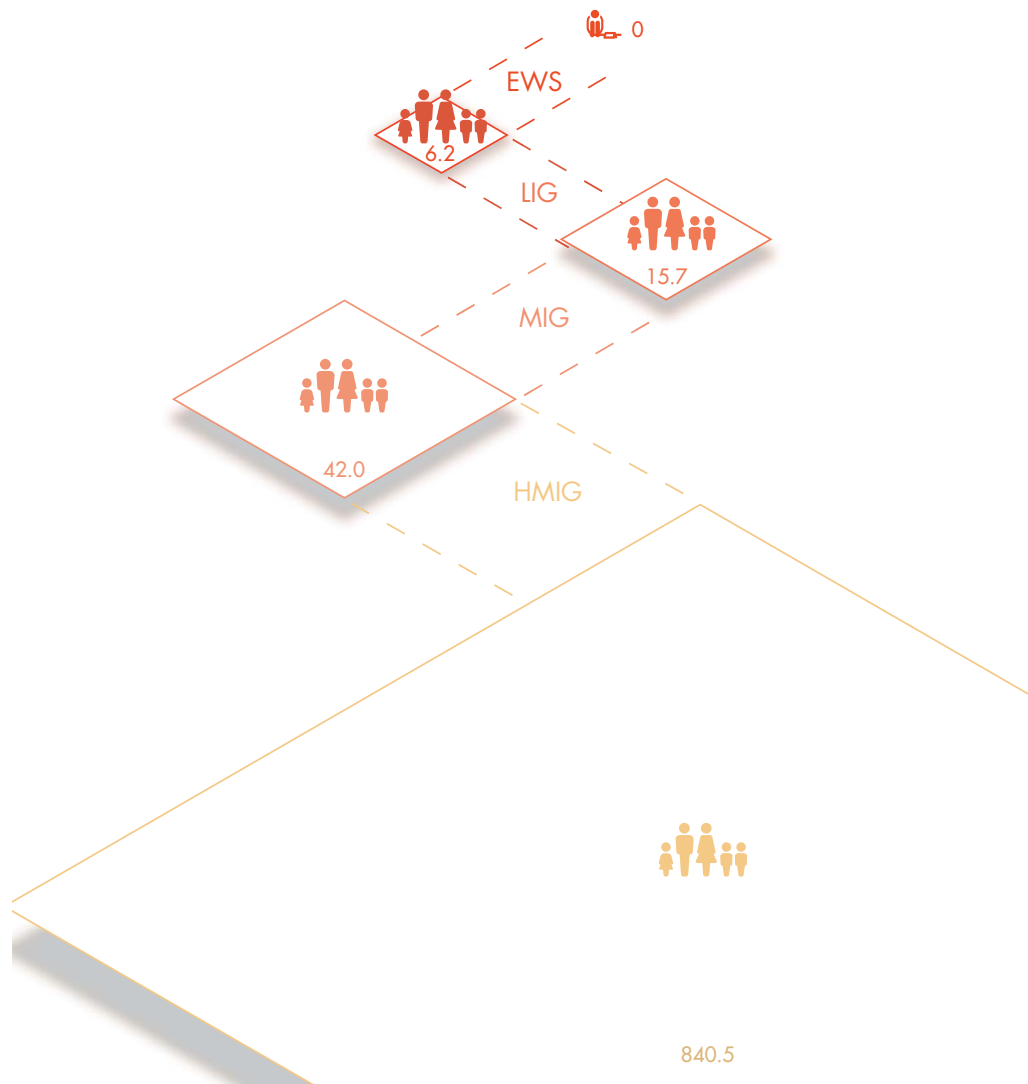
Property Rates of the Mumbai Metropolitan Region
rupee/m²



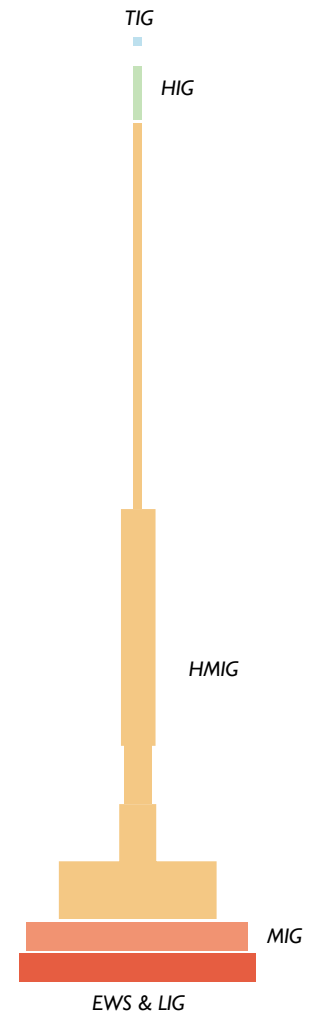
Rent Prices of the Mumbai Metropolitan Region
rupee/m²



Affordability of Mumbai
amount of m² affordable on the regular housing market



Affordability of Nalasopara
amount of m² affordable on the regular housing market



Income Distribution of Urban India

A Slum is an informal settlements that lacks one or more of the following five conditions: access to clean water, access to improved sanitation, sufficient living area that is not overcrowded, durable housing and secure tenure.

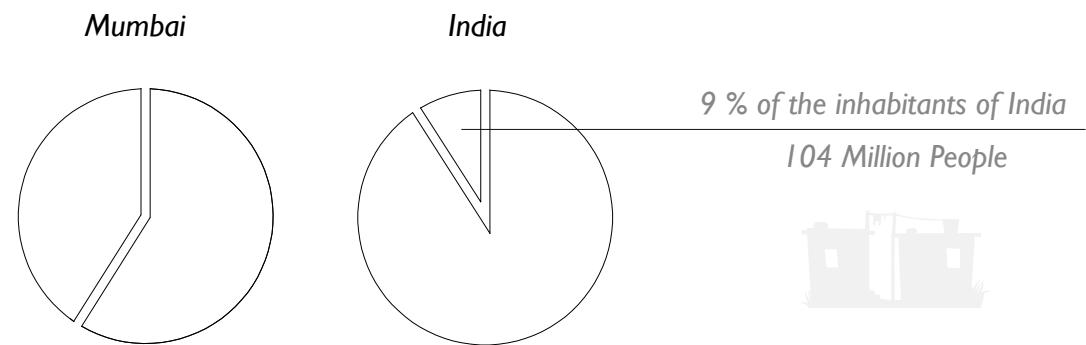
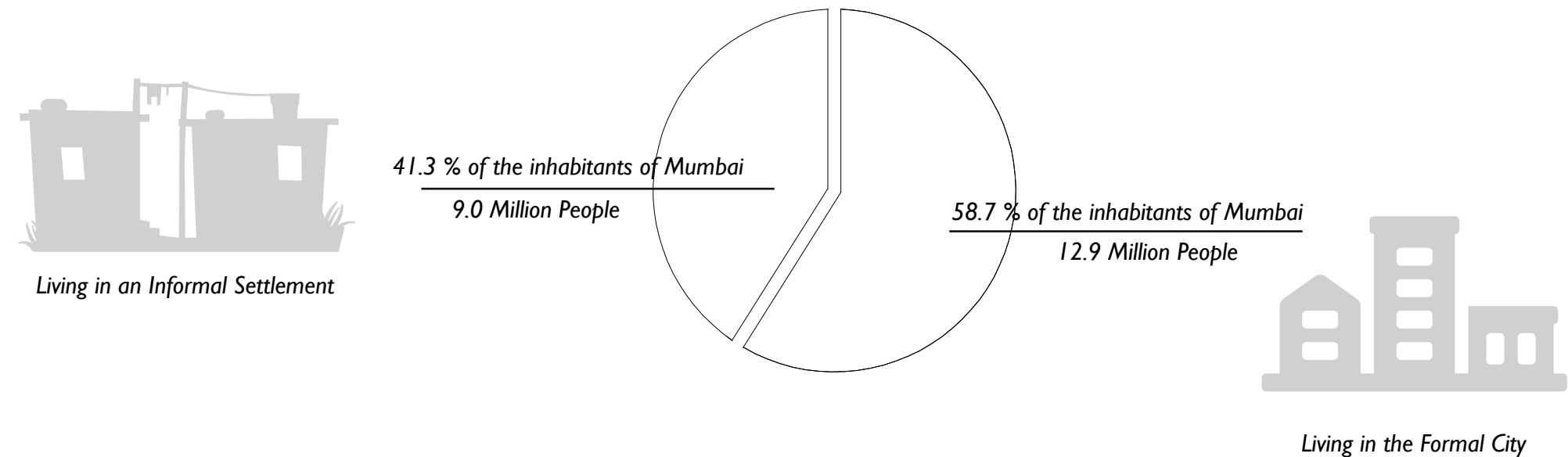
- UN-Habitat

“A Slum, for the purpose of Census, has been defined as residential areas where dwellings are unfit for human habitation by reasons of dilapidation, overcrowding, faulty arrangements and design of such buildings, narrowness or faulty arrangement of street, lack of ventilation, light, or sanitation facilities or any combination of these factors which are detrimental to the safety and health.”

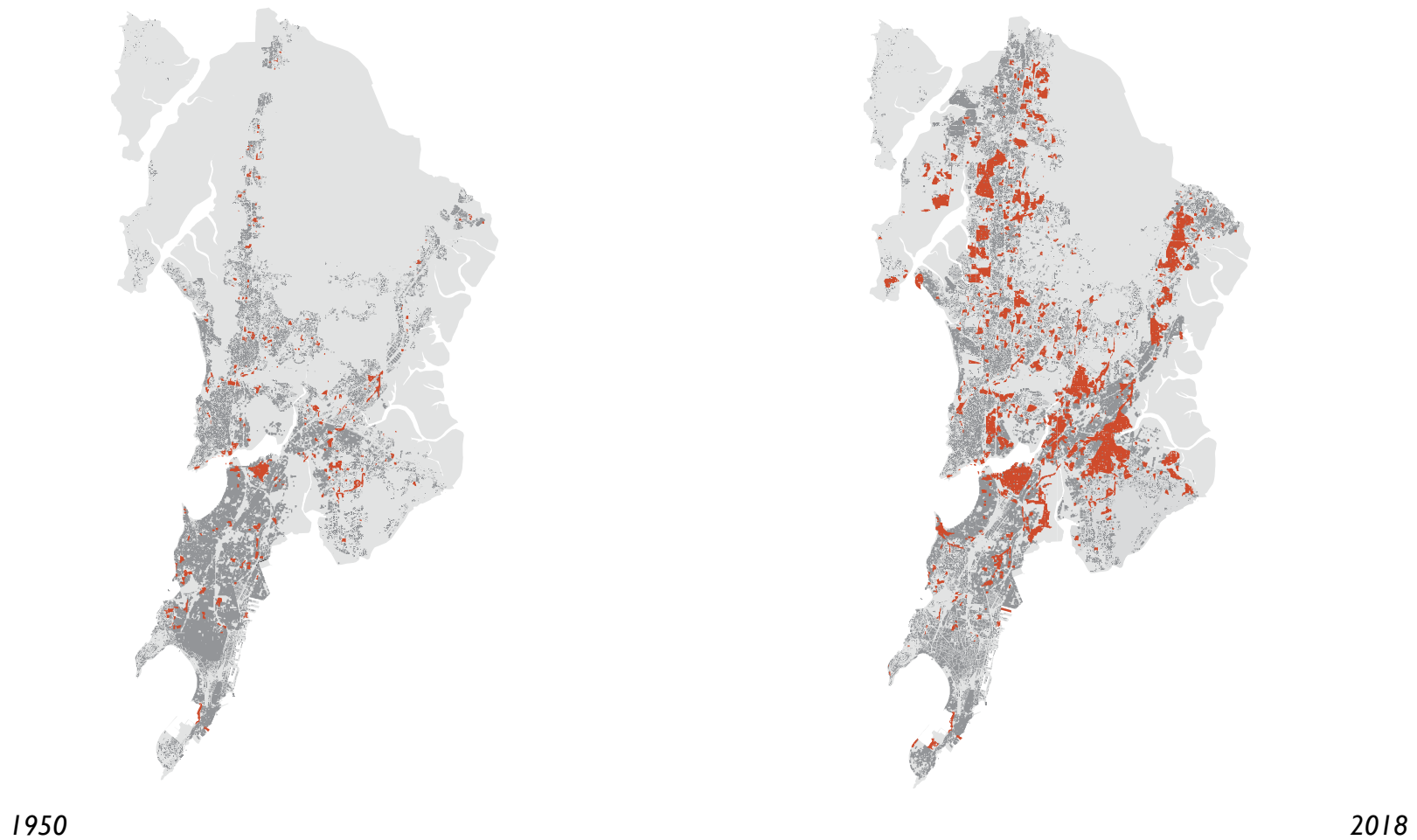
- Office of the Registrar General, Census of India, 2011



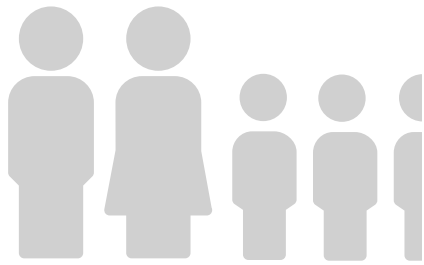
Informal Settlements in the Greater Mumbai



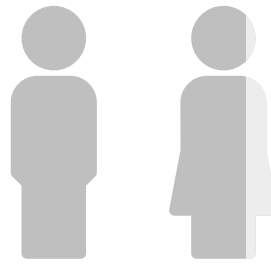
The Percentage of People living in an Informal Settlement



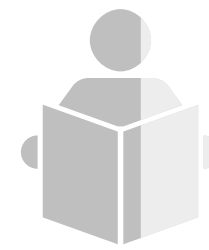
Mumbai's slums occupy 12 percent of its total geographic area and up to a quarter of the available construction area in the city.



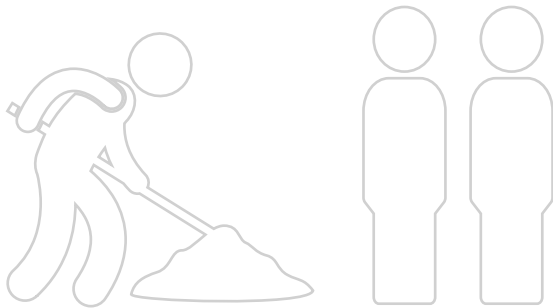
Average household size of 4.5.



*Sex ratio of 842 females
per thousand males.*



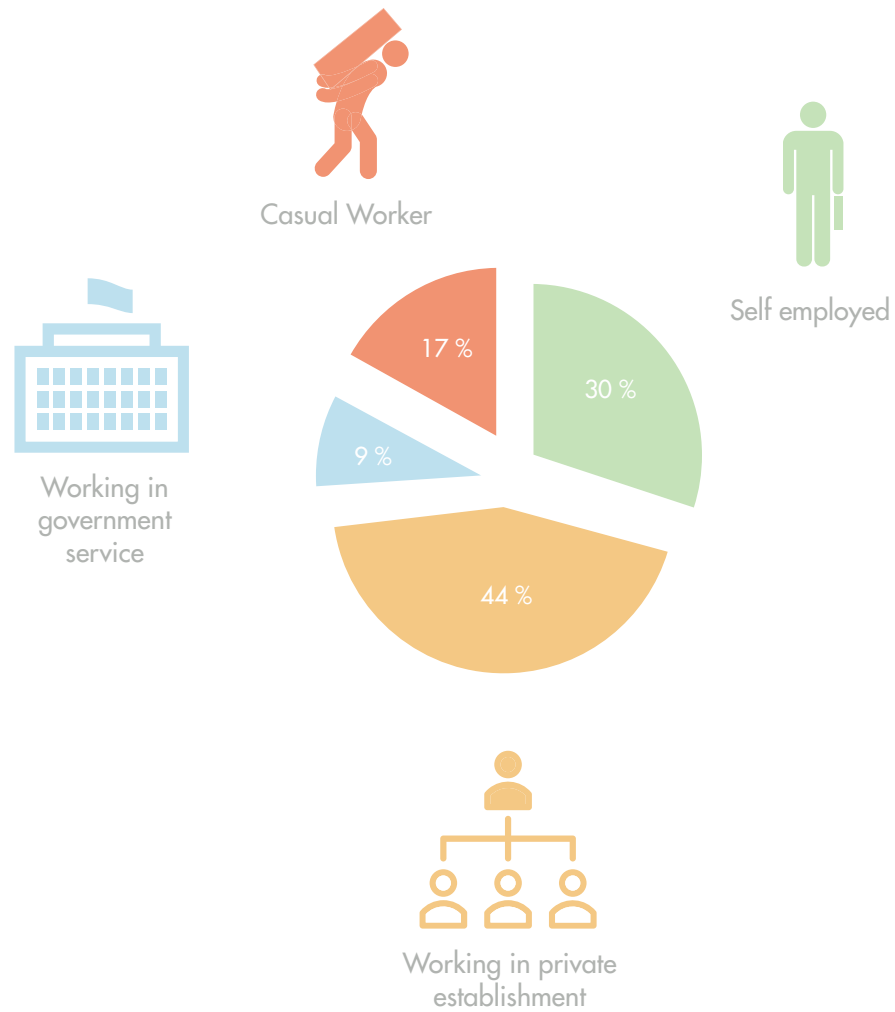
Literacy rate of 60%.



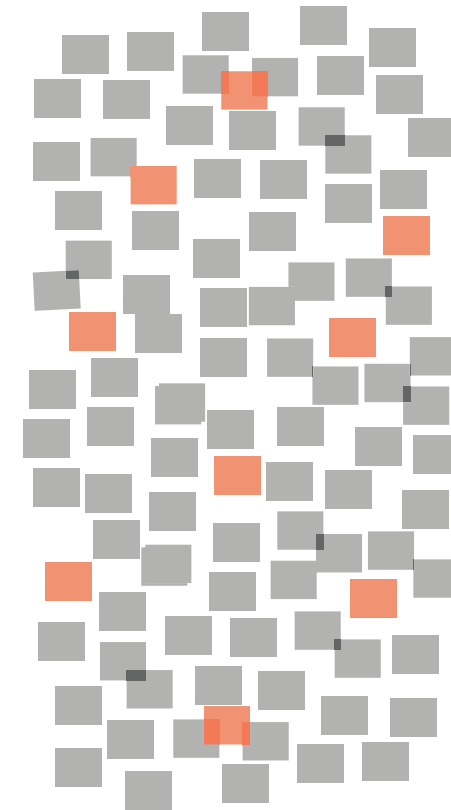
33 percent of the population works



An average of 1.46 workers per household

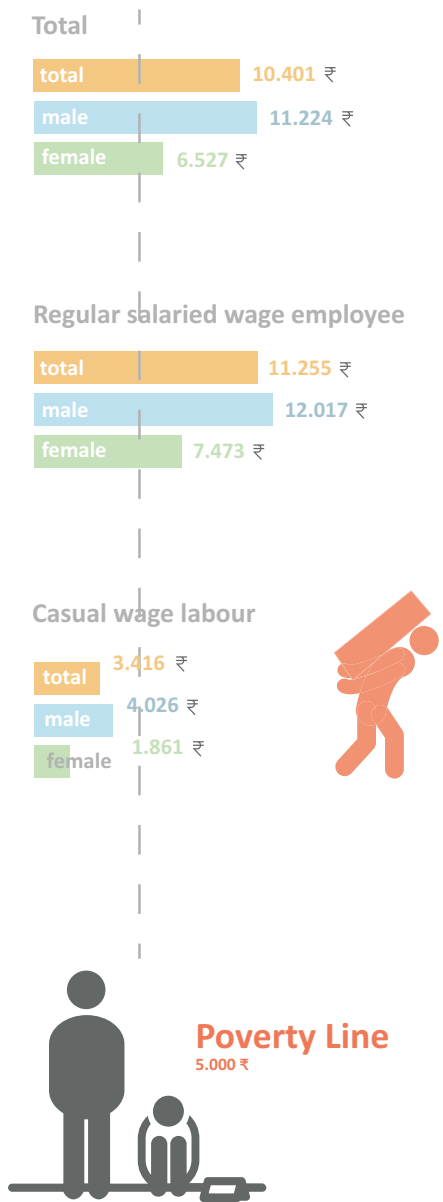


Types of labor in the Slum

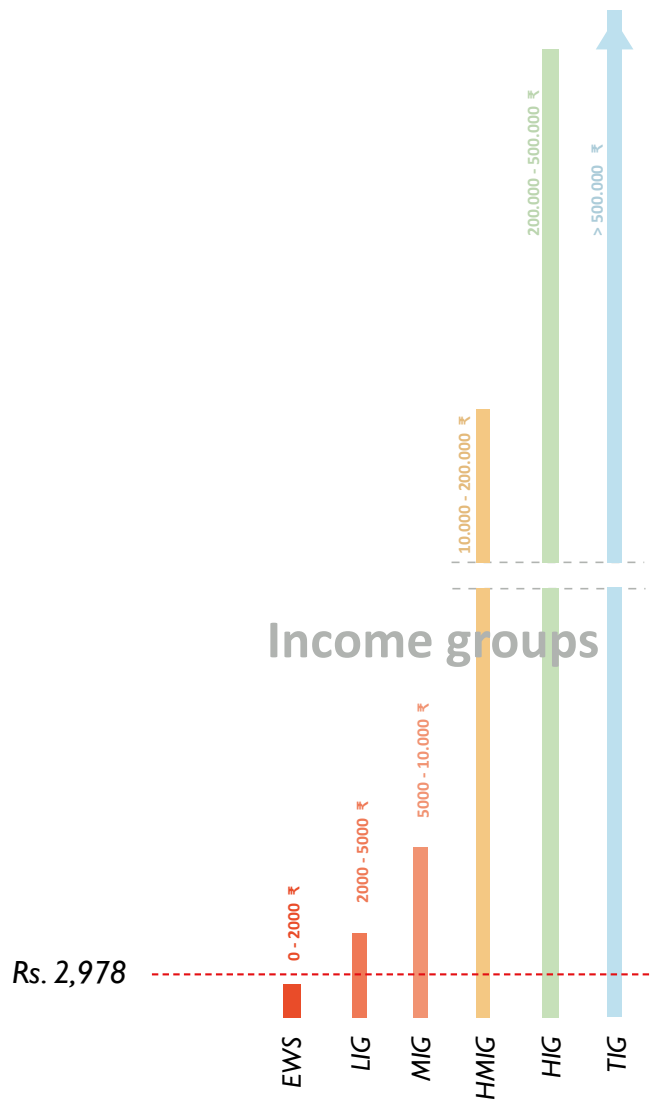


9 percent of structures in the Slum has commercial establishments.

Home-based economic activity is common as a secondary source of income.



40 percent of the houtholds were considered to be below the poverty line



Average monthly household income in the Slum



62% of slums have predominantly dwellings made of permanent materials like brick walls and reinforced cement roofs.



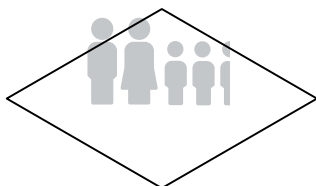
27% of slums have predominantly semi-permanent structures (brick walls and tin or asbestos cement sheet roof).



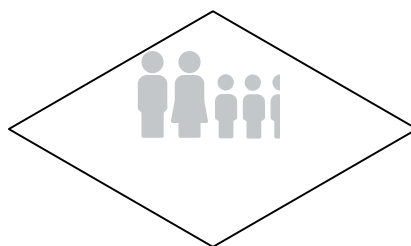
11% of slums have predominantly temporary structures.



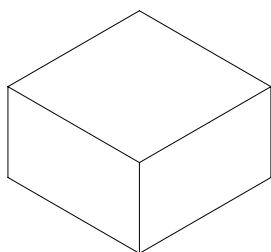
42 % of houses have an area less than 10m²



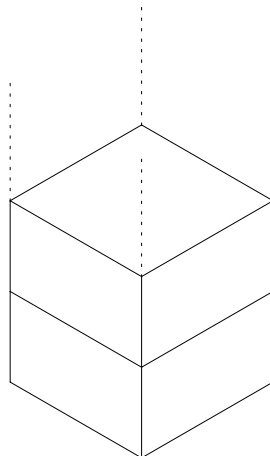
38% of houses have an area between 15 and 20m²



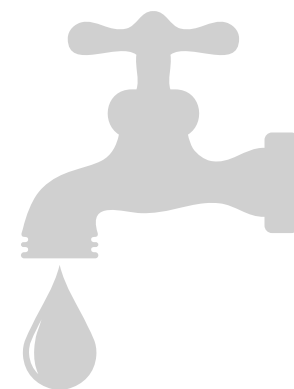
Only 9 % of houses have an area more than 20m²



55% of the houses have one story.



45% of the houses have two or more stories



About 49% of slums have access to watersupply from shared standpipes, while 38.3% have a supply from more than one source. Remaining slums get their water from tube wells or community standpipes. Only 5% of slums have individual taps whereas 0.87% of slums have no supply.



Sanitation in slums is very poor as 73% of slums depend on community toilets provided by the government, 28% defecate in the open, 0.7% of slums have to pay to use toilets managed by NGOs and only 1% of slums have individual toilets.

Methods of Social Housing

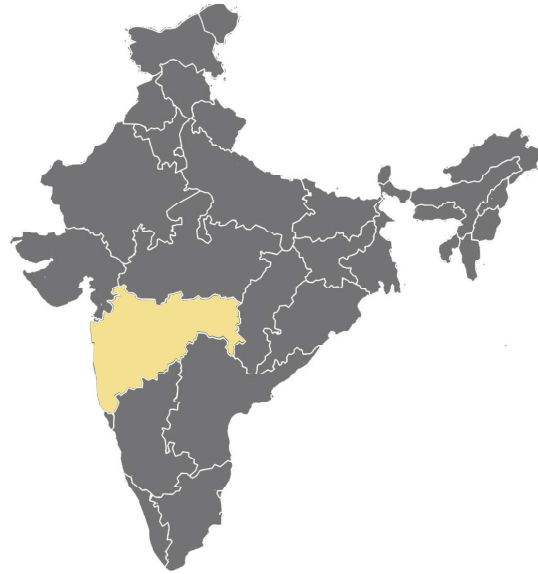
Analysis of governmental models

*Information used in this research is substracted from the official website
of the Maharashtra Housing and Area Development Authority
(MAHDA) <https://mhada.gov.in/en>*

Political Framework

Under the federal structure of the Constitution of India, matters pertaining to housing and urban development have been assigned to State Governments. The 74th Amendment of the Constitution of India's Act has further delegated many of these functions to urban local bodies.

However, the Government of India plays a role in shaping the policies and programmes of the country as a whole and also allocates resources to the State Governments through various Centrally Sponsored schemes, provides finances through national financial institutions and supports various external assistance programmes for housing and urban development in the country as a whole.



Housing institutions of the Government of Maharashtra

Affordable Housing schemes in Maharashtra focus on incentivizing projects through higher Floor Space Index and redevelopment of old buildings and slums.

The three main state agencies responsible for implementation of the various schemes are:

- *Maharashtra Housing and Area Development Authority (MHADA)*
- *Slum Rehabilitation Authority (SRA)*
- *Mumbai Metropolitan Region Development Authority (MMRDA)*

Maharashtra Housing and Area Development Authority (MHADA)

Mumbai Housing and Area Development Board (MHADA)

To undertake the construction of residential buildings under various housing schemes for different sections of the society.

Mumbai Slum Improvement Board (MSIB)

To provide basic amenities, such as water taps, drainage, pathways, latrines and streetlights etc. to slums and slum-dwellers of the Greater

Mumbai Building Repair and Reconstruction Board (MBRRB)

To deal with the problems faced by tenants residing in dilapidated buildings in Greater Mumbai and to undertake structural repairs and reconstruction, so as to make them structurally sound and safe for habitation.



Slum Rehabilitation Authority (SRA)

In 1995 the SRA was established by the Government of Maharashtra.

In 1995 the Government of Maharashtra established the Slum Rehabilitation Authority through which a comprehensive slum rehabilitation scheme was launched by introducing an innovative concept of using land as a resource and allowing incentive floor space index (FSI) in the form of tenements for sale in the open market, for cross-subsidization of the slum rehabilitation tenements which are to be provided free to the slum-dwellers.

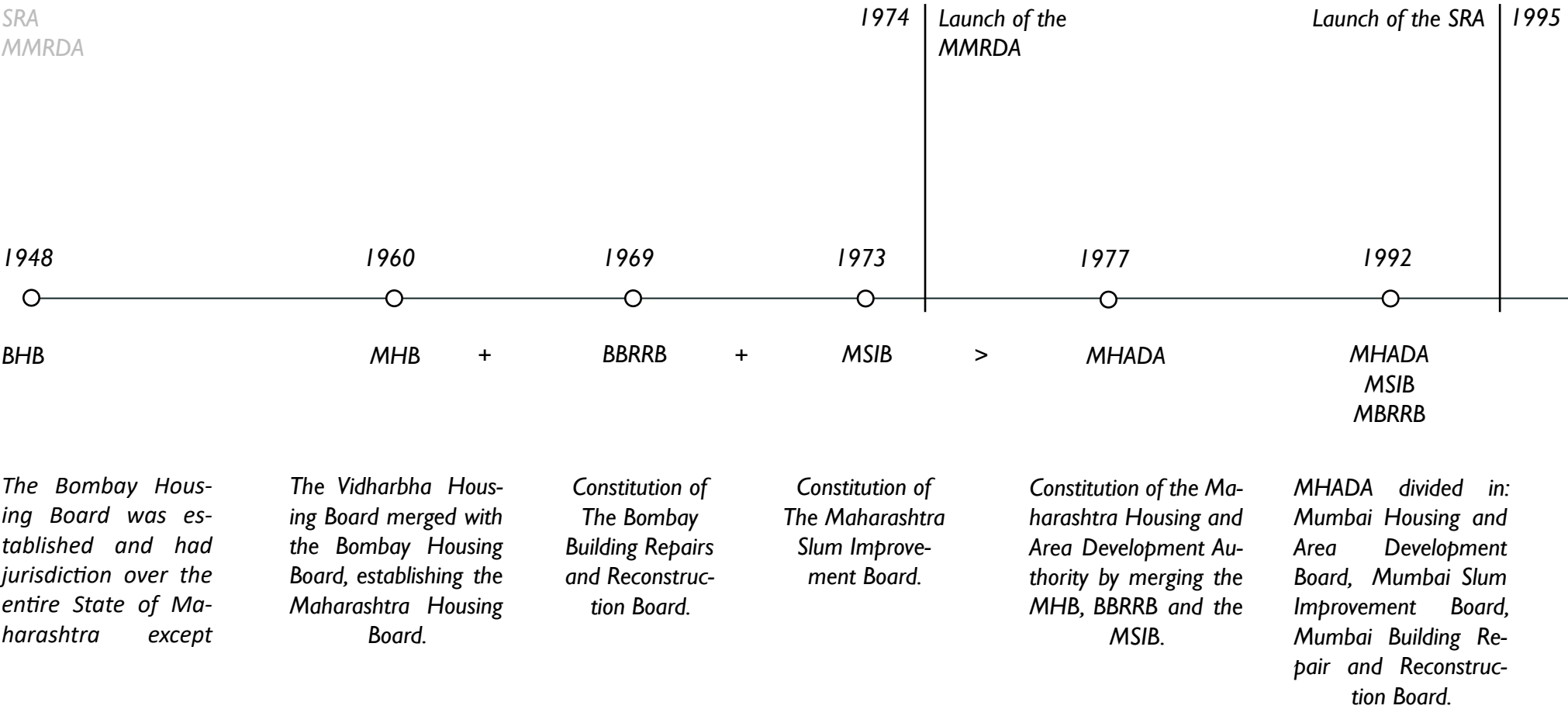


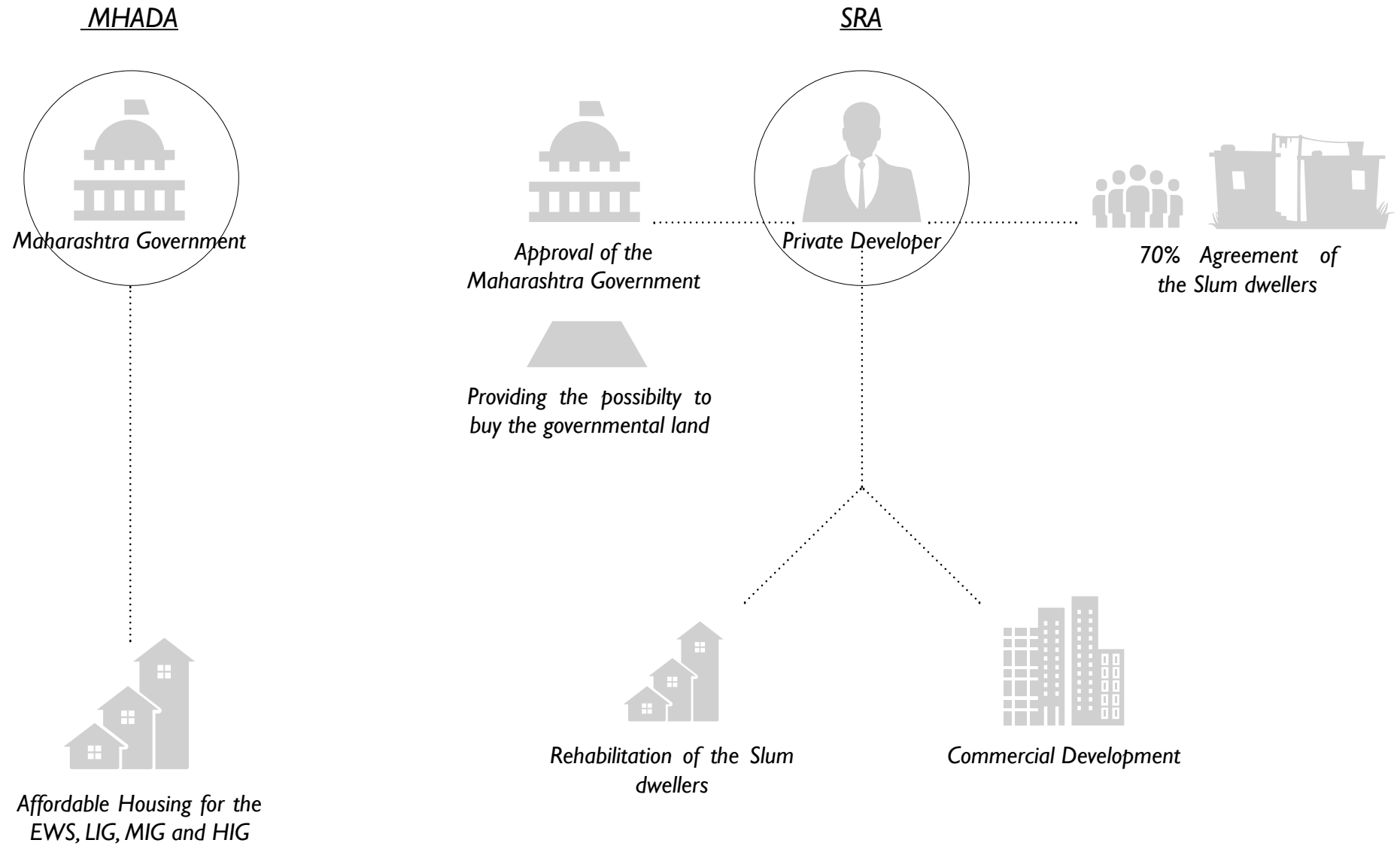
Mumbai Metropolitan Region Development Authority (MMRDA)

In 1974 the MMRDA was established by the Government of Maharashtra as an apex body for planning and co-ordination of development activities of the Mumbai Metropolitan Region.

Focusses predominantly on infrastructure.







Initiatives implemented by the government of Maharashtra

Special Township Policy

Under the Policy, a contiguous minimum area of 40 hectares can be developed as a township and 33.3% of the tenements or 20% of the total built up area is to be used for EWS/LIG houses. The developers are provided additional 20% FSI over the Zonal FSI/FAR allowed in the Special Township.	private
---	----------------

Cluster Redevelopment

A cluster of old, dilapidated buildings or slums can be clubbed in a cluster for redevelopment, to be defined as 'Urban Renewal Cluster' of a minimum Size of 4,000 Sq.m to 10,000 Sq.m. Redevelopment can be done by MHADA, MCGM, Developers, or Societies themselves.	mhada private society
---	--------------------------------------

Development/Redevelopment on MHADA land

In all Urban Areas, the FSI for development on MHADA land has been increased to 2.5; 60% tenements are to be kept aside for EWS/LIG/MIG housing. For redevelopment of old MHADA colonies in Mumbai, FSI of 3 has been granted. Societies have the option to redevelop their buildings either through Private Developers, or through MHADA.	mhada private
--	--------------------------

Redevelopment of old and dilapidated buildings

In the Island City of Mumbai, the buildings are very old and many of them are in dilapidated condition. Under the DCR 33(7), FSI/FAR of 3 is allowed for Redevelopment of these Cess Buildings.	mhada
---	--------------

Inclusive housing in layouts

Any development of a layout exceeding an area of 4,000 Sq.m will require reservation of 20% of the Built up Area for EWS and LIG households. Incentive FSI of 20% will be provided to the developer and tenements will be handed over to MHADA at the ready reckoner rate.	private
--	----------------

Slum Rehabilitation Scheme

In-situ, transit and Project Affected Person (PAP) Schemes for slum rehabilitation undertaken by Slum Rehabilitation Authority, MHADA and MMRDA.	sra mhada mmrda
--	--------------------------------

Affordable Housing in Mumbai Metropolitan Region

MMRDA's rental housing scheme (2008) has been modified into an Affordable Housing scheme in November 2013. The private sector is offered incentive FSI in return for providing self-contained tenements of 160 sq.ft carpet area along with the appurtenant land to MMRDA free of cost which shall be allotted to eligible low income group households.	private mmrda
---	--------------------------

Initiatives implemented by the government of India

Rajiv Awas Yojana (RAY) 2013- 2022

The Scheme provides financial support to States/ Union Territories/Urban Local Bodies (ULBs)/Central Government Agencies for providing housing and improvement of basic civic infrastructure and social amenities in selected slums. RAY will also extend financial support to States for creation of affordable housing stock through public-private partnership under the Affordable Housing in Partnership (AHP) component of the scheme.

Rajiv Rinn Yojana (Interest Subsidy Scheme for Housing the Urban Poor)

Rajiv Rinn Yojana (RRY) is an instrument to address the housing needs of the economically weaker/low-income segments in urban areas, through enhanced credit flow. RRY has been formulated by modifying the Interest Subsidy Scheme for Housing the Urban Poor (ISHUP) piloted in the 11th Plan period with enhanced scope and coverage. Fresh guidelines for the scheme were issued in October 2013; hence it is still too early to comment on the progress of the scheme thus far.

3. Basic Services to Urban Poor (BSUP, 2009)

Provision of Basic Services to Urban Poor including security of tenure at affordable prices, improved housing, water supply, sanitation and ensuring delivery through convergence of other already existing universal services of the Government for education, health and social security. Care will be taken to see that the urban poor are provided housing near their place of occupation. MHADA is the nodal implementing agency for BSUP in Maharashtra.

4. Affordable Housing in Partnership

The scheme of Affordable Housing in Partnership aims to encourage private sector participation in creation of affordable housing stock, recognising that mere efforts of the Government would be insufficient to address the housing shortage. It was earlier introduced in 2009 as part of BSUP component of JNNURM and subsequently, Affordable Housing in Partnership was dovetailed with Rajiv Awas Yojana (RAY) in 2011. Central Government has now approved implementation of RAY for the period of 2013-2022. Central government will assist in construction of houses for EWS/LIG as part of group housing schemes of the States/UTs. These housing schemes will be implemented by the States/UTs through partnership with private sector or public sector including Parastatal bodies such as MHADA.

Housing Stock Issues

1995 - 2014:

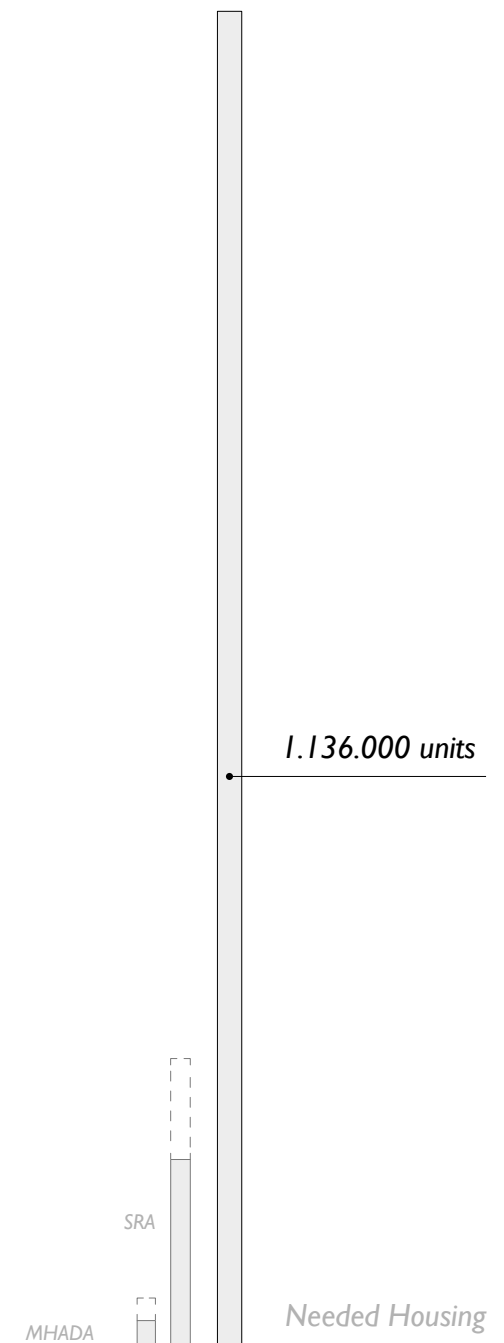
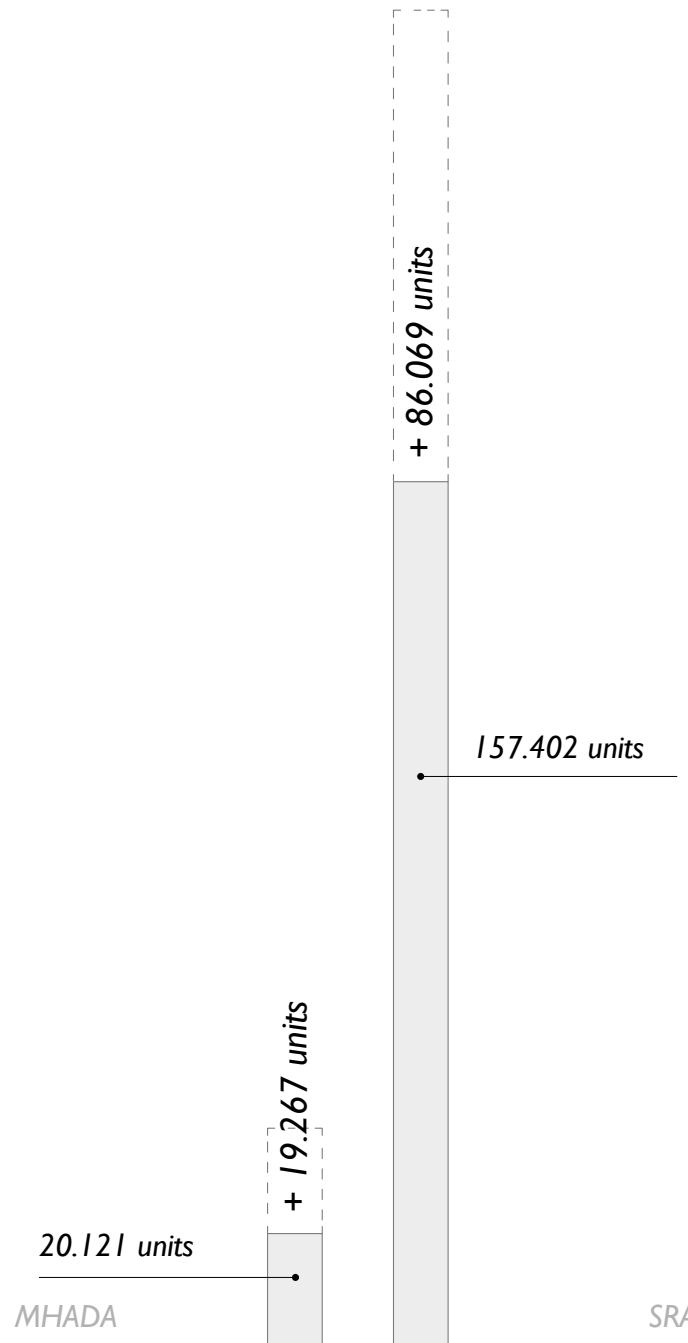
200.030 dwelling units have been built in Mumbai by State Government agencies.

Another 108.000 units are currently under construction.

157.402 units have been built under SRA's schemes in this period.

No projects have taken off in Mumbai under MMRDA's Rental Housing Scheme (2008).

No projects have taken off under the Rajiv Awas Yojana and Affordable Housing in Partnership Schemes of the Government of India, in Mumbai, as of September 2014.



This estimate does not take into account Mumbai's future requirements.

Illegal slumdwellers can get SRA flats, but will have to pay

- Times of India - 24 November 2017

Slum Rehabilitation Scheme

“The slum scheme is a profitable business venture for builders, with the active backing of politicians.”

- a division bench of Bombay high court - 2006

Mumbai slum extortion: Congress demands action against SRA officials

- Times of India - 11 February 2018

It has created an atmosphere where the entire city is looking more inequitable and segregated in rich – low density – low Floor Space Index (FSI) and poor- high density high FSI city

- Seminar on Slum Rehab: A Review. School of Habitat Studies, TISS and the Committee for Right to Housing (CRH)

Housing for all? Maharashtra govt "utilizes" 0.444% of budget in 2017-18, scheme not meant for slum-dwellers: GBGBA

- <https://www.counterview.net/2018/02/housing-for-all-maharashtra-govt.html> - 20 February 2018

MHADA

Activity 2014 - 2017

*Information used in this research is substracted from the official website
of the Maharashtra Housing and Area Development Authority
(MAHDA) <https://mhada.gov.in/en>*

Sale of Tenements 2014

297 EWS tenements

Average carpet area:

- 25.0 m²

Average cost of tenement:

- 1.592.680,-

Average EMD to be paid:

- 15.200

1323 LIG tenements

Average carpet area:

- 29.8 m²

Average cost of tenement:

- 2.528.910,-

Average EMD to be paid:

- 15.200

665 MIG tenements

Average carpet area:

- 59.5 m²

Average cost of tenement:

- 4.865.010,-

Average EMD to be paid:

- 27.640,-

245 HIG tenements

Average carpet area:

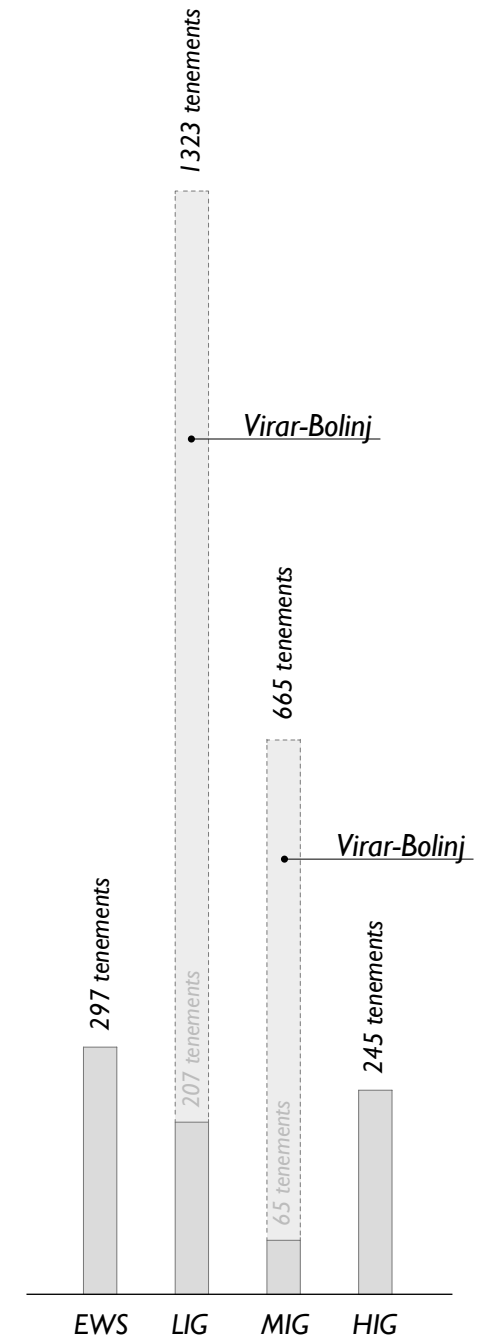
- 61.4 m²

Average cost of tenement:

- 7.808.330,-

Average EMD to be paid:

- 75.200,-



Sale of Tenements 2015

326 EWS tenements

Average carpet area:

- 27.1 m²

Average cost of tenement:

- 1.819.760,-

Average EMD to be paid:

- 15.200,-

430 LIG tenements

Average carpet area:

- 28.2 m²

Average cost of tenement:

- 2.672.410,-

Average EMD to be paid:

- 25.200,-

241 MIG tenements

Average carpet area:

- 43.6 m²

Average cost of tenement:

- 4.450.450,-

Average EMD to be paid:

- 50.200,-

0 HIG tenements

Average carpet area:

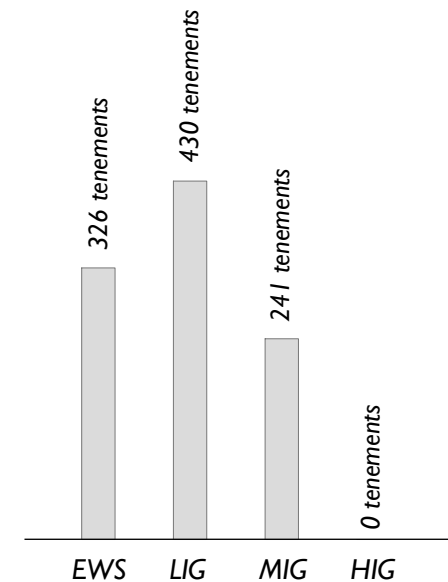
-

Average cost of tenement:

-

Average EMD to be paid:

-



Sale of Tenements 2016

191 EWS tenements

Average carpet area:

- 21.9 m²

Average cost of tenement:

- 1.299.950,-

Average EMD to be paid:

- 15.300,-

417 LIG tenements

Average carpet area:

- 30.2 m²

Average cost of tenement:

- 2.802.620,-

Average EMD to be paid:

- 25.300,-

228 MIG tenements

Average carpet area:

- 45.3 m²

Average cost of tenement:

- 4.352.520,-

Average EMD to be paid:

- 50.300,-

136 HIG tenements

Average carpet area:

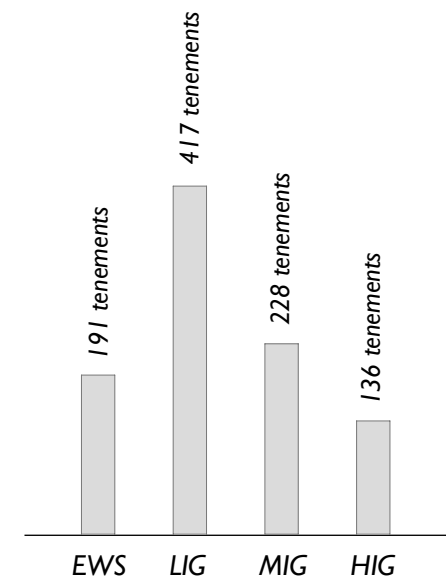
- 46.2 m²

Average cost of tenement:

- 8.083.930,-

Average EMD to be paid:

- 75.300,-



Sale of Tenements 2017

8 EWS tenements

Average carpet area:

- 23.0 m²

Average cost of tenement:

- 1.648.560,-

Average EMD to be paid:

- 15.336,-

191 LIG tenements

Average carpet area:

- 38.3 m²

Average cost of tenement:

- 1.799.603,-

Average EMD to be paid:

- 25.336,-

281 MIG tenements

Average carpet area:

- 39.8 m²

Average cost of tenement:

- 4.498.125,-

Average EMD to be paid:

- 50.336,-

338 HIG tenements

Average carpet area:

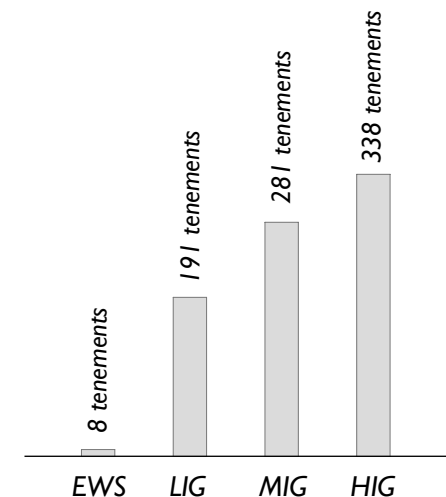
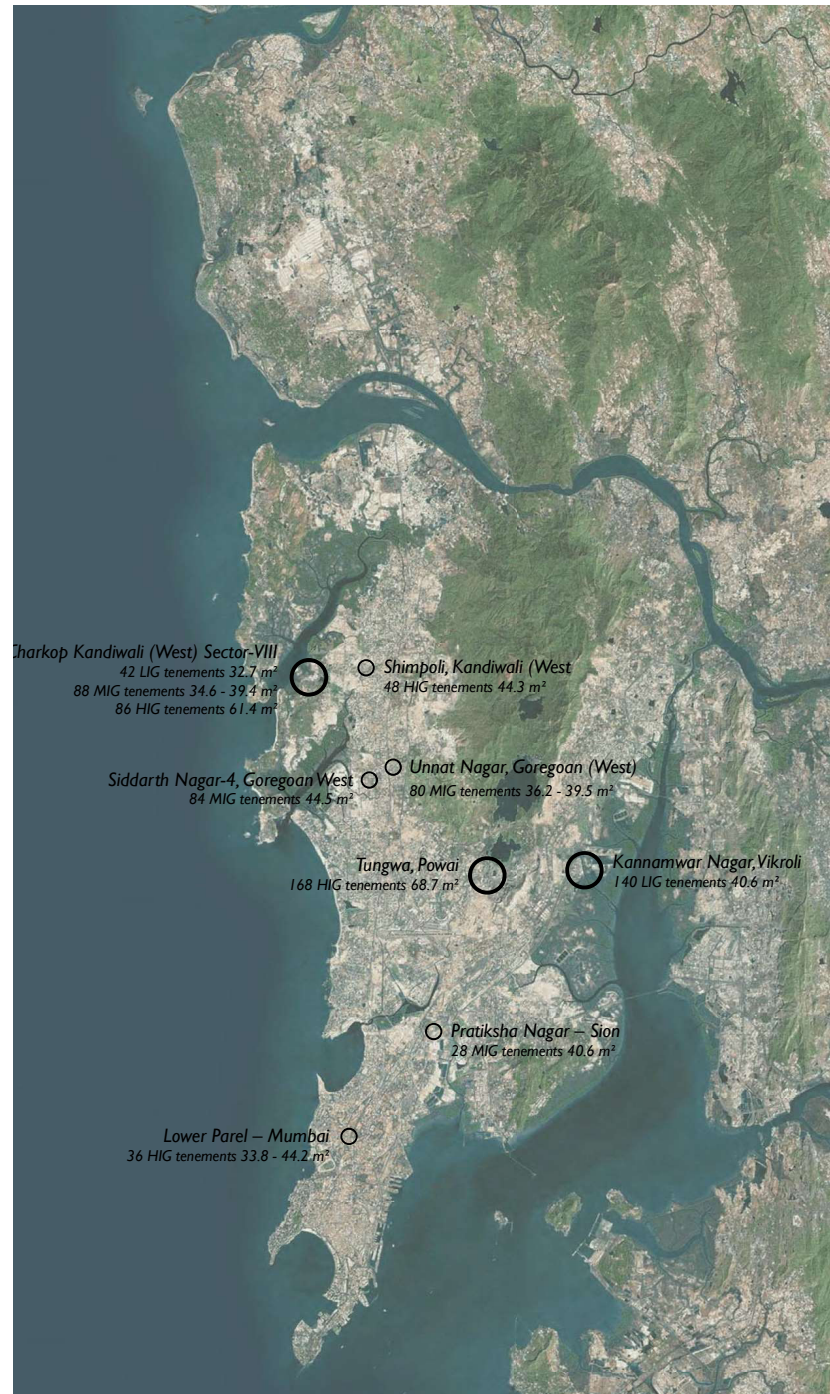
- 59.8 m²

Average cost of tenement:

- 11.390.025,-

Average EMD to be paid:

- 75.336,-



2014 - 2017

822 EWS tenements

Average carpet area:

- 25.1 m²

Average cost of tenement:

- 1.615.265,-

Average EMD to be paid:

- 15.225,-

2.361 LIG tenements

Average carpet area:

- 30.3 m²

Average cost of tenement:

- 2.544.390,-

Average EMD to be paid:

- 19.625,-

1.415 MIG tenements

Average carpet area:

- 50.6 m²

Average cost of tenement:

- 4.638.970,-

Average EMD to be paid:

- 39.560,-

719 HIG tenements

Average carpet area:

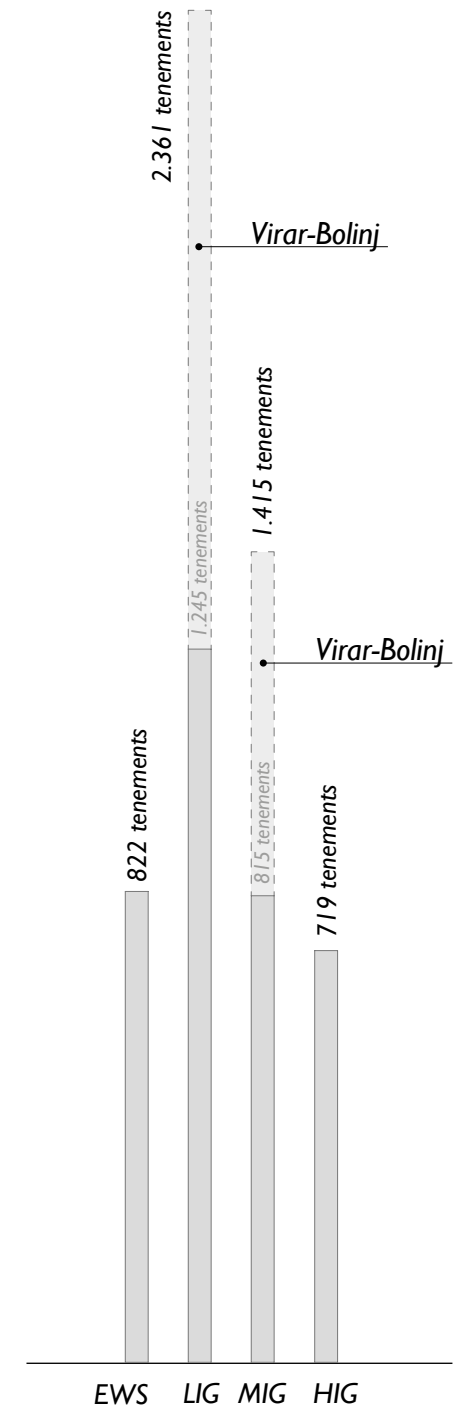
- 57.8 m²

Average cost of tenement:

- 9.544.210,-

Average EMD to be paid:

- 75.280,-



MHADA

Highlighted Projects

Information used in this research is substracted from the official website of the Maharashtra Housing and Area Development Authority (MAHDA) <https://mhada.gov.in/en>

Highlighted Projects MHADA Projects

1. Magathane, Borivali East, Mumbai

- 560 Transit Tenements
- 110 HIG tenements

Total area: 12.848 m²

2. Swadeshi Mill

- 1108 Mill Workers Tenements
- 540 Transit Tenements
- 5 shops

Total area: 12.612m²

3. Unnat Nagar, Goregaon West

- 42 Transit Tenements
- 86 MIG Tenements

Total area: 4.212 m²

4. Colony Virar-Bolinj

- 3.496 LIG Tenements
- 1.804 MIG Tenements

Total area: 69.410 m²



Magathane, Borivali East, Mumbai



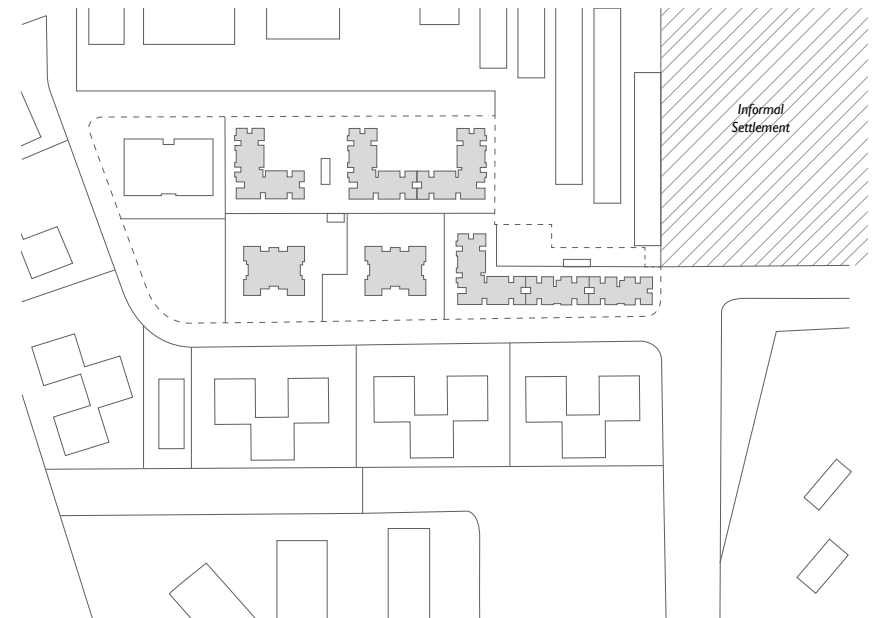
Redevelopment of Existing Transit camp and construction of New Transit Tenements & HIG Tenements at Magathane, Borivali (E) Mumbai.

