

**The Growth and Development of Homes in
Aranya Township:
Understanding the Effects of Strategic Urban
Design**

Mayank Shekhawat

Supervisor: Prof. Vikram Bhatt

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TABLE OF CONTENT

SUMMARY

RESUME

ACKNOWLEDGEMENTS

LIST OF FIGURES

ABBREVIATIONS

CHAPTER 1: INTRODUCTION

1.1 Preface

1.2 The Research

1.2.1 Rationale of study

1.2.2 Research question

1.2.3 Goals and objectives

1.2.4 Intended audience

1.2.5 Methodology

1.2.6 Scope and limitations

1.3 Research outline

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

2.2 History of post occupancy evaluation

2.3 Types of post occupancy evaluation

2.3.1 Indicative POE

2.3.2 Investigative POE

2.3.3 Diagnostic POE

2.4 Milestones in post occupancy evaluation of housing projects

2.5 Progressive housing

CHAPTER 3: READING ARANYA

3.1 Introduction

3.2 Housing situation in Indore

3.3 Site context and characteristics

3.4 Reference and studies

3.5 Broad objectives and philosophy

3.6 The planning and design of Aranya

3.6.1 Residential and activity structure

3.6.2 Planning at the township level

3.6.2.1 Road network

3.6.2.2 Distribution of residential areas

3.6.3 Planning at sector level

3.6.4 Planning at cluster/street level

3.6.5 Service core

CHAPTER 4: EWS DWELLING

- 4.1 House form
- 4.2 Climate responsive design
- 4.3 House extensions
- 4.4 Efficient design
- 4.5 Materials and construction techniques
- 4.6 Dwelling variation designed by CMCH, McGill University, Canada
 - 4.6.1 Reference and studies
 - 4.6.2 Design of demonstration scheme

CHAPTER 5: CASE STUDIES

- 5.1 Introduction
- 5.2 Methodology/ Procedure
 - 5.2.1 Potential harms and risks of the survey
 - 5.2.2 Privacy and confidentiality of data collected
- 5.3 Case studies
 - 5.3.1 Cluster surveyed in sector designed by B.V. Doshi
 - 5.3.2 Cluster surveyed in demonstration scheme

CHAPTER 5: CONCLUSION

BIBLIOGRAPHY

SUMMARY

In most third world countries, nearly half the urban population lives in slums or squatter settlements. They pose overwhelming challenges to city officials and professionals dealing with housing and other urban issues, particularly in the Global South where the urbanization has taken place at more than double the speed of urbanization in the Global North (Wainer et al., 2016). Specific to India, the nation witnessed mass migrations to cities during the late 1970s and 1980s owing to large population growth and lack of economic development at the rural base (Curtis, 1988). This further contributed to the growth of slums and squatter settlements in and around most urban centers. Even the lowest cost housing designed by architects was beyond the financial reach of these people. The Aranya Township, however, stands out as a remarkable project in this regard.

Aranya, a low-income progressive housing project, was an innovative experiment of settlement planning conceived as a large enough project to tackle the city-level dearth of housing in Indore, India. Designed by architect B.V. Doshi, the project was conceived as a sites-and-services development scheme for 6,500 families with a projected population of about 60,000 residents; today, it is home to 80,000 (Bhatt, 2018). Remarkably, around 65% of the plots were reserved for what the Indian government categorized as the Economically Weaker Section of society earning less than 2 dollars per day (Bhatt, 2018). Being well rooted in the social, cultural and economic context of the place, the design of the township reveals an innovative approach to integrated development creating a holistic environment, at the same time remaining sympathetic to the lifestyle of the urban poor (Sharma et al, 2007).

The Center for Minimum Cost Housing at McGill University was closely involved with B.V. Doshi's Vastu Shilpa Foundation in this project to explore and understand the lifestyle, physical environments and aspirations of the poor clients. Their studies were critical in evolving a framework for the Aranya Township. Furthermore, the CMCH at McGill University collaborated with the architect to design a few clusters within the township. Advancing further on Doshi's approach, the McGill group developed a scheme that strategically varied in plot geometry, pattern, setbacks, and spaces to facilitate appropriation, house organization and orientation.

The report is a post occupancy review of the Aranya township, focussing on how the residents took advantage of the urban design framework laid out by designers. Being a progressive housing development, it is important to explore how the actual progressive designing was carried out by the residents of the project; to explore if and how the numerous variations in plot conditions and configurations shaped the individual dwellings and the community.