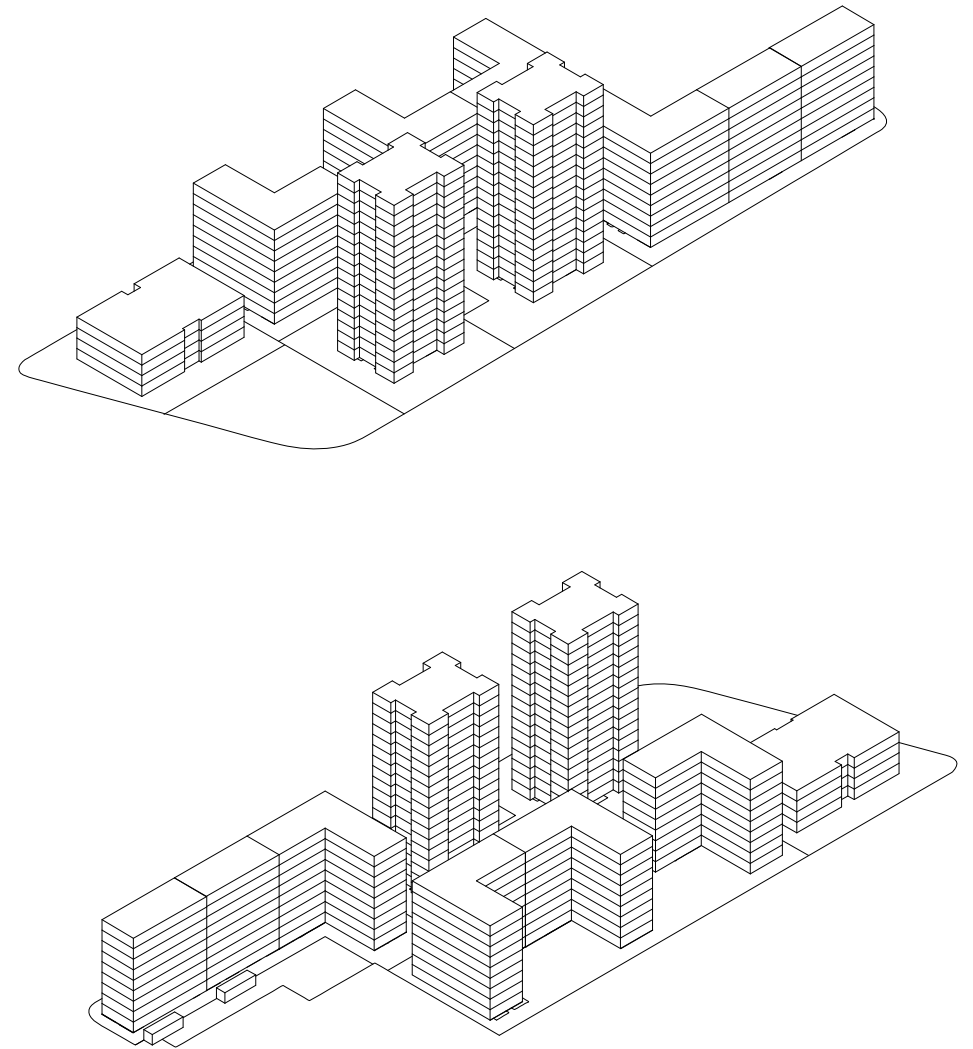
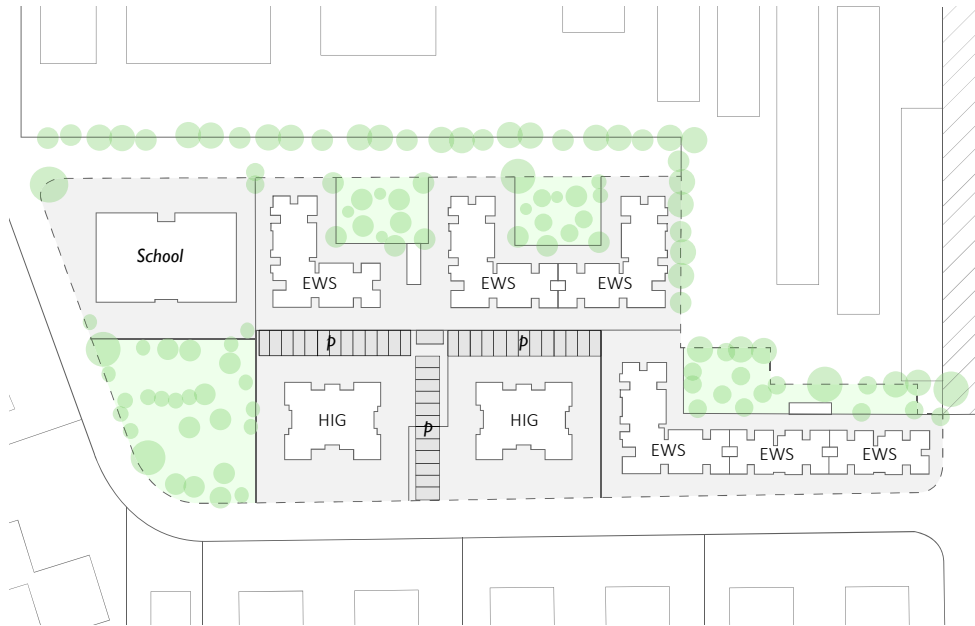
- 560 Transit Tenements - 16.7 m²
- 110 HIG tenements - 64.9 m²
- 670 households
- 3,215 residents
- 1 School

Total area:	12,848 m ²
Built area:	3,613 m ²
Open area:	9,235 m ²
Green area:	2,150 m ²
Institutional space:	2,862 m ²

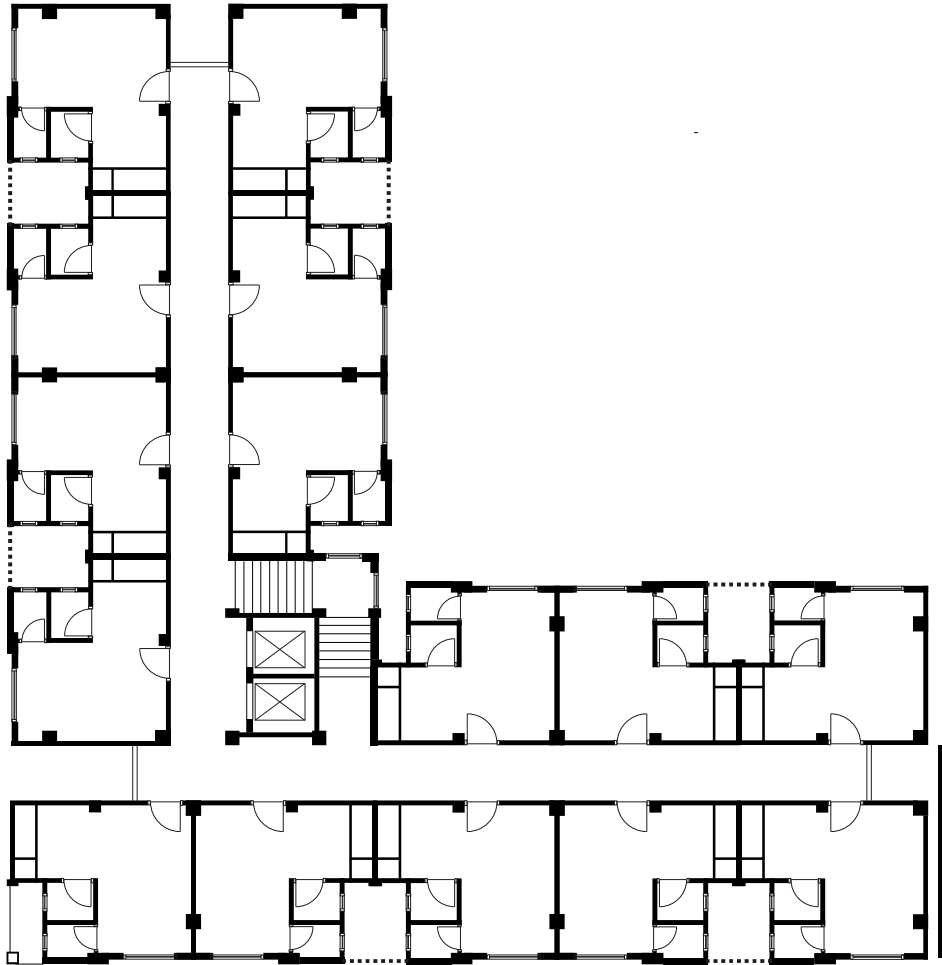
$$FSI: 34.185 \text{ m}^2 / 12.848 \text{ m}^2 = 2.7$$

m ² open area/p:	2.87 m ² /p
m ² green area/p:	0.67 m ² /p
m ² Institutional area/p:	0.89 m ² /p

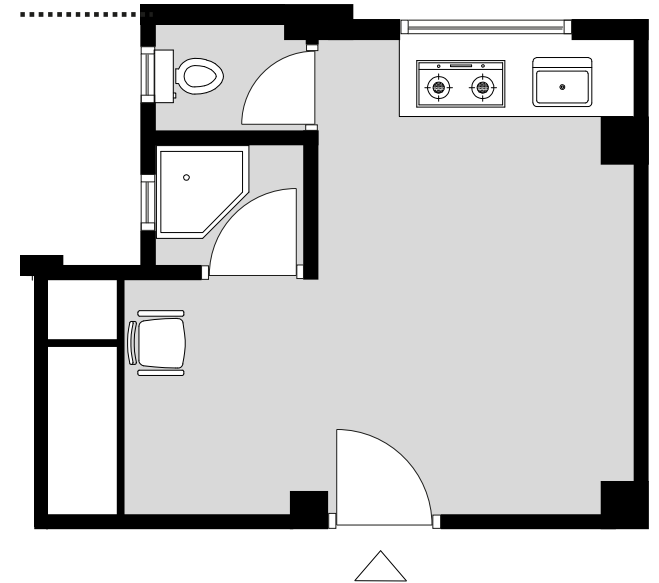




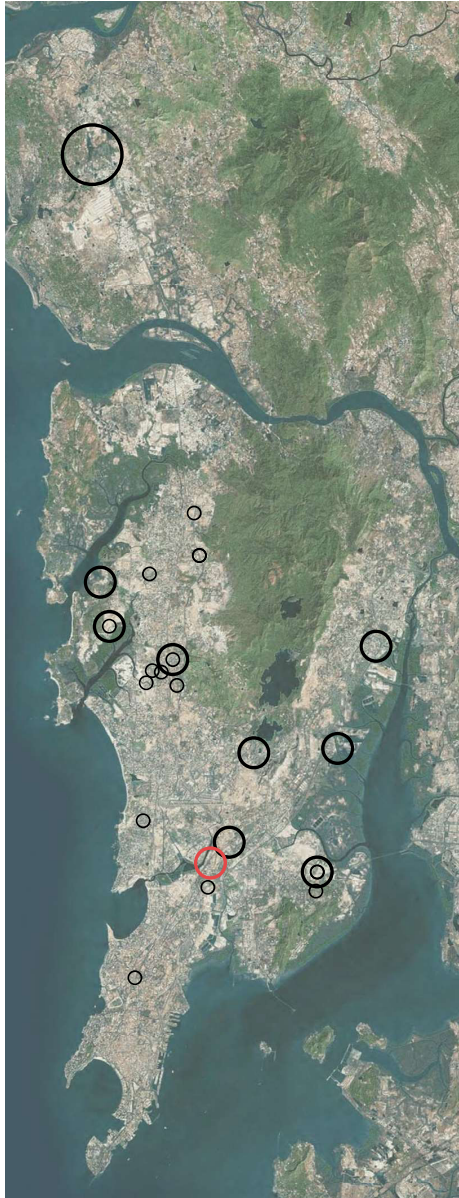
Masterplan of a MHADA development in Magathane



Masterplan of a MHADA development in Magathane



Swadeshi Mill



Housing for Mill workers and Transit Tenements in Swadeshi Mill, Compound, Kurla East, Mumbai.

Date of taking possession: 04/01/2008

Work Completed.

- 1108 Mill Workers Tenements
- 540 Transit Tenements
- 5 shops
- 1648 households
- 7.910 residents

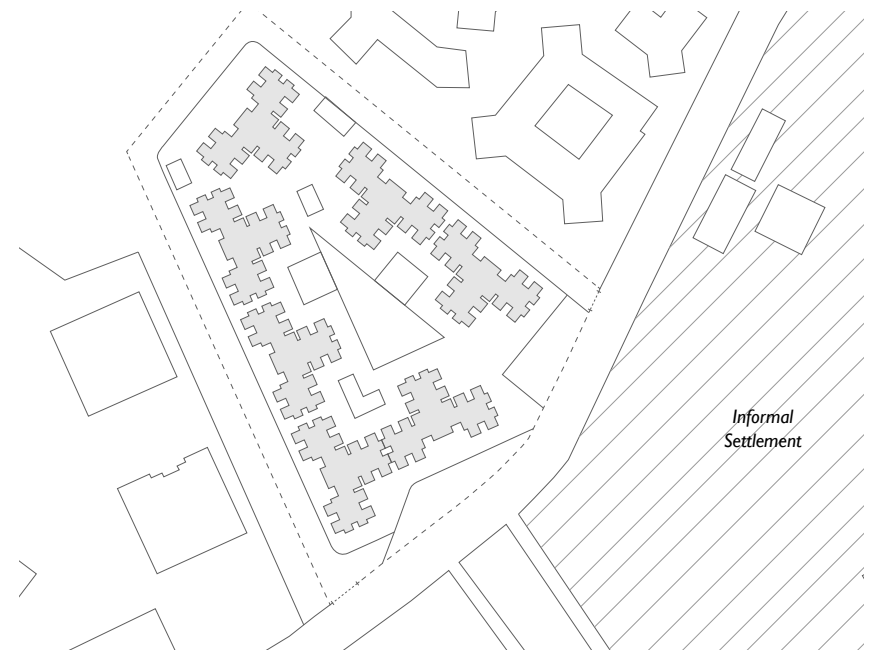
Total area:	12.612m ²
Built area:	4.135 m ²
Open area:	8.477 m ²
Green area:	1.012 m ²
Institutional space:	0 m ²

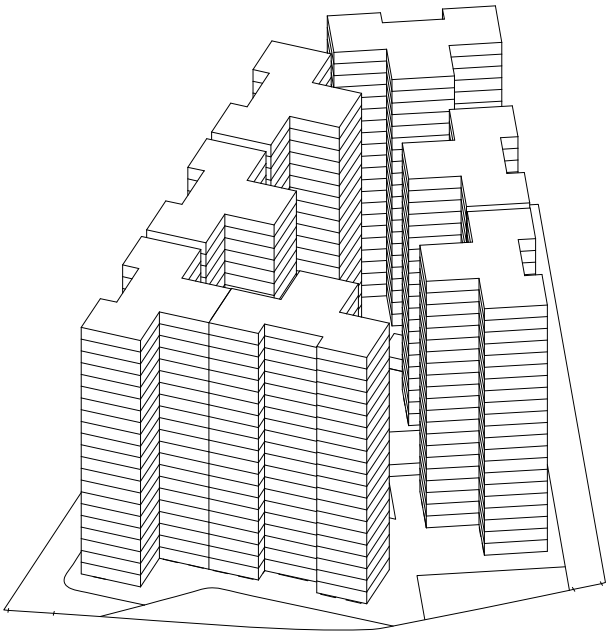
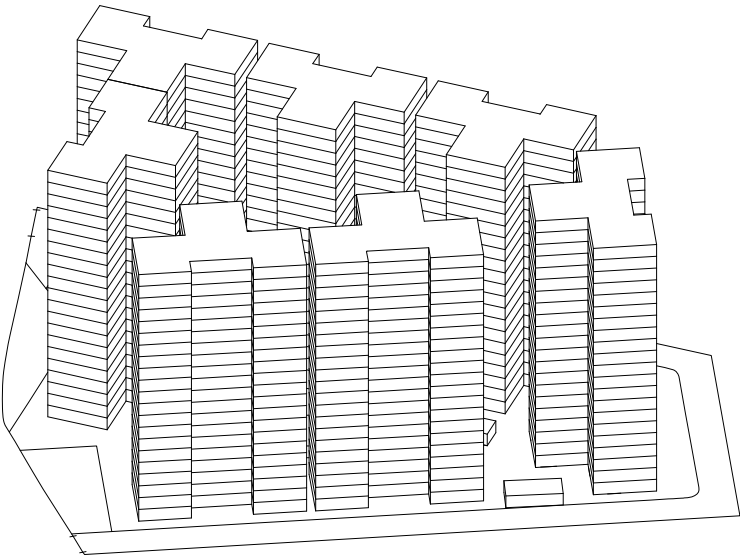
$$FSI: 68.784,1 \text{ m}^2 / 12.612 \text{ m}^2 = 5.5$$

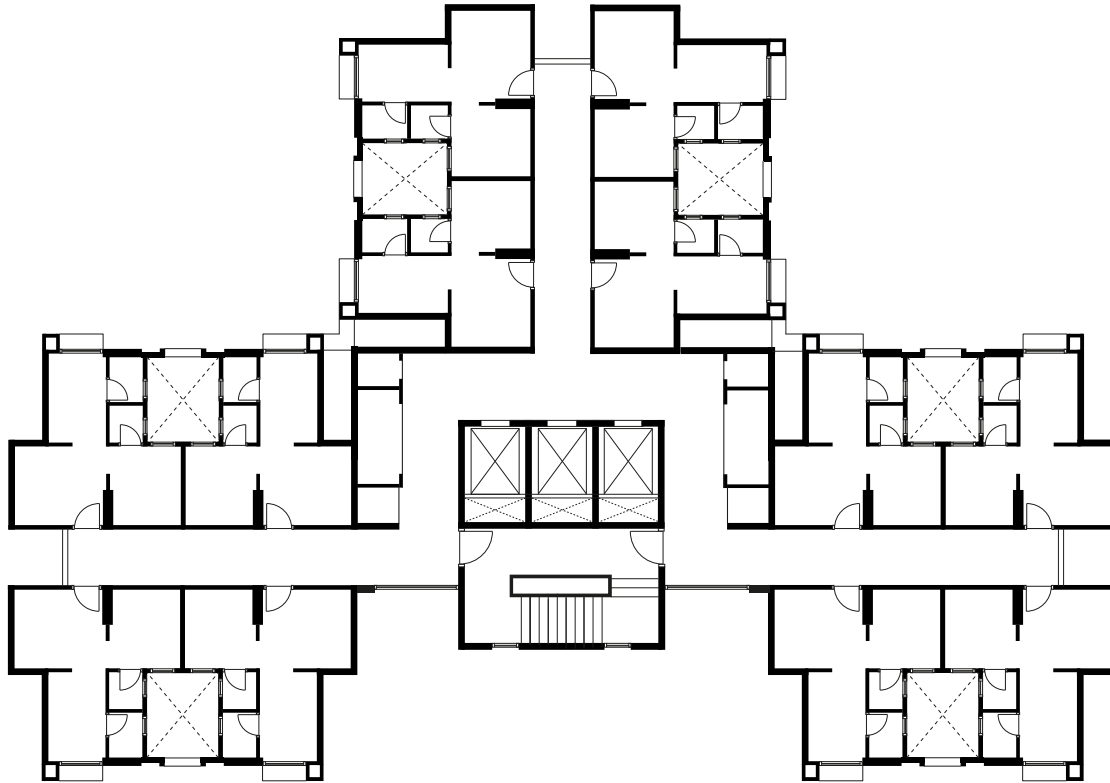
m ² open area/p:	1,07 m ² /p
m ² green area/p:	0,13 m ² /p
m ² Institutional area/p:	0 m ² /p



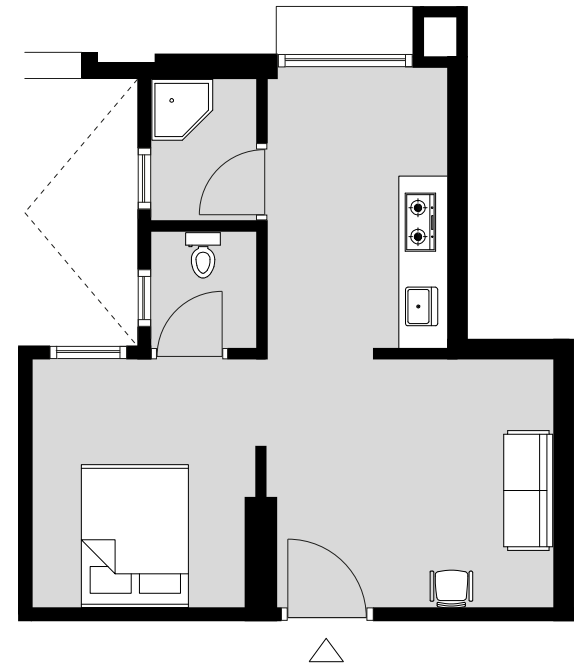
The Swadeshi Mill Project



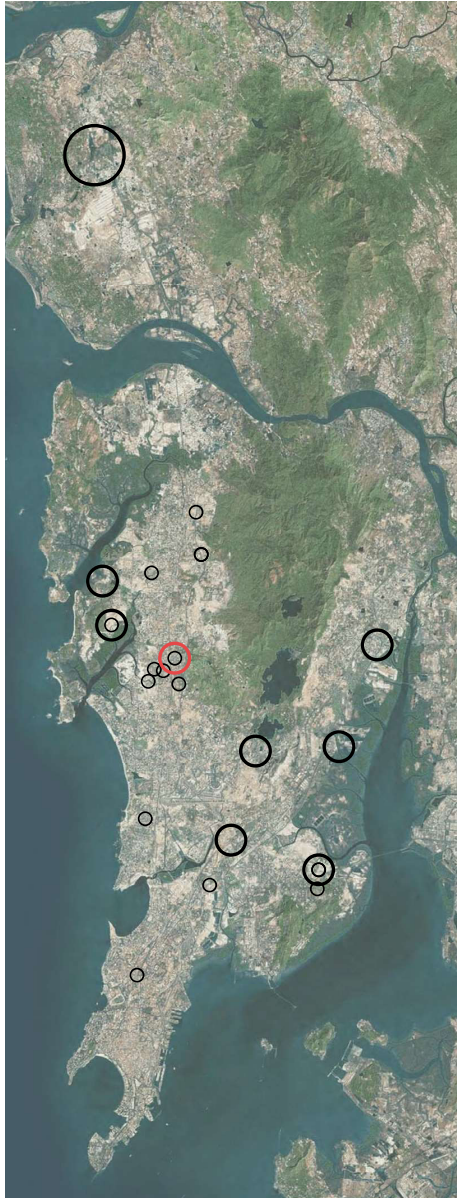




Masterplan of a MHADA development in Magathane



Unnat Nagar, Goregaon West



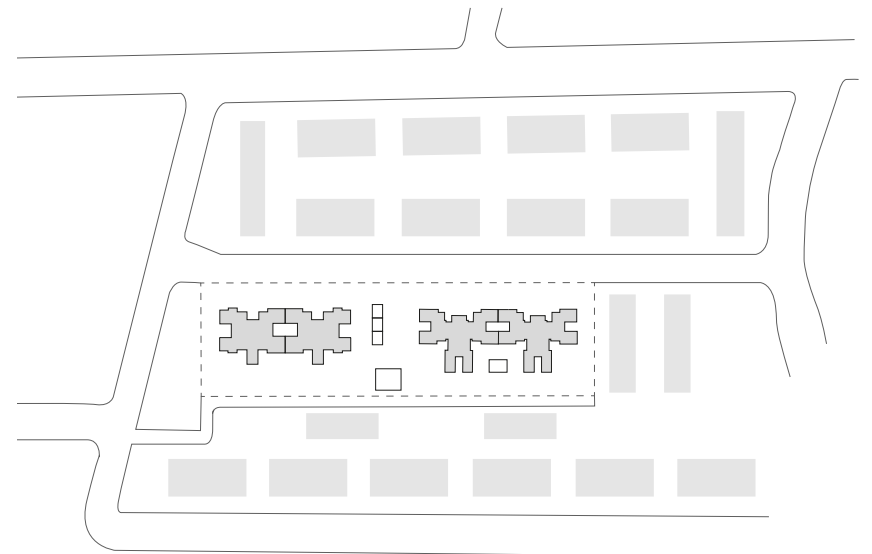
Redevelopment of existing Transit Camp & constructing new transit & MIG tenements in Siddharth Nagar, Goregaon West, Mumbai.

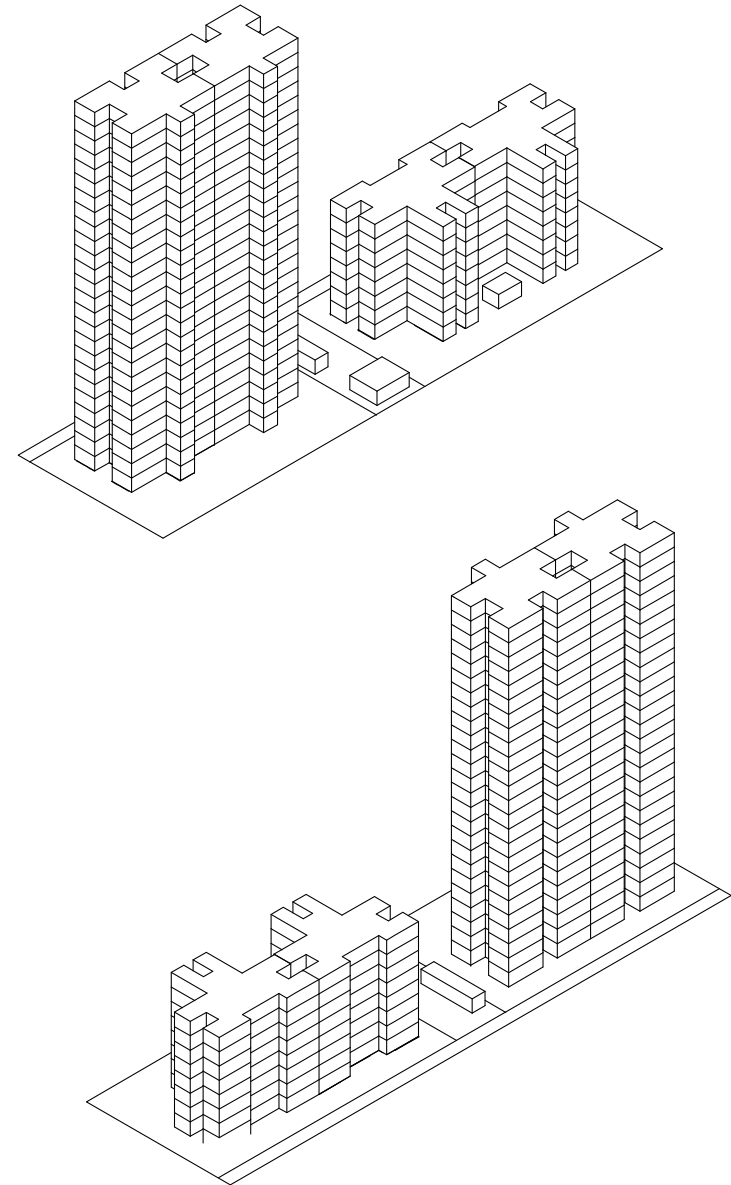
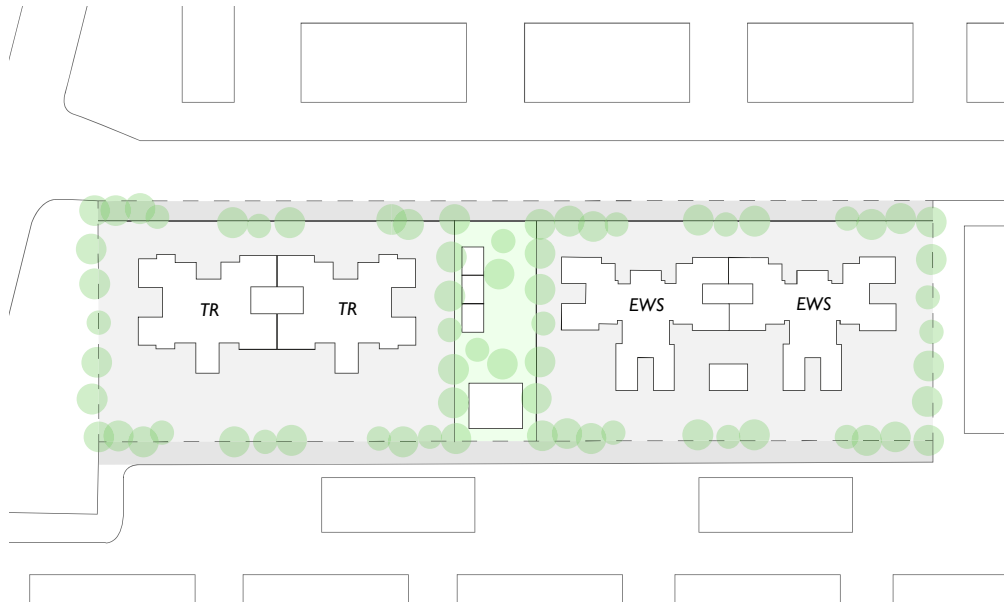
- 42 Transit Tenements
- 86 MIG Tenements
- 128 households
- 615 residents

Total area:	4.212 m ²
Built area:	1.089 m ²
Open area:	3.123 m ²
Green area:	352 m ²
Institutional space:	0 m ²

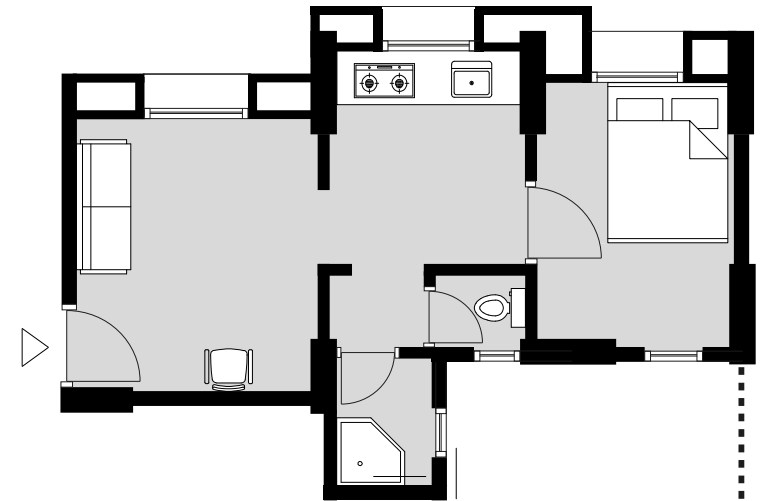
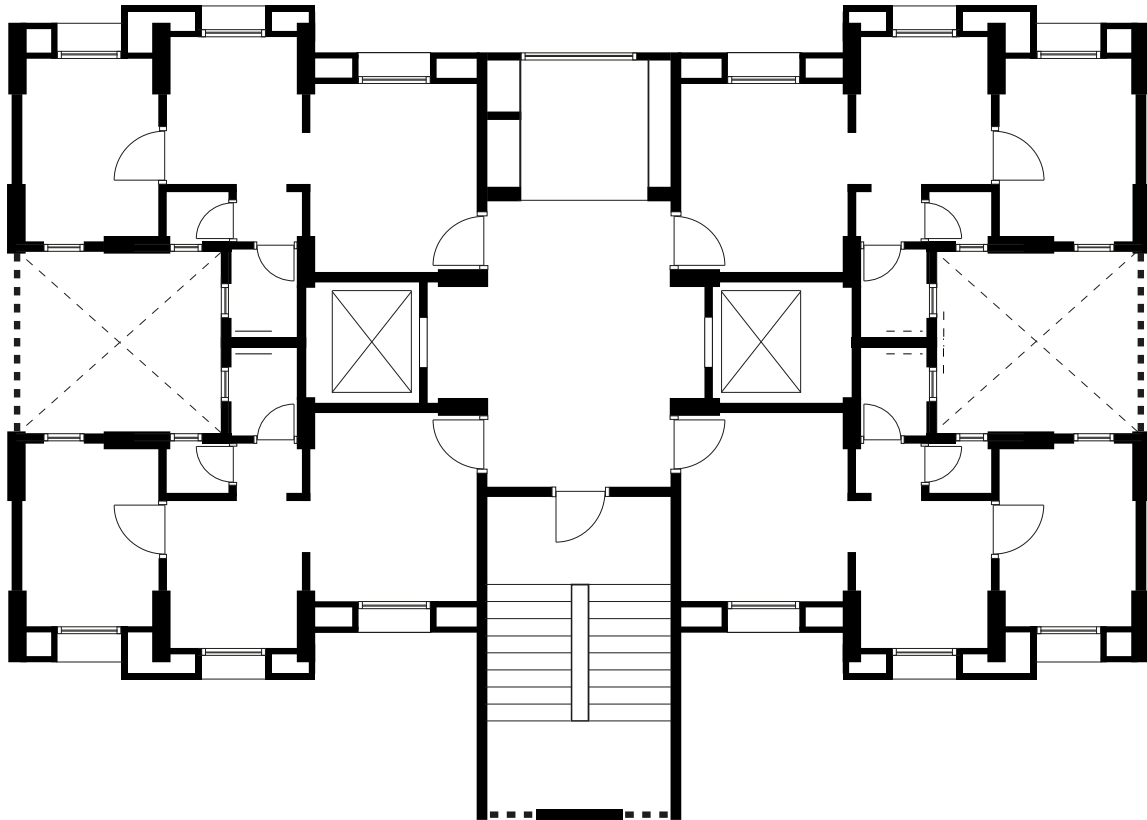
FSI: $15.711,5 \text{ m}^2 / 4.212 \text{ m}^2 = 3.7$

m ² open area/p:	5.07 m ² /p
m ² green area/p:	0.57 m ² /p
m ² Institutional area/p:	0 m ² /p





Masterplan of a MHADA development in Unnat Nagar, Goregaon West



Masterplan of a MHADA development in Unnat Nagar, Goregaon West

MHADA Colony Virar-Bolinj



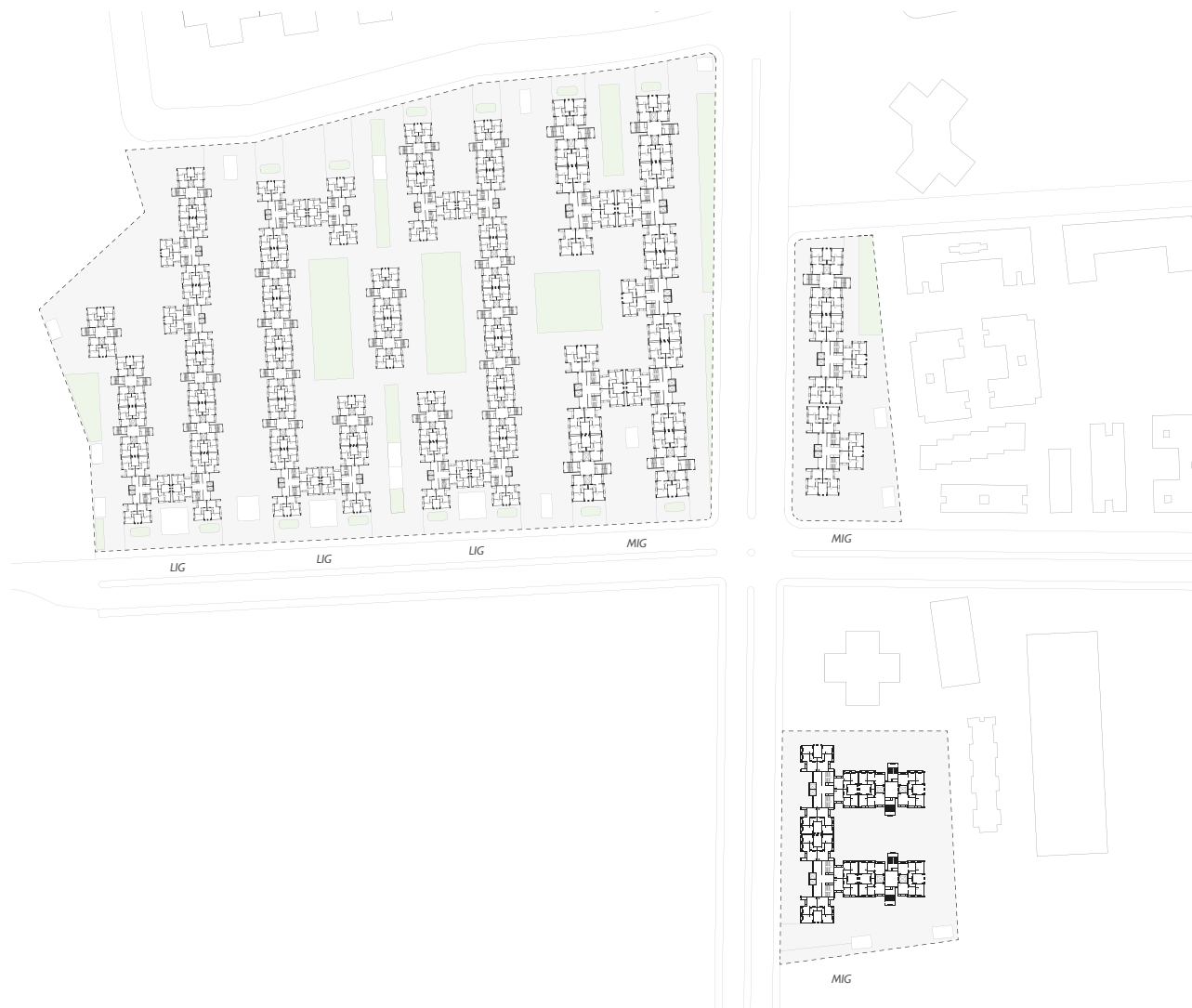
- 3.496 LIG Tenements
- 1.804 MIG Tenements
- 5.300 households
- 25.440 residents

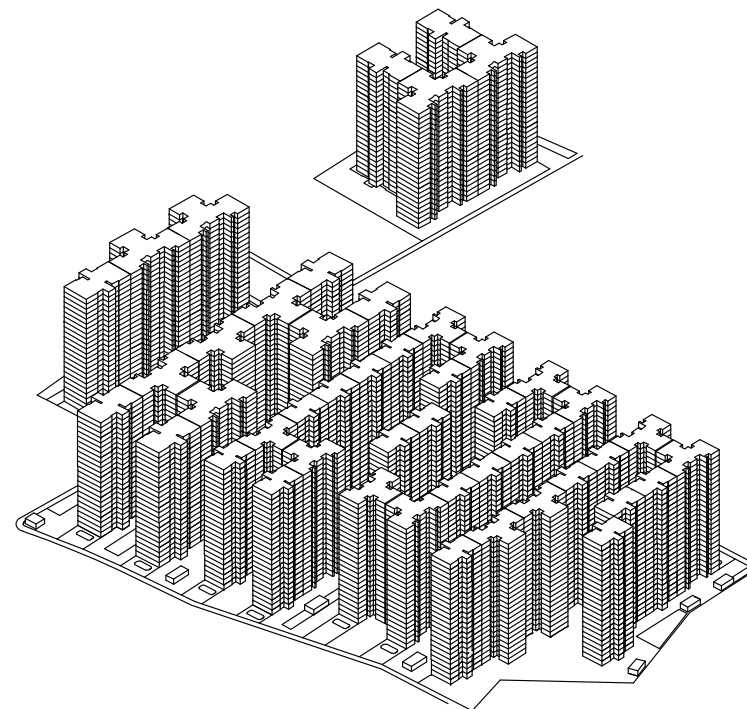
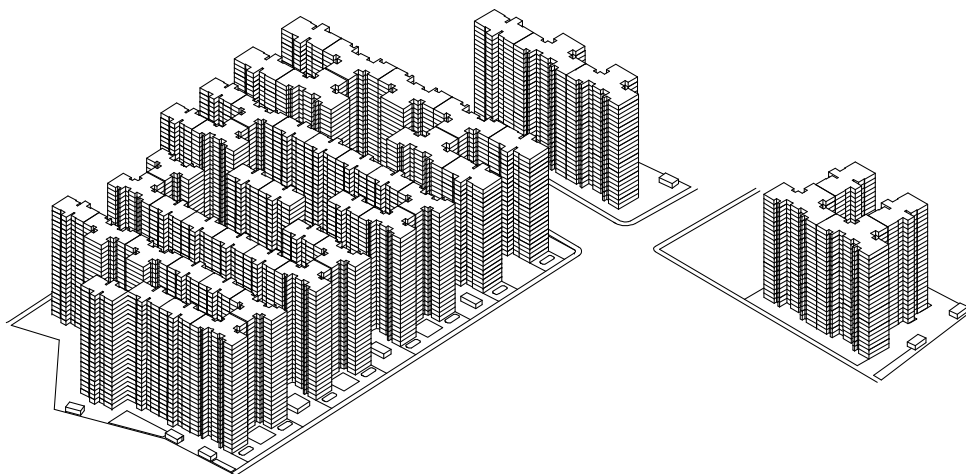
Total area:	69.410 m ²
Built area:	21.310 m ²
Open area:	48.100 m ²
Green area:	5.892 m ²
Institutional space:	unknown

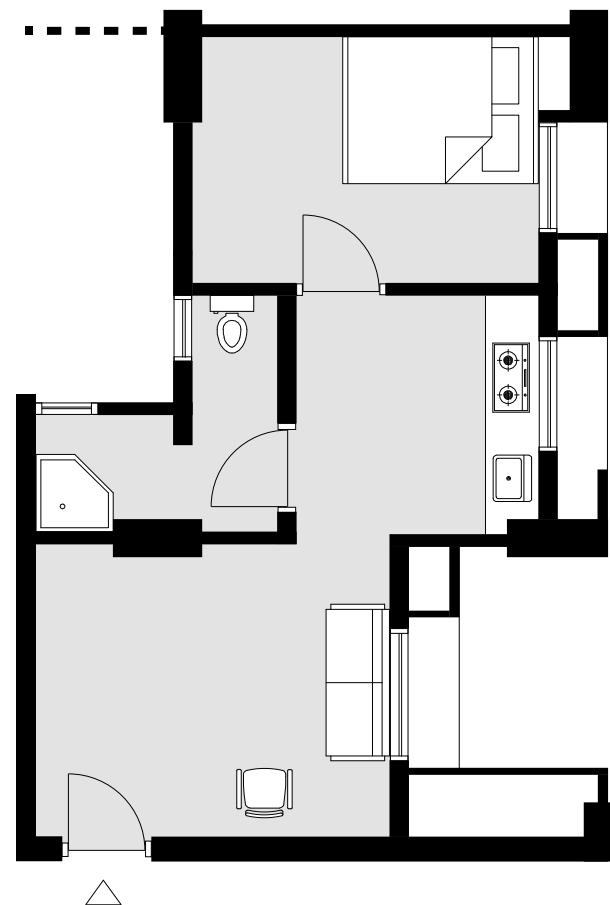
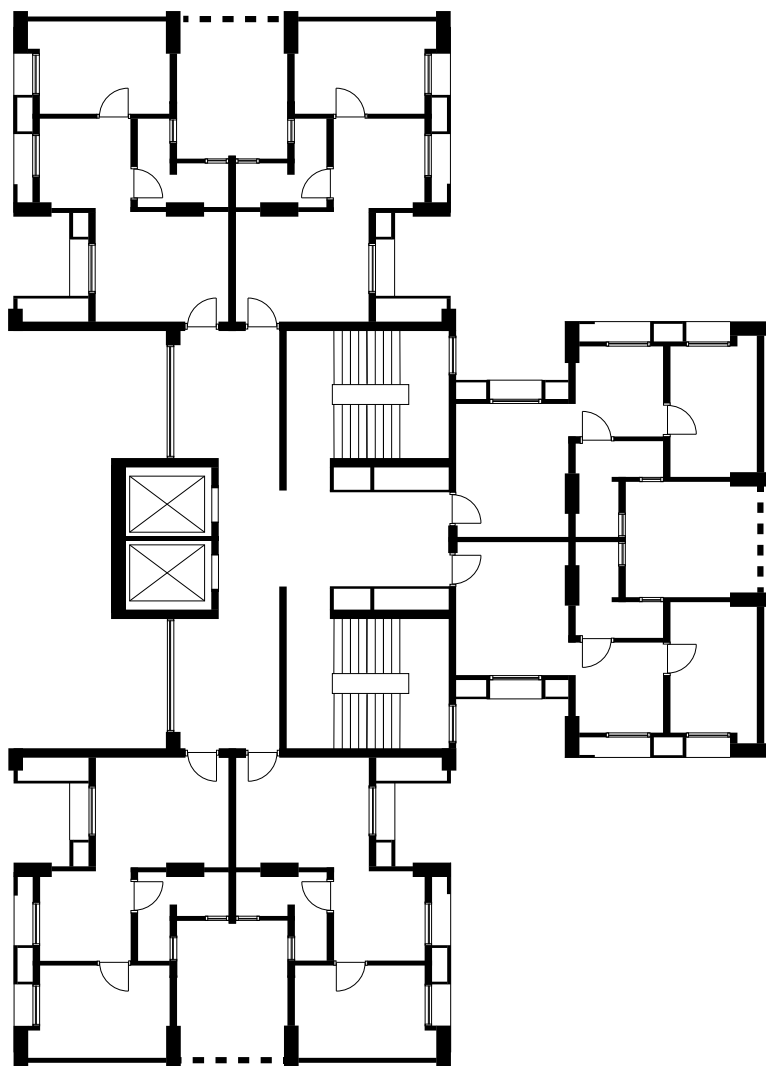
$$FSI: 458.724 \text{ m}^2 / 69.410 \text{ m}^2 = 7.0$$

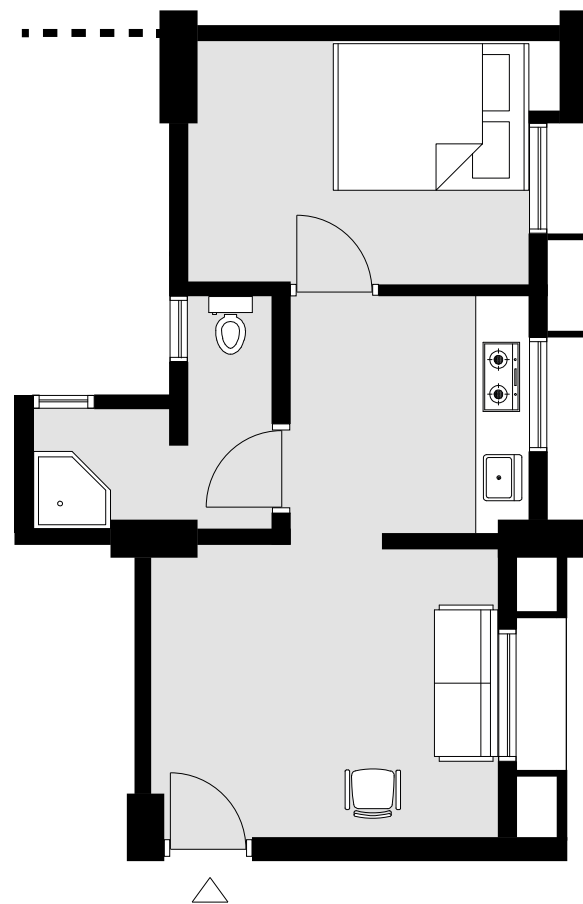
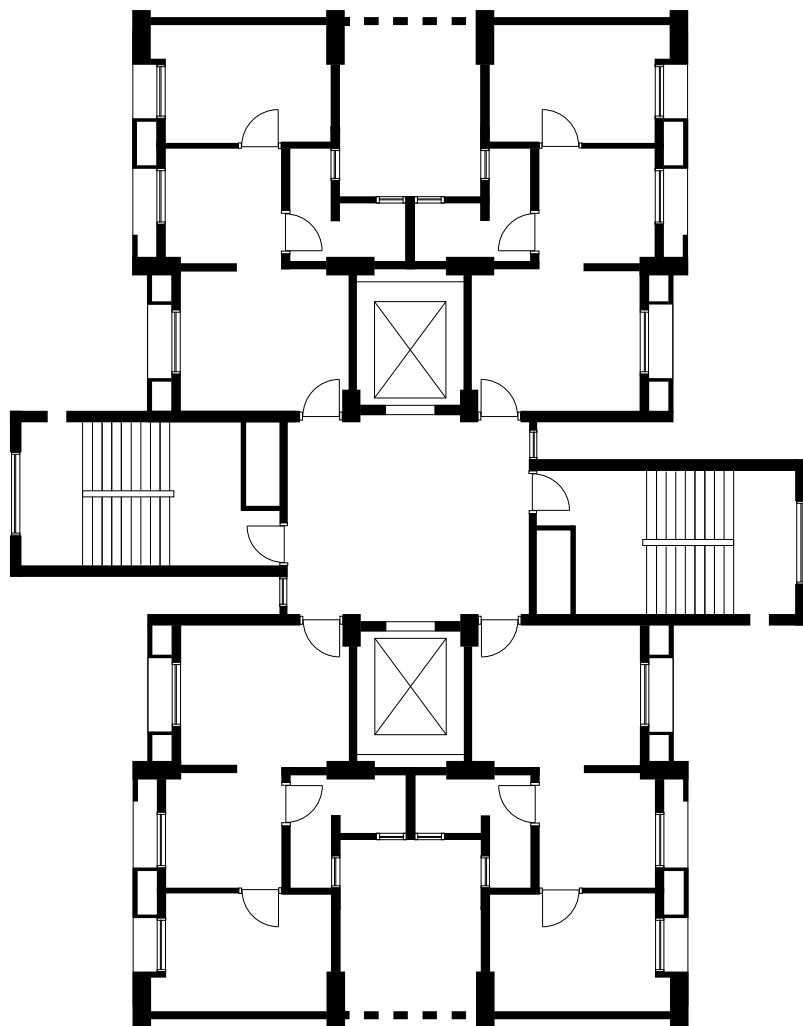
m ² open area/p:	1.89 m ² /p
m ² green area/p:	0.23 m ² /p
m ² Institutional area/p:	unknown













MHADA

Concluding

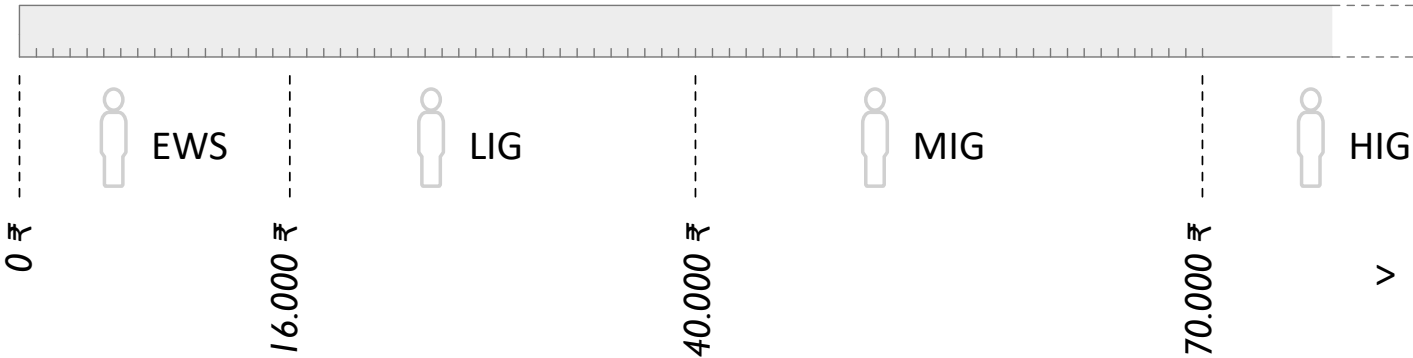
What is Affordable?

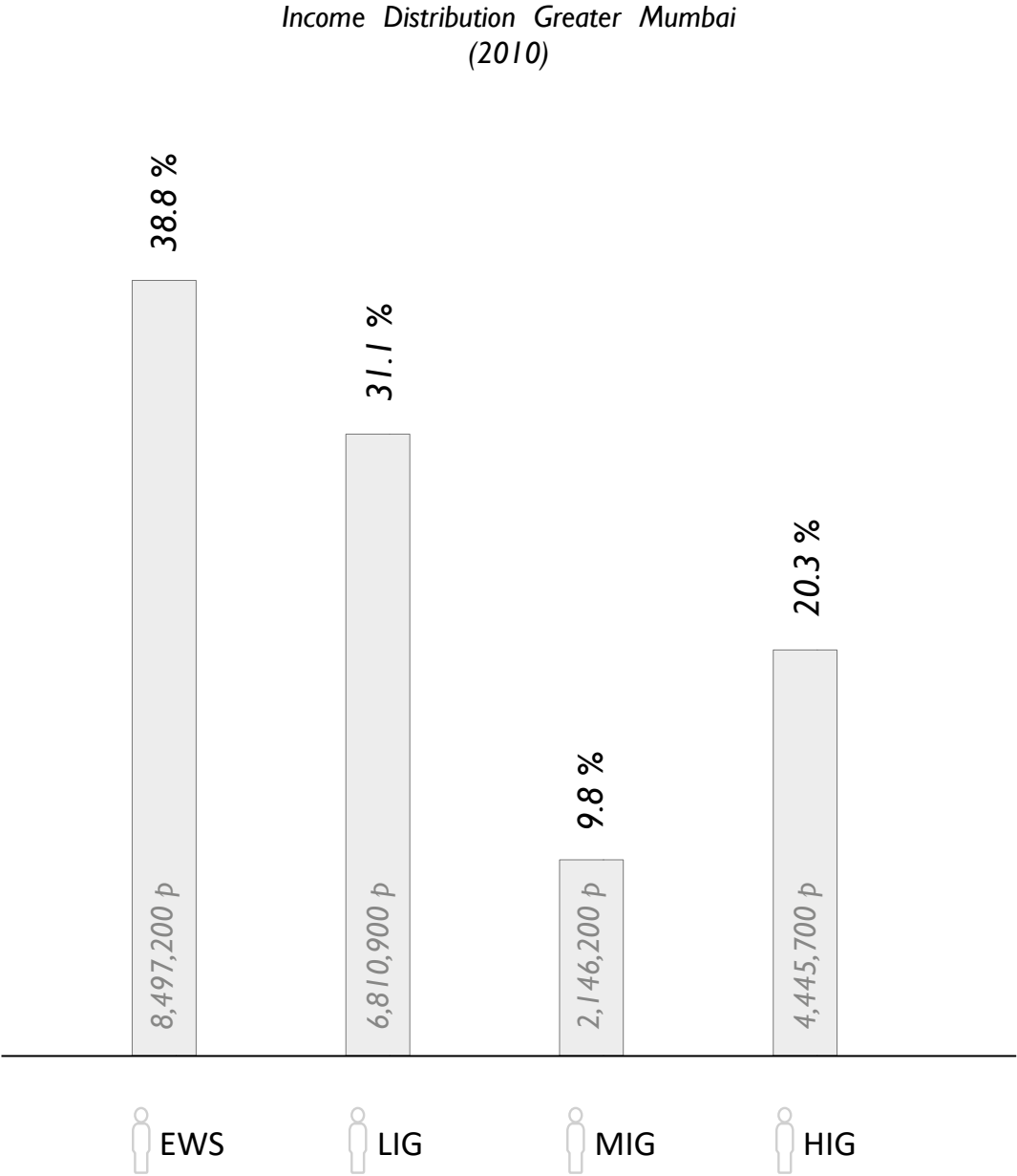
A High Level Task Force on 'Affordable Housing for All'²¹ (2008) set up by the Ministry of Housing & Urban Poverty Alleviation, Government of India, has suggested that the following parameters be used to define affordability:

Income Group	 EWS/LIG	 MIG
Size	28 - 56 m ² carpet area	Not exceeding 112 m ² carpet area
Cost	Not exceeding 4 times household gross annual income	Not exceeding 5 times household gross annual income
EMI/Rent	Not exceeding 30% of gross monthly income	Not exceeding 40% of gross monthly income

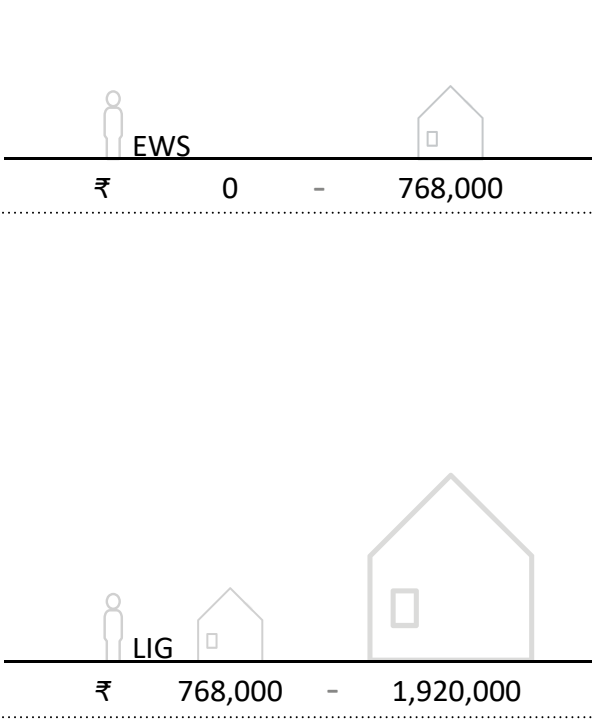
Income Groups

The monthly household income per income group as defined by the Maharashtra Government.

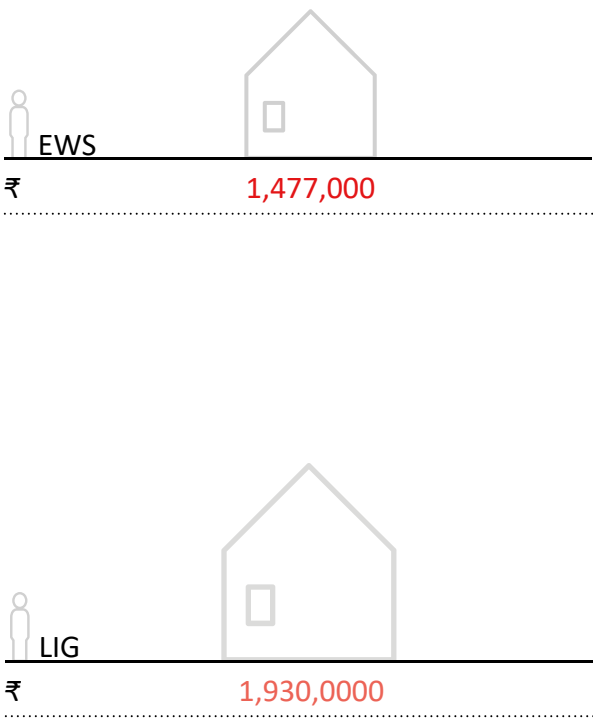




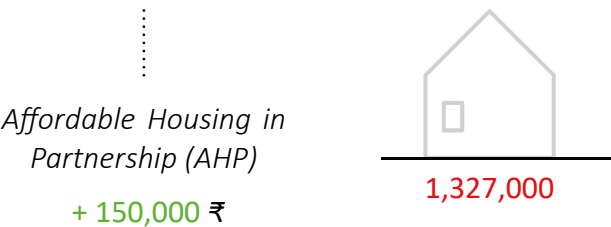
Ideal Cost of an affordable house (Rs.)



Average Price of MHADA Dwelling

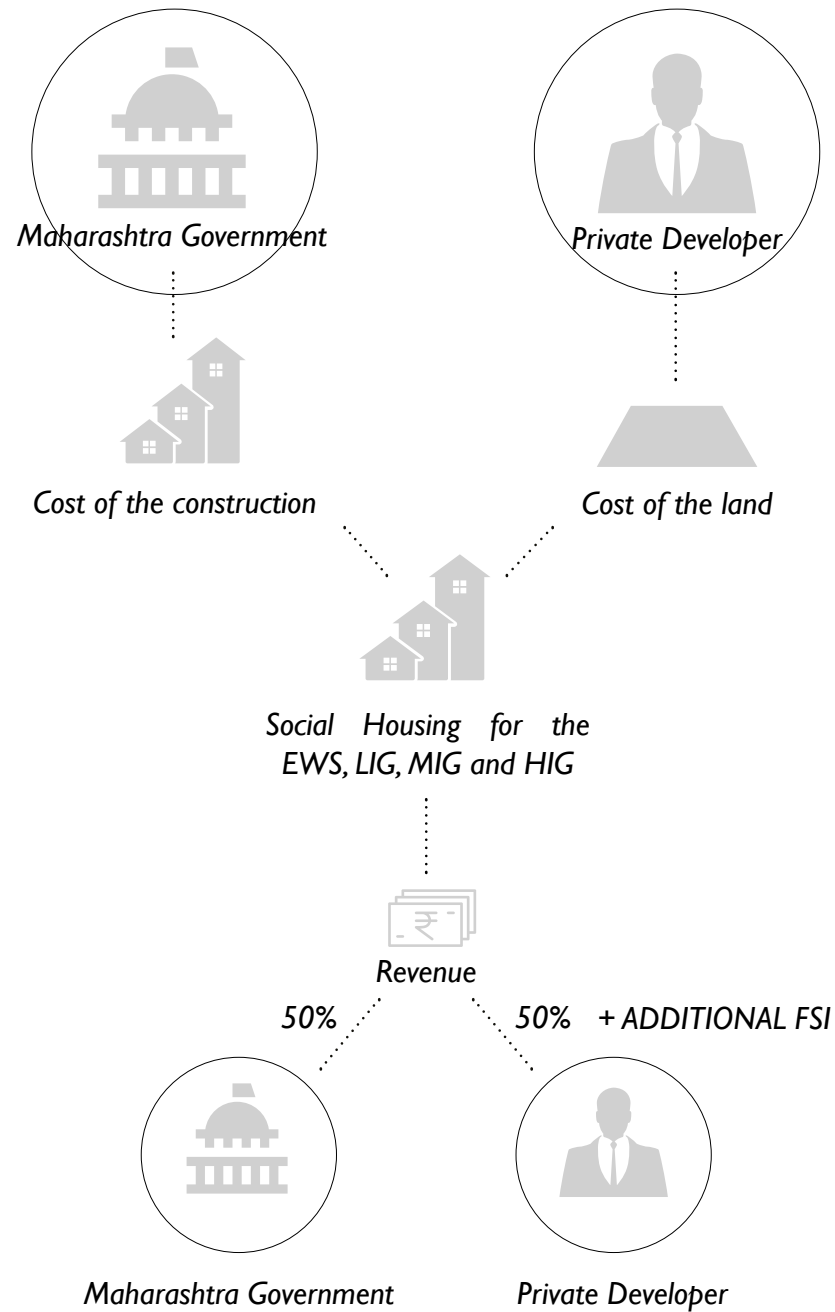


Pradhan Mantri Awas Yojana - PMAY Scheme



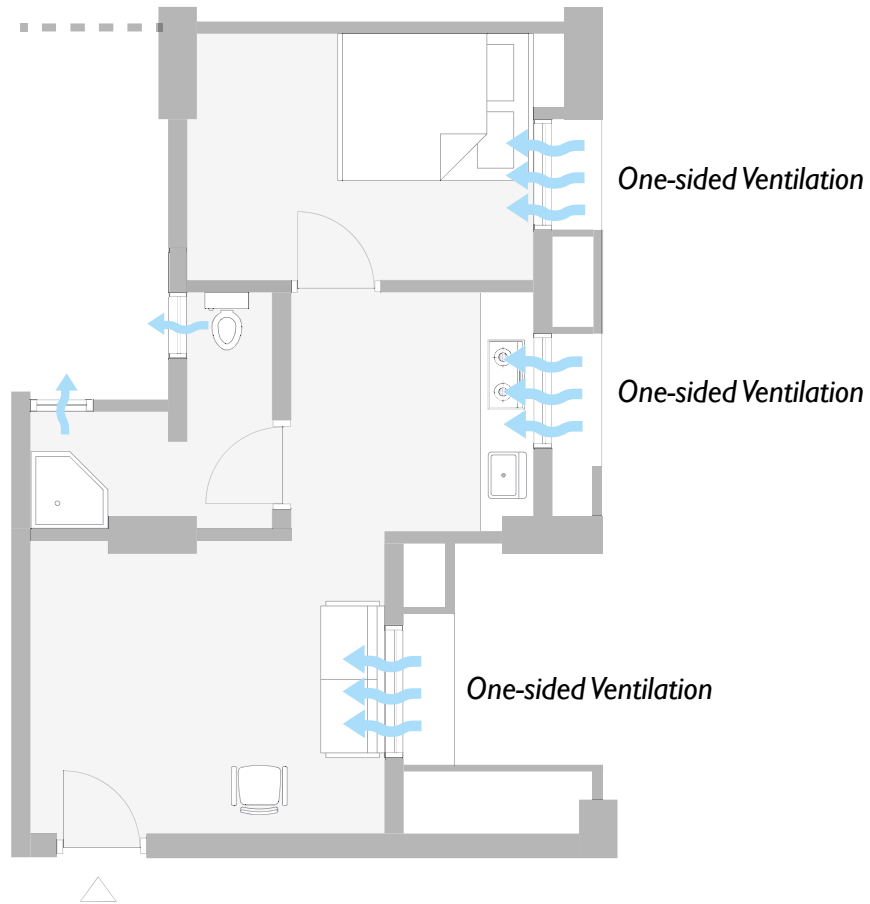
Affordable housing

MHADA -
Private Developer
Scheme

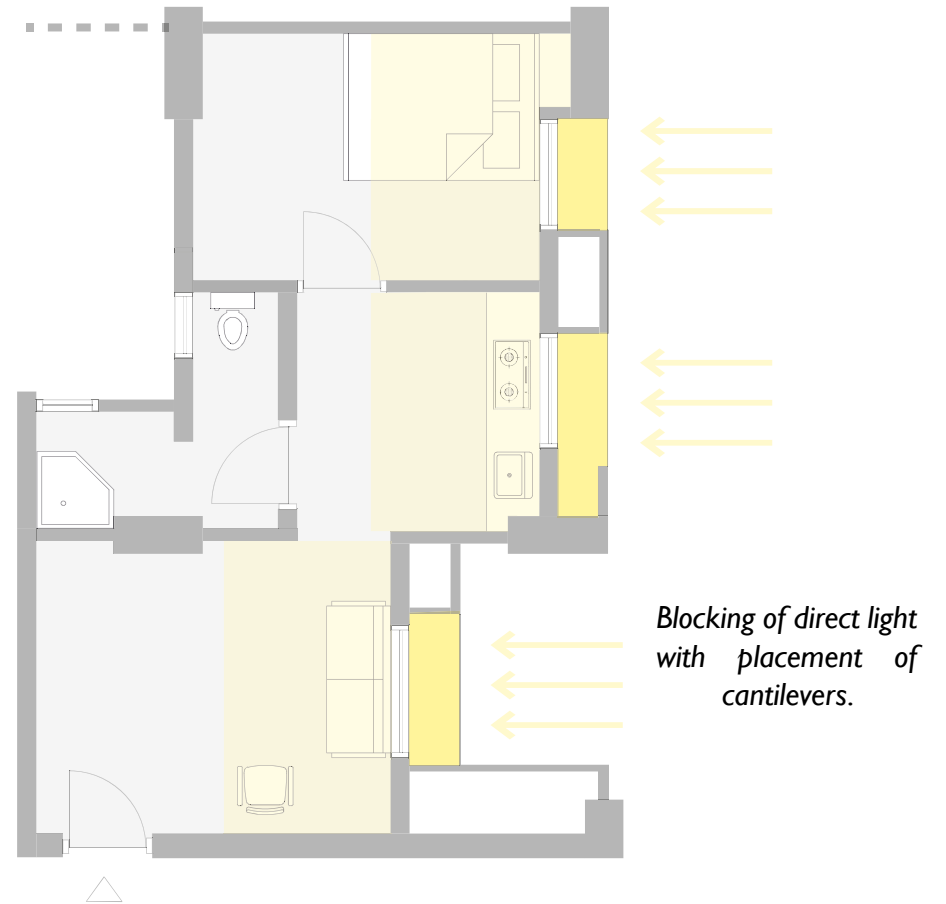


Plan Analysis

MHADA Dwelling



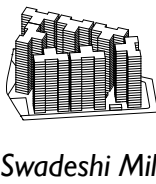
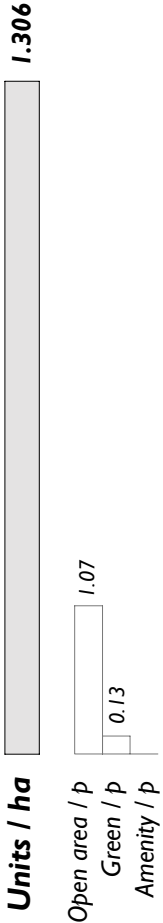
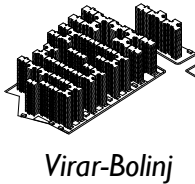
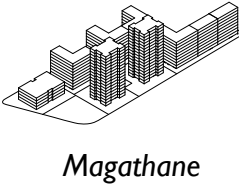
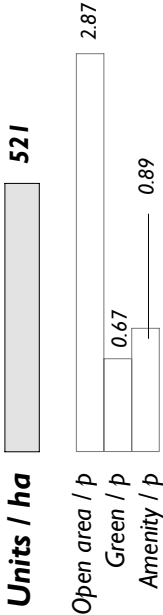
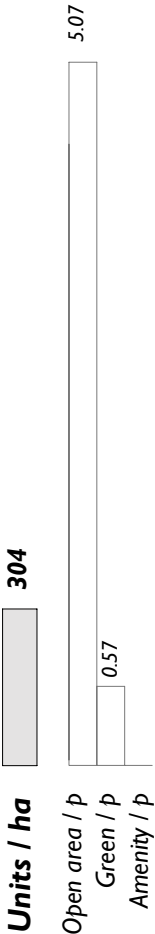
Ventilation



Light

Comparative study MHADA Projects

The effect of density increasing policies on the liveability of the city



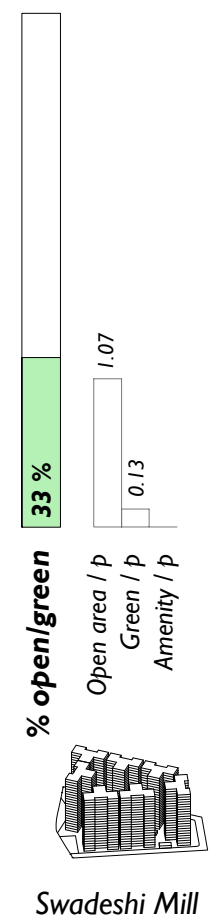
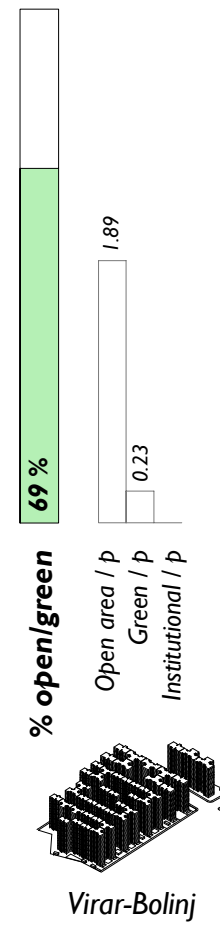
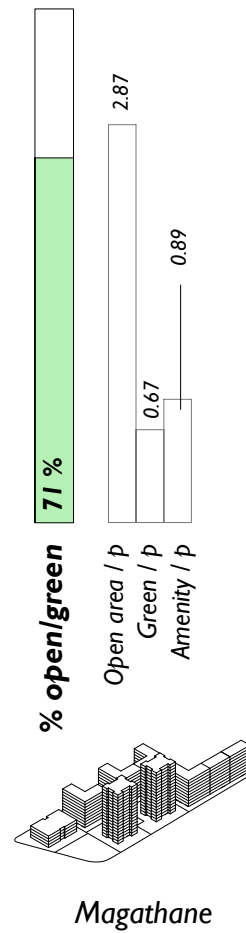
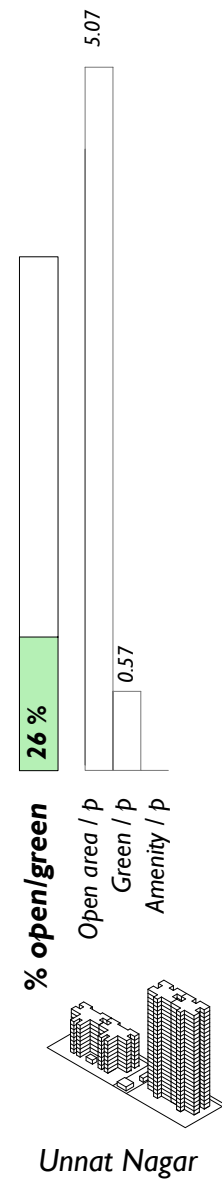
Comparative study MHADA Projects

The shortcoming of current regulations regarding open space, green space and amenities.

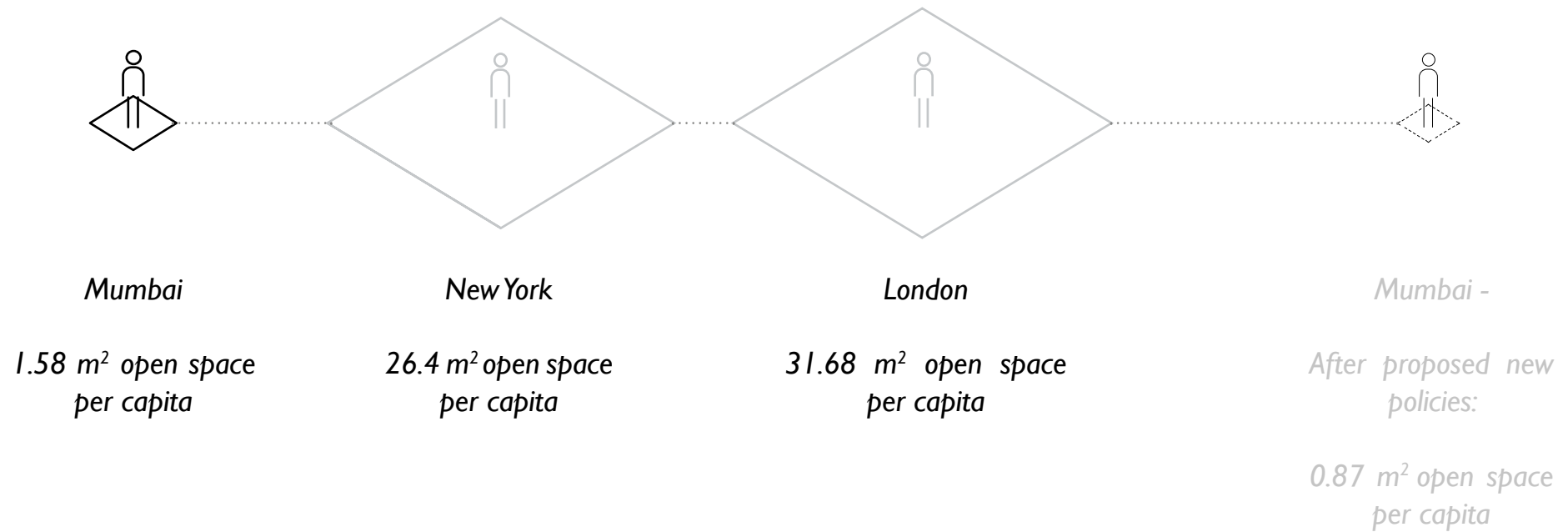
Development Control Regulations (DCR) for Mumbai Metropolitan Region (MMR) 2016 - 2036

- 20% of the plot area to be allocated for open space (open and green space).

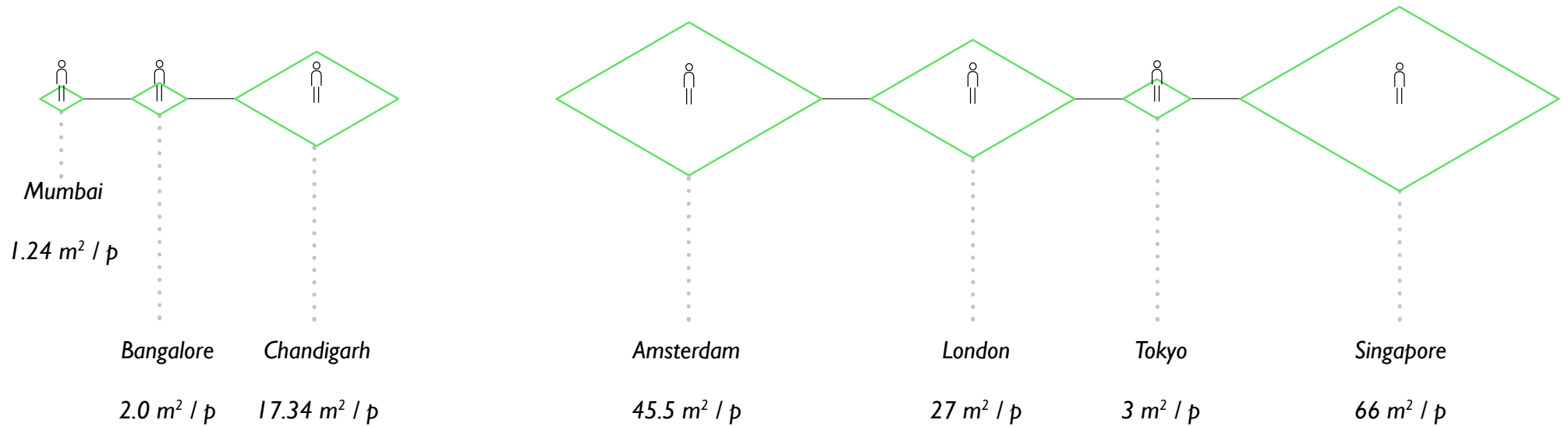
- 5% of the plot area to be allocated for amenities.



Open Space (including greenspace) in the City of Mumbai



Green Space in Mumbai

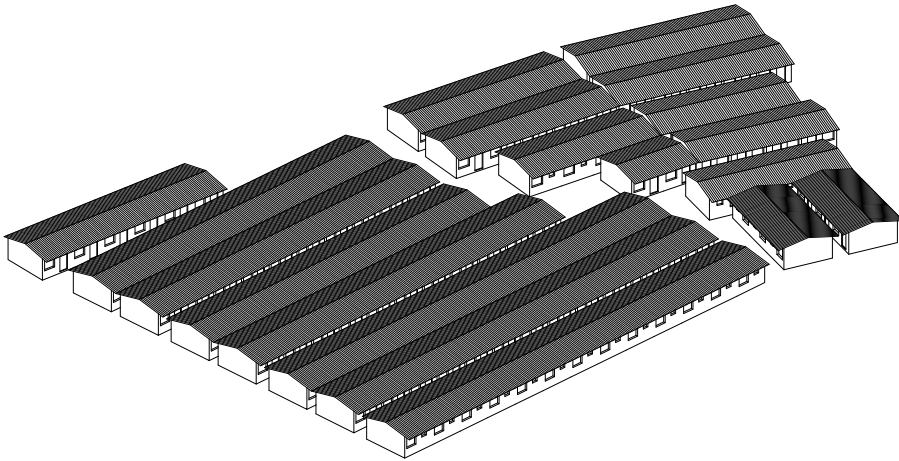


<http://www.dnaindia.com/analysis/column-indian-cities-are-sorely-lacking-in-neighbourhood-parks-2519531>

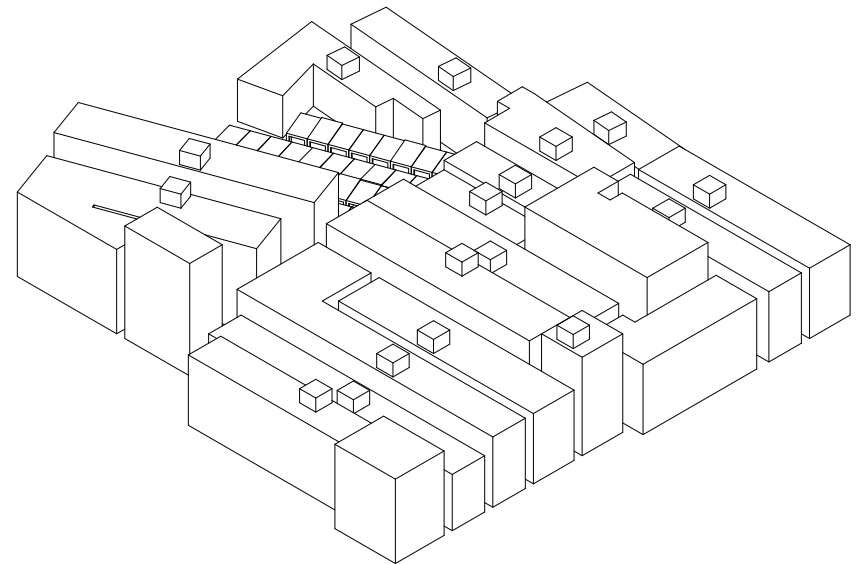
<https://www.baharash.com/liveable-cities-how-much-green-space-does-your-city-have/>

*The Importance of Open
Space for the Urban Poor
in Nalasopara*

The two dominant urban forms of living of the Urban Poor in Nalasopara :



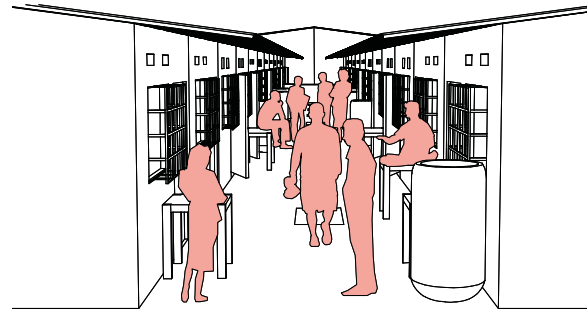
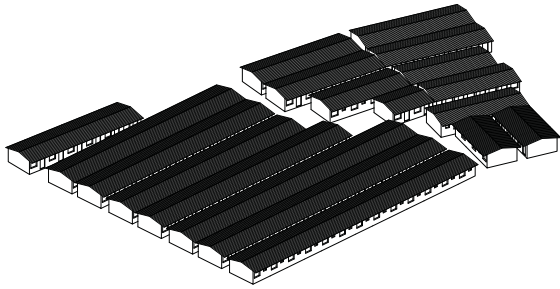
Baith - Chawl



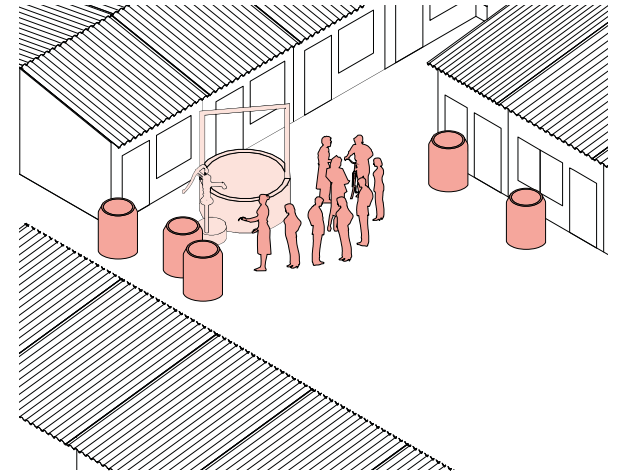
Chawl

Open Space in Nalasopara

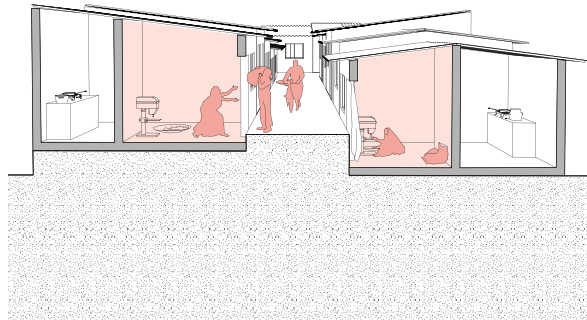
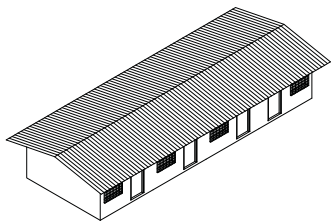
Baith - Chawl



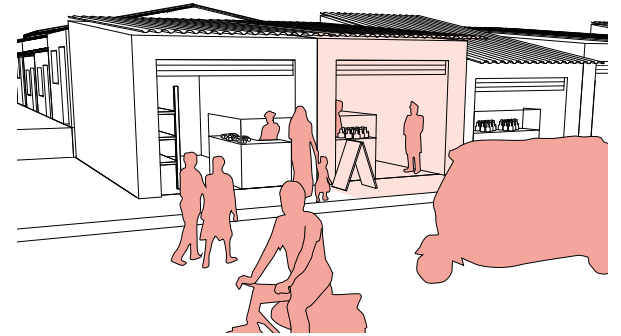
Communal Alleys



Functional In Between Spaces



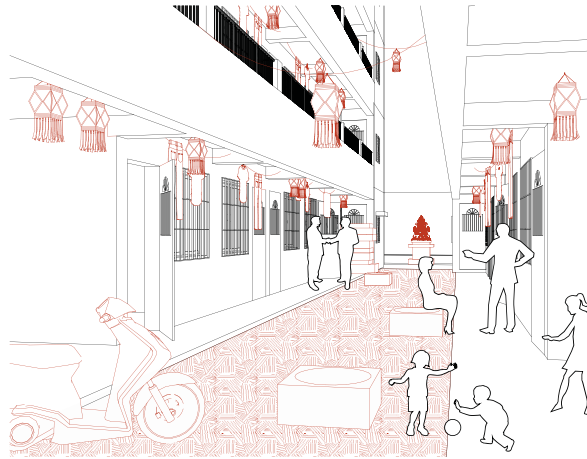
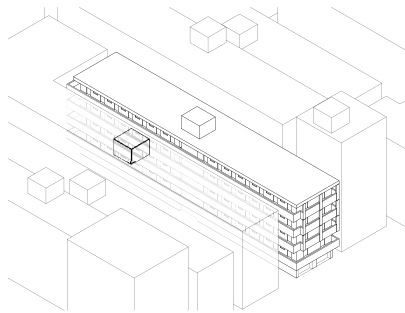
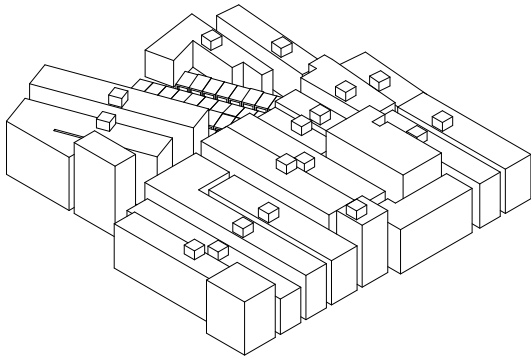
Domestic Workshops



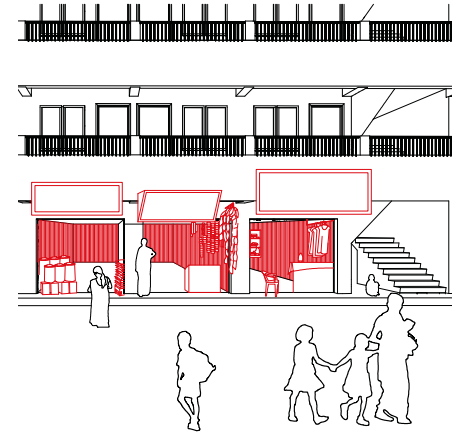
Local Shops

Open Space in Nalasopara

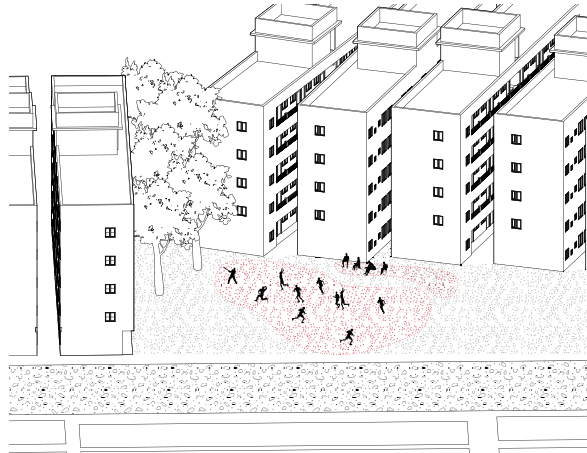
Chawl



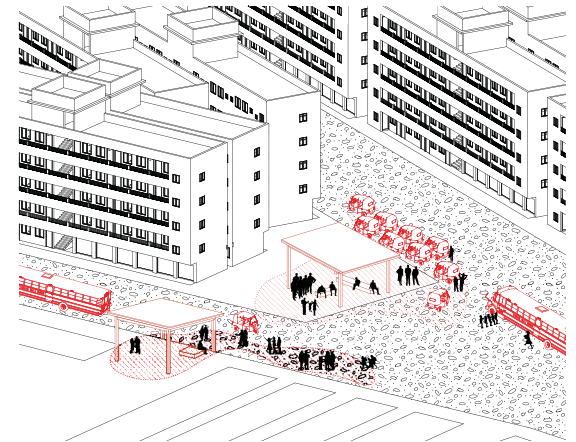
Front Alley



Plinth Shops



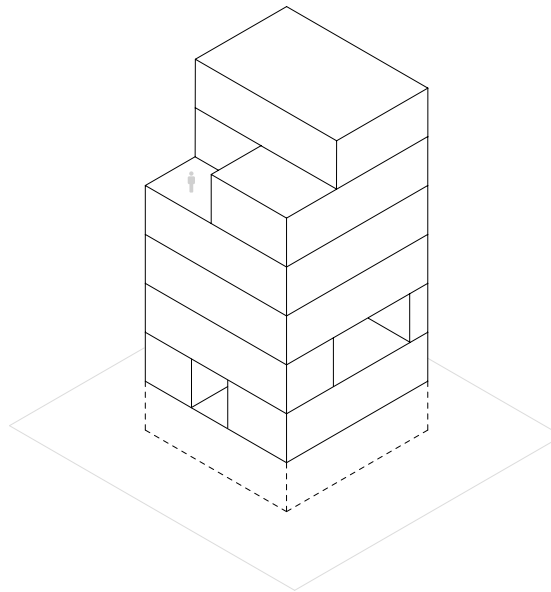
Sports



Transportation

Design Hypothesis

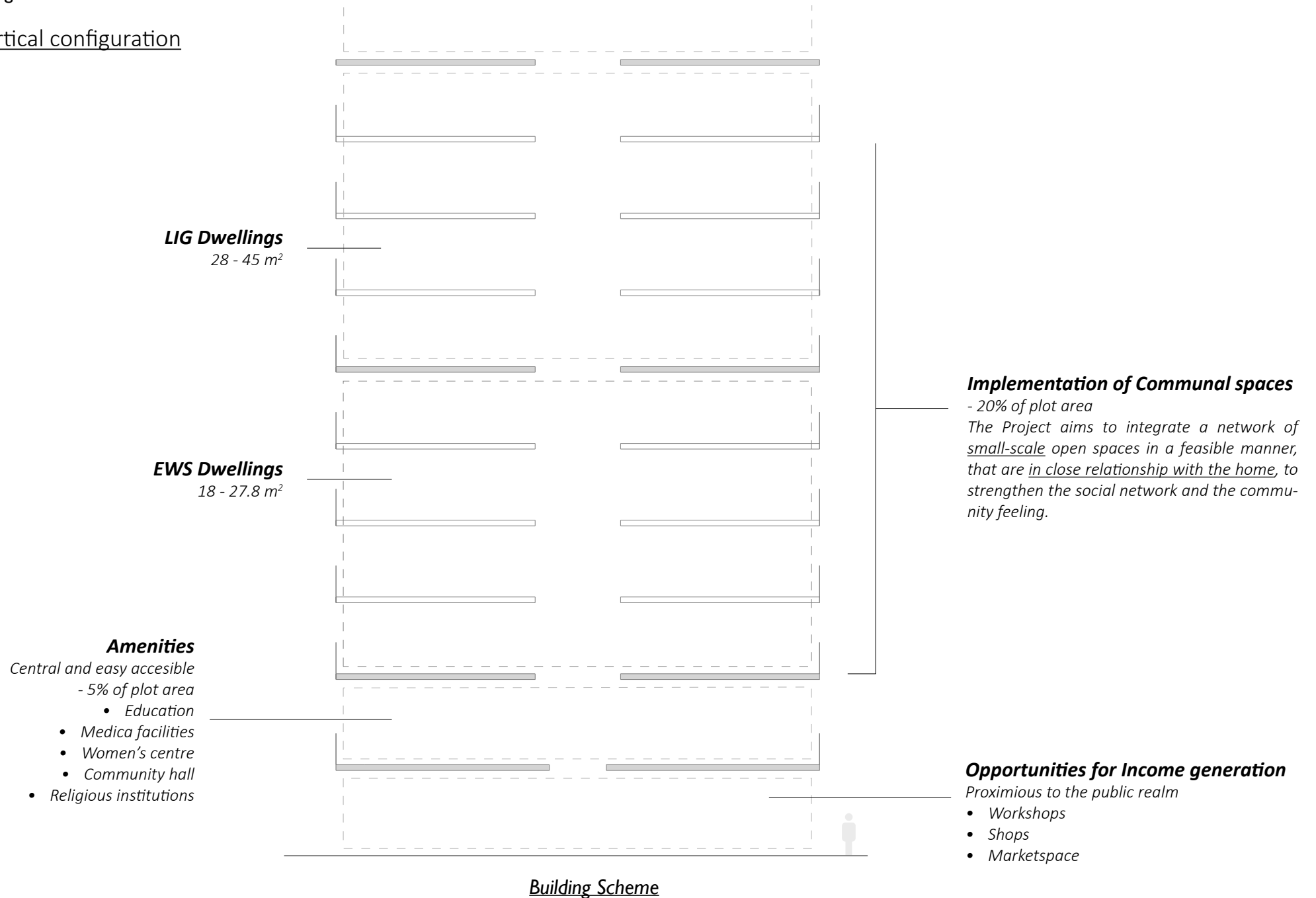
To design an affordable, high-density, high-rise building type intended for the Economical Weaker Section and the Lower Income Group of Nalasopara that incorporates in its vertical configuration open space, amenities and opportunities for income generation.



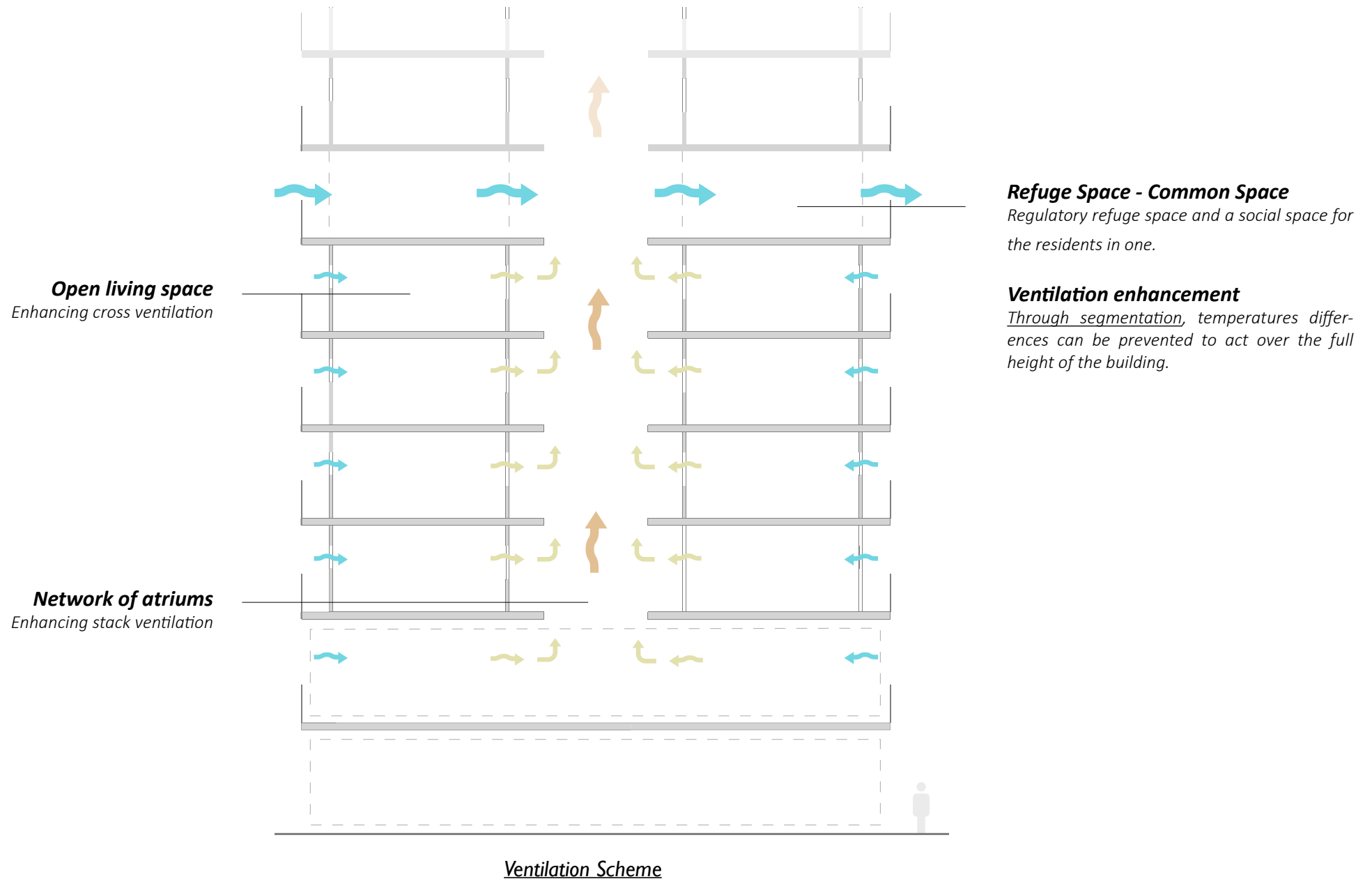
Design Phase I

Defining Guidelines

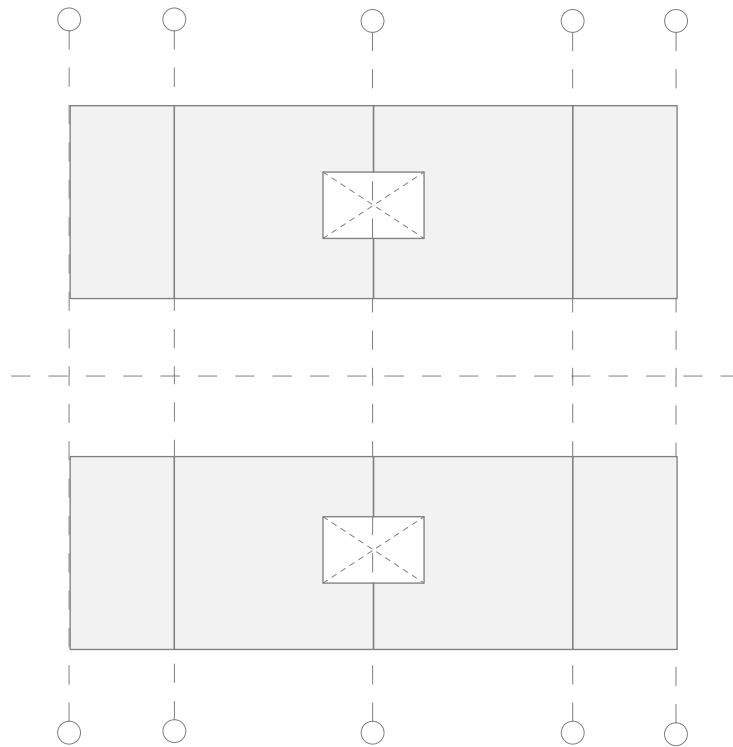
Vertical configuration



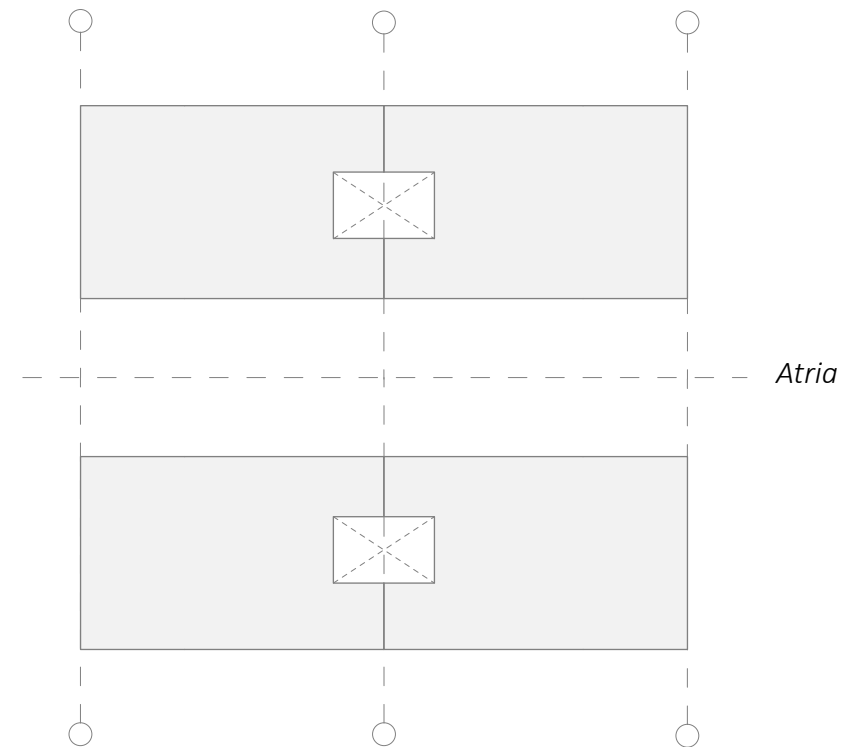
Ventilation strategy



Horizontal layout



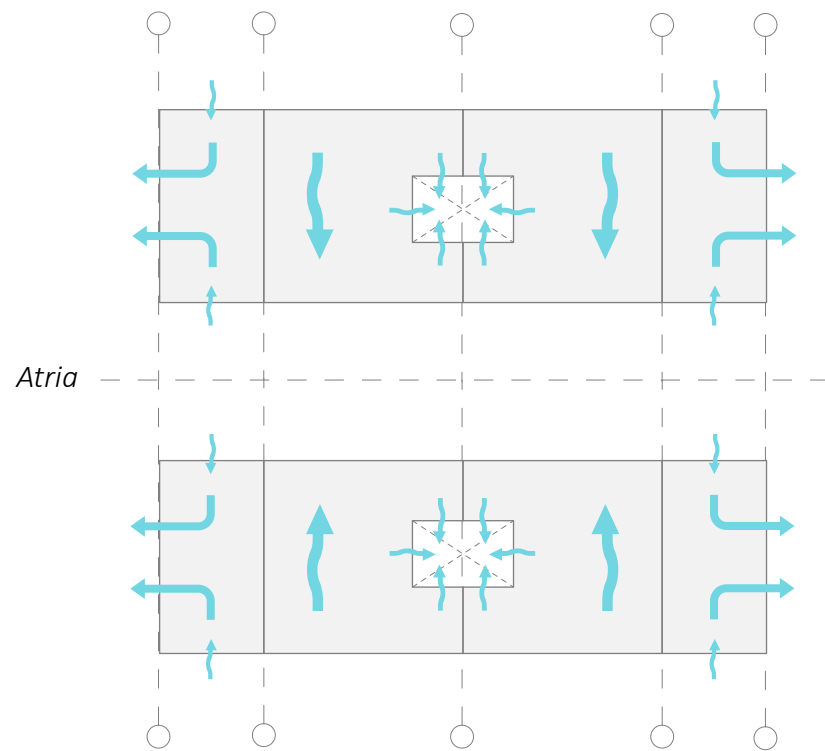
EWS - dwellings



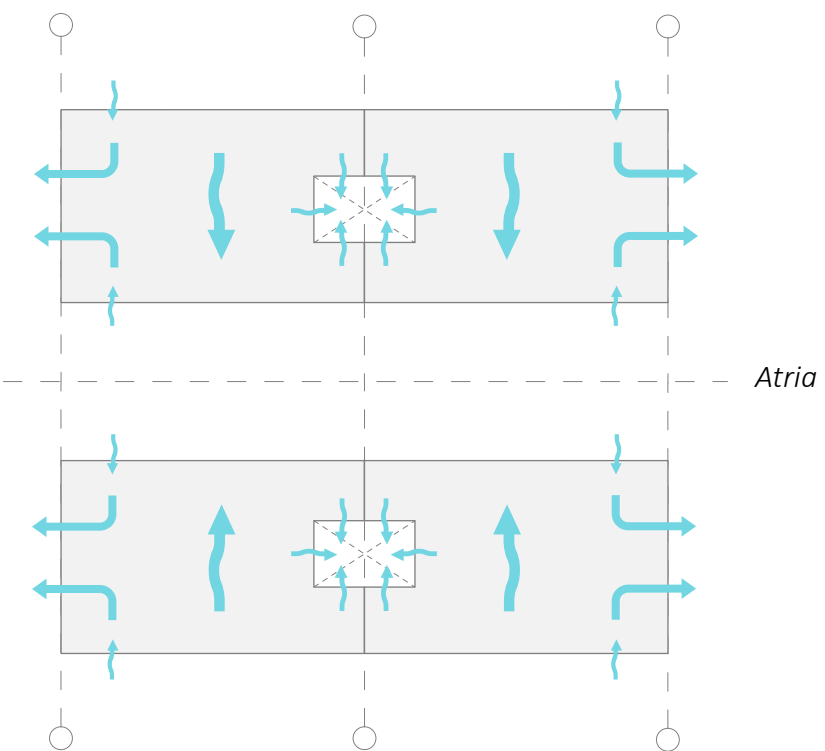
LIG - dwellings

Atria

Ventilation strategy

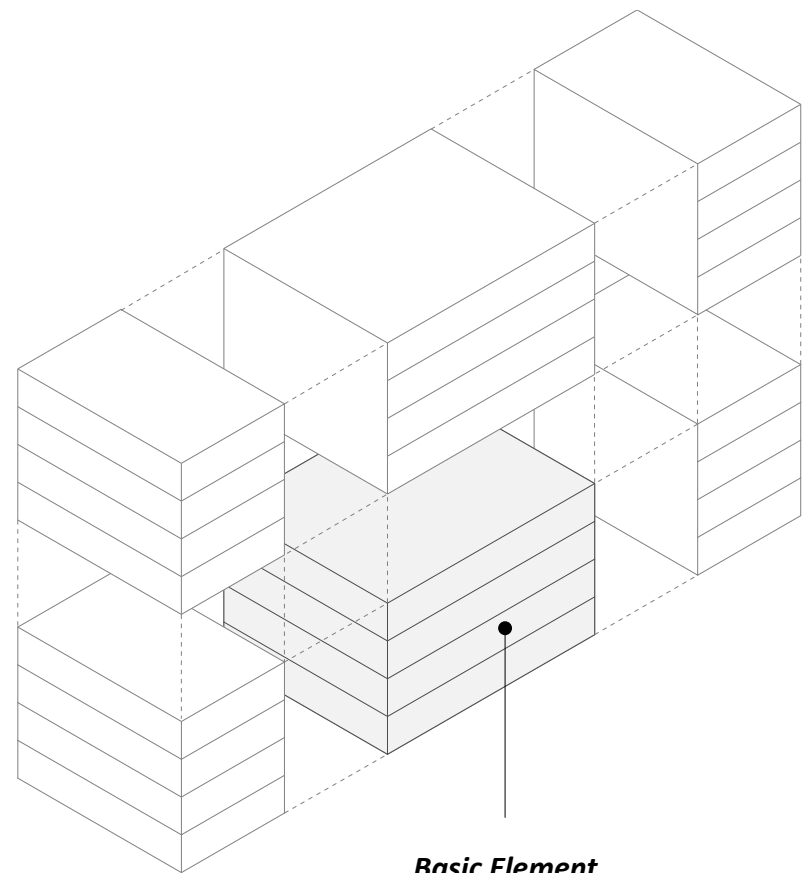


EWS - dwellings

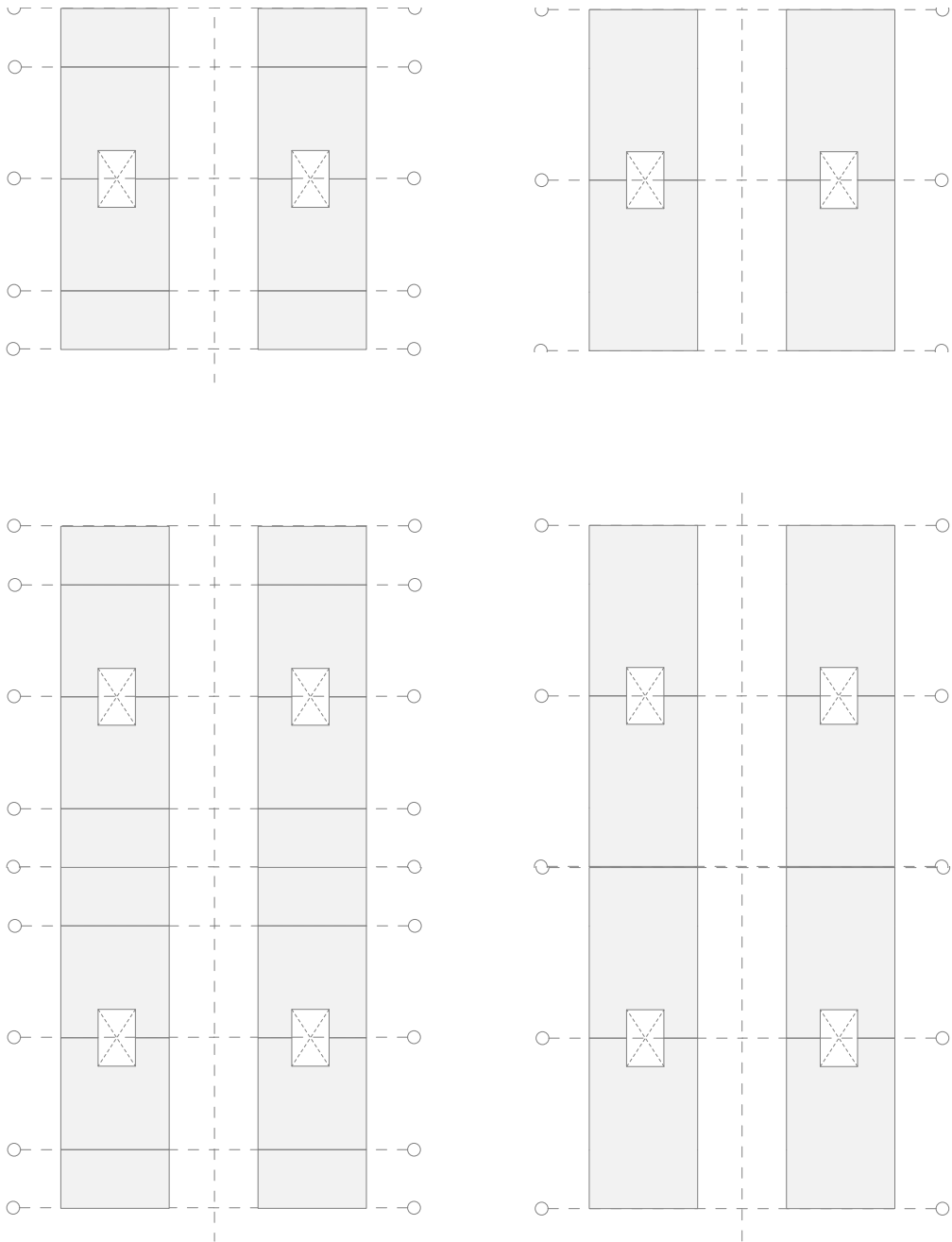


LIG - dwellings

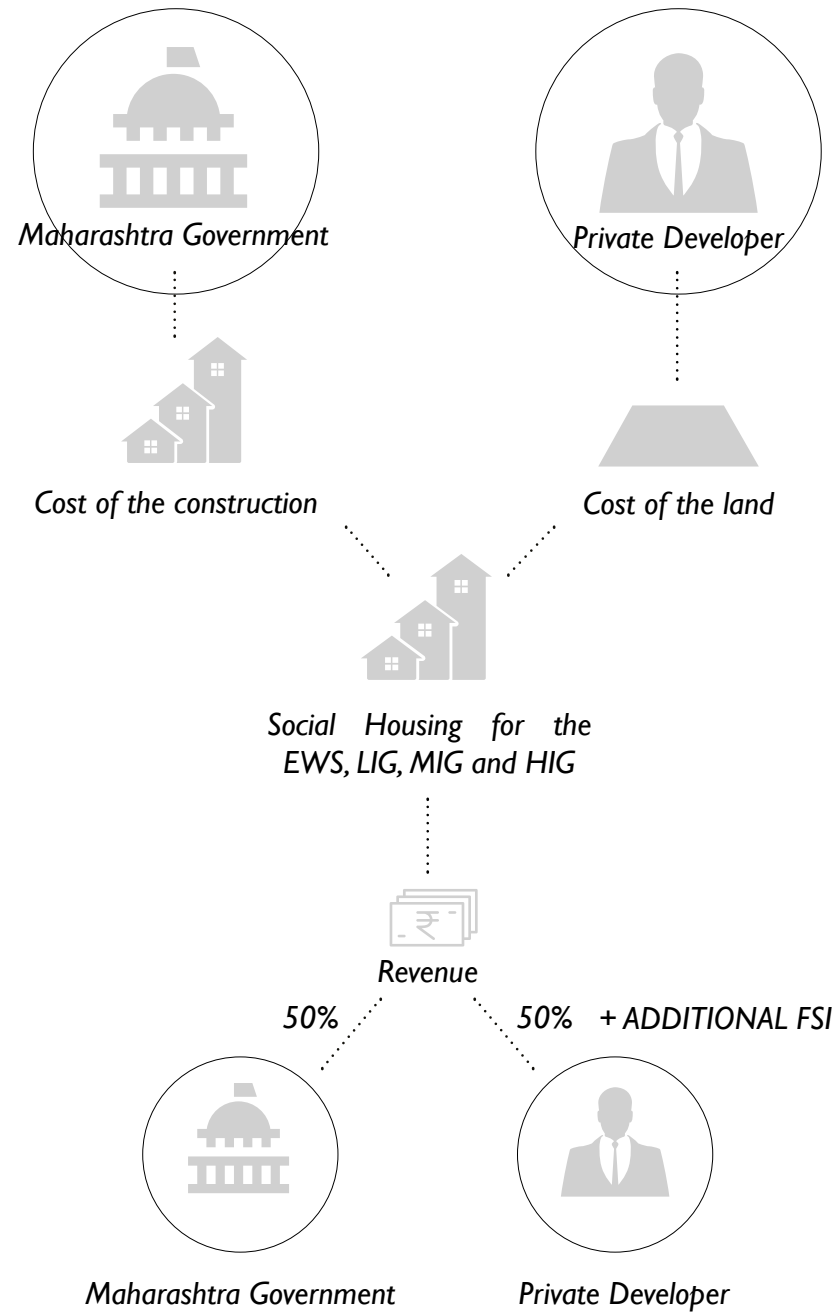
Module possibilities



Basic Element
Possibilities of variation



Financial strategy



Location

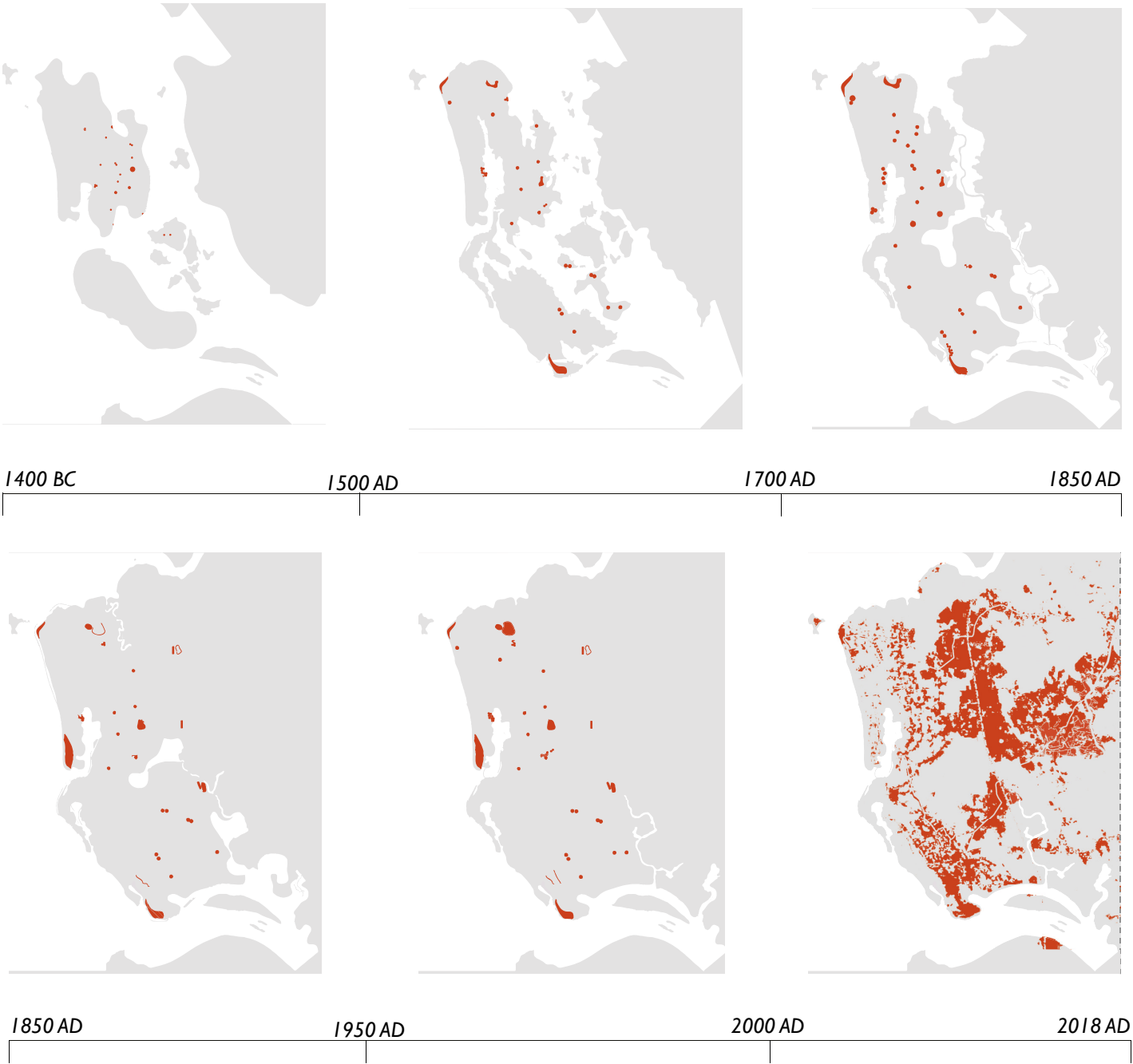
Analysis of the urban context

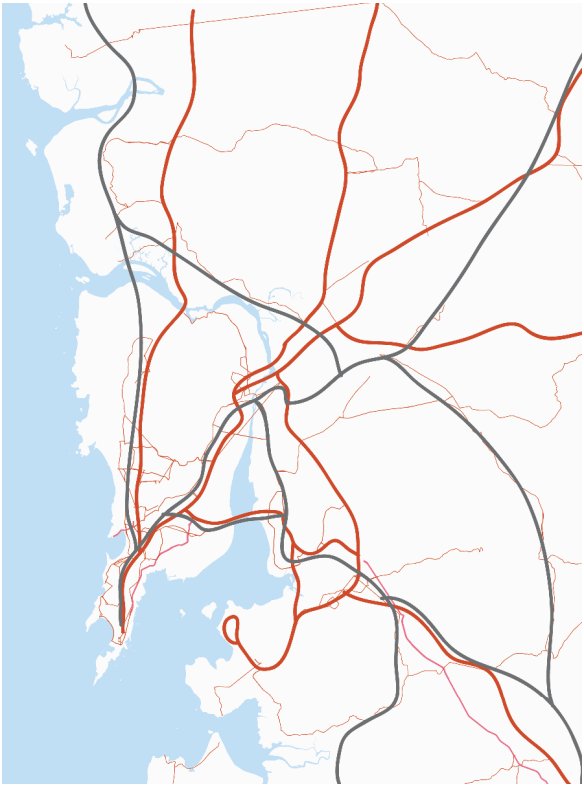
Vasai Virar



area: 331 km²
population: 1.221.223



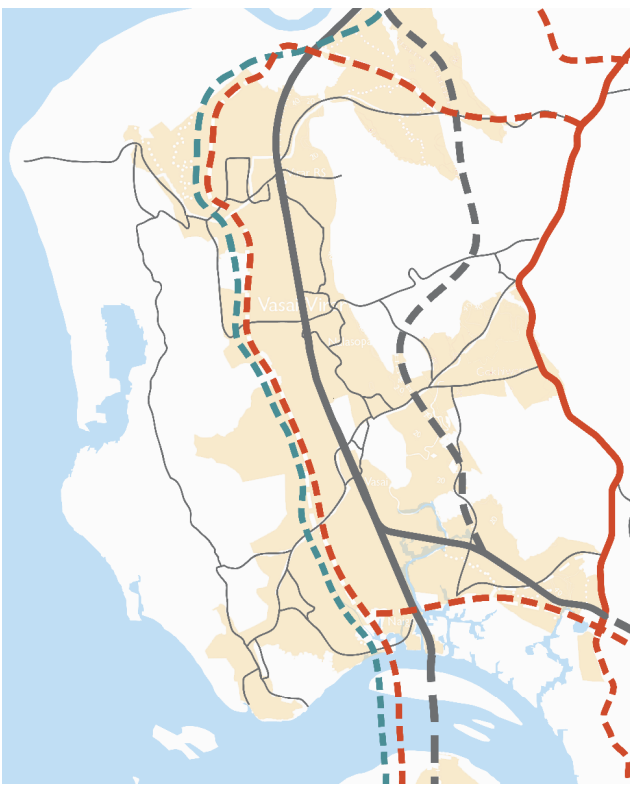









Infrastructural Network of MMR



Main infrastructure Vasai-Virar



Vision Vasai-Virar 2036

-  Railway
-  Highway
-  Main Road
-  Second Road
-  Interior Road

Nalasopara

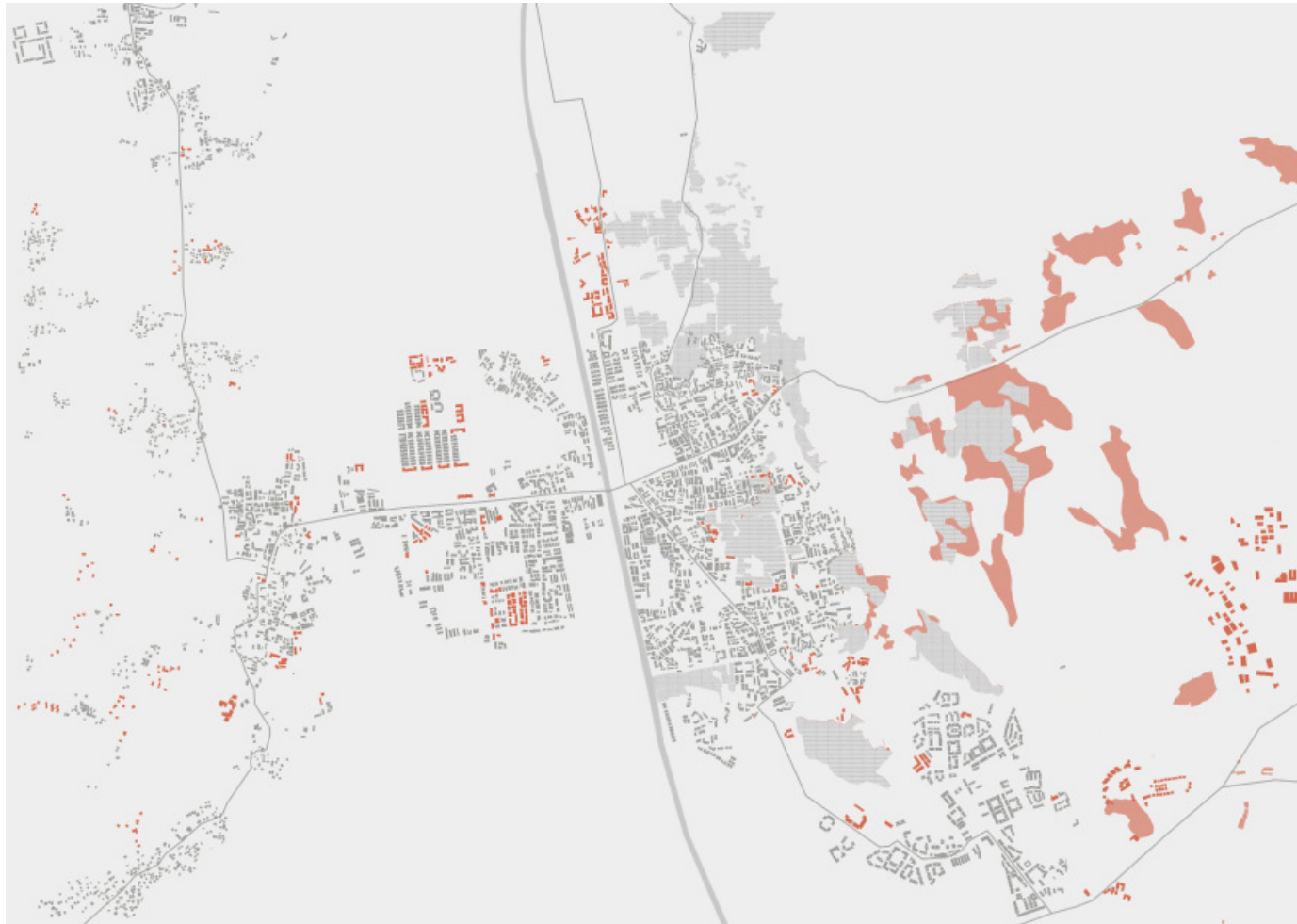


area: 43 km²
population: 564.664

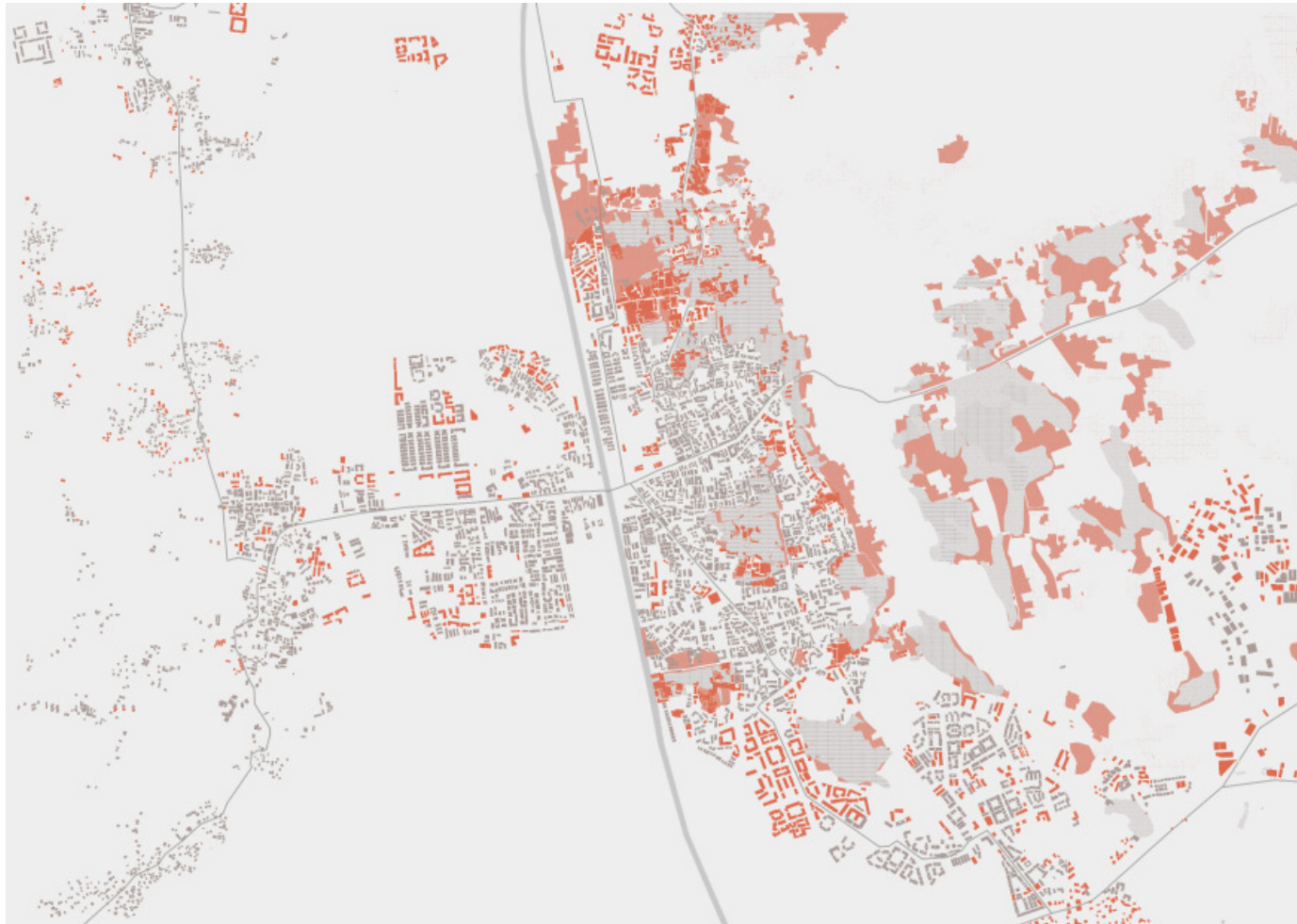




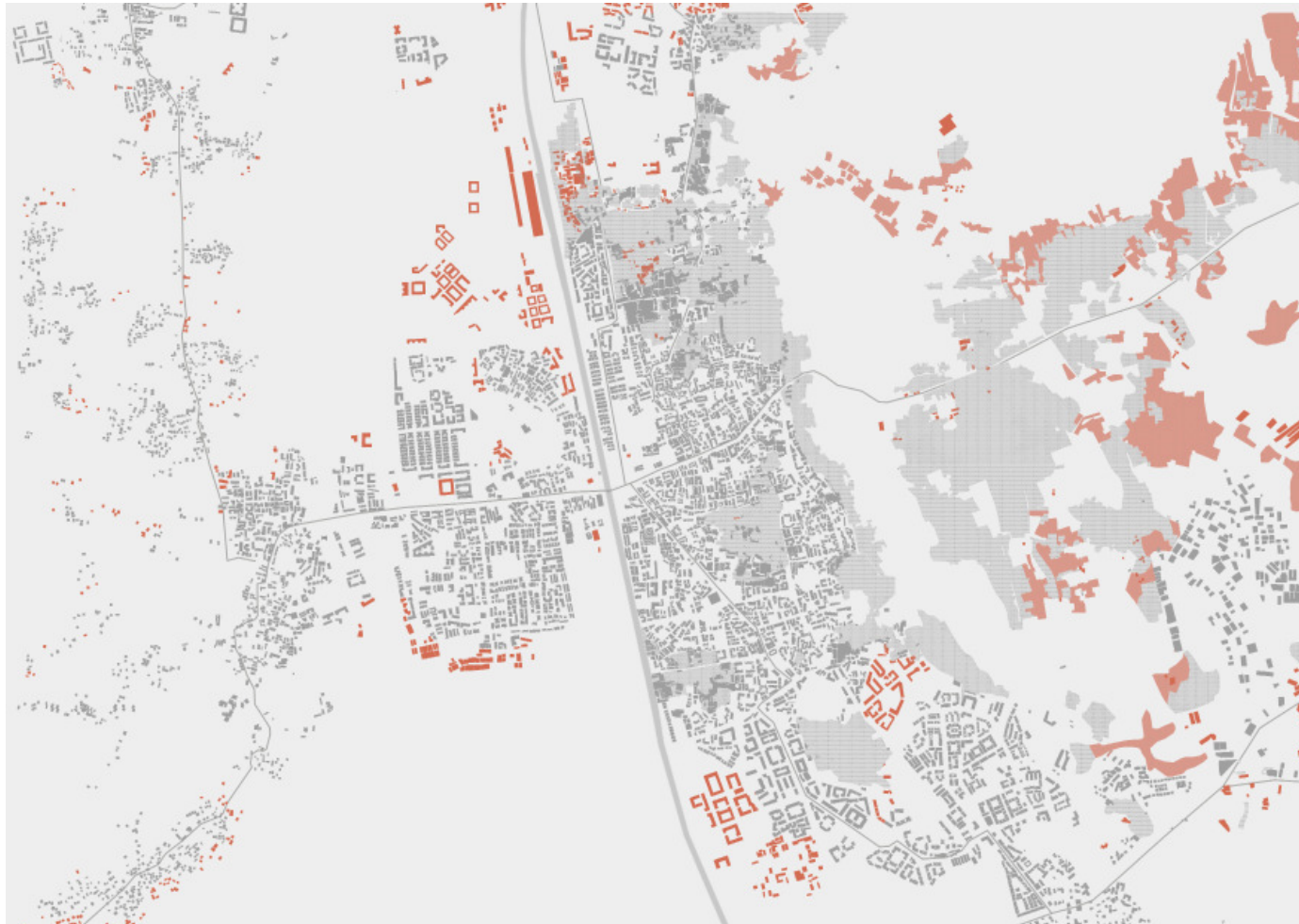
Nalasopara
2002



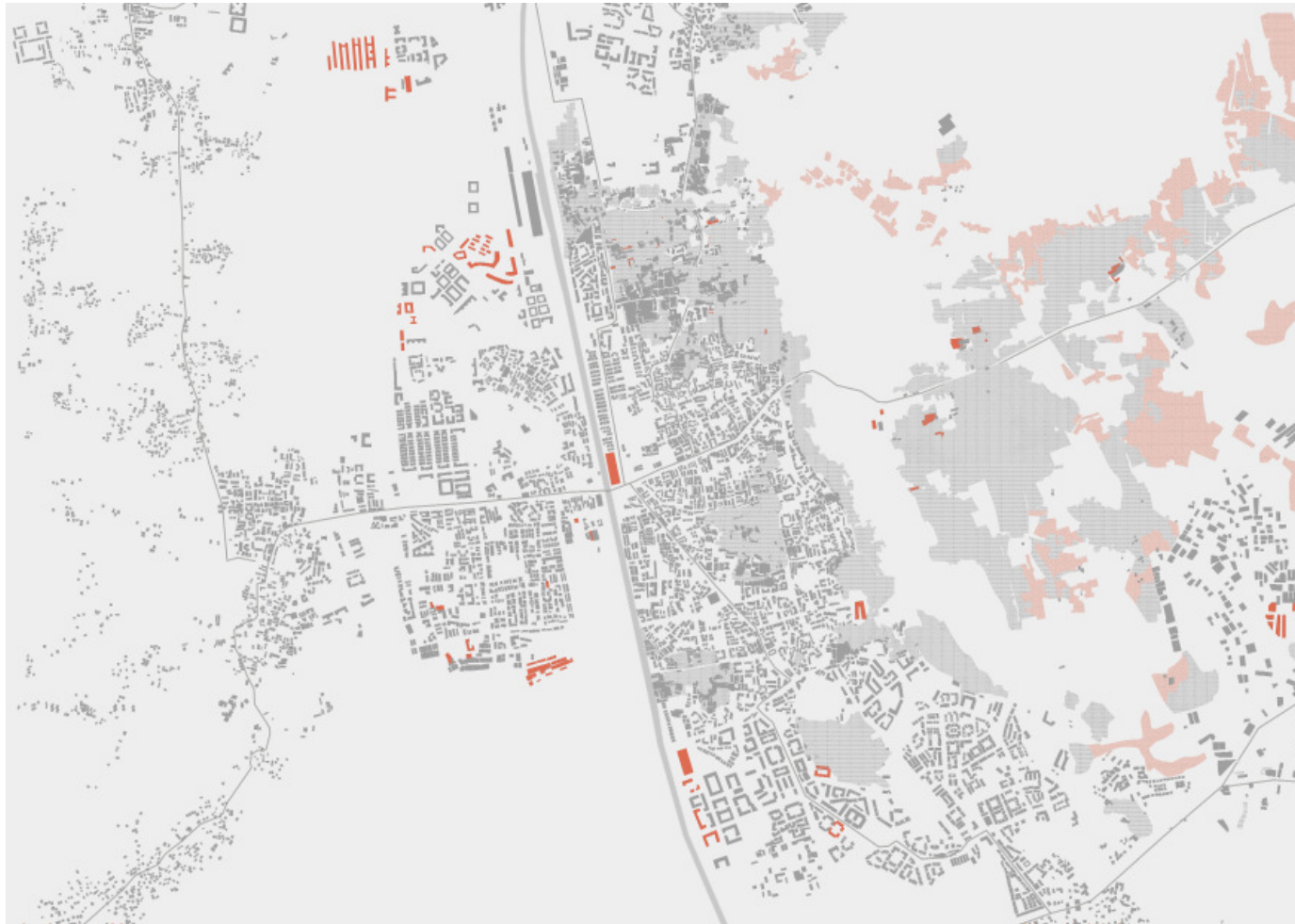
Nalasopara
2002 - 2005



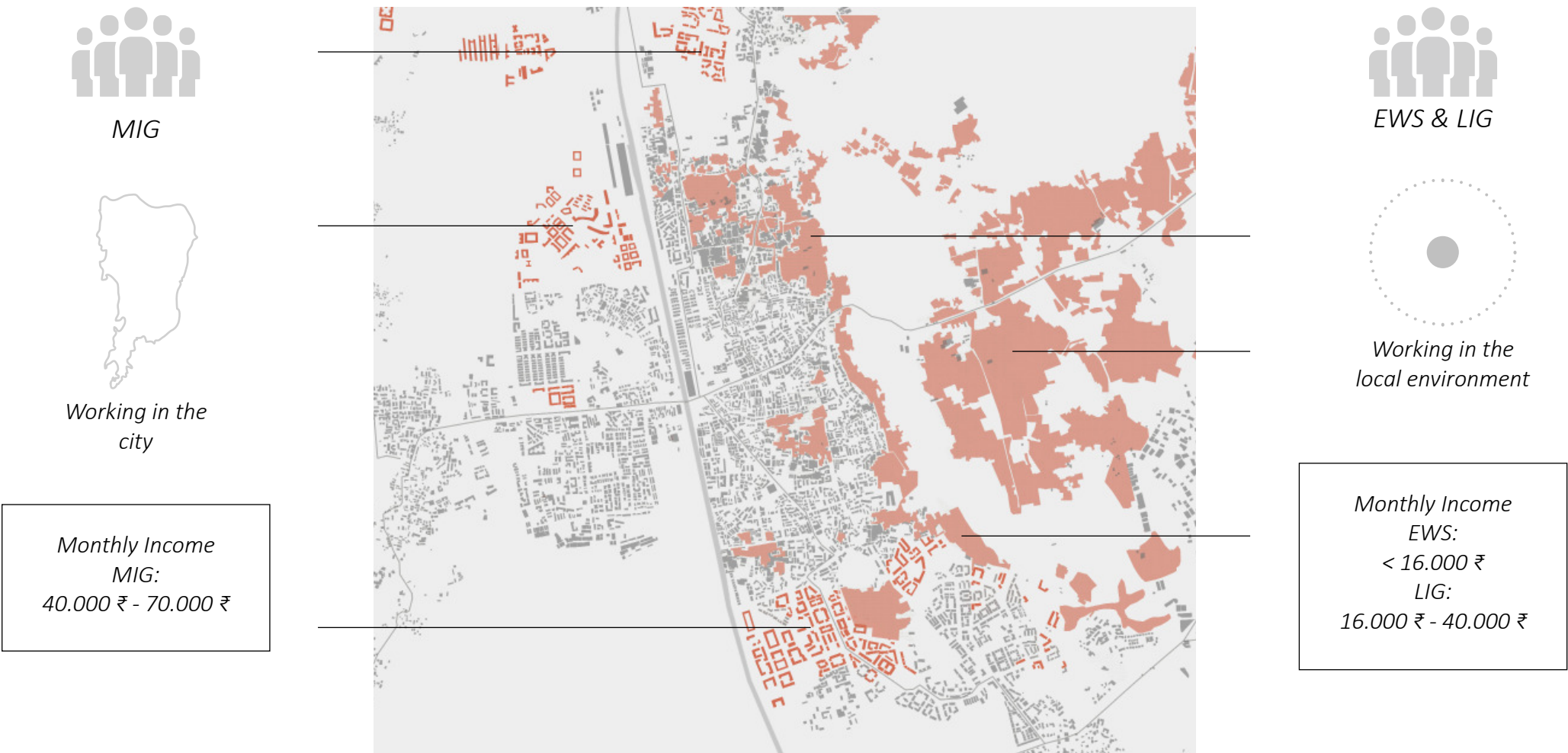
Nalasopara
2005 - 2009



Nalasopara
2009 - 2013



Nalasopara
2013 - 2018



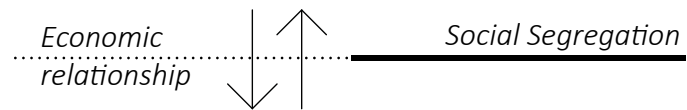
Growth of Nalasopara
2002 - 2018

Location // Nalasopara

Historical social segregation in Mumbai



EWS & LIG
Labour Force



MIG & HIG
Capital

A balance of interests



*Chawl Housing early 20th century,
Mumbai*

Location // Nalasopara

Increasing social segregation in Mumbai



EWS & LIG

*Economic
relationship*

Social Segregation



MIG & HIG



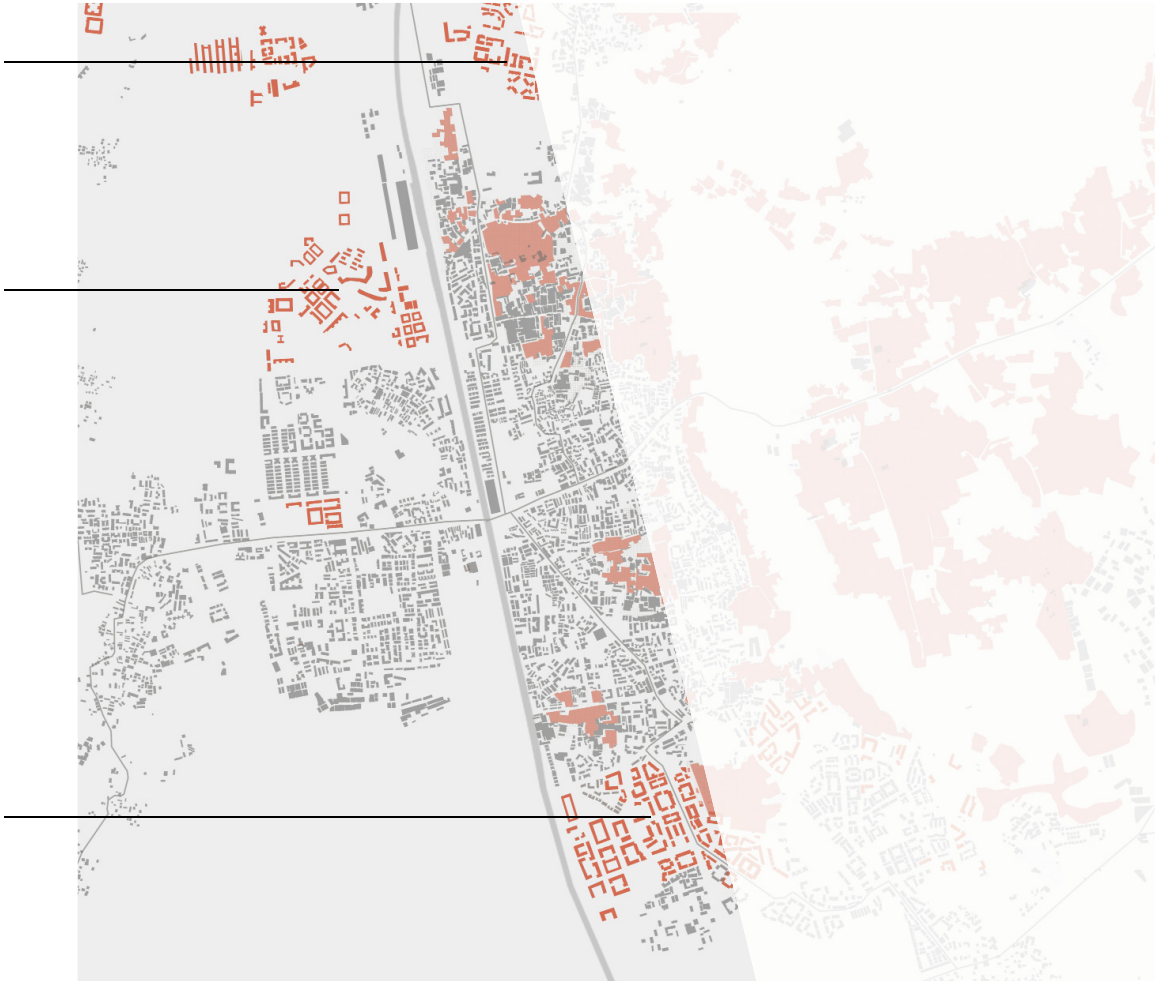


MIG



Working in the
city

Monthly Income
MIG:
40.000 ₹ - 70.000 ₹



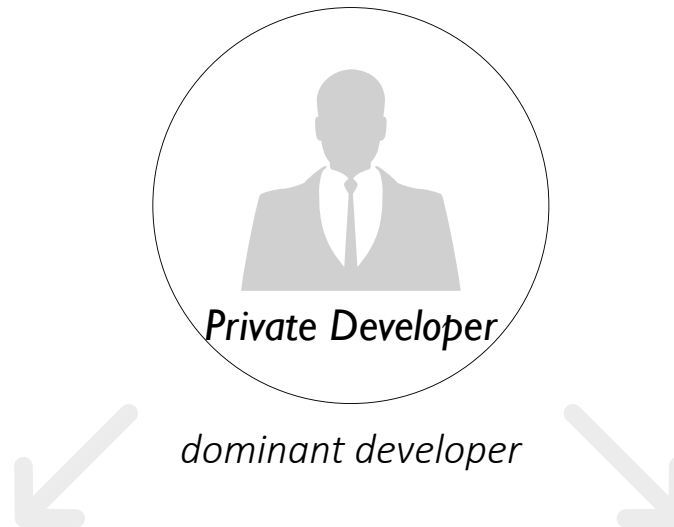


Areas in transition



Areas in transition

Characteristics of the Urban Tissue



Consequences

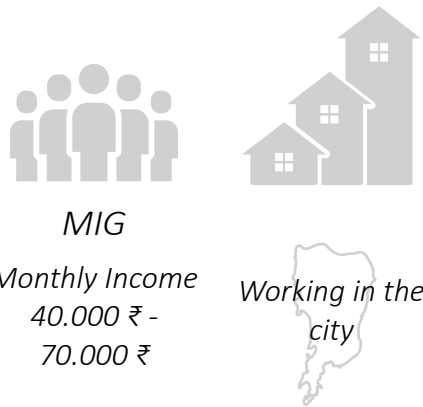
- Qualitative dwellings
- Caters for the MIG Market
 - Sufficient accessibility
- Qualitative infrastructure
- Boosts further growth of Nalasopara

Consequences

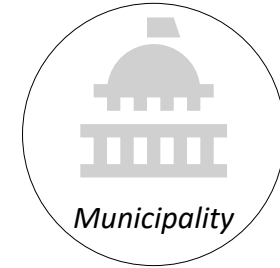
- socially excluding
- Monofunctional
- lack of public space
- Lack of amenities
- Lack of divers commerical activity
- Land speculation -> Broken Urban tissue



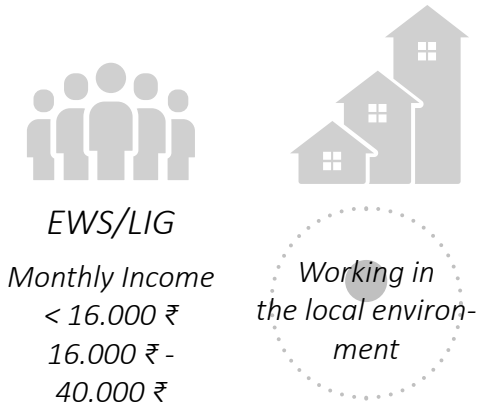
Private development of the urban tissue



- Qualitative dwellings
- Caters for the MIG Market
- Sufficient accessibility
- Qualitative infrastructure
- Boosts further growth of Nalasopara



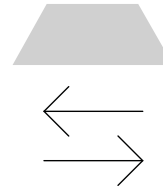
Development of social housing



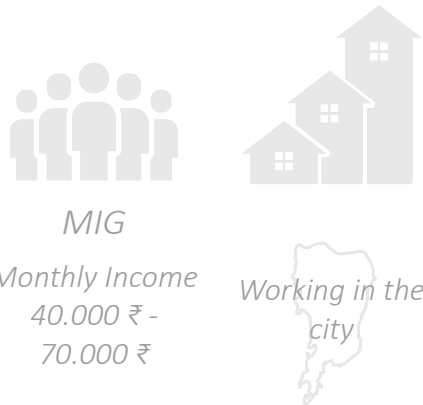
- Affordable social housing
- Caters for the EWS and LIG Market
-> decrease of social segregation
- Functionally diverse
- Increase of Public space
- Increase of amenities
- Increase of local commercial activity



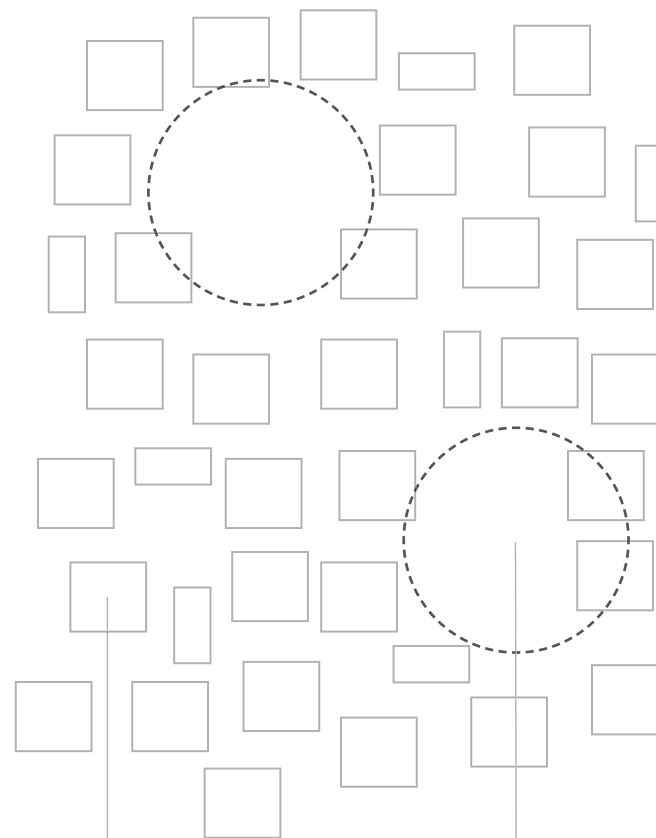
Urban Strategy Symbiosis



Private development of the urban tissue



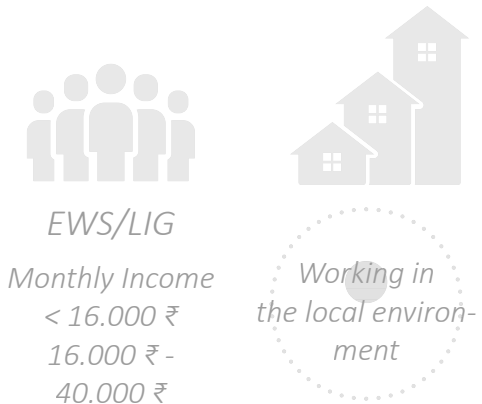
- Qualitative dwellings
- Caters for the MIG Market
- Sufficient accessibility
- Qualitative infrastructure
- Boosts further growth of Nalasopara



Urban Tissue

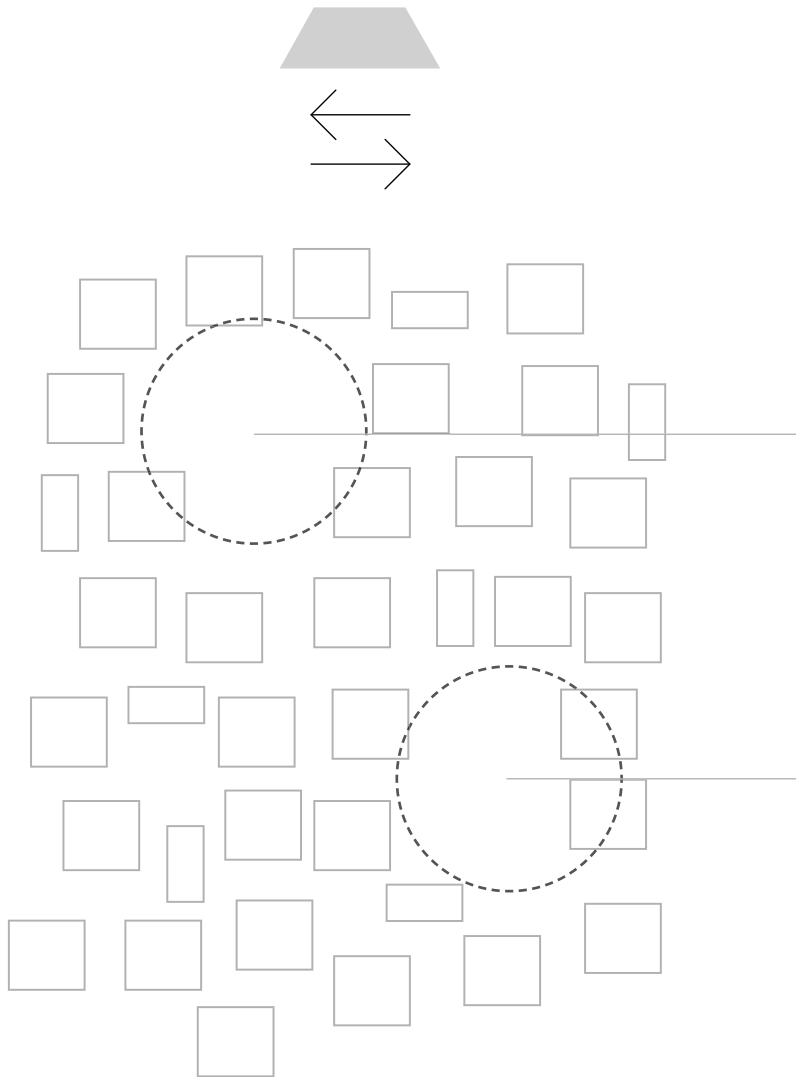
Social Housing

Development of social housing



- Affordable social housing
- Caters for the EWS and LIG Market
-> decrease of social segregation
- Functionally diverse
- Increase of Public space
- Increase of amenities
- Increase of local commercial activity

Urban Strategy Symbiosis



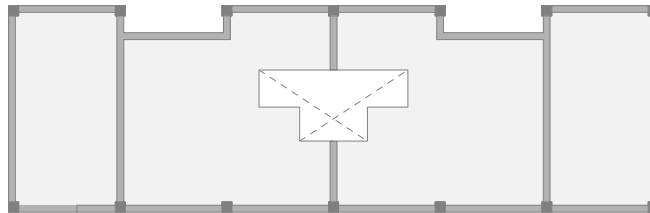
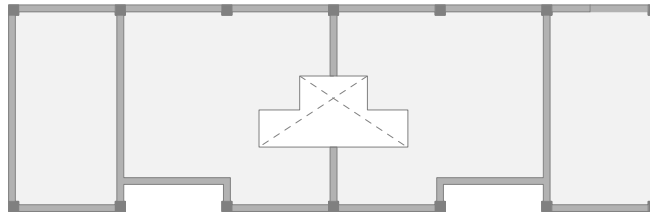
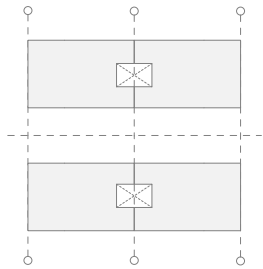
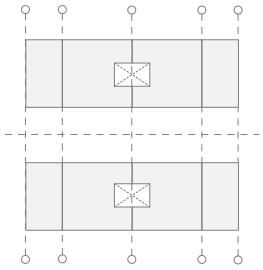
Conditions for Implementation

- For the developments to house a small society of EWS and LIG inhabitants. -> creating community
- To be located on the borders of the area. -> bridging neighborhoods
- To be located close to main infrastructure -> inducing accessibility
- To incorporate existing buildings in the development of the area. -> induce adaption

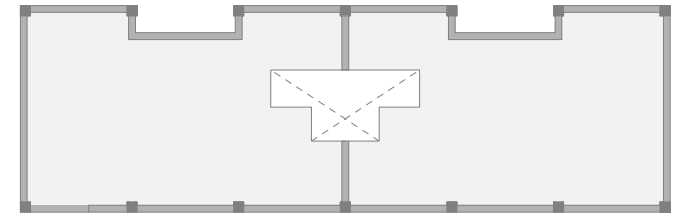
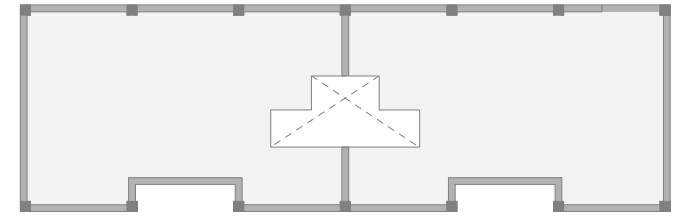
Design Phase II

Typological Development

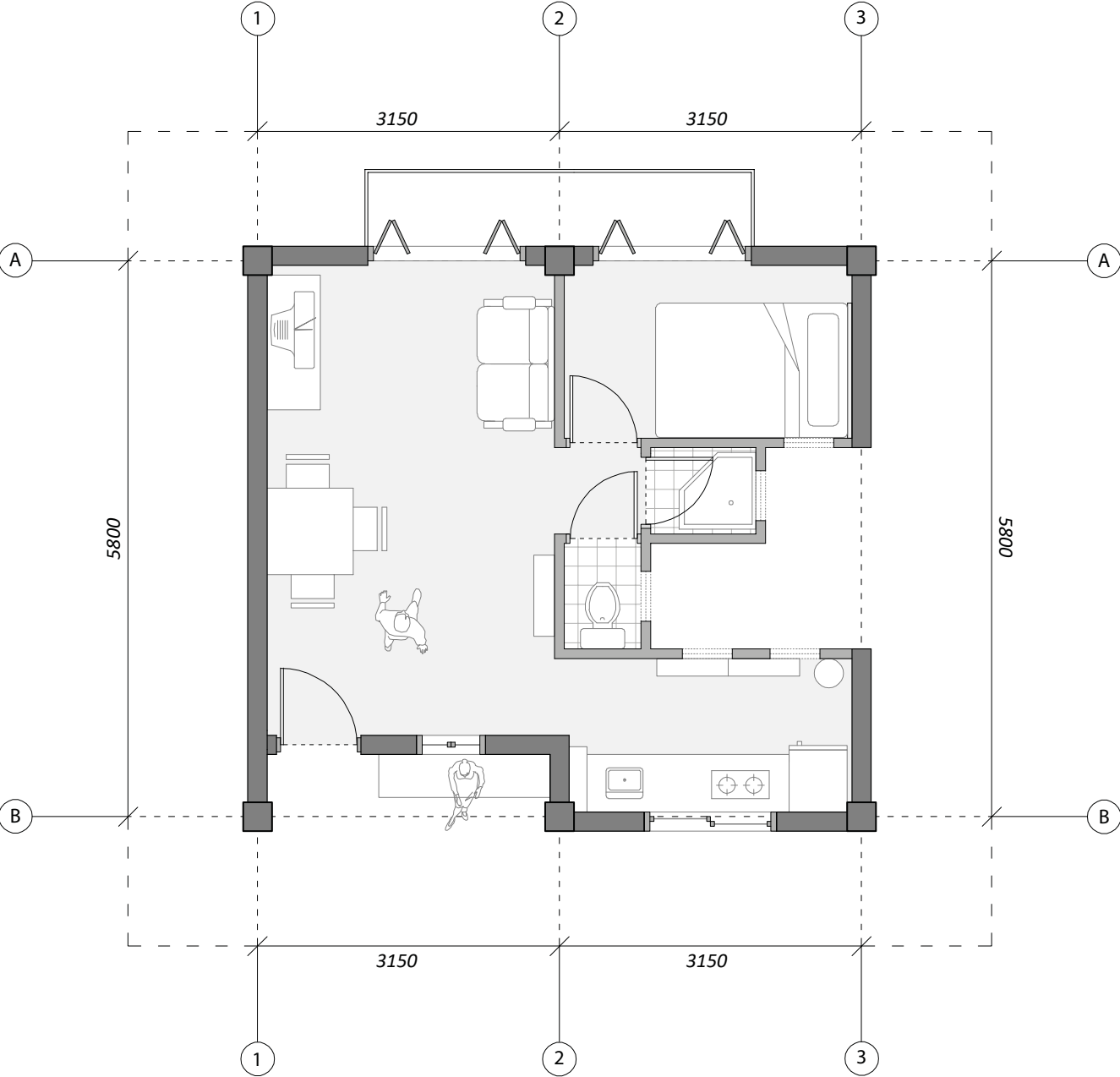
Horizontal layout



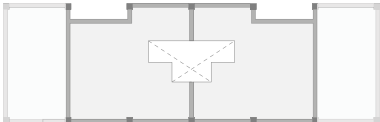
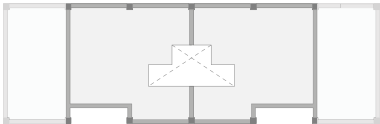
EWS layout

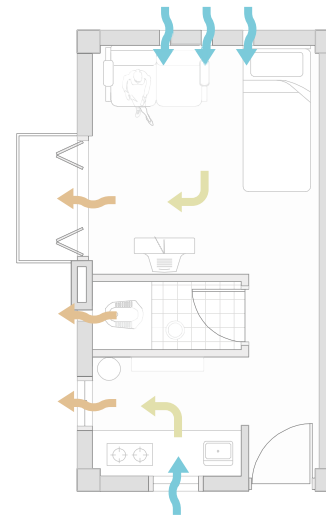
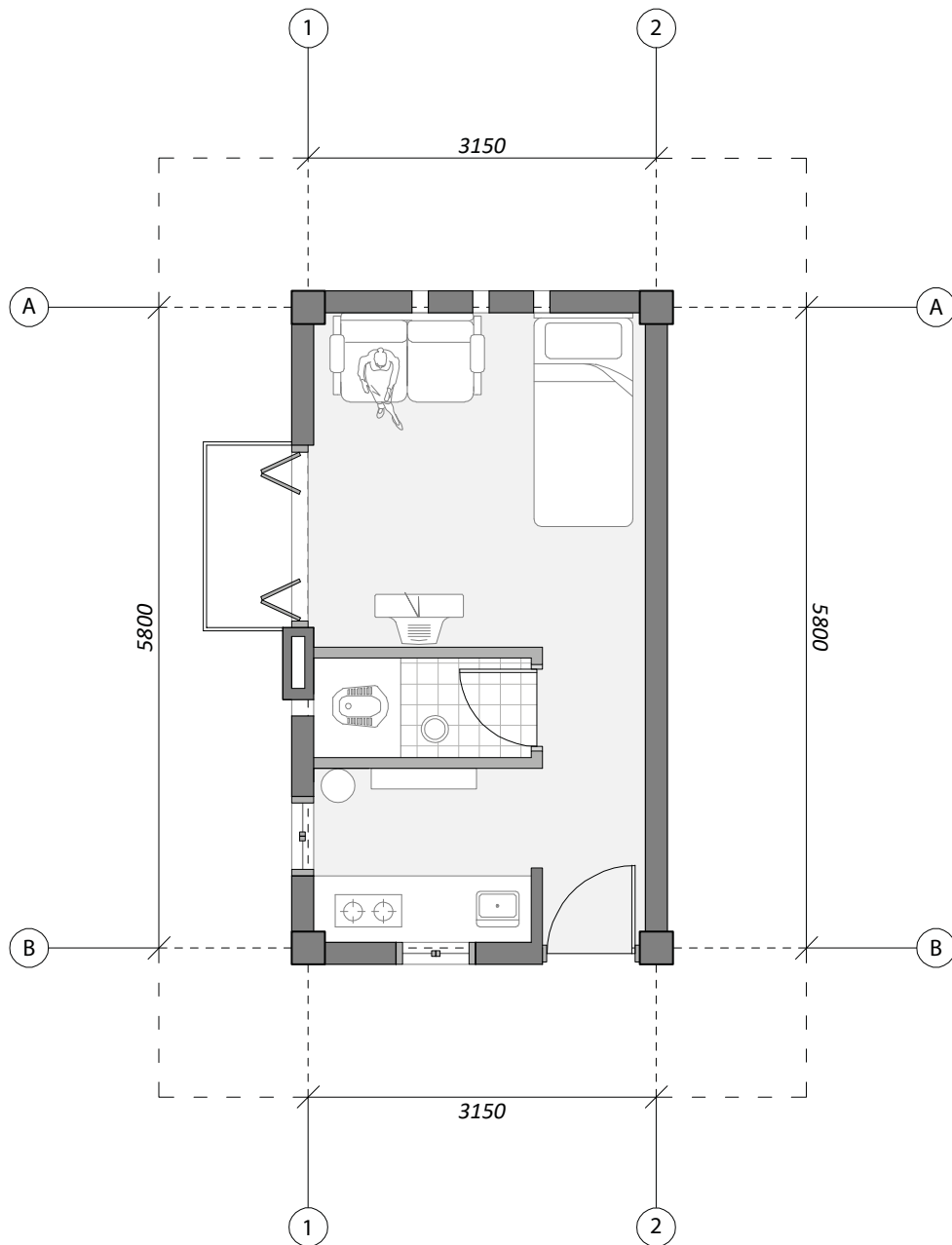


LIG layout

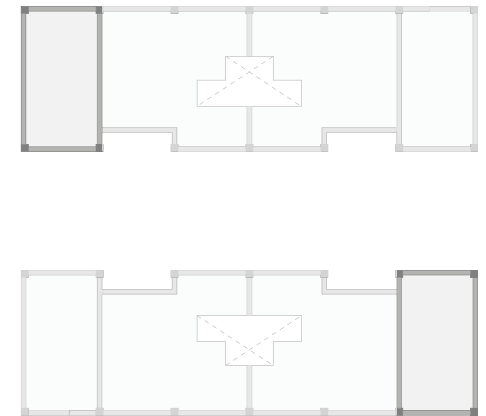


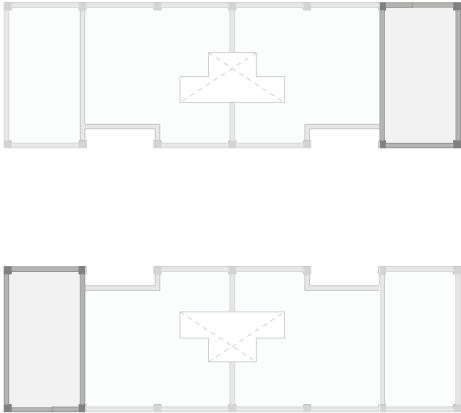
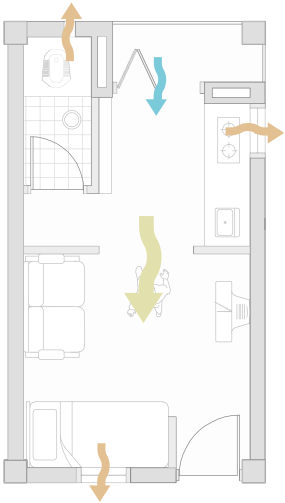
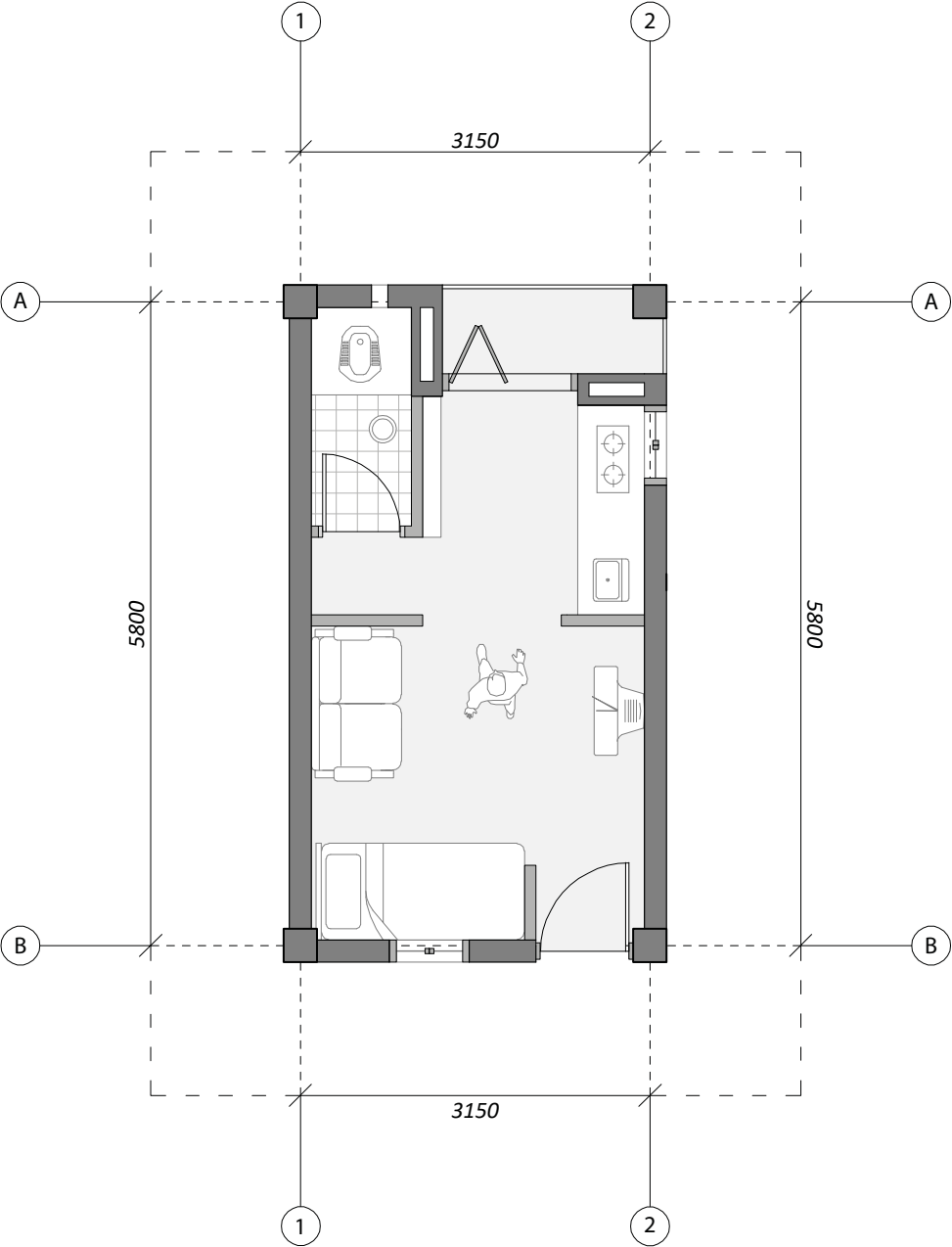
EWS - Family apartment
27,6 m²



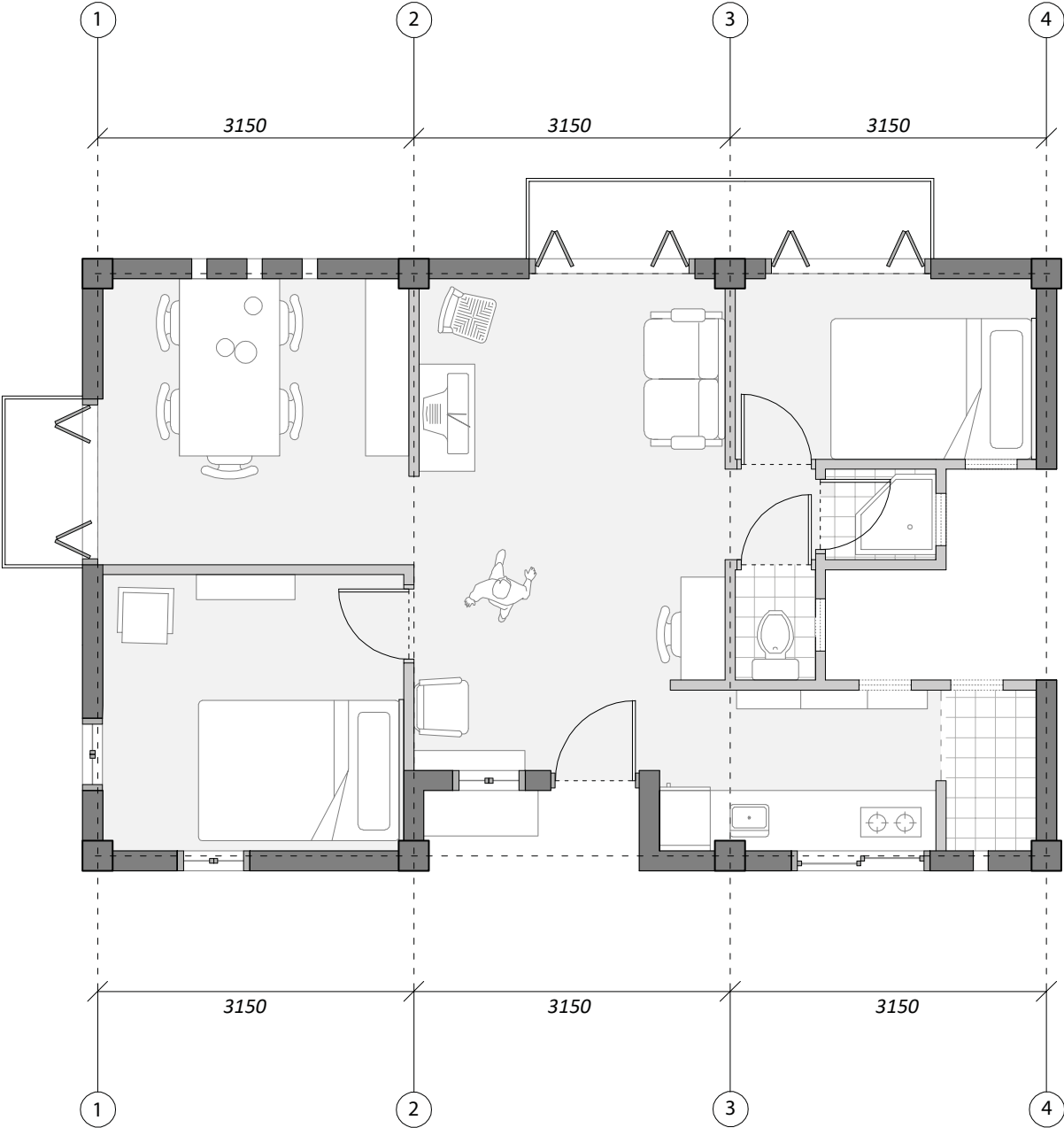


EWS - Corner type 1
16,5 m²

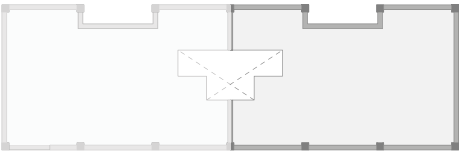
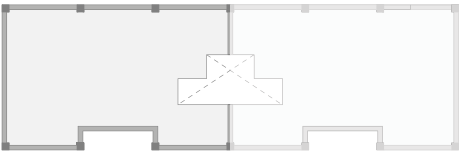


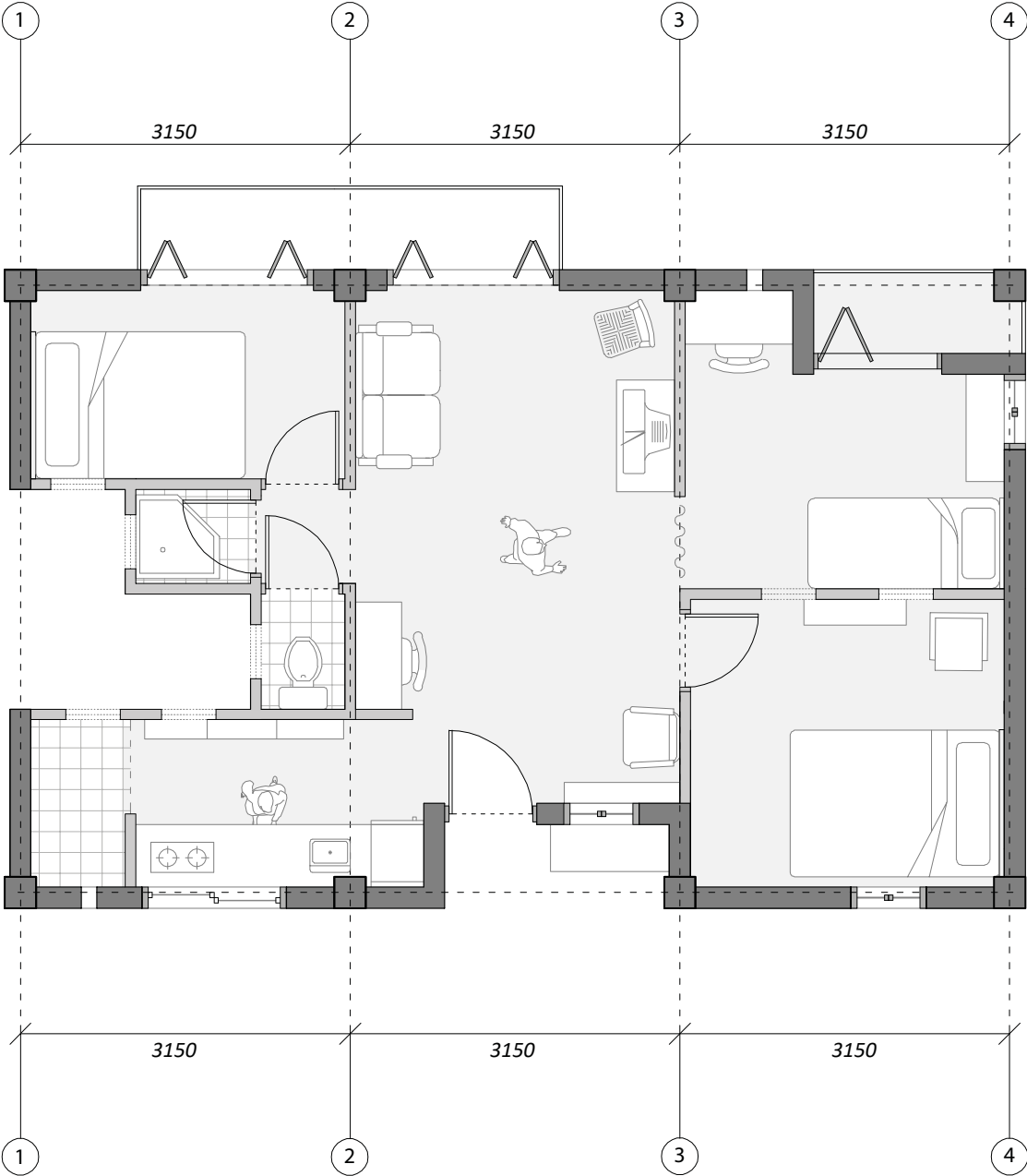


EWS - Corner type 2
16,4 m²

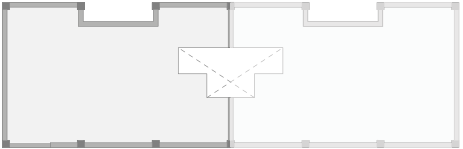
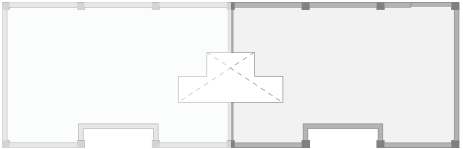


LIG type 1
44,8 m²

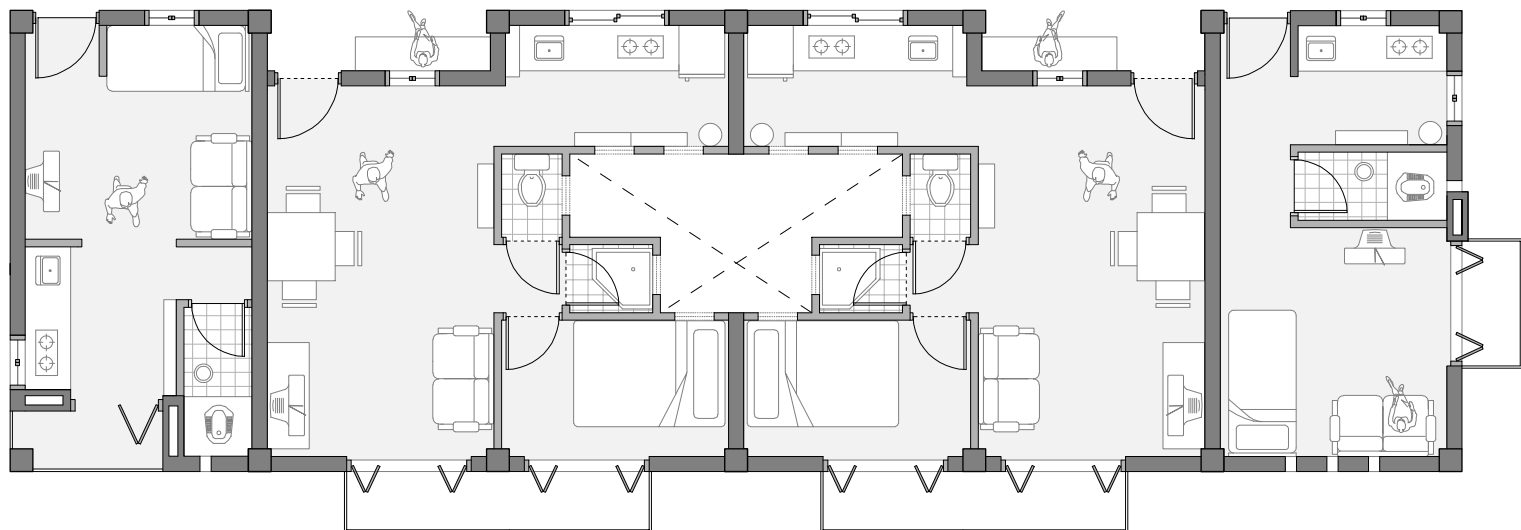
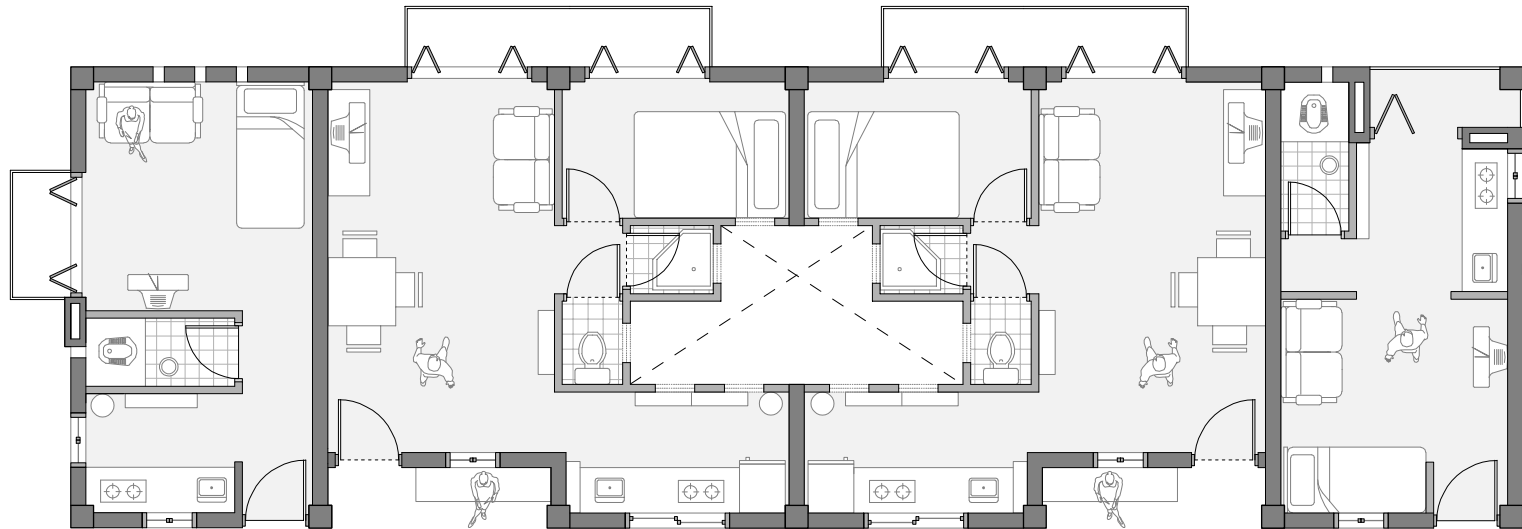




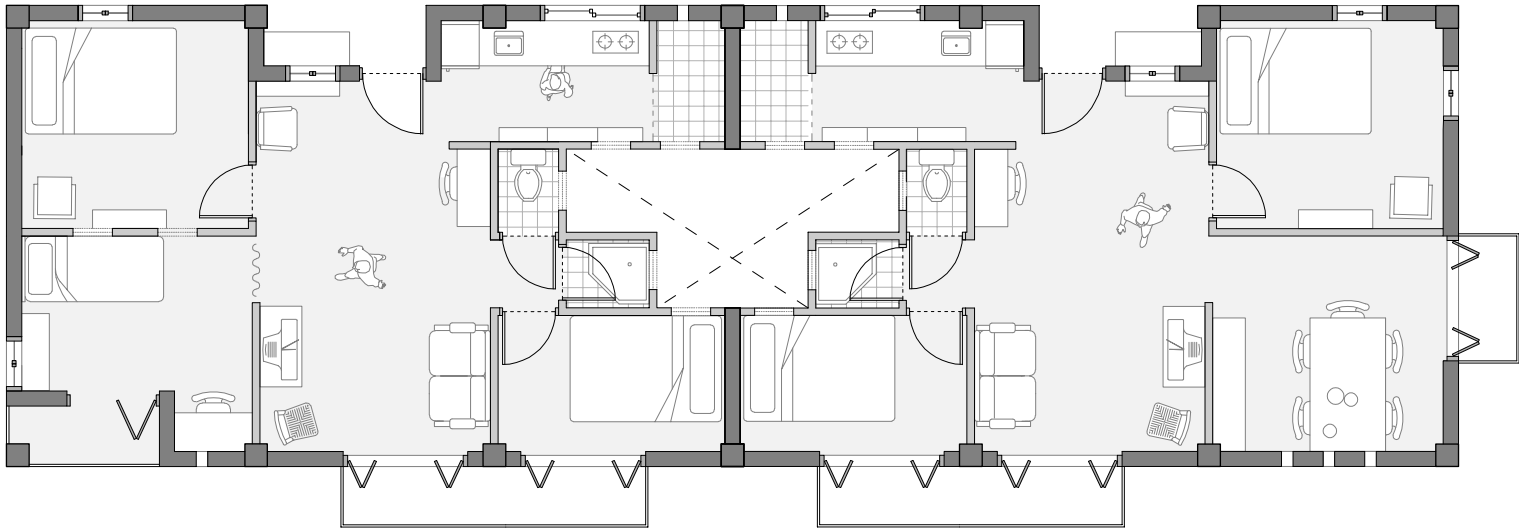
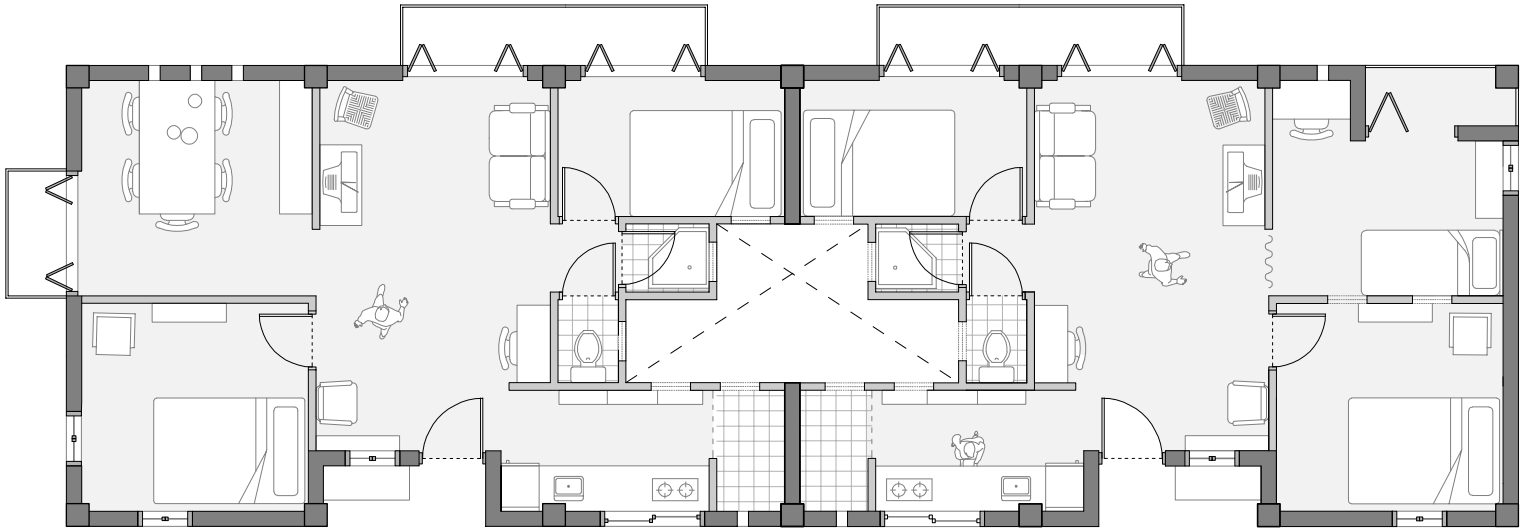
LIG type 2
44,8 m²

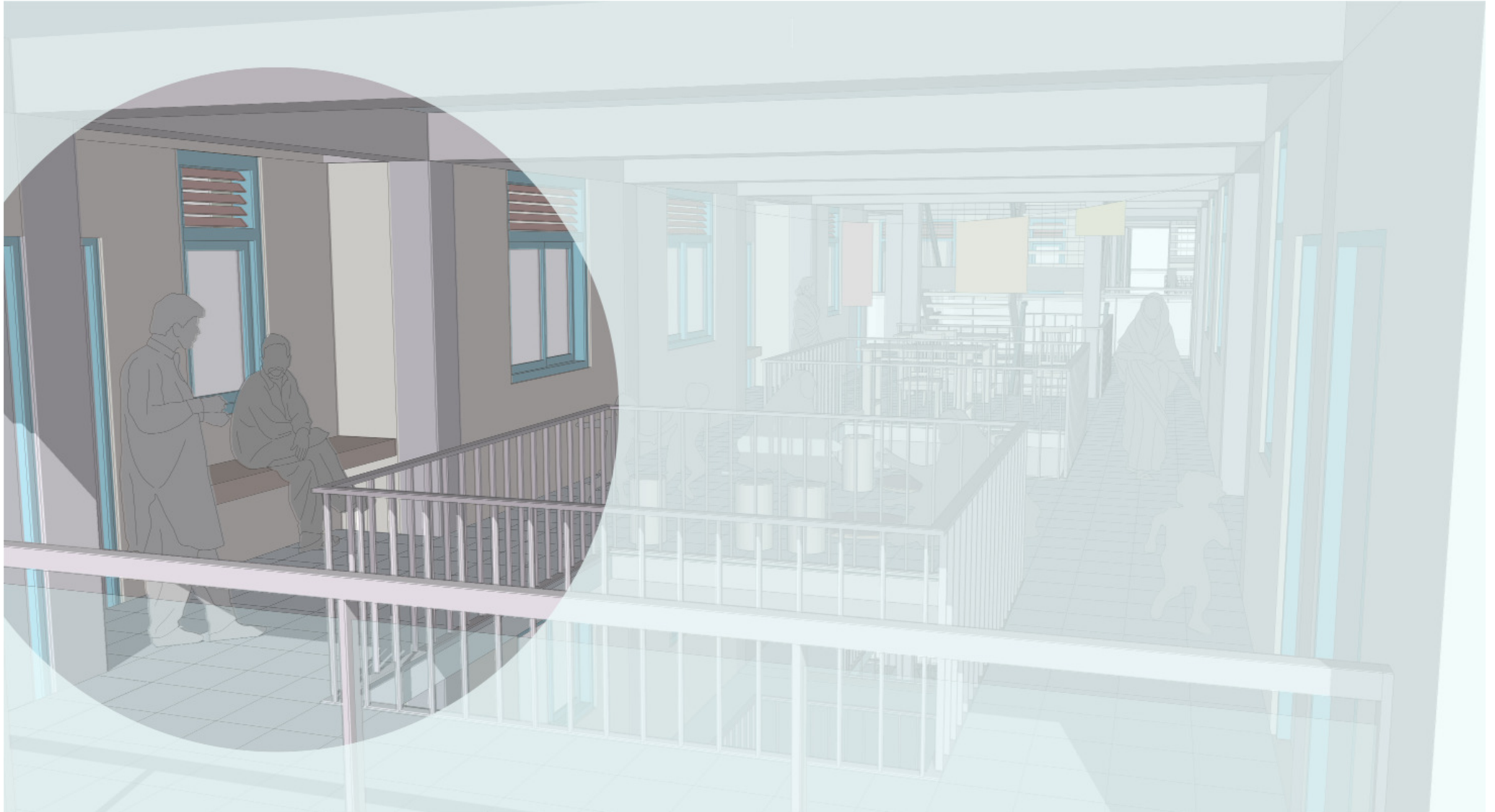


EWS Floor

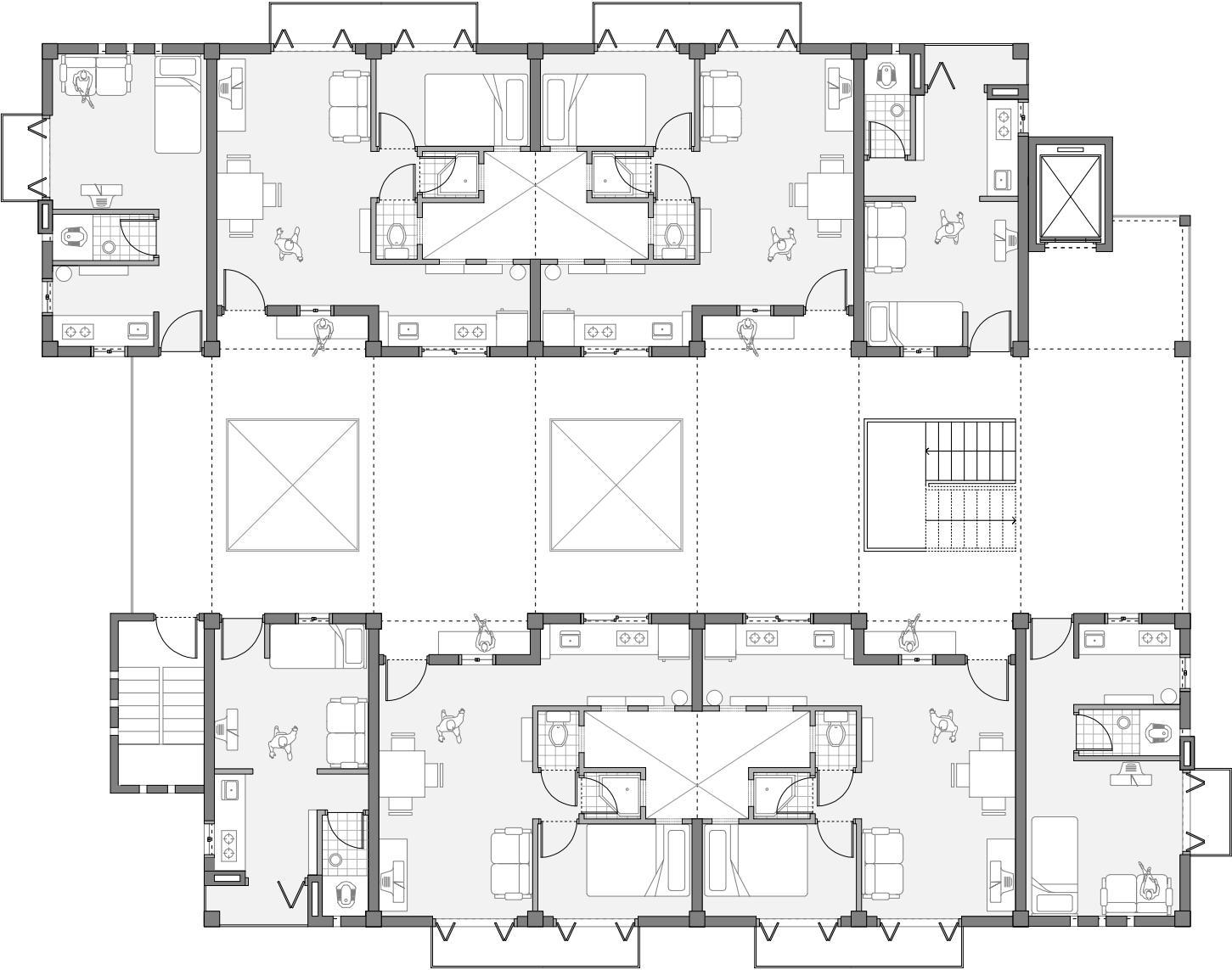


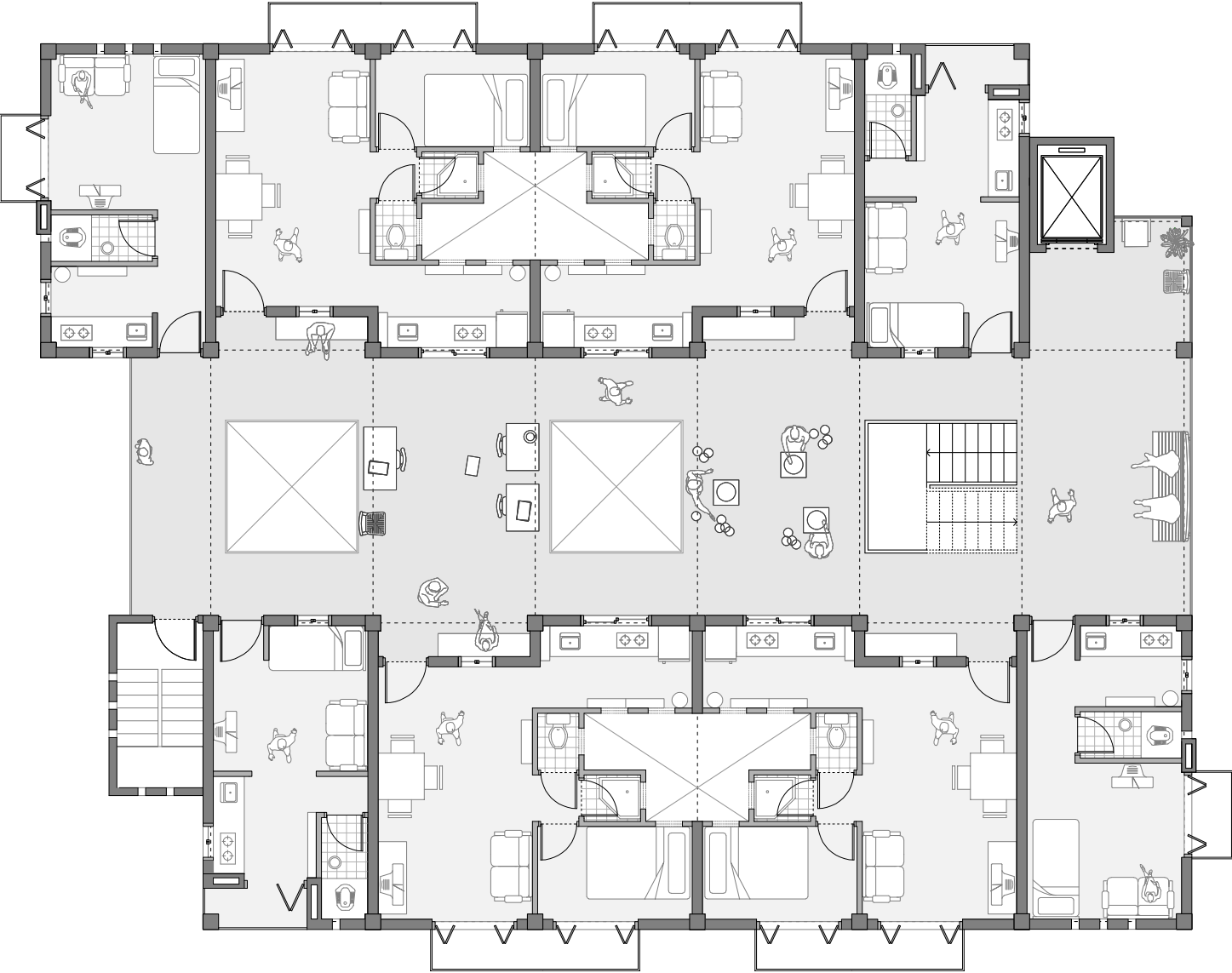
LIG Floor



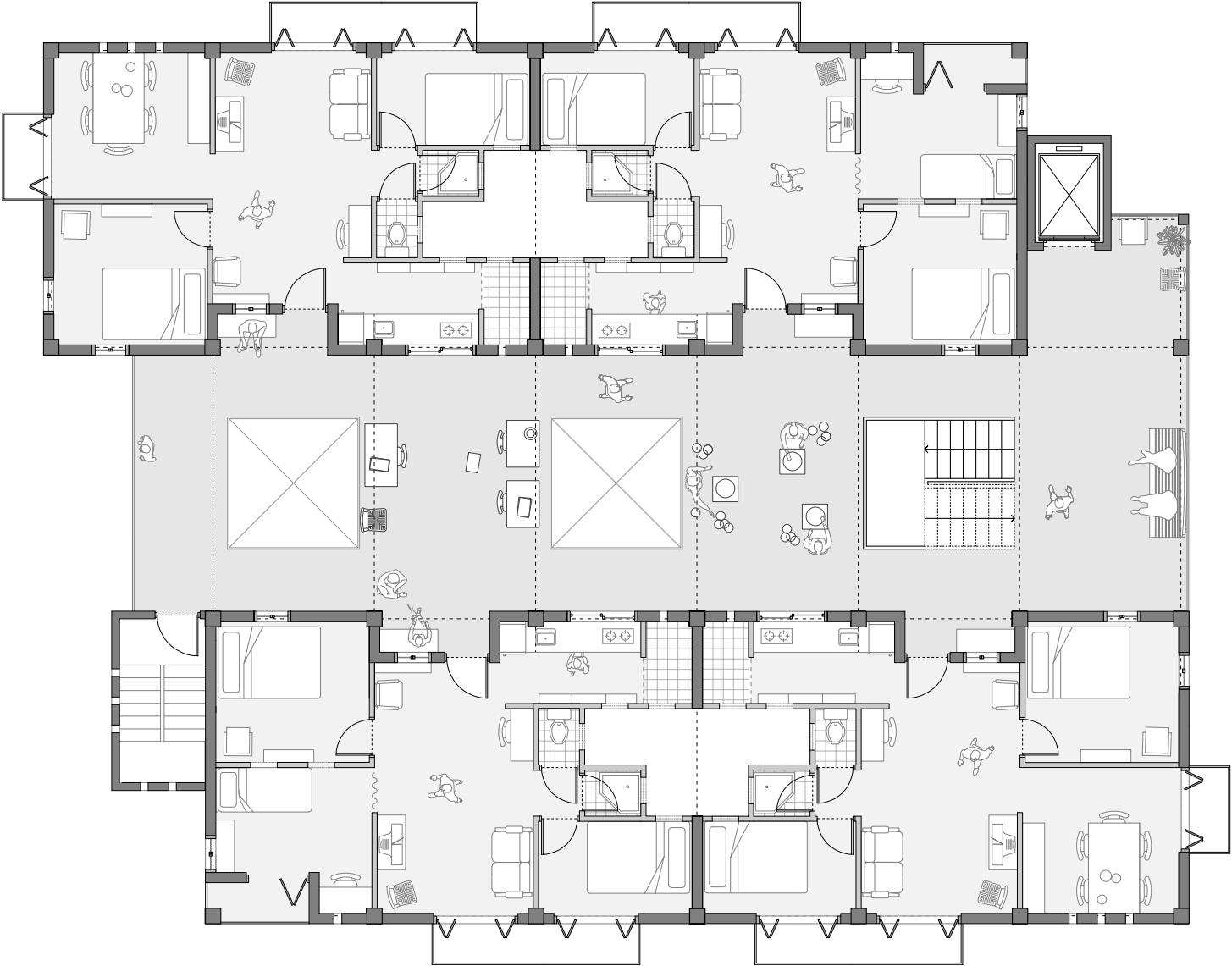


Impression of the otla

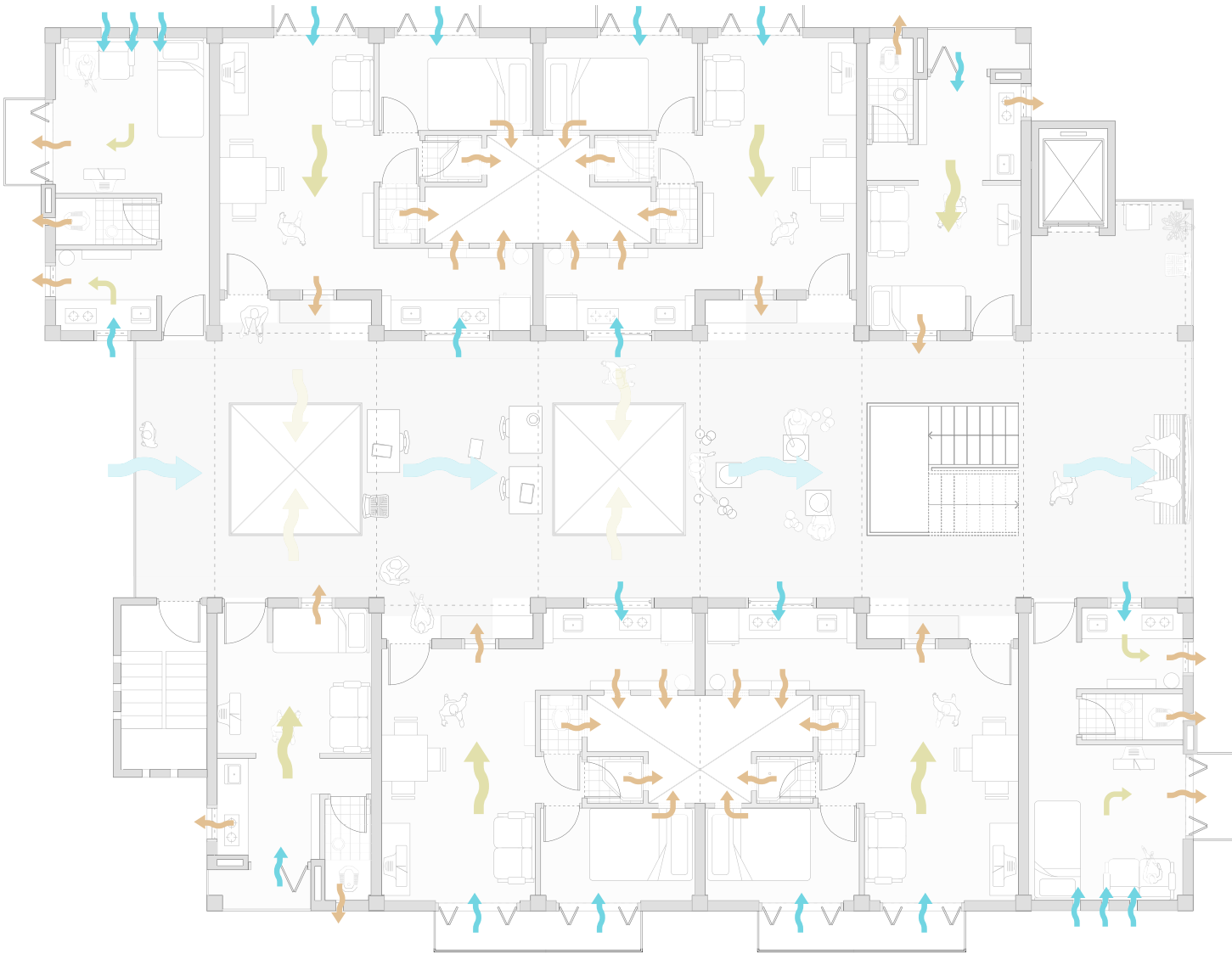


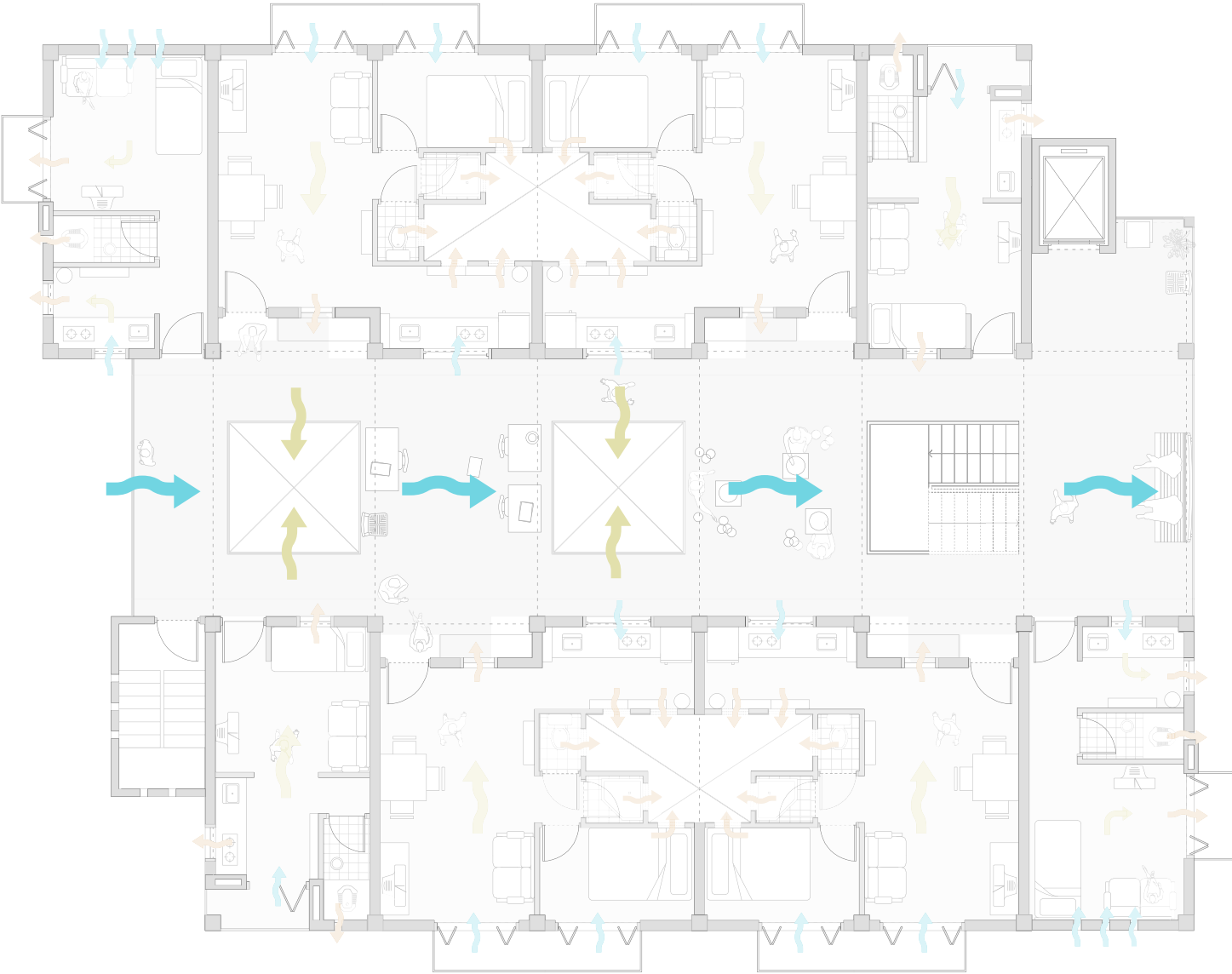


Dwelling floorplan
EWS



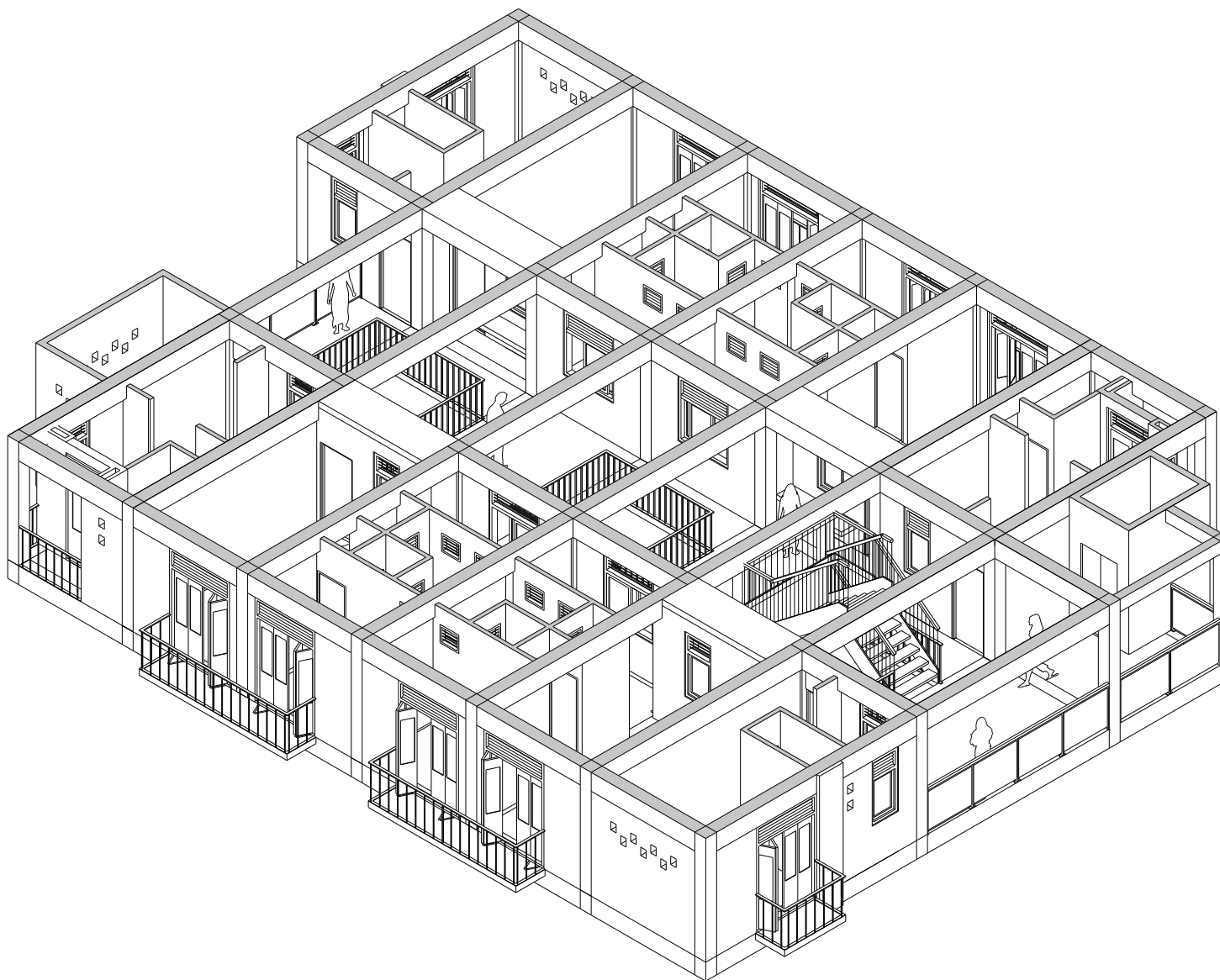
Dwelling floorplan
LIG

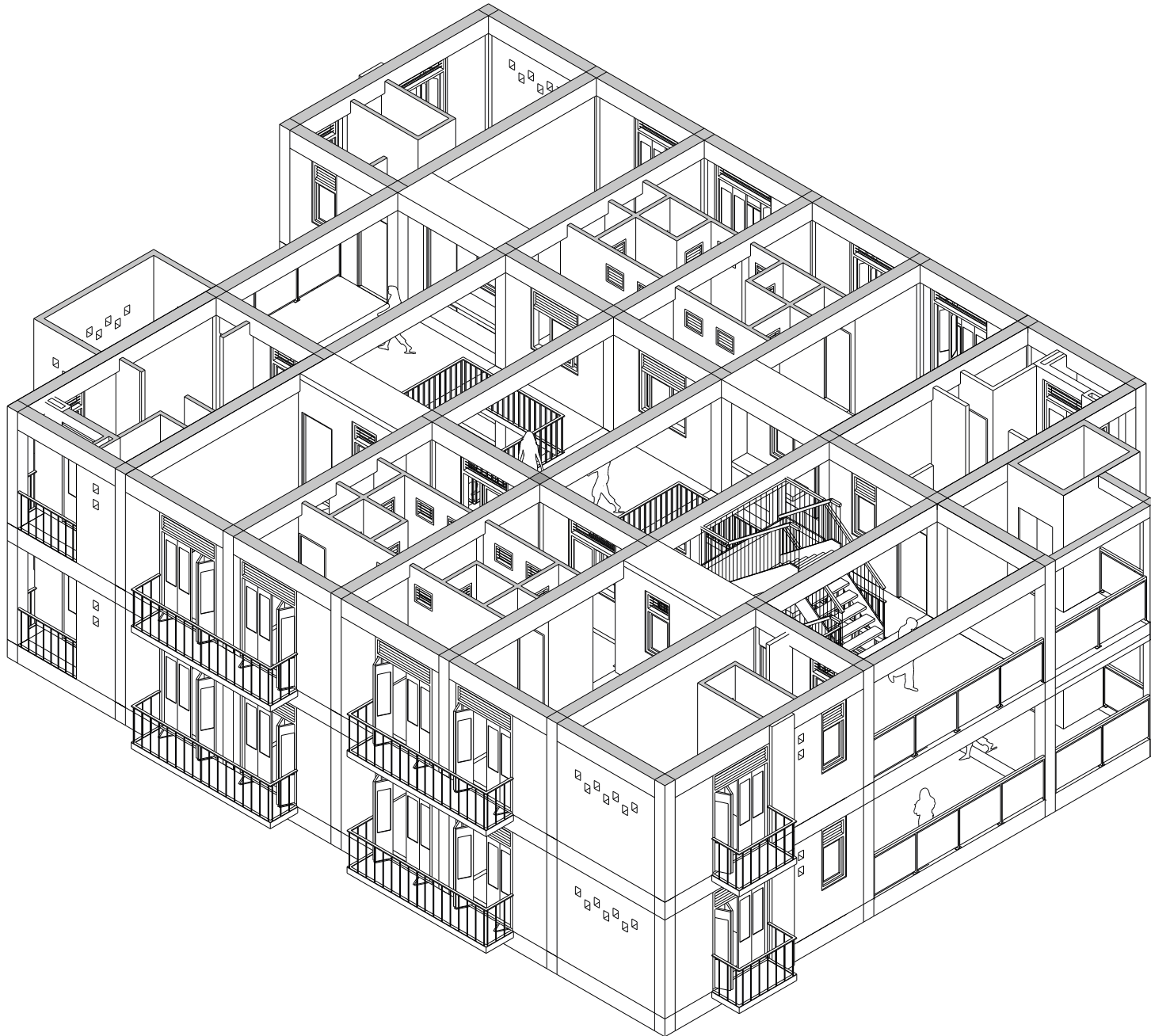


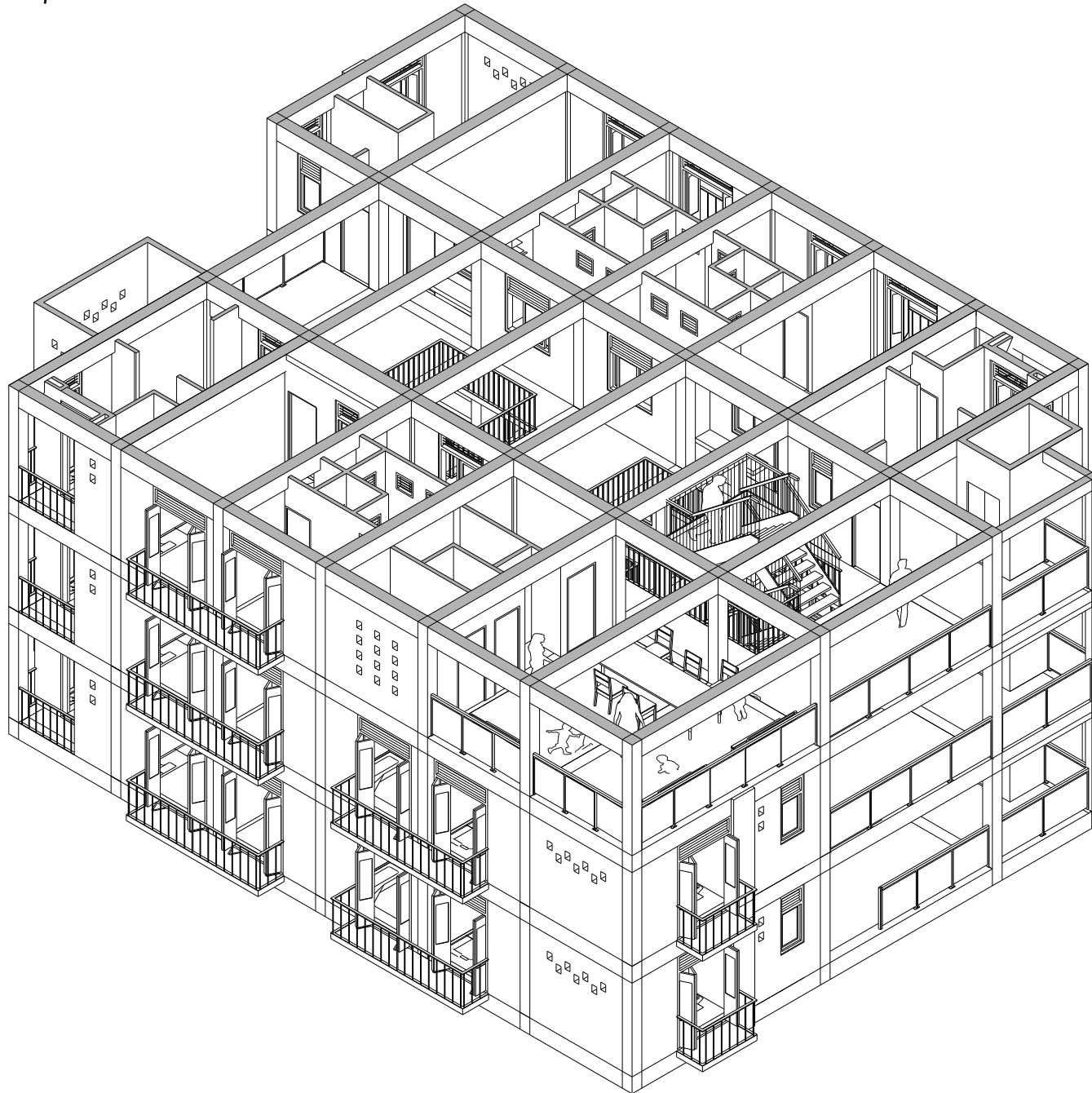


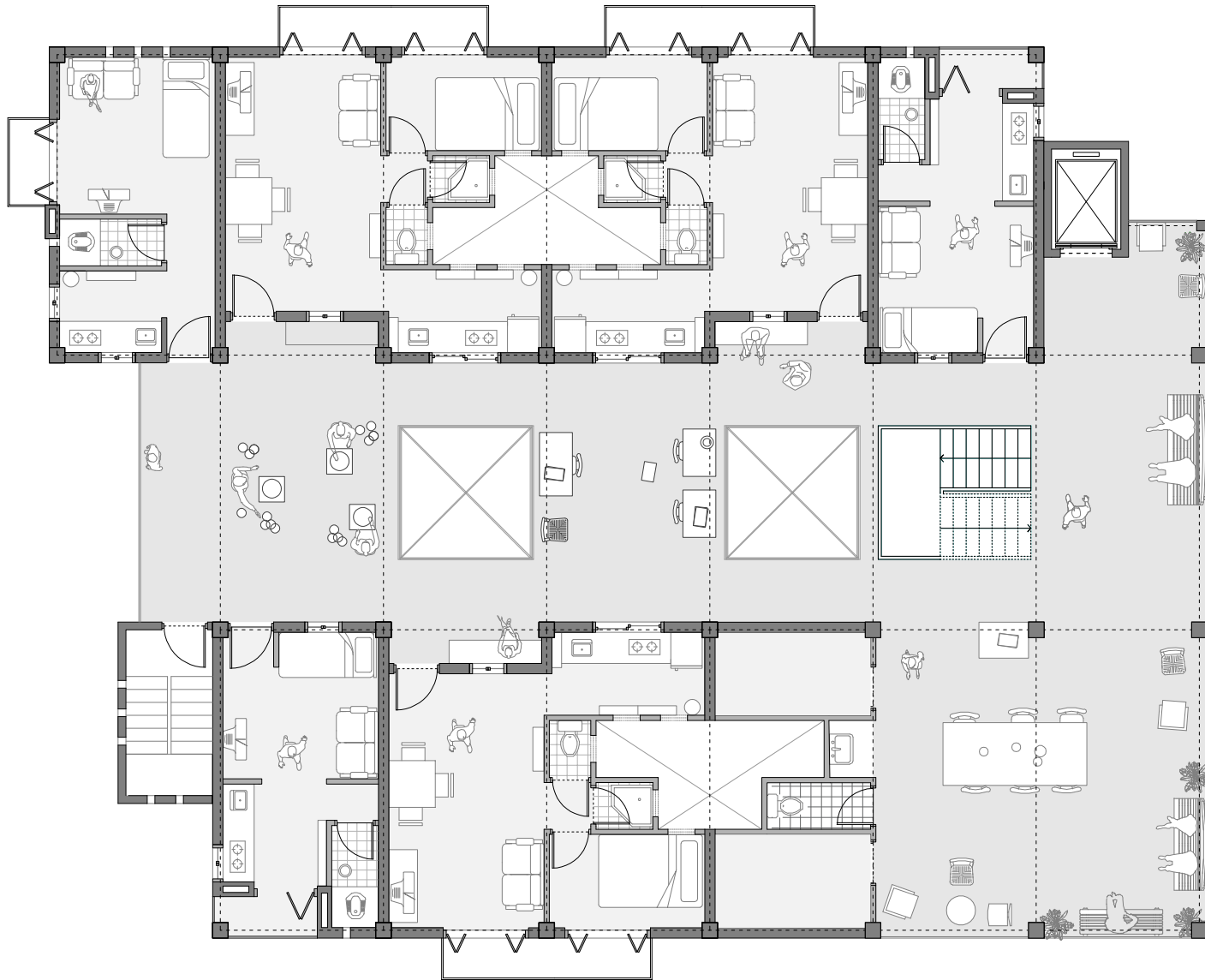


Impression of the atria space

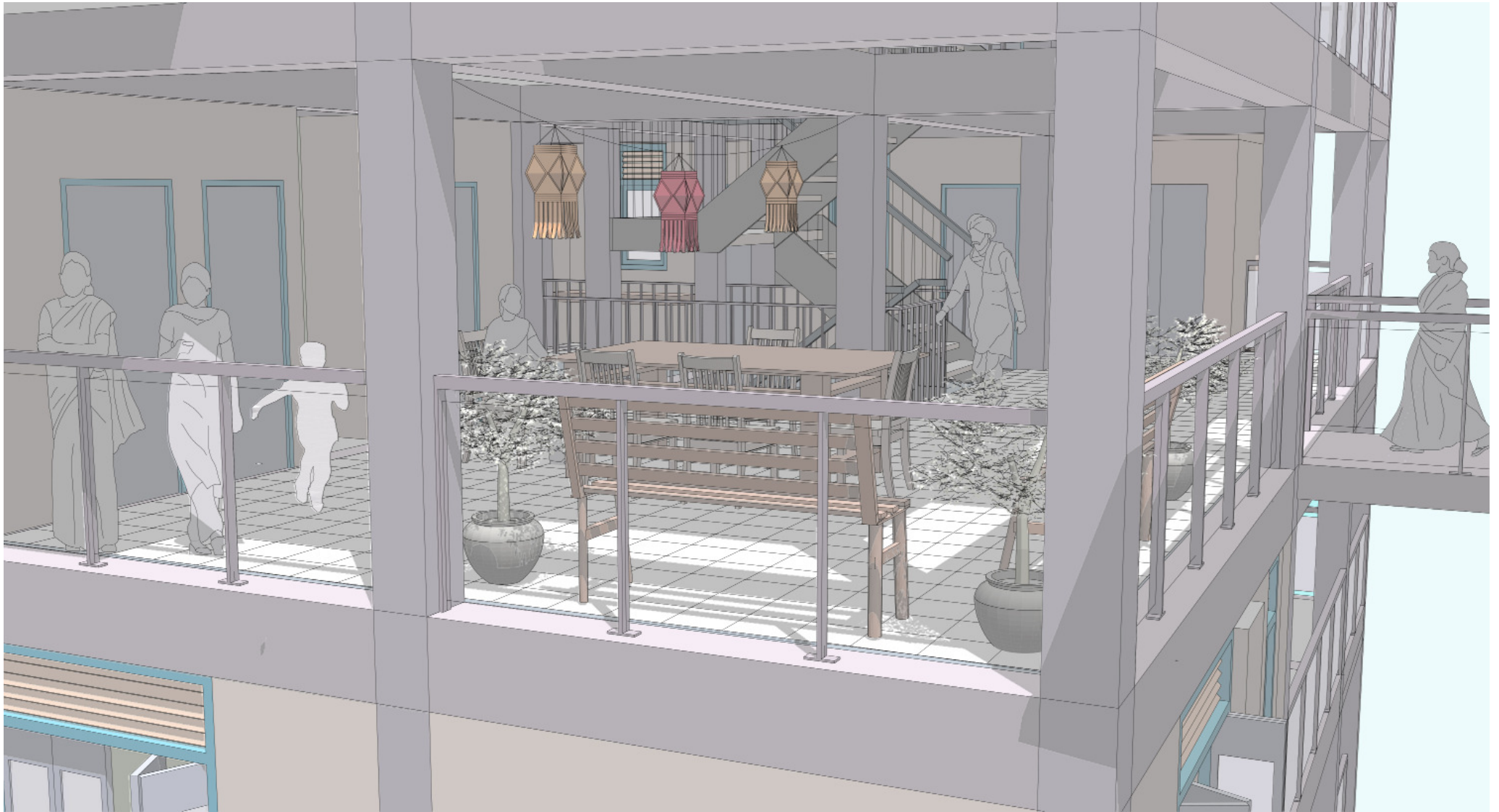




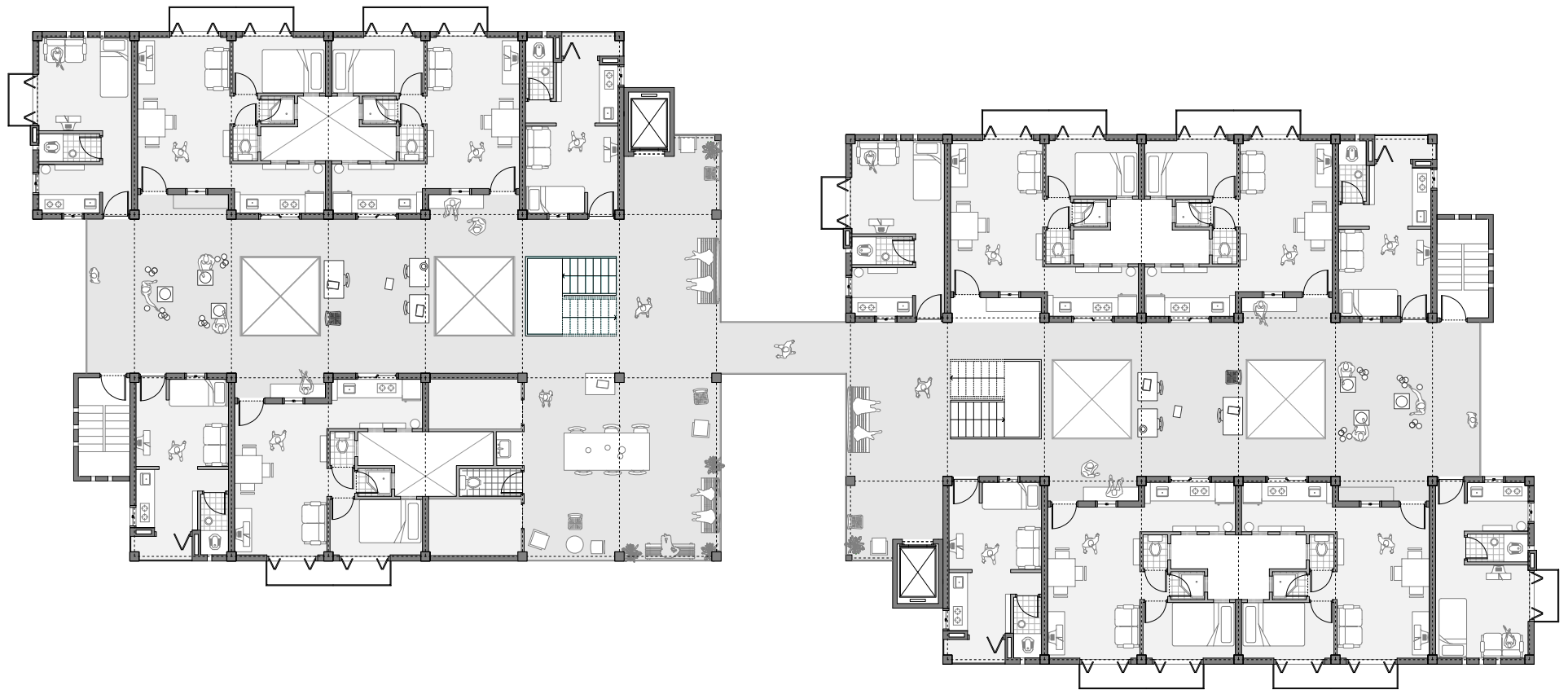




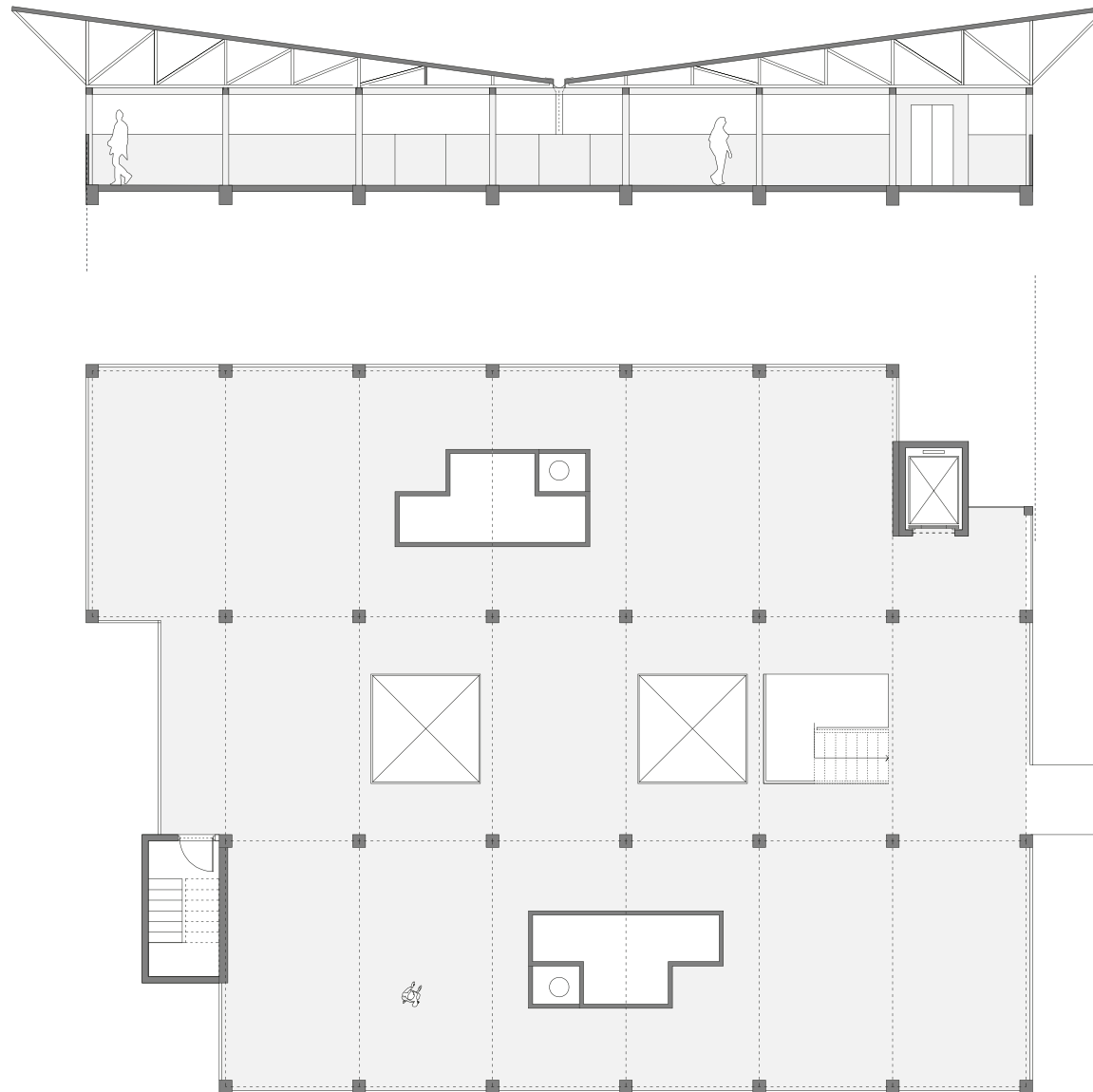
Dwelling floorplan
including common space

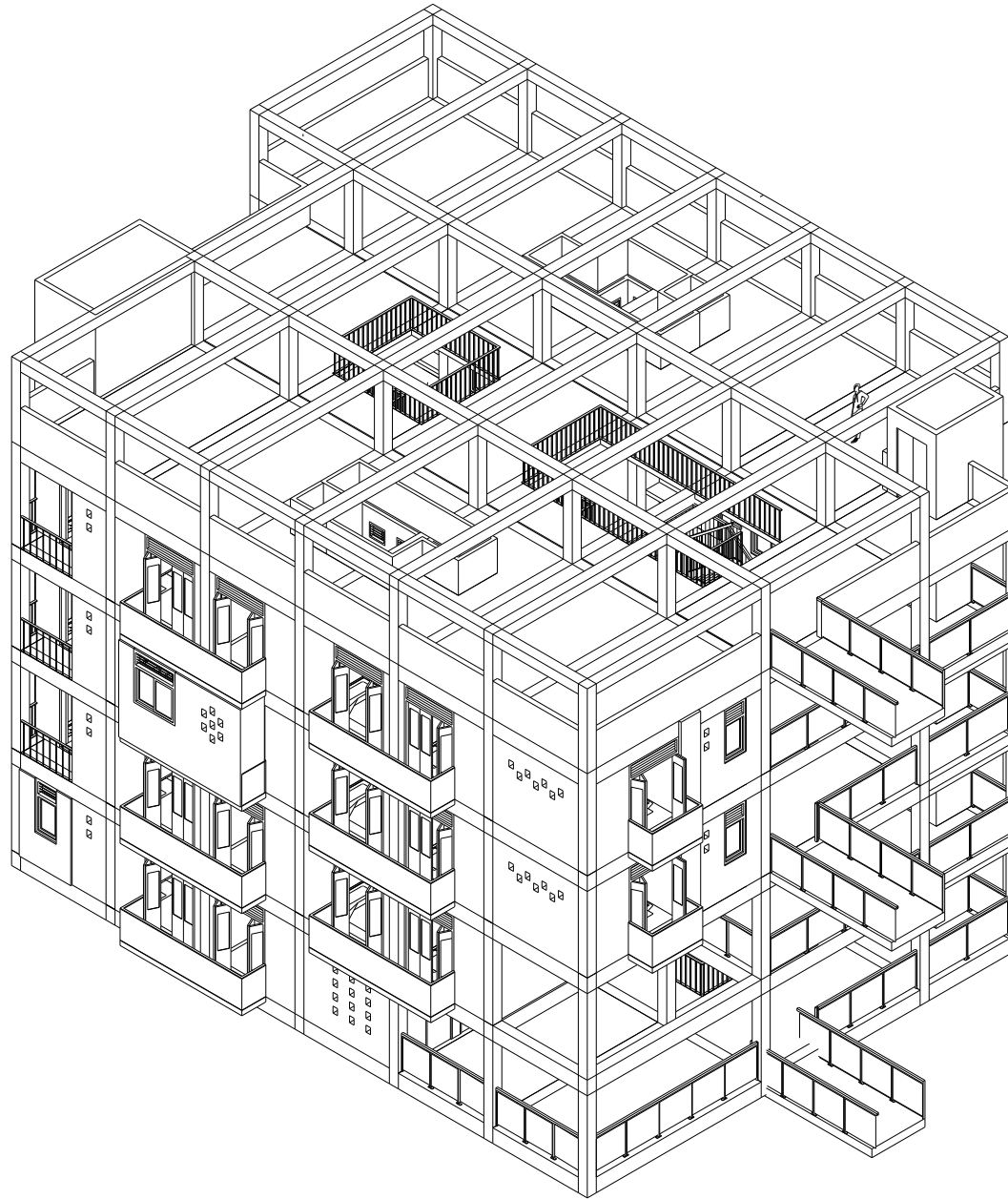


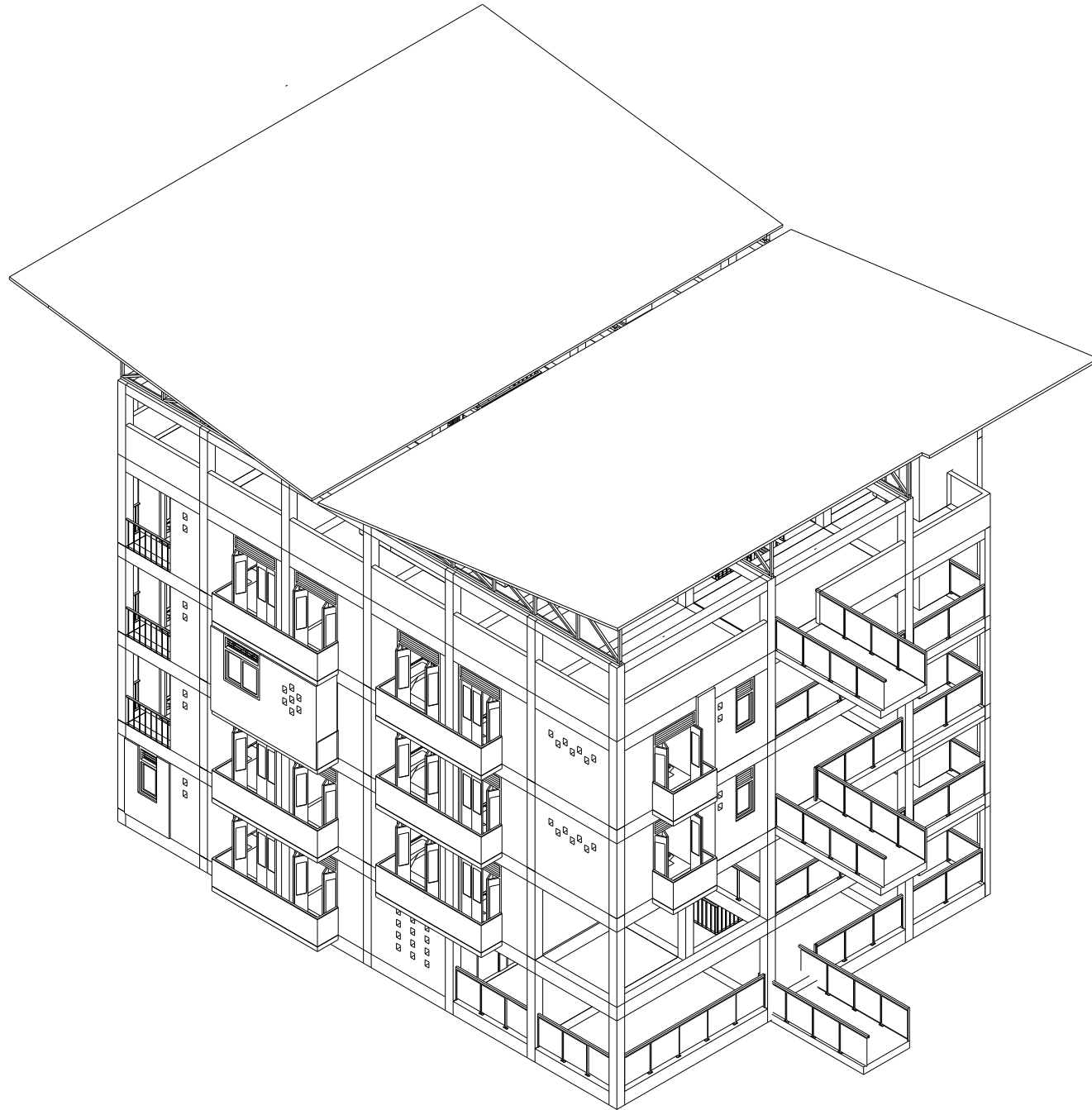
Impression Common Space

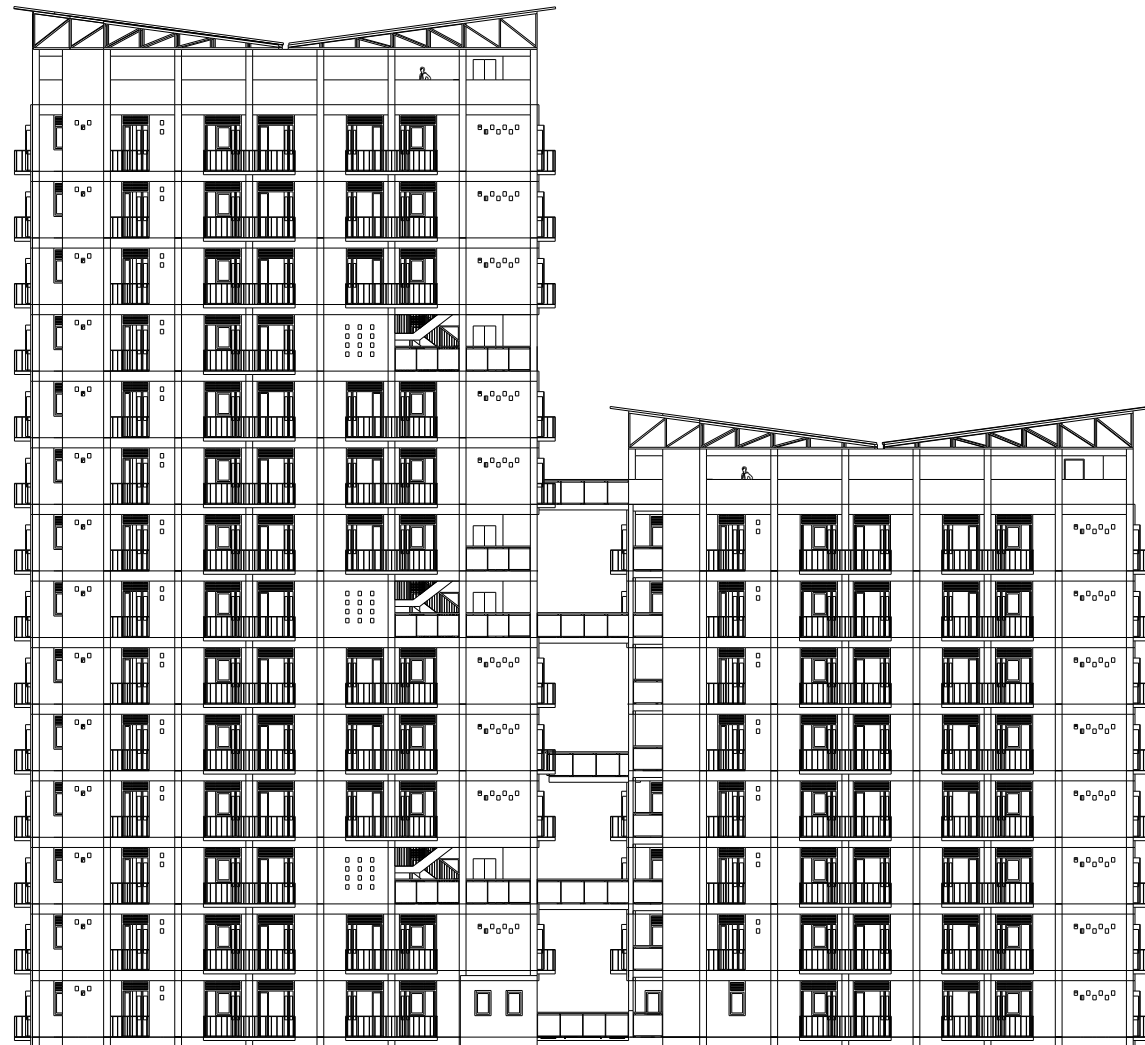


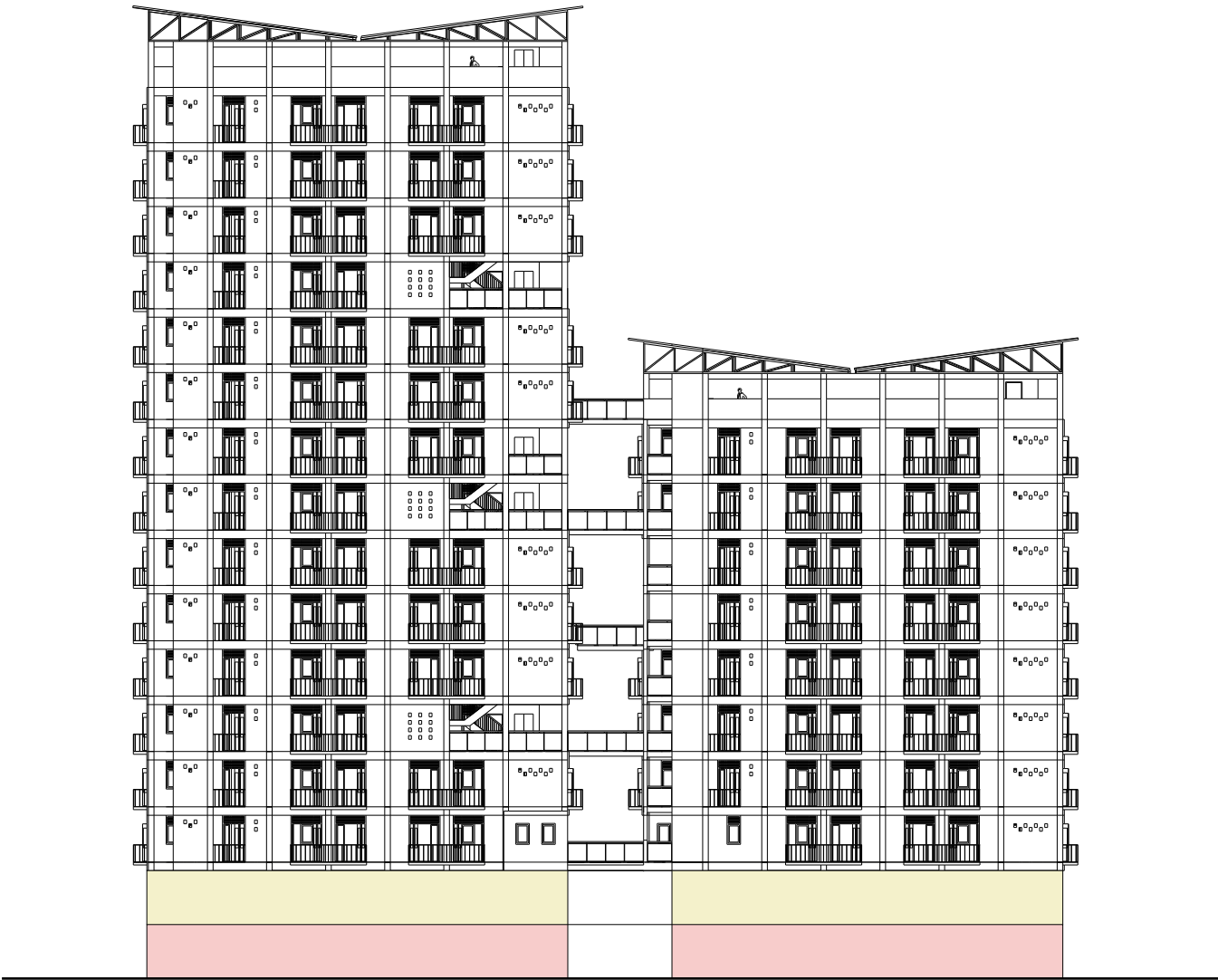
Dwelling floorplan
including common space



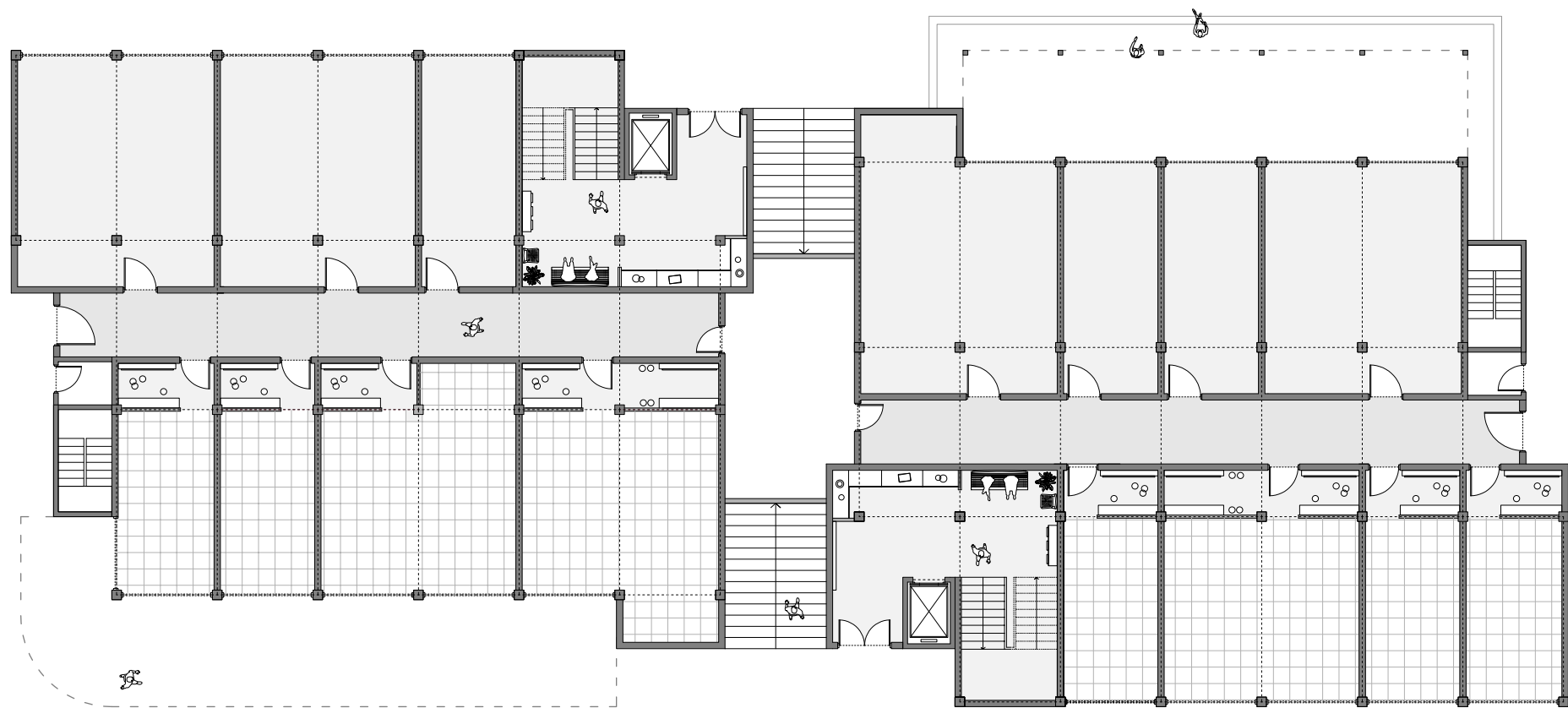




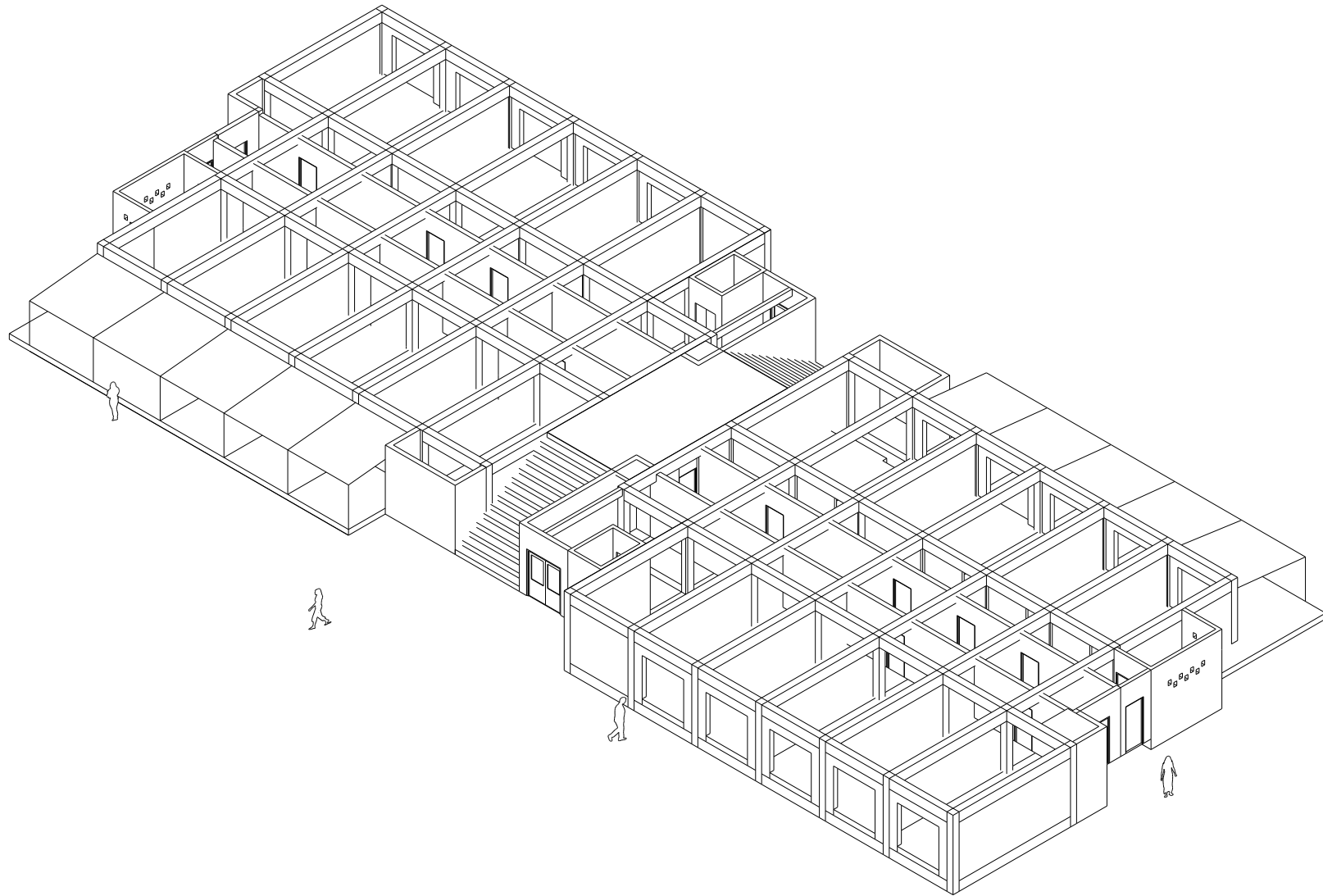






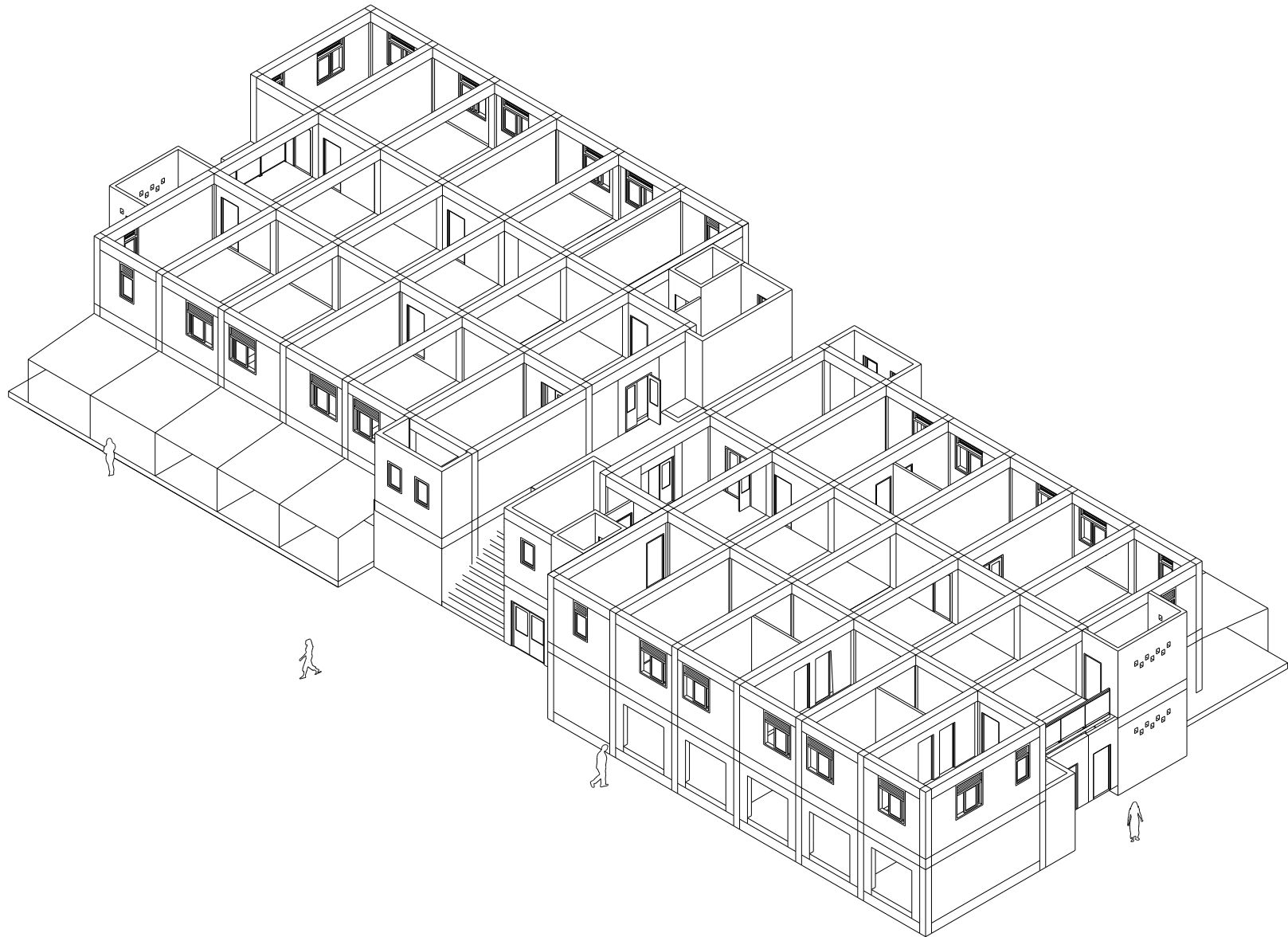


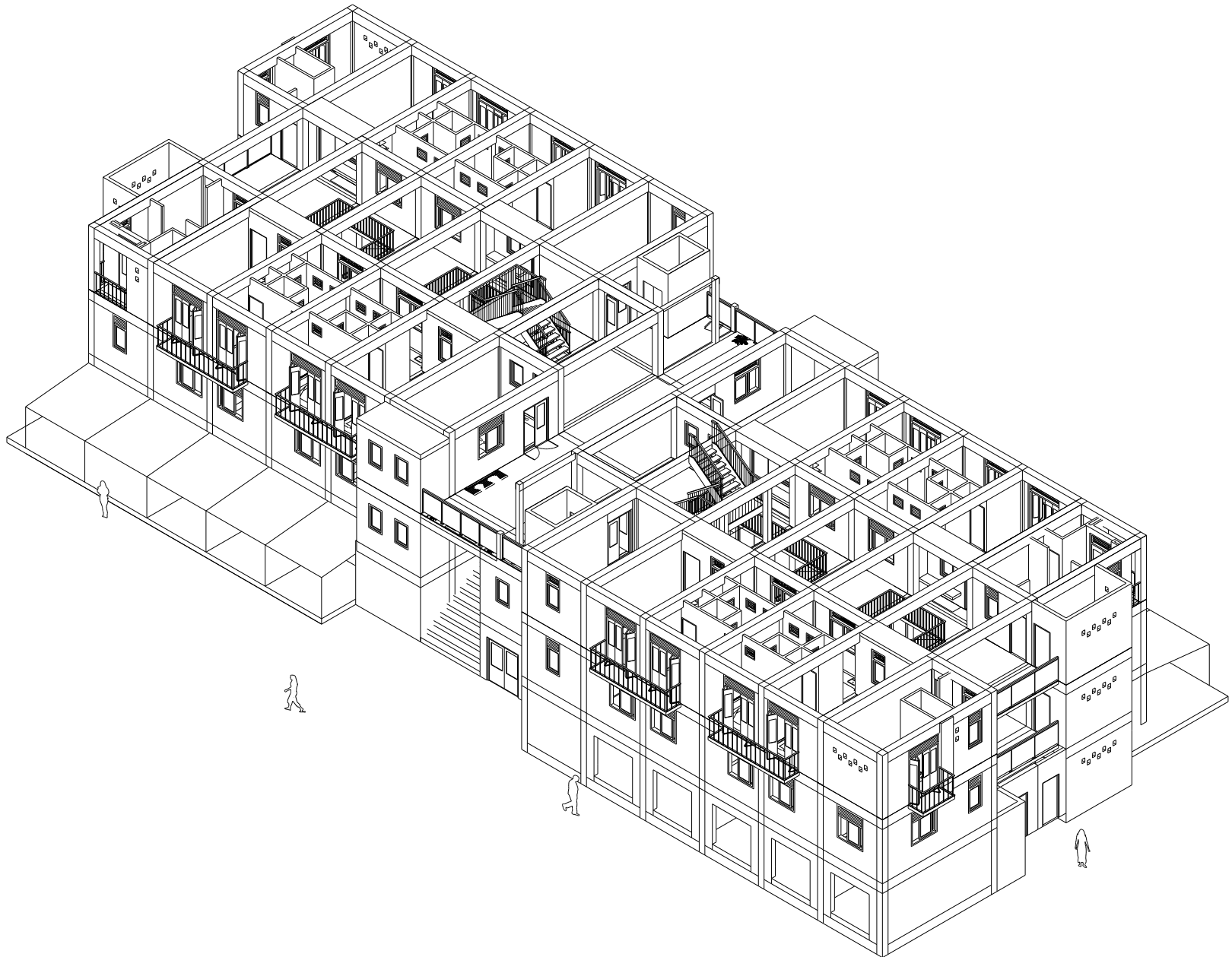
Floor 0





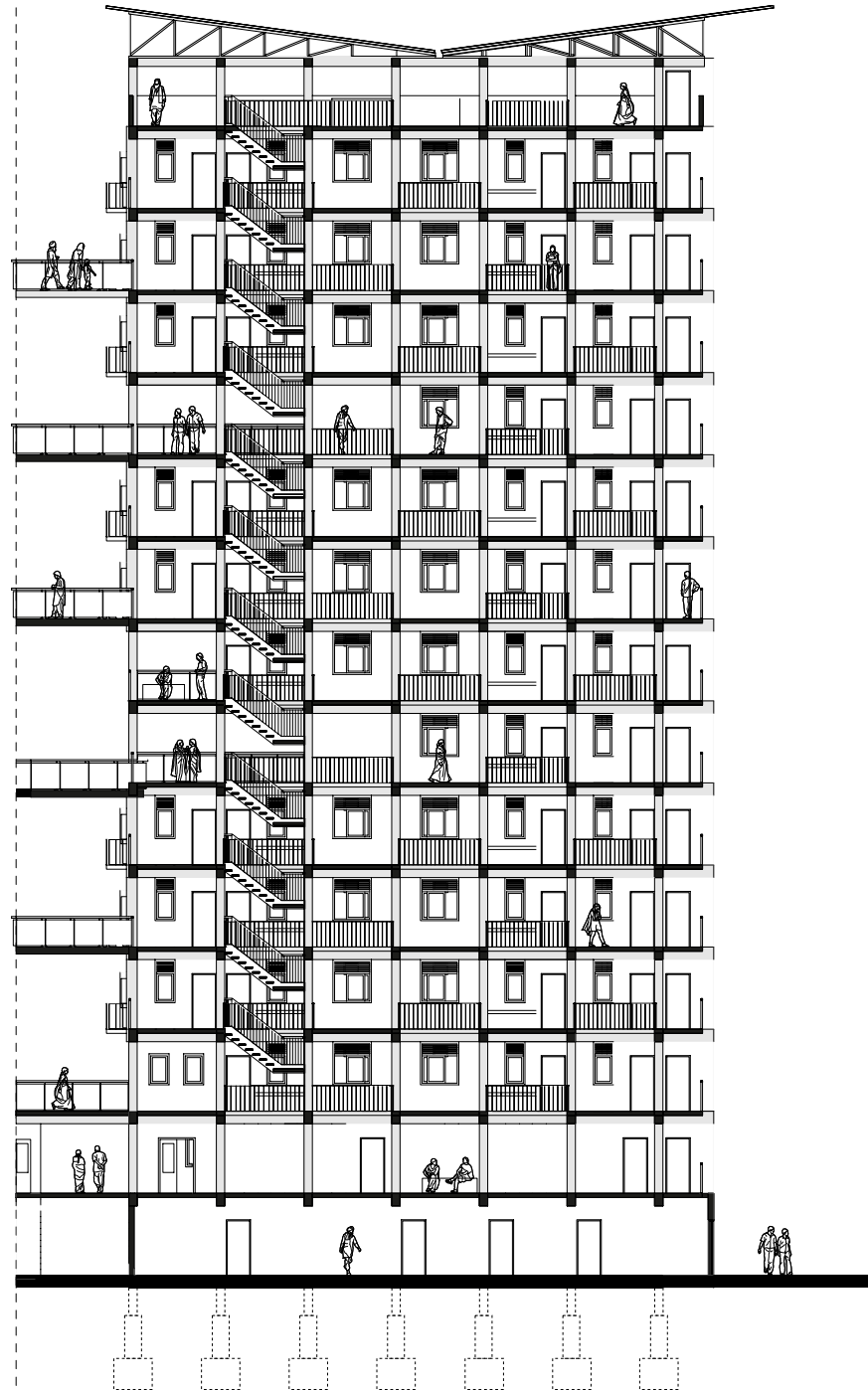
Floor 1

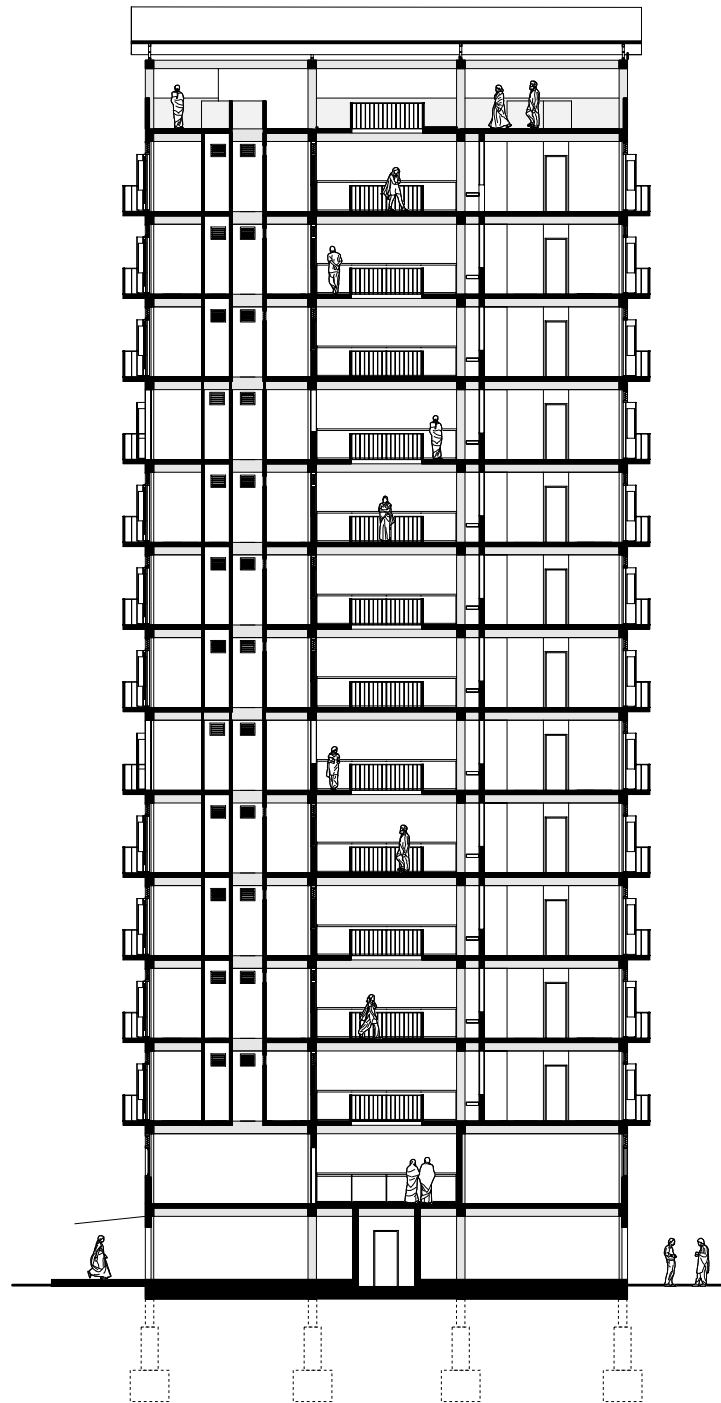






Building Design

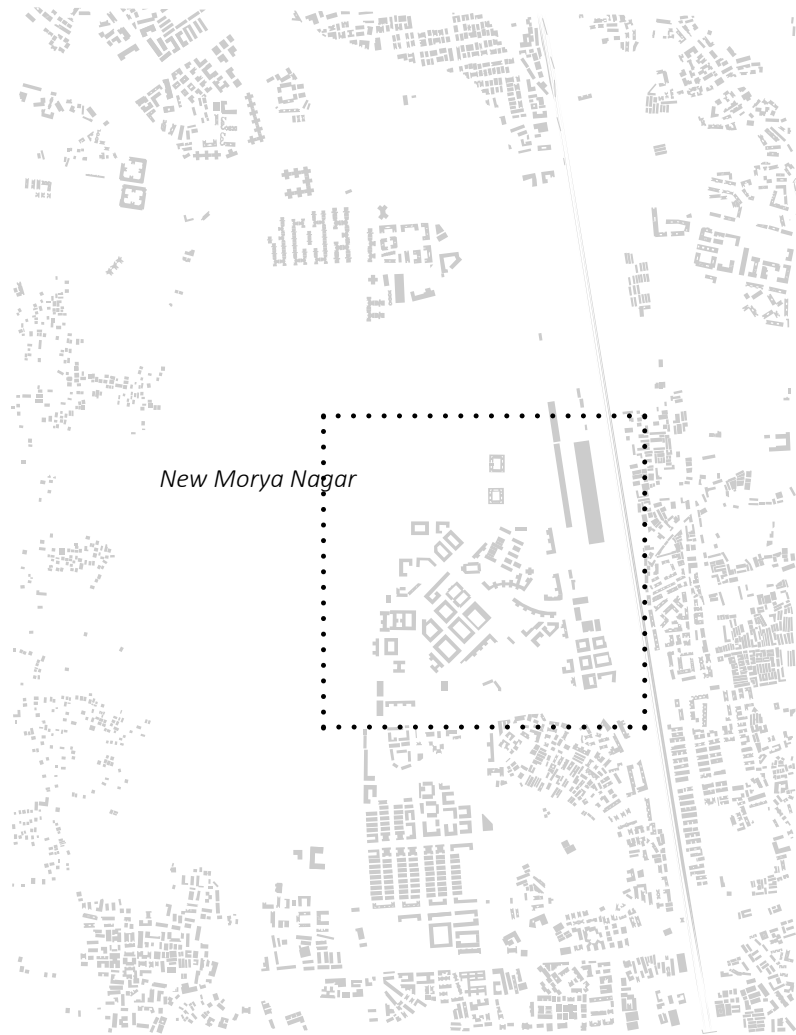




Site

Analysis of New Morya Nagar

New Morya Nagar



The location of New Morya Nagar within the area of West-Nalasopara



New Morya Nagar 2002



New Morya Nagar 2009



New Morya Nagar 2012



New Morya Nagar 2015

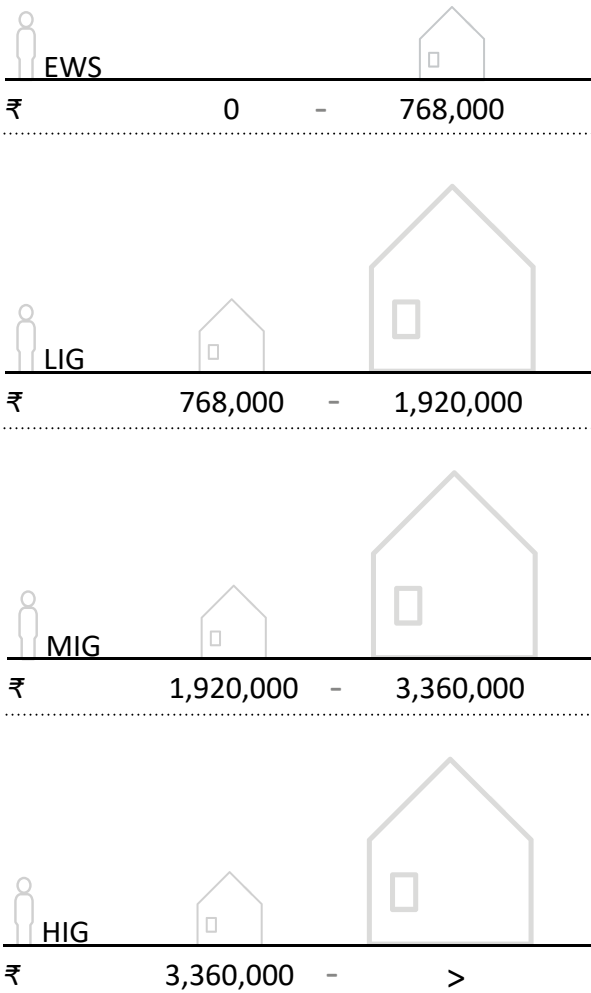
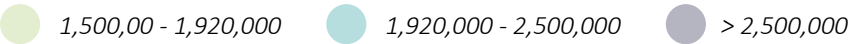


New Morya Nagar 2018

Function

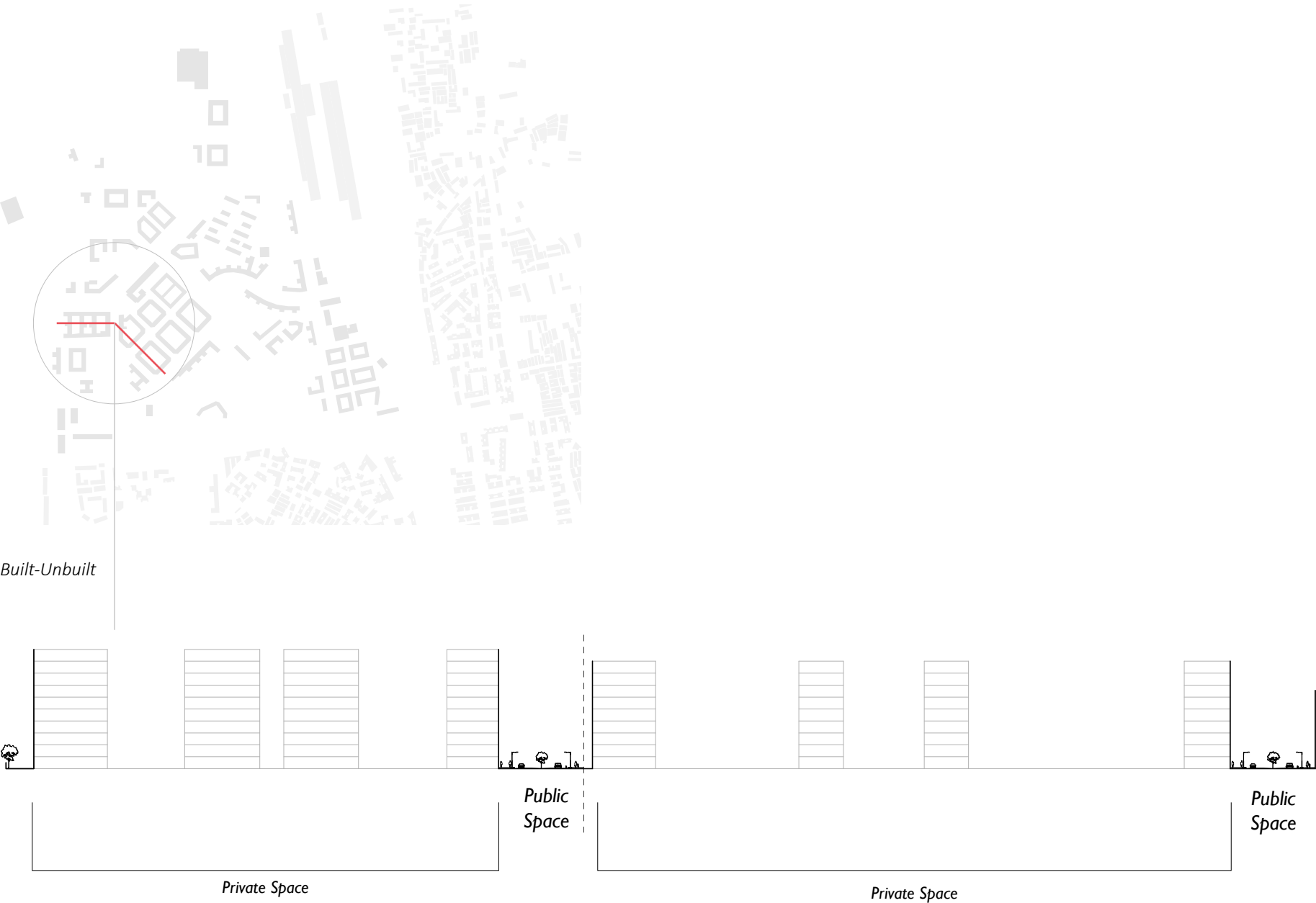


Real Estate Value



Ideal Cost of an affordable house (Rs.)
per incomegroup

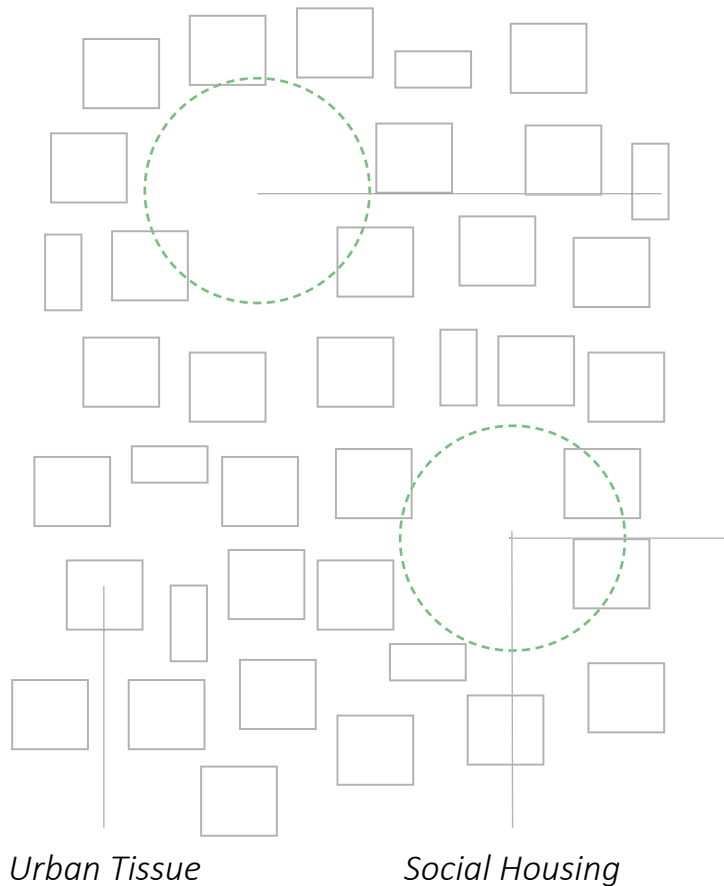
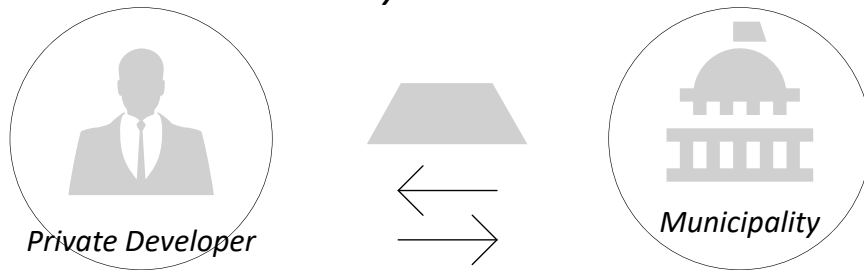
Public Space







Urban Strategy Symbiosis



Conditions for Implementation

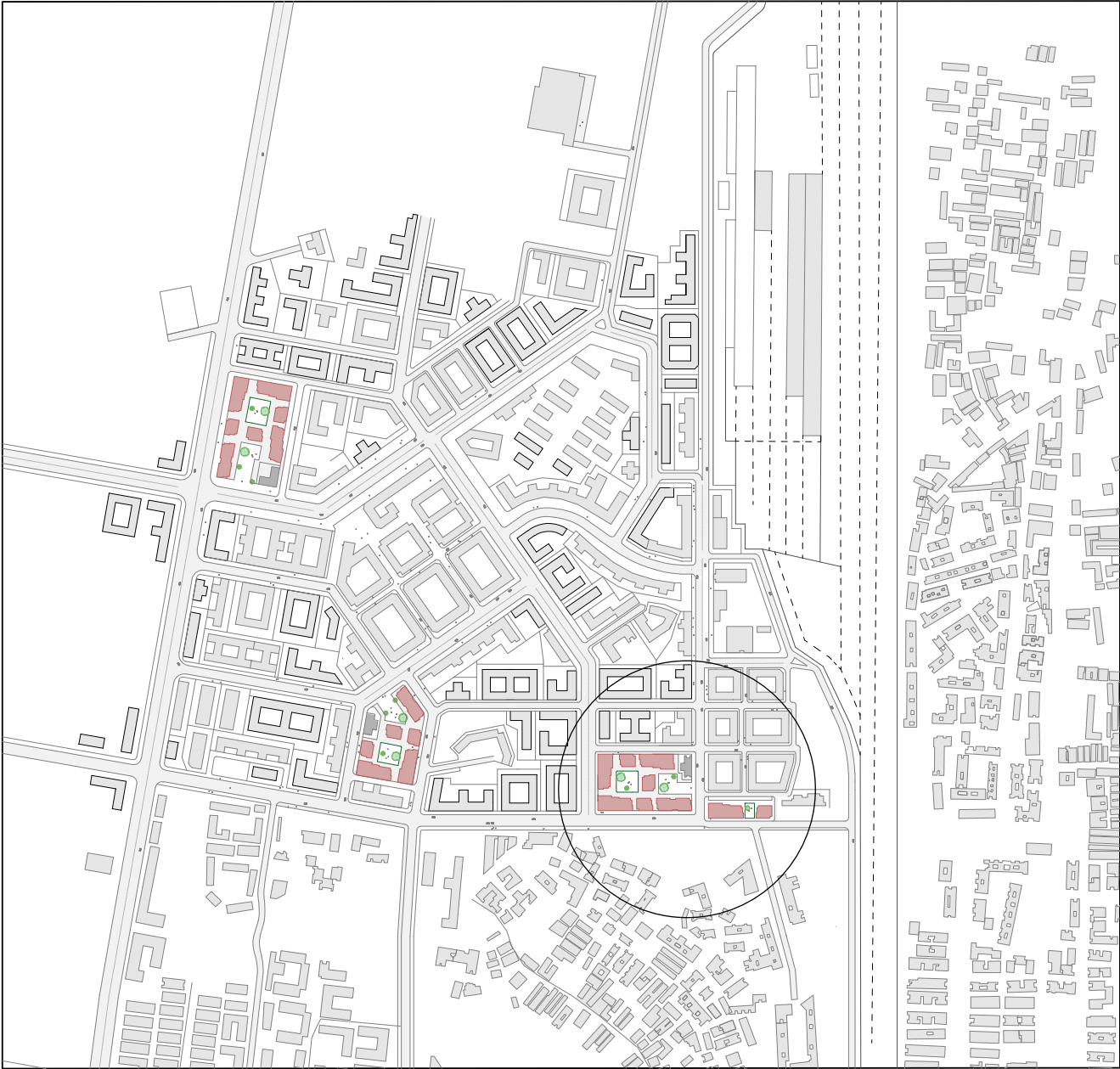
- For the developments to house a small society of EWS and LIG inhabitants. -> creating community
- To be located on the borders of the area. -> bridging neighborhoods
- To be located close to main infrastructure -> inducing accessibility
- To incorporate existing buildings in the development of the area. -> induce adaption







Proposed future scenario

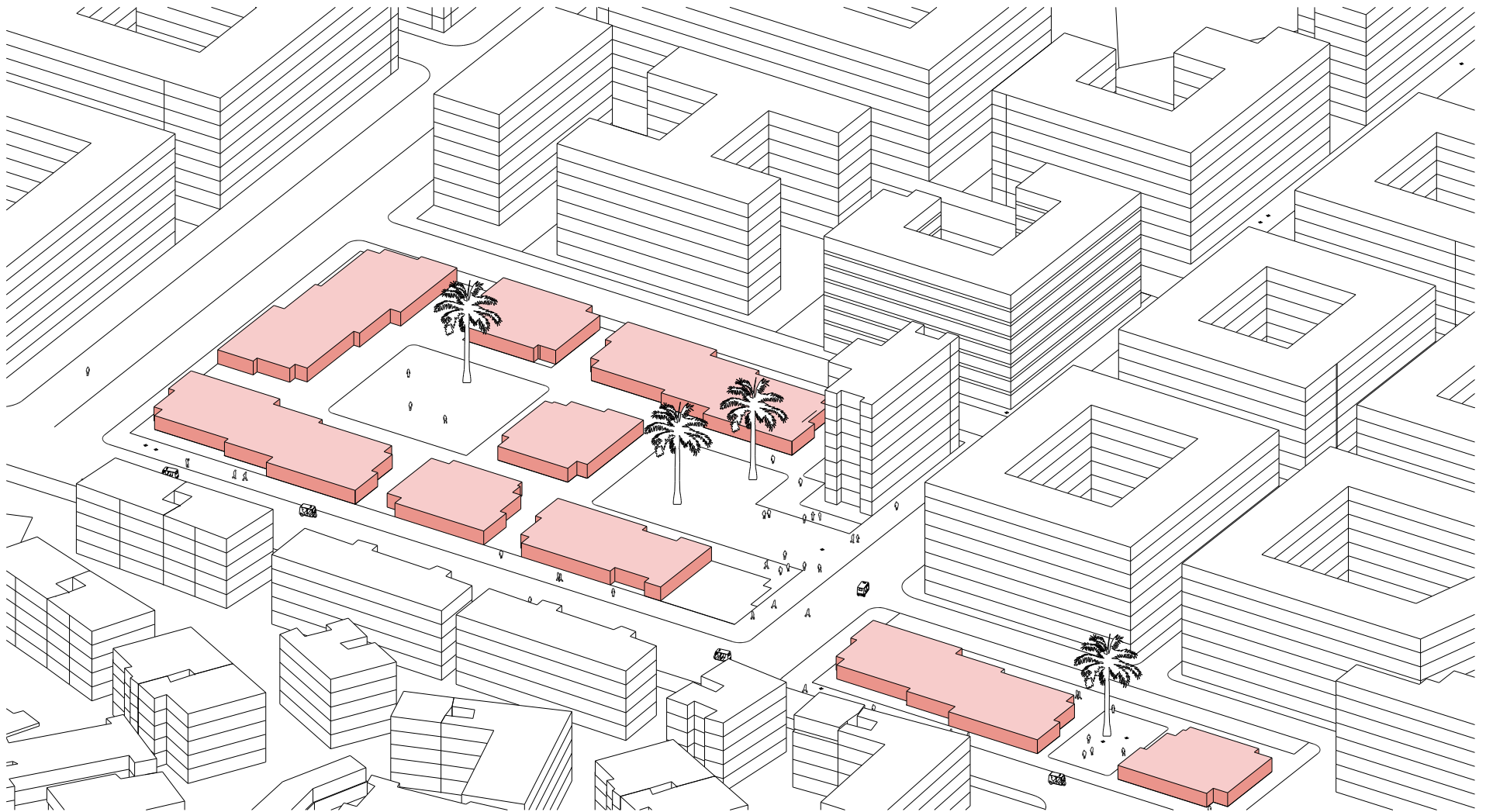


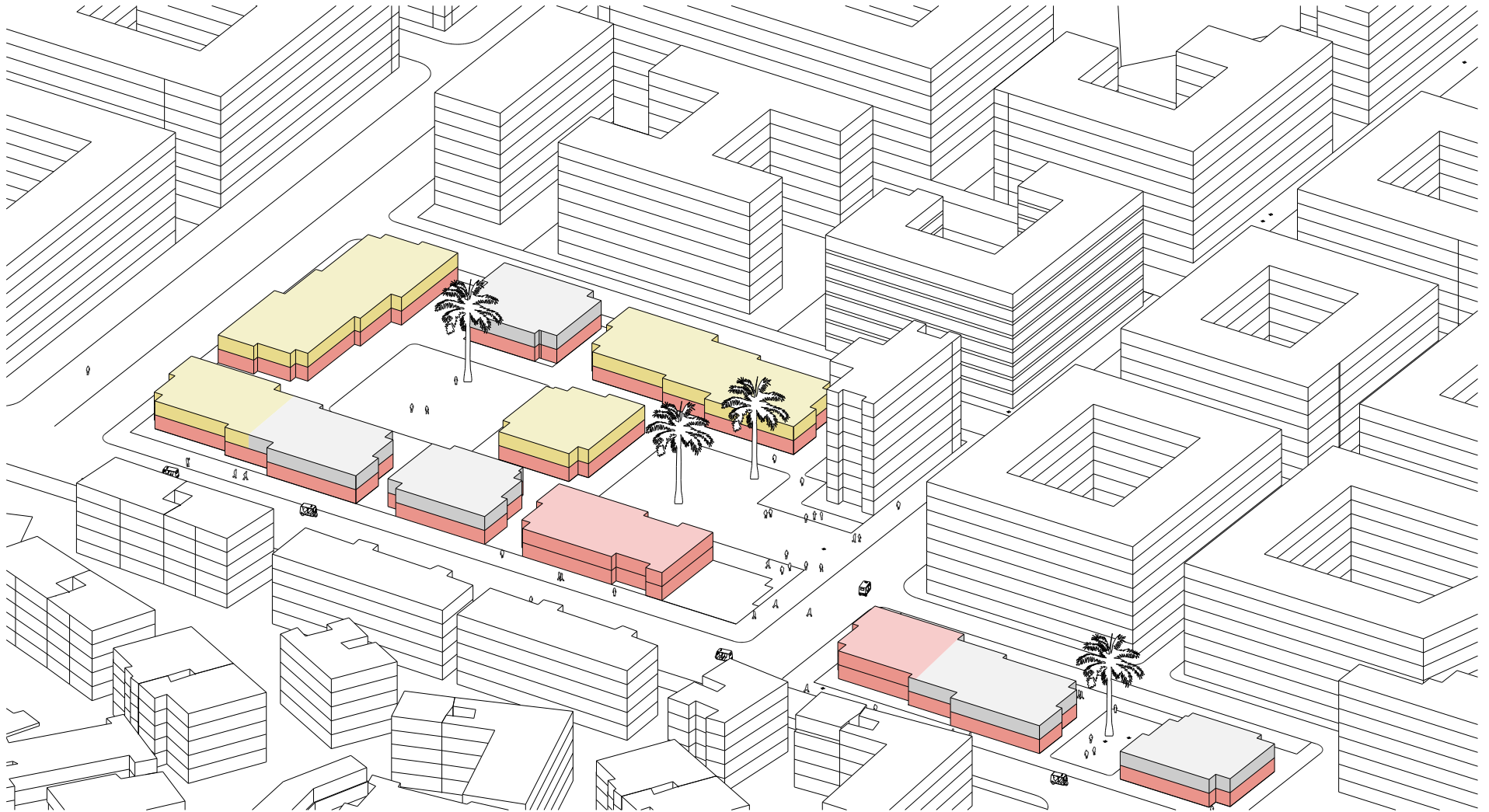
Locating the site

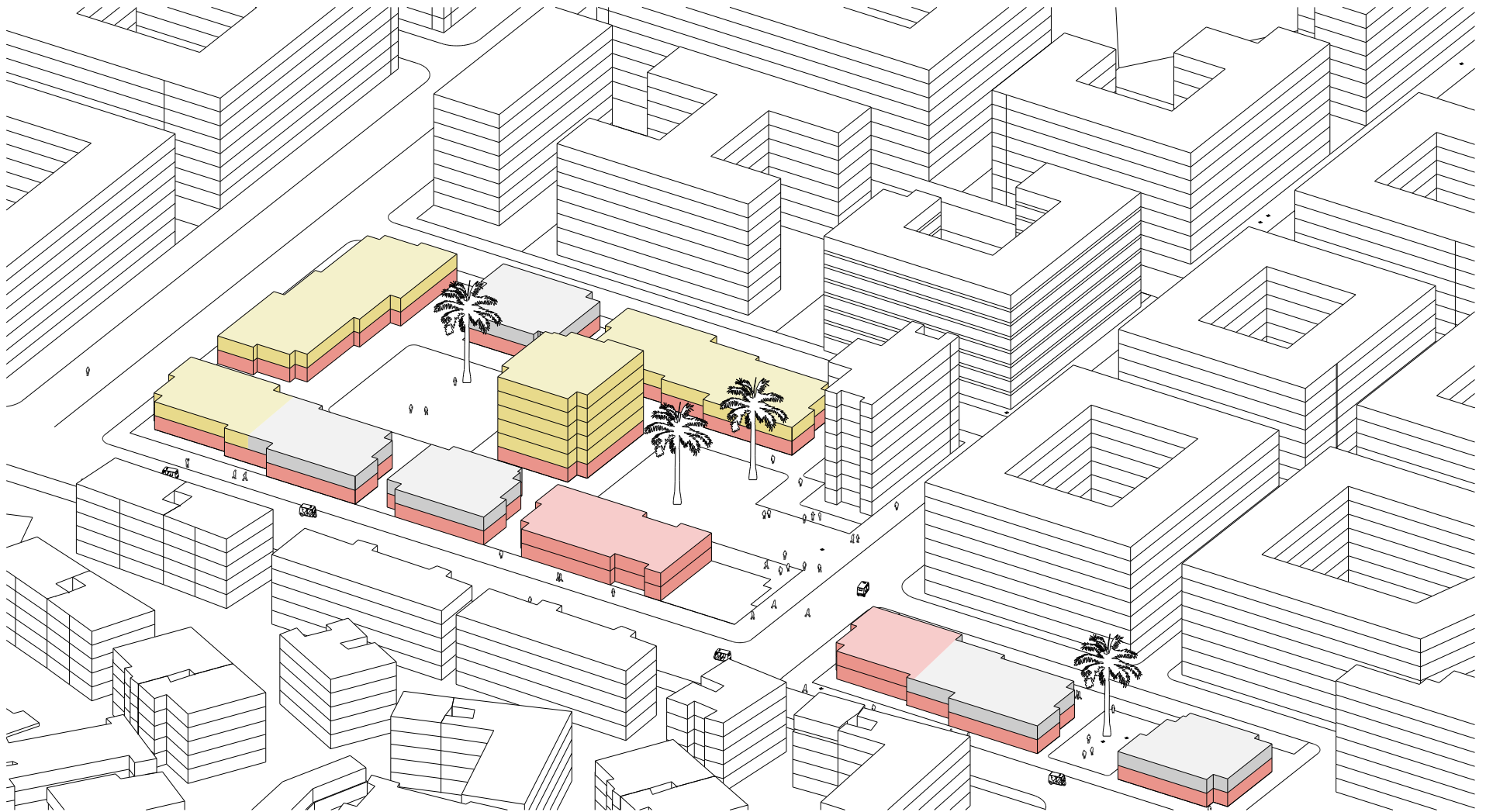
Masterplan

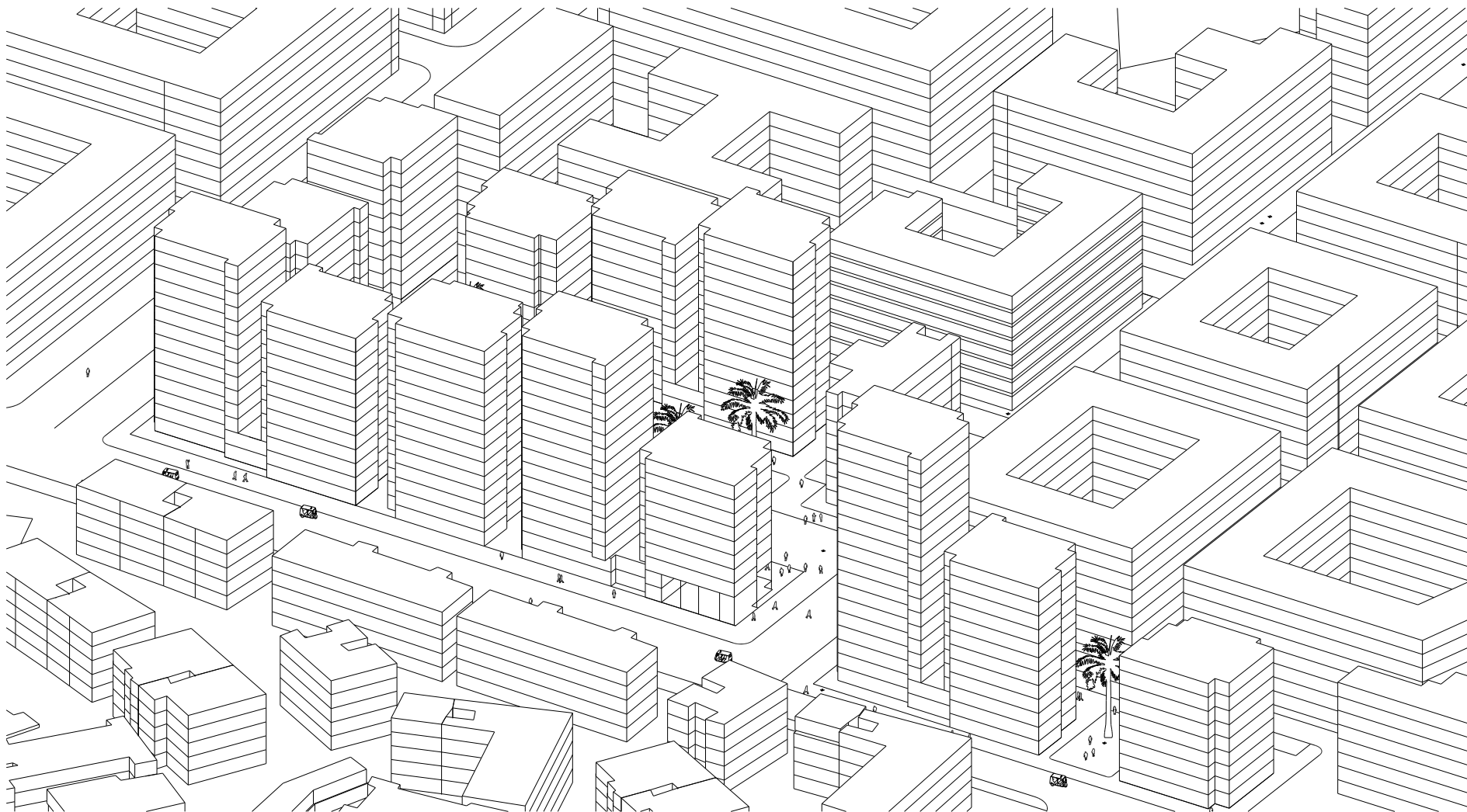
Urban Design







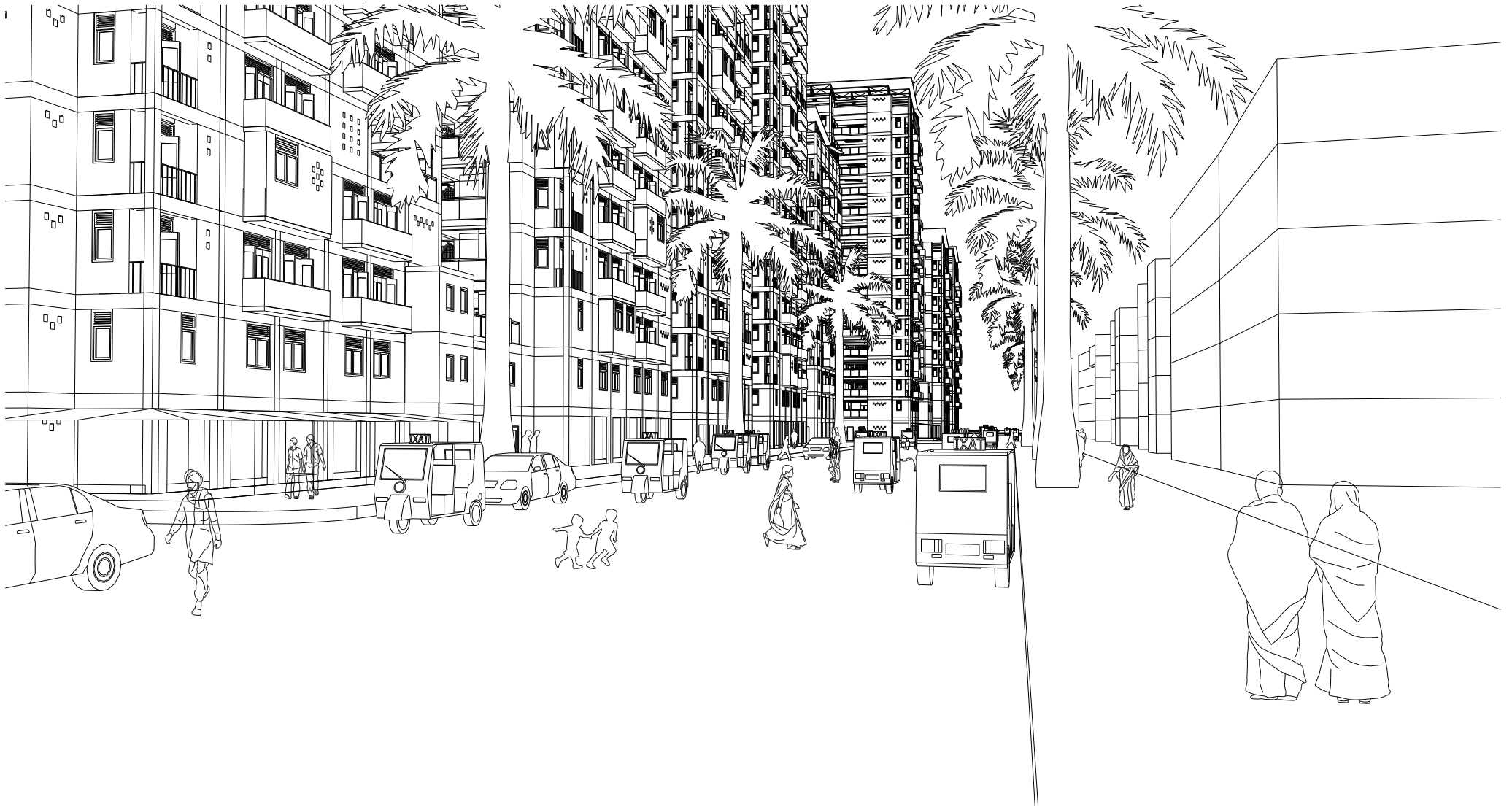




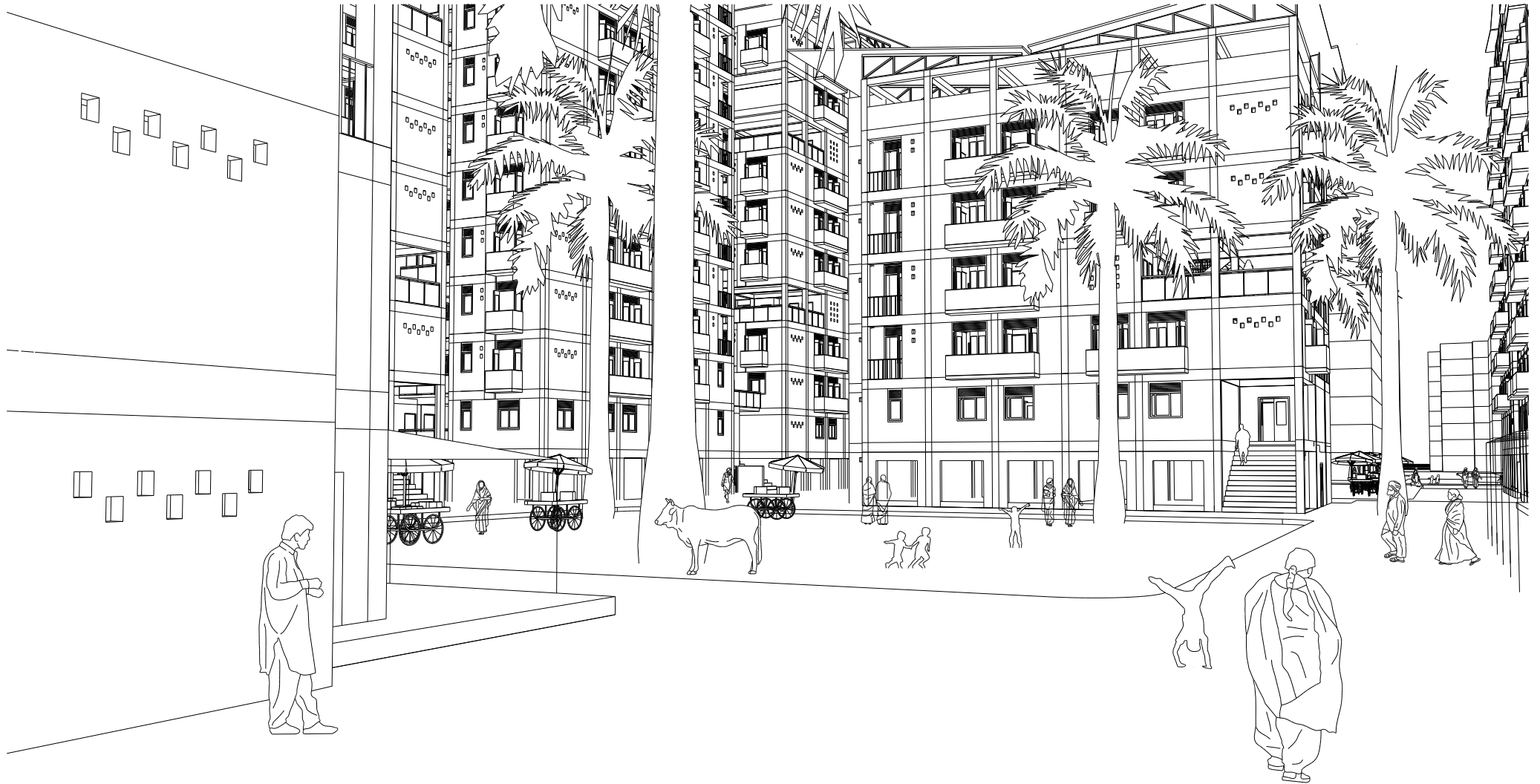






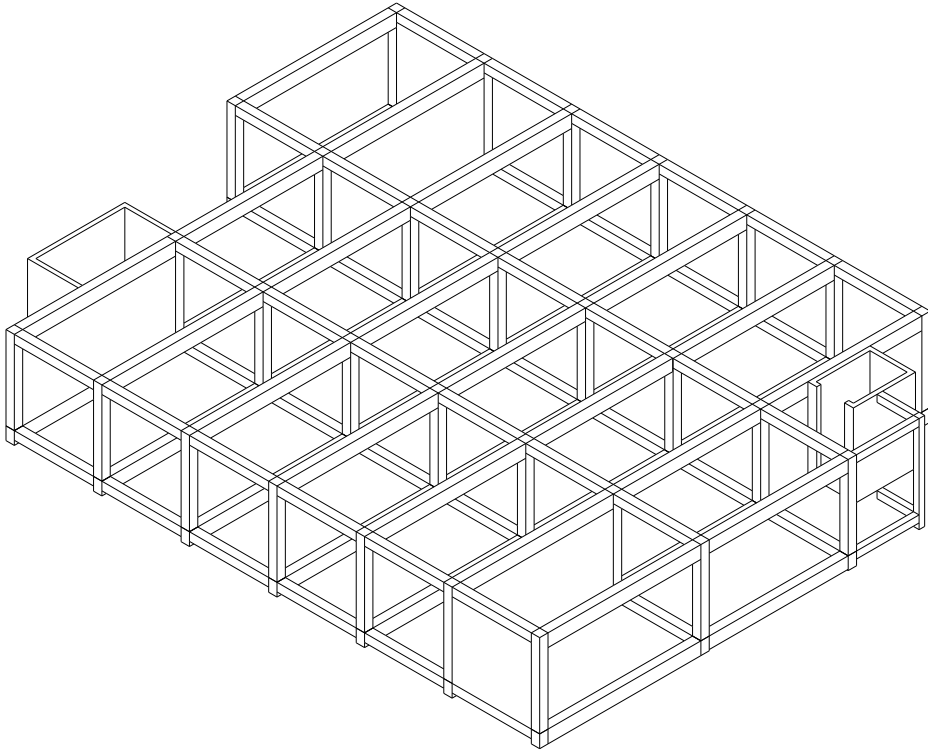




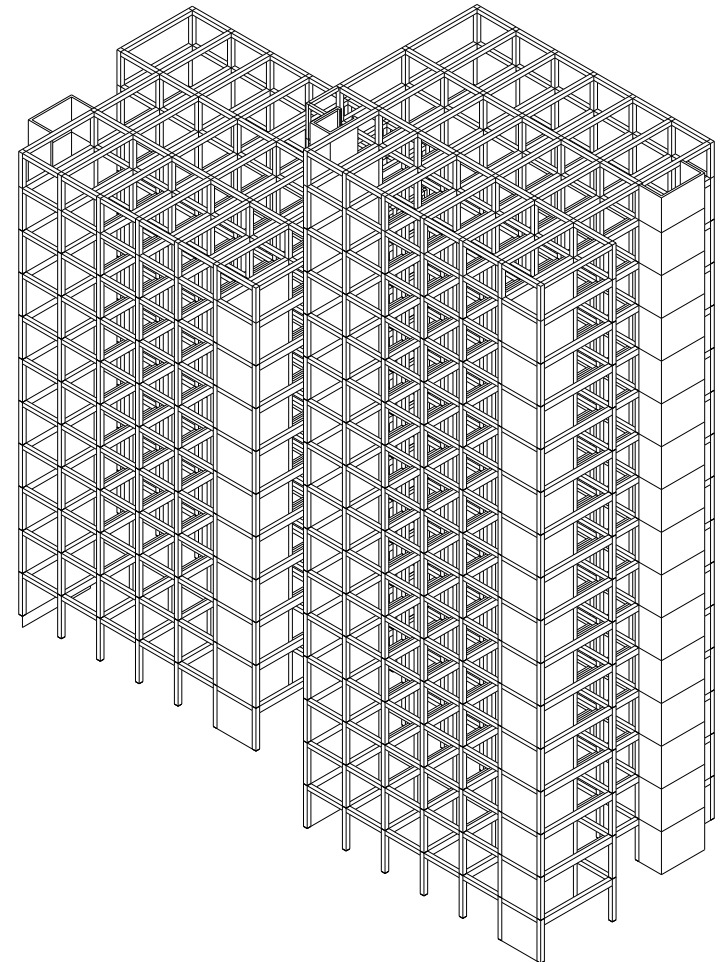


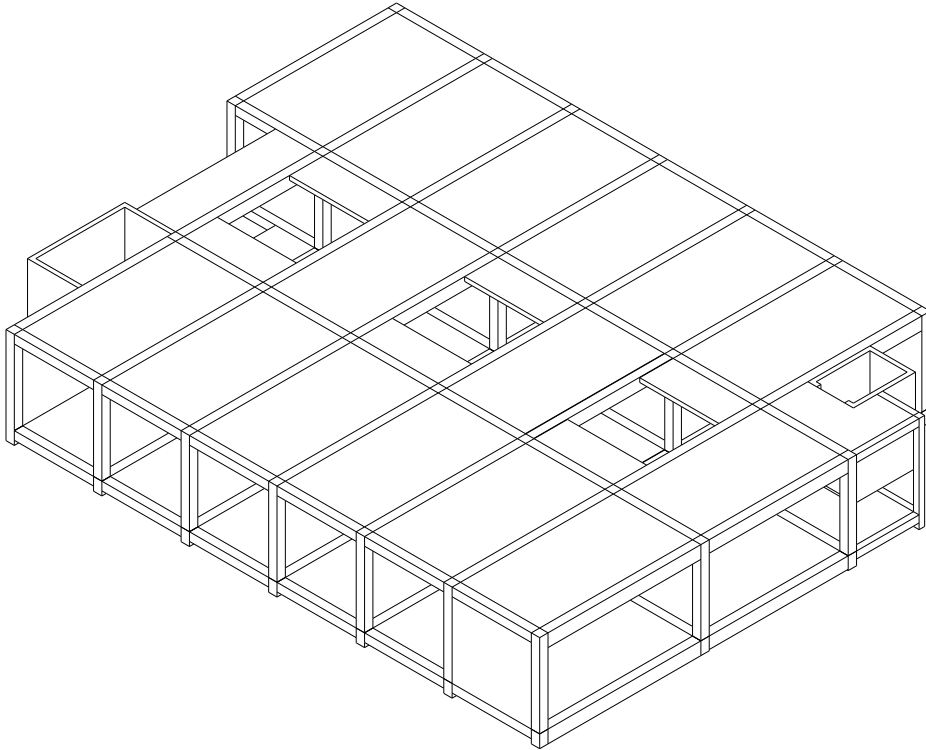
Impression of Courtyard

Technical Elaboration



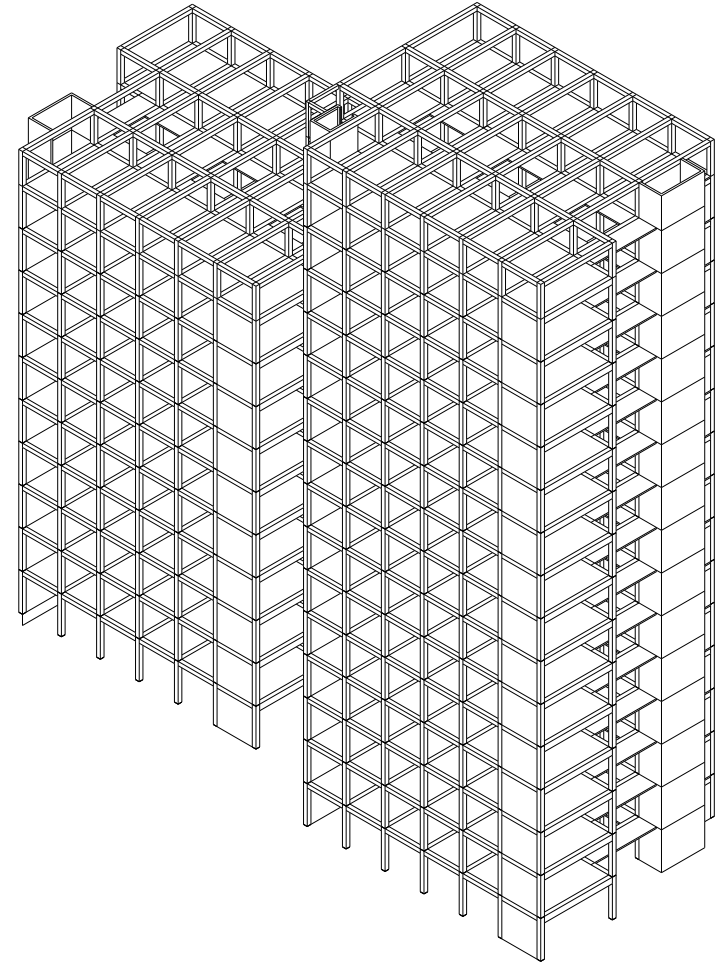
- Basic Constructional Elements
- Basic Column-Beam Structure
 - 2 Cores
 - Stability Walls

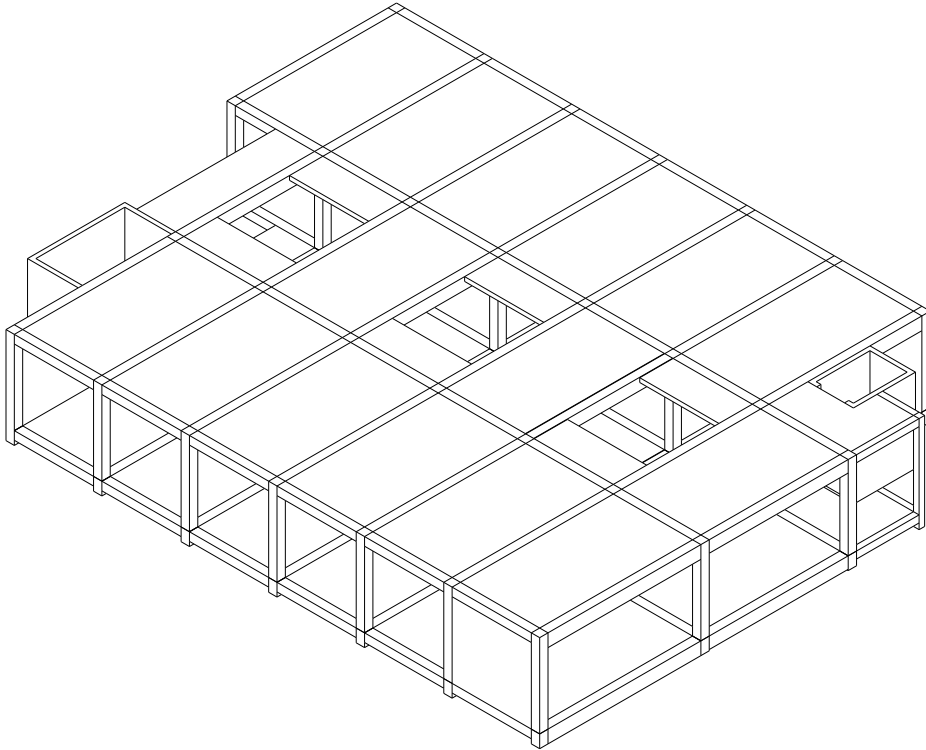




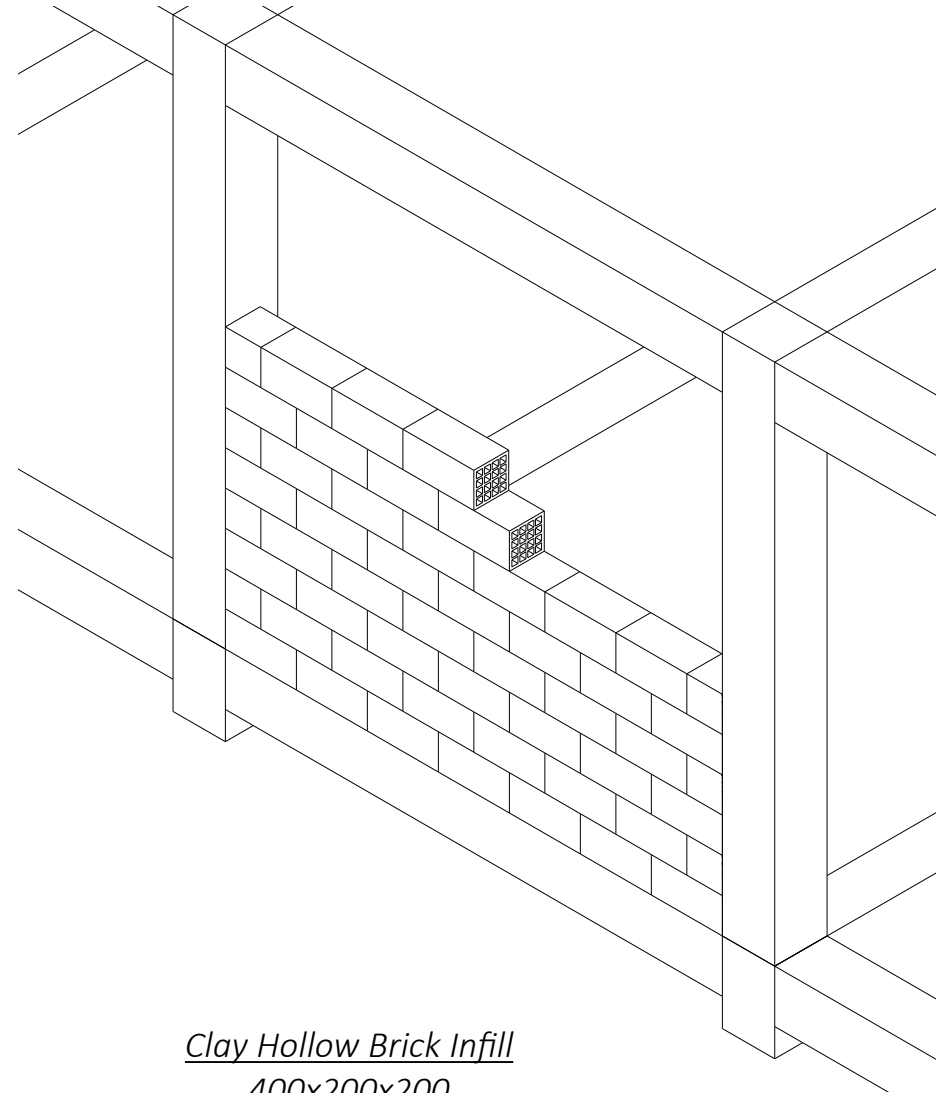
Poured on-site Concrete Structure

- Basic Column-Beam Structure
- 2 Cores
- Stability Walls
- Floors



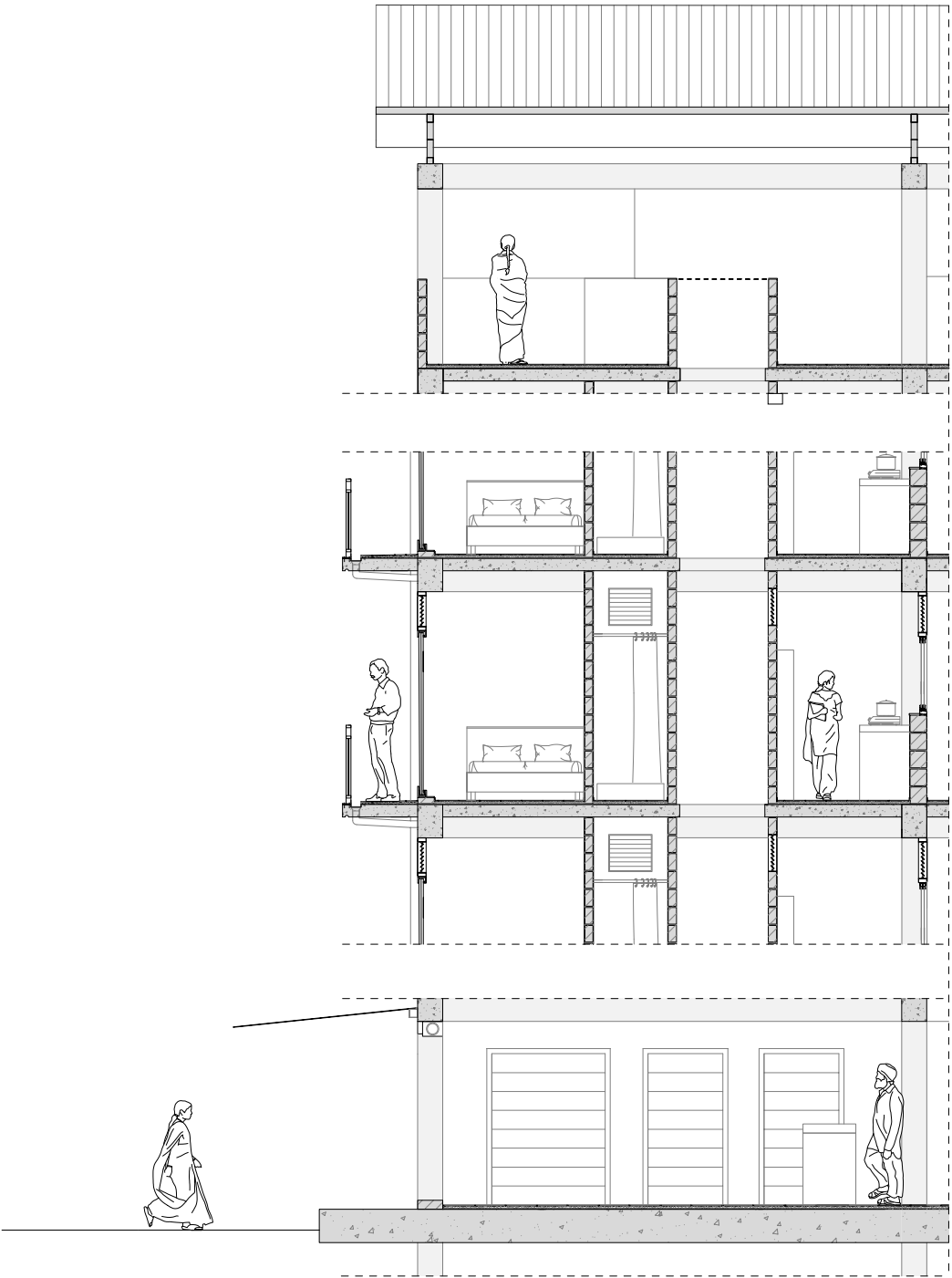


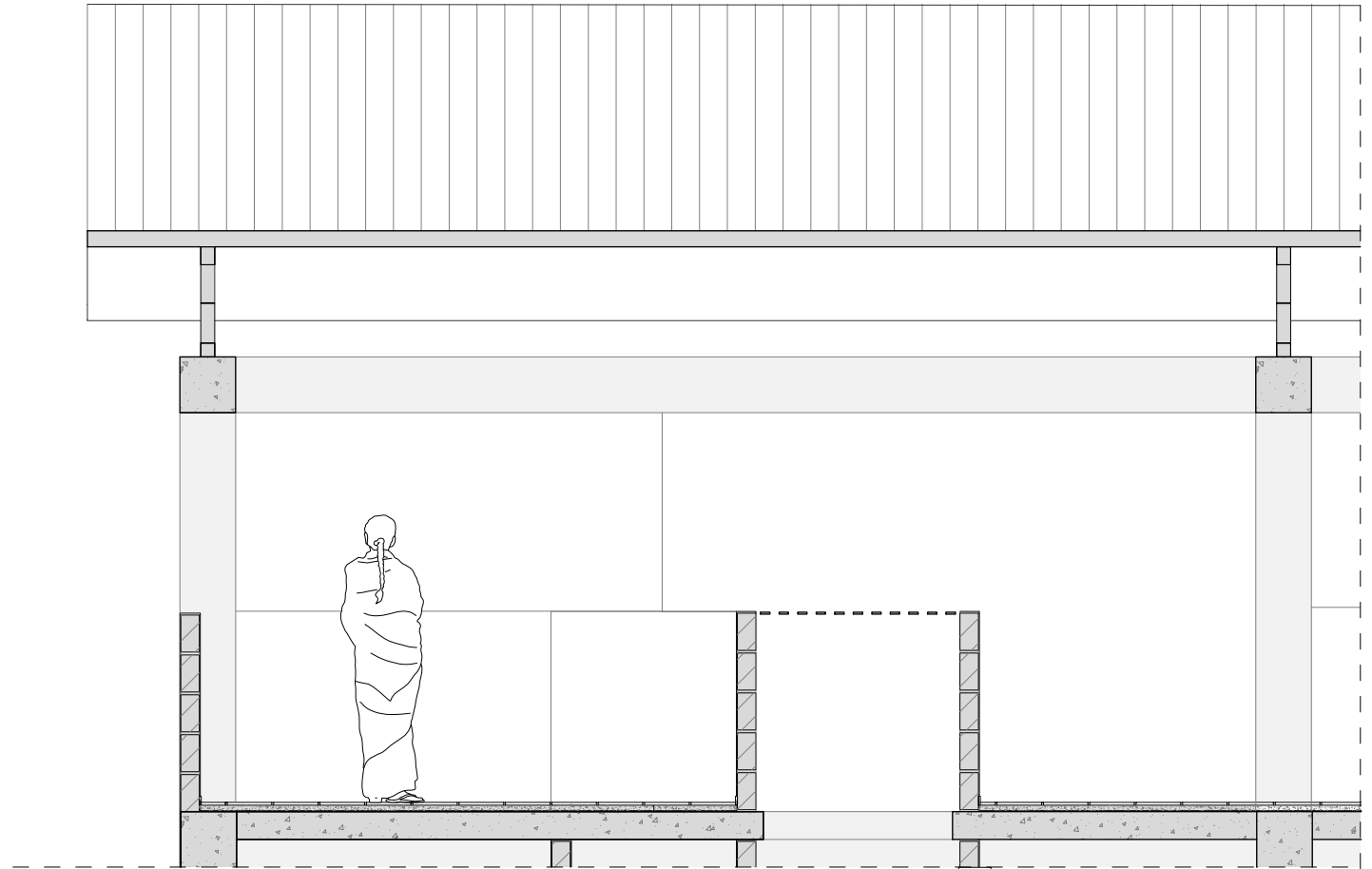
Poured on-site Structure



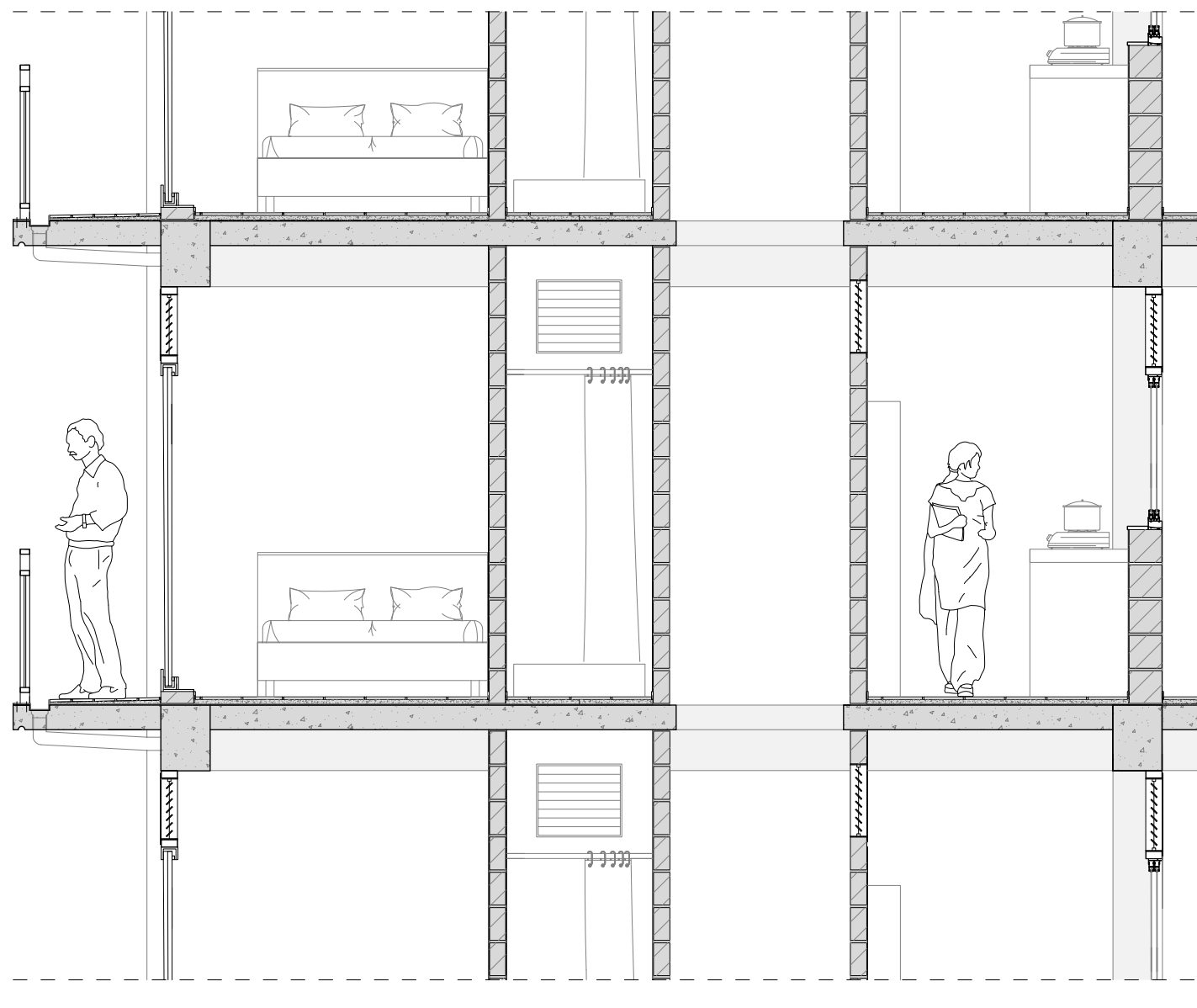
Clay Hollow Brick Infill
400x200x200

Technical Section of the Facade

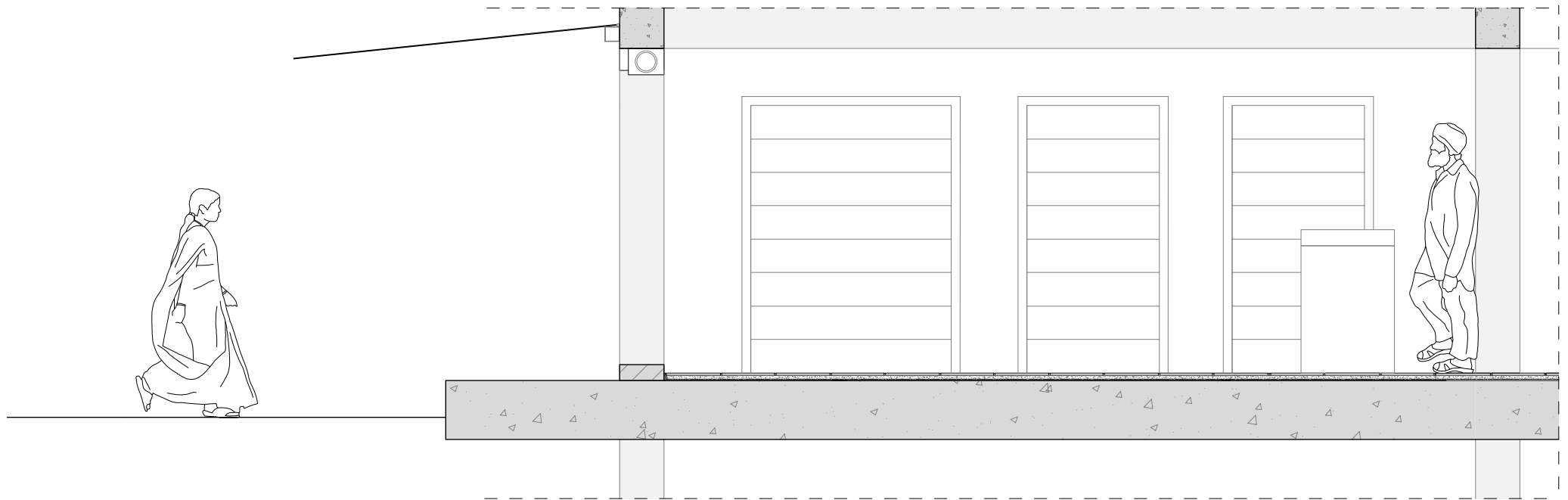




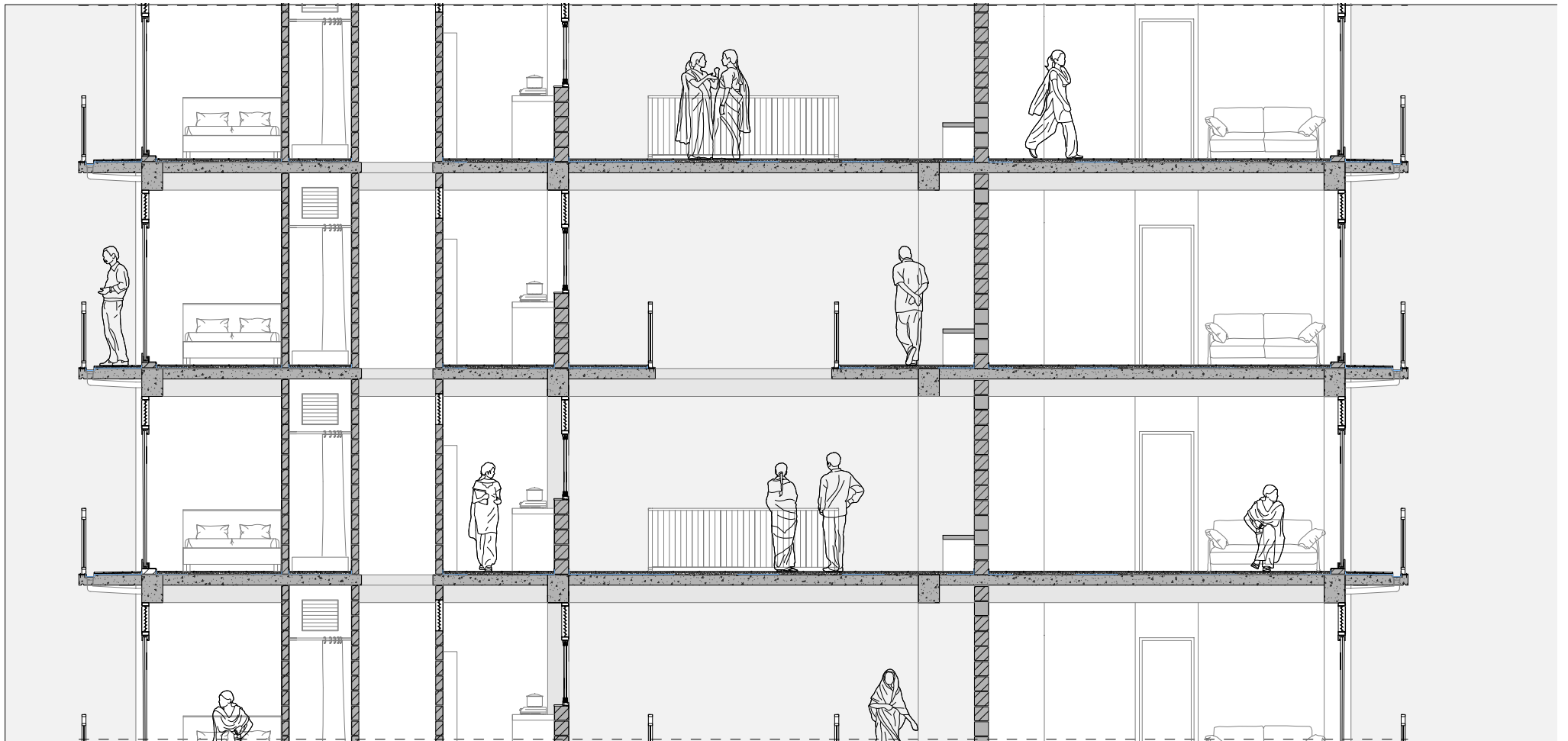
Technical Section of the Roof



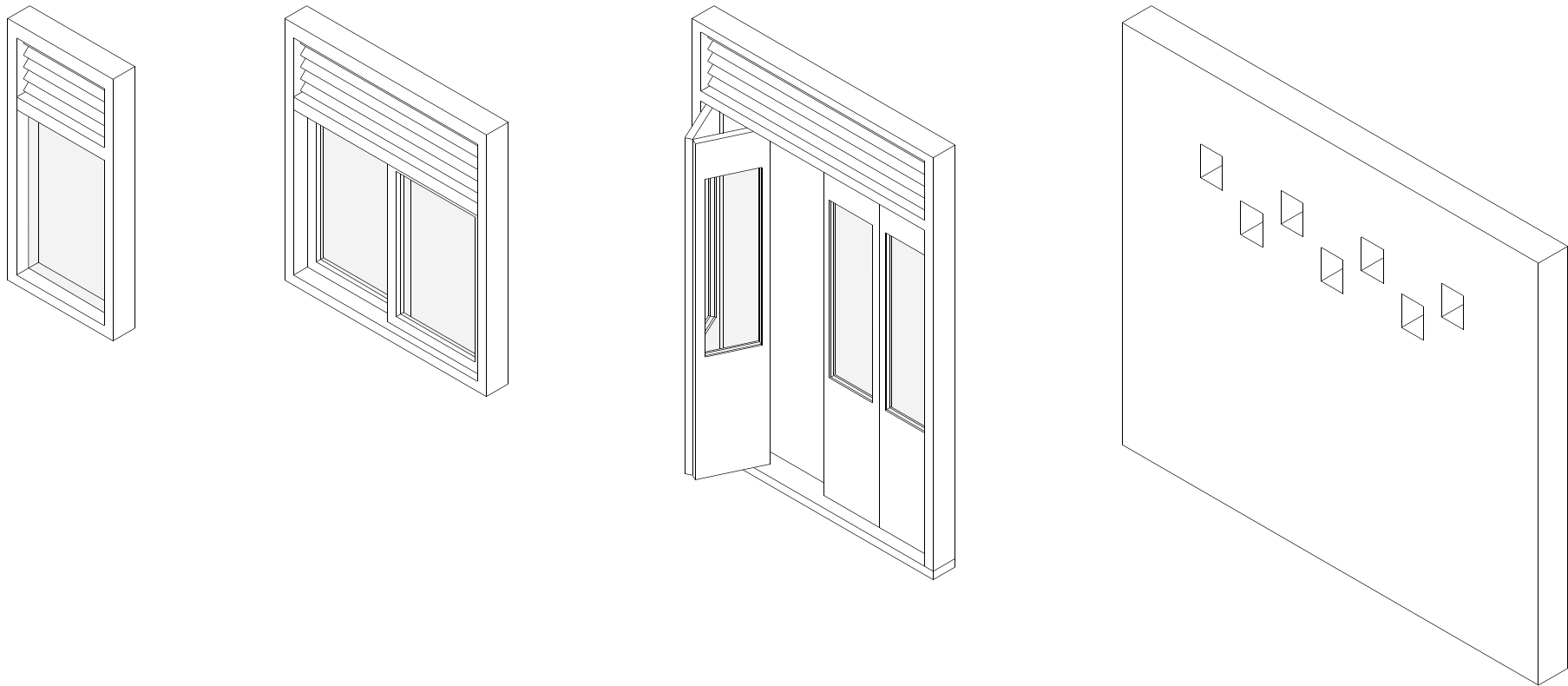
Technical Section of the Dwelling



Technical Section of the Ground Floor



Technical section through the Residential floor

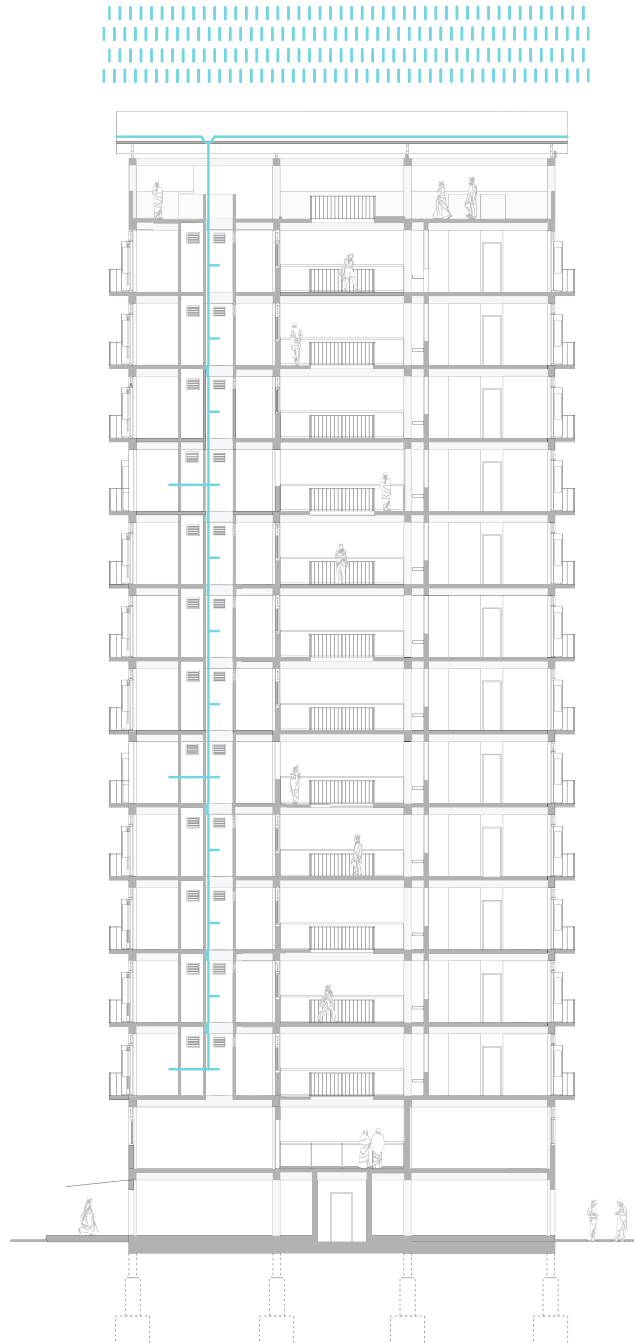


Types of Facade Openings

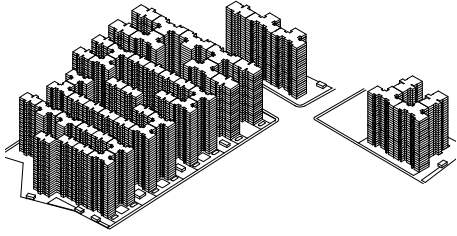
Built form enhancing
natural ventilation



Collection and reuse of rainwater

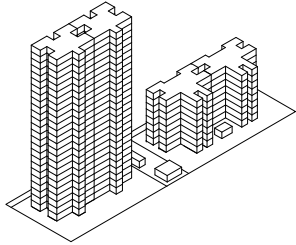


Conclusion



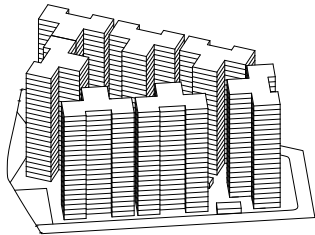
Virar Bolinj Colony

- 3.496 LIG Tenements
 - 1.804 MIG Tenements
- 764 Units/Ha
69 % open-to-sky
1.89 m² open area pp
0 m² institutional area pp



Unnat Nagar

- 42 Transit Tenements
 - 86 MIG Tenements
- 304 Units/Ha
26 % open-to-sky
5.07 m² open area pp
0 m² institutional area pp

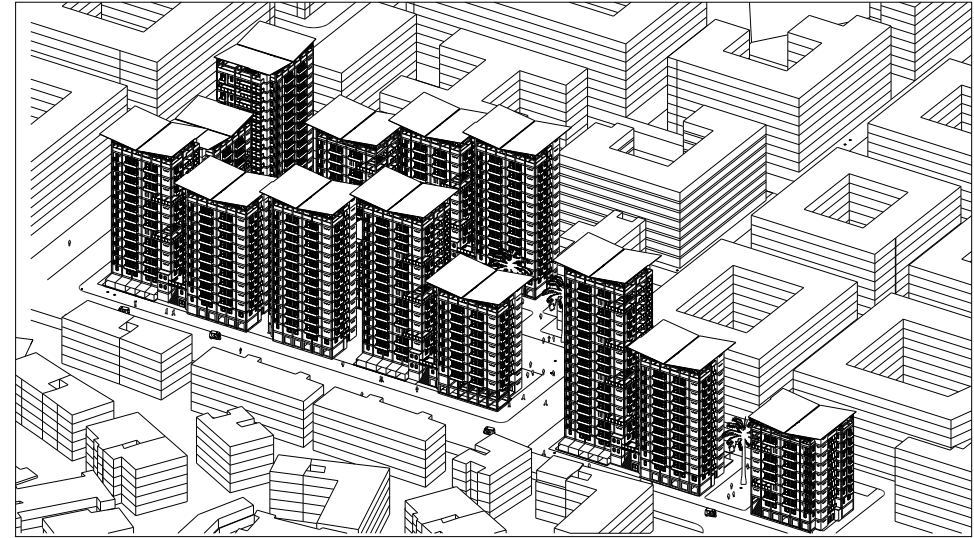
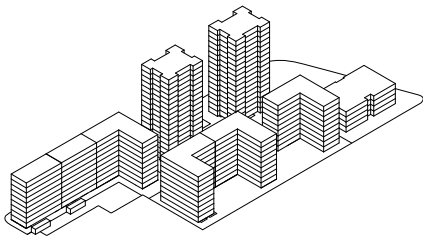


Swadeshi Mill

- 1108 EWS Tenements
 - 540 Tenements
- 1.306 Units/Ha
33 % open-to-sky
1.07 m² open area pp
0 m² institutional area pp

Magathane

- 560 Transit Tenements
 - 110 HIG Tenements
- 521 Units/Ha
71 % open-to-sky
2.87 m² open area pp
0.89 institutional area pp



Proposed development

- 568 EWS Tenements
 - 280 LIG Tenements
- 848 units
719 units / ha
Total area: 11.800 m²
Built area: 6.000 m²
Open-to-sky area: 5.800 m²
Open-to-sky area per person:
1,47 m²
Institutional space per person:
0,8 m²

Proposed development

Social space

Open-to-sky area: 5.800 m²

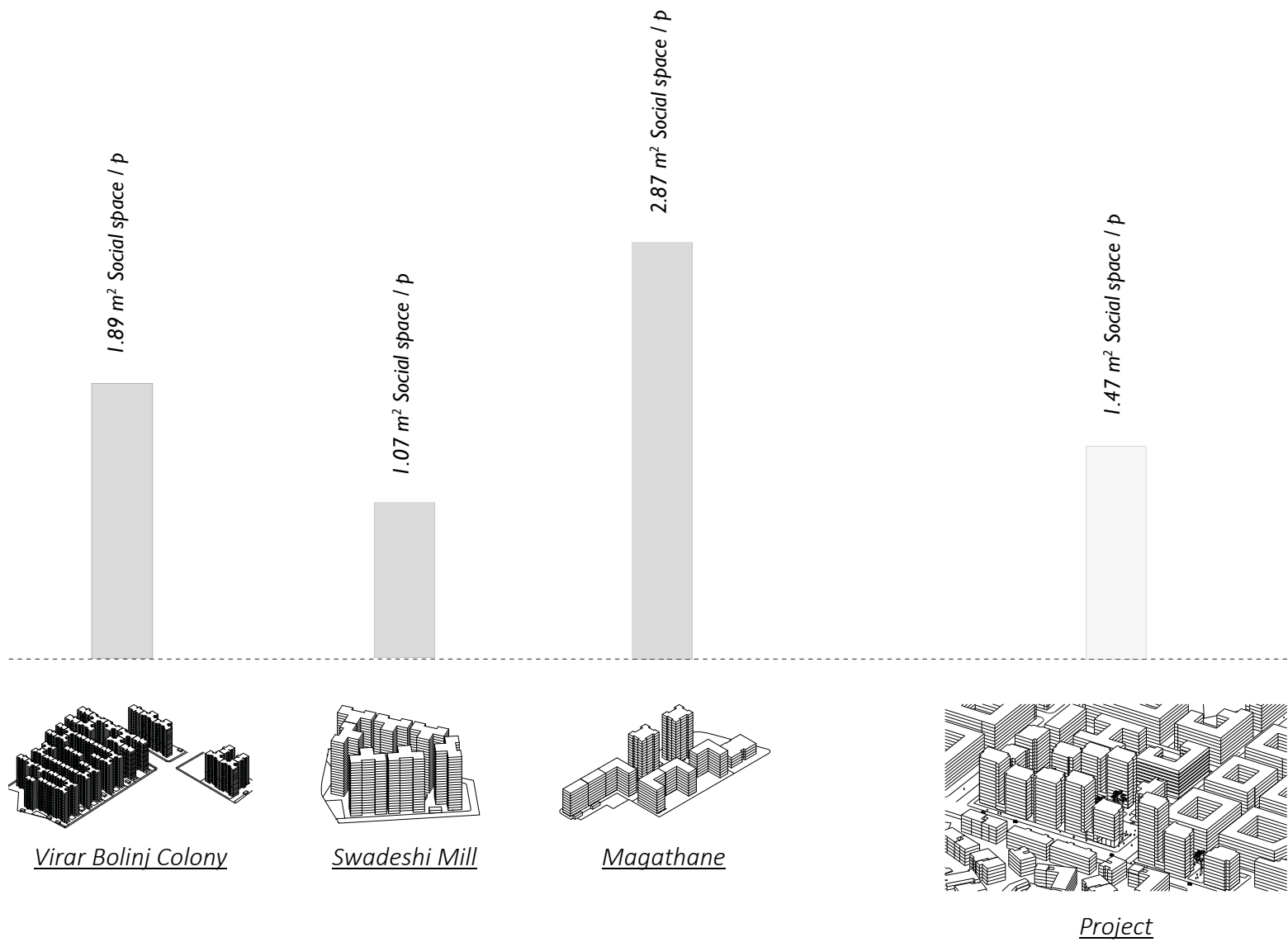
Atria spaces + Otlas:
75 m² per dwelling floor

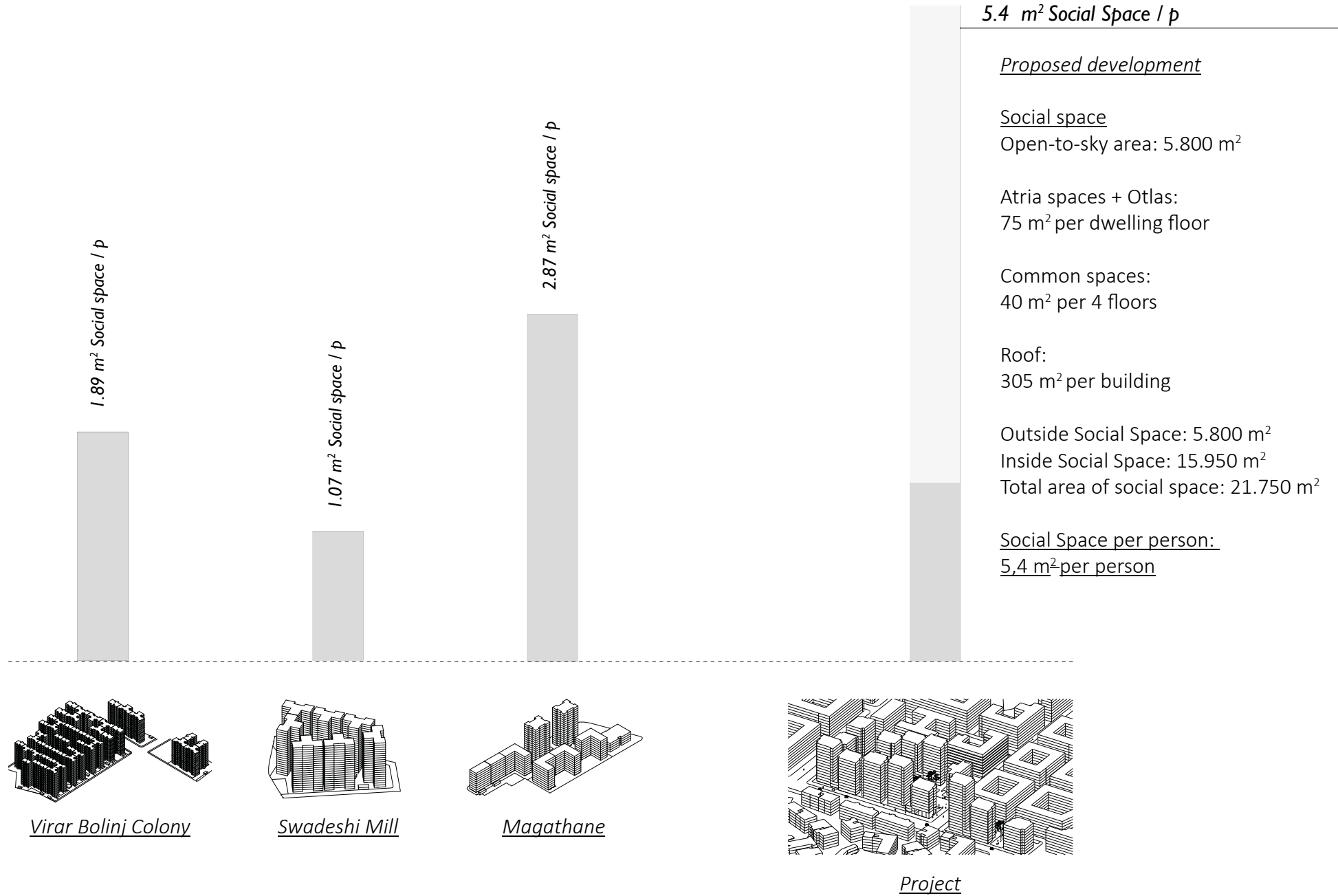
Common spaces:
40 m² per 4 floors

Roof:
305 m² per building

Outside Social Space: 5.800 m²
Inside Social Space: 15.950 m²
Total area of social space: 21.750 m²

Social Space per person: 5,4 m² per person





Reflection

Graduation Project 2017/2018

This is a reflection describing and reviewing my process of graduating in the studio Global Housing 2017 – 2018, Mixing Mumbai; Affordable Housing for Inclusive Development. In its work the studio of Global Housing seeks to rethink current systems of affordable housing and to engage with pressing dwelling- and urban issues in developing territories, as well as with the increasing cross-cultural character of contemporary architectural practice. My graduation project forms a part of this venture.

The graduation studio of 2017 – 2018 studies on affordable housing in Mumbai, India.

In the past decades Mumbai has experienced a huge increase of citizens who, drawn by the economic opportunities of

the big city, come to Mumbai for chances of a better life. The city is struggling with the effects that this has on the city. A big part of its population resides in informal settlements, living under impoverished circumstances. My projects revolves around improving these circumstances through the development of durable, affordable, qualitative social housing that is able to reach high densities while maintaining a qualitative level of living.

The studio Global Housing works with a set of research methods. First, the students are encouraged to use historical, theoretical and typological research to gain a broad insight into the subject. Then, through a 10-day fieldtrip in Mumbai, the subject is more thoroughly explored in an qualitative, ethnographic manner using tools as observation, interview, drawing and photography. After this trip an ethnographic study is done on living patterns of studied groups of people.

The focus on ethnographic research coincides with the character of the field of study of the studio. The studio focusses on cross-cultural matters and ethnographic research can help to work concise in contexts that differ so much from

our own. By using tools as active observation, in-depth engagement or research on-site, context-rich information can be subtracted. I found the most interesting and enjoyable application of this approach to be a set of interviews that we conducted in the city of Nalasopara. By observing a number of cases through semi-structured interviews that were inductive and open-ended of character me and my fellow students were able to get a better insight into the complex reality of everyday-life in Mumbai.

The use of these specific methods of research has had an influence on the steps that followed after it. With these methods an emphasis is put on the perspective of the user, in my case the perspective of the Mumbaikars that reside in the informal settlements. Through the interaction with the users I can get a better view of their situation with which I can later work on through research and design. My perspective on the situation is in that case not of importance as I have no experience of living in an informal settlement and thereby am not able to point out the exact problems and opportunities. The position that I do take with this research is that I believe that it is

problematic that the voices and opinions of these inhabitants of informal settlements are often not heard. This position has had a significant influence on the nature of my problem statement and design hypothesis that both revolve around the perspective of the inhabitant of an informal settlement as well as on my later design that holds this future resident as a central figure for its development.

These parts of research are part of the methodological line of inquiry of the graduation studio, in addition to this individual research has been conducted by me. For this quantitative research and typological research has been carried out that focuses on social housing developed during the past decades by the municipality of Mumbai. Data on the general scope of social housing, data on a number of case studies and typological analyses of social housing projects formed together a useful basis for further development of the project.

The process of graduating has been very informative and I have been able to learn from it as it helped me to further develop my skillset as an architecture student. During the MSc. 1 I have been part of a

project from the Dutch Housing studio which introduced me to the challenges and opportunities that lay within Dutch housing design. With this graduation I have been able to get to know a whole different side of housing. In this project the circumstances are very extreme, like the ever-increasing population density, the striking poverty and the organizational complexity. This forces the student to come up with more extreme ideas, concepts and eventually designs. To work in this context has broadened my view on social housing as it showed me the full scope of aspects that can play a role in the development of such projects. In that sense it was useful that the graduation studio embraces this complexity and pushes the student to constantly take into account aspects as affordability, political complexity, land ownership, climate and more. While it was not always easy to simultaneously work on this different topics, it has in the end led to a layered project that is able to tackle a multitude of problems at the same time and with that adding a more valuable piece of work to the study on this topic. When reviewing my individual process I can recognize changes in ways of working, which have less to do with the grad-

uation studio specific and more to do with my personal development of work methods and approaches for design.

My P2 evaluation went rather chaotic. Coming up with a set of compelling ideas and concepts I was nevertheless not able to tie them together. This situation has occurred often during my time as a student and I knew I had to think of other ways to structure my process so to be able to come to a better and more wholesome end product that functions as a proper translation of my ideas and concepts.

To get to this point I started working more patiently, I started developing all different aspects more thoroughly and with that the graduation project started to develop more organically and in a durable manner. For me this is an important part of the graduation as to learn how to improve the work and design process makes the work more enjoyable and at the same time improves the level of the end product.

During my graduation process the feedback given by the mentors has played a helpful role in the development of the

project. They were able to concisely point out flaws in the project that could be improved as well as at times suggest directions for the further design process. Having had for example some difficulties with making the step from the architectural design to the urban design the feedback helped me to make this step and eventually develop a project that is able to deliver on all different scales.

The final graduation period will take the project to its final and presentable form through the making of an urban and architectural model, further finetuning of the existing drawings, further technical elaboration, the making of a set of compelling perspectives and through the finetuning of the storyline. Helped by the feedback of the P4 I aim to successfully develop these products and come to an end product that embodies all that I have learned throughout this graduation.

This graduation project fits within the bigger scientific work of the studio. The studio's work is focused on the study of affordable housing in the global south. The term global south refers to countries that have experienced histories of colonialism, neo-imperialism and differential economic and social change through

which large inequalities in living standards, life expectancy and access to resources are maintained. The countries of South-America, Africa and a part of Asia are seen as the global south. During the past decades these countries have experienced a huge migratory flow from the rural areas to the cities. This flow has put a lot of pressure on the capacity of the cities to house the people, resulting in a lack of affordable housing. The studies of the Global Housing studio strives to do research on this process.

My individual project fulfills a part of this as a research through design. My specific project focusses on Mumbai. Within this context it focusses on the challenge of working with very high densities. As the cities in the global south are dealing with extreme growth, which is expected to even increase, I believe that the challenge for future urban planners and architects is to be able to house people very densely while being able to still offer a certain level of living quality. Because of the way economic activity is centralized in cities, densification of the cities will continue to take place and low-rise housing developments will become less probable to be developed. Within this

new reality I believe that a focus should be on the development of types of middle- and high rise housing which are able to incorporate spatial, social and economical qualities that currently are often missing in these developments.

My graduation project strives to, through the development of a mid and high-rise type, get a finer understanding of the possibilities and limitations of vertical housing. By bringing high-rise architecture together with spatial, social and economical qualities that can be found in low-rise housing projects, the extent to which high-rise development can be a solution for the overpopulation of cities in the global south can be researched. Outcomes of this research are, when generalized, transferable to research on cities in the global south in general as these cities deal with the same issues of overpopulation.

The current lack of affordable housing in the city of Mumbai is a result of big economic, social and political changes that overreach the scope of architecture. The reason that problems regarding affordable housing are not being solved has not to do with the local architects and

urban planners but more so with the incapability of the governing authorities to solve this and correlating issues. In that context I believe that the value of this graduation project lies not in a potential application but more so in its academic value. Precisely because we operate within an academic context we can handle the issues at stake on a more abstract level and thereby come to new ideas and concepts. This graduation project is not potentially applicable in practice but as an academic work it has the potential to further push the discussion on affordable housing in the global south.