RÉSUMÉ

Dans la plupart des pays du tiers-monde, près de la moitié de la population urbaine vit dans des bidonvilles ou des logements illégaux. Cette population pose un défi important pour les autorités municipales et les personnes professionnelles qui sont en charge du logement et autres enjeux urbains, principalement dans le *Global South* où l'urbanisation s'est effectuée plus de deux fois plus vite que l'urbanisation dans le *Global North* (Wainer et al., 2016). Vers la fin des années 1970 et 1980, l'Inde a subi un exode rural en raison d'une forte croissance démographique ainsi que l'absence d'un développement économique dans les milieux ruraux (Curtis, 1988). Ces faits ont accentué l'expansion des bidonvilles et des logements illégaux dans la majorité des zones urbaines et les alentours; les logements les plus abordables conçus par les architectes étaient hors de la portée financière. C'est à ce regard que la municipalité *Aranya* se distingue des autres.

Aranya, un projet progressif de logements abordables, était une expérience innovatrice de planification de logements conçus à grande échelle pour résoudre la pénurie des logements urbains à *Indore*, Inde. Conçu par l'architecte B.V. Doshi, ce projet est un plan de développement de *sites-and-services* pour 6,500 familles, soit environ 60,000 résidents; aujourd'hui, 80,000 personnes y résident (Bhatt, 2008). Il est intéressant de noter qu'environ 65% des terrains était réservé pour la classe catégorisée par le gouvernement indien comme *Economically Weaker Section* (Économiquement faible), donc gagnant moins de 2 dollars américains quotidiennement (Bhatt, 2008). Étant bien ancré dans le contexte social, culturel et économique d'*Indore*, la conception de la municipalité démontre une approche innovative au développement intégré, créant un environnement holistique tout en étant accueillant au mode de vie des pauvres urbains (Sharma et al, 2007). Le *Center for Minimum Cost Housing* de l'Université McGill était en étroite collaboration avec *Vastu Shilpa Foundation de B.V Doshi* dans ce projet pour la recherche et la compréhension du mode de vie, de l'environnement physique et les aspirations des clients pauvres. Leurs études furent essentielles pour le développement d'un système de base pour la municipalité d'*Aranya*. De plus, le CMCH de l'université McGill a travaillé en collaboration avec l'architecte pour la conception de quelques agglomérations dans la municipalité. En suivant l'approche de Doshi, le groupe de McGill a pu développer un système stratégique qui a fait en sorte que les terrains soient développés avec une géométrie, une configuration, un recul, des et espaces de plans pour ainsi faciliter l'appropriation, l'organisation et l'orientation des logements. Ce rapport est une analyse à la suite de l'occupation de la municipalité d'*Aranya*, et il est centré sur comment les résidents ont maximisé le système de conception de milieux urbains établi par les concepteurs. Étant un projet progressif de développement de logements

abordables, il est primordial d'explorer comment la conception progressive actuelle a été reçue par les résidents, afin d'explorer si et comment les nombreuses variations des conditions et configurations des plans ont formé les logements individuels et la communauté.

KEYWORDS

Aranya, urban design, low-cost housing, India, Balkrishna Doshi, progressive development, Center for Minimum Cost Housing, post-occupancy review.

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LIST OF FIGURES

Figure 1.1 Share of urban population living in slums, 2014.

Source: World Bank – WDI, retrieved from <https://ourworldindata.org/urbanization>18

Figure 1.2 Urbanization growth in India.

Source: Census of India, 2011, retrieved from <https://ars.els-cdn.com/content/image/1-s2.0-S1364032116311649-gr6.jpg>20

Figure 1.3 Housing shortage in India from 1951- 2011

Source: Selected Socio-Economic Statistics India 2017. Retrieved from https://www.business-standard.com/article/current-affairs/how-has-india-done-on-parameters-of-roti-kapda-makaan-since-independence-118082000652_1.html20

Figure 2.1 Le Corbusier’s Pessac- before and after

Source: Boudon, P. (1972). *Lived-In Architecture: Le Corbusier’s Pessac Revisited* (G. Onn, Trans.) Massachusetts, US: The MIT Press. (Original work published in 1969)30

Figure 2.2 Incremental construction process

Source: Mellin, R. (1984). Sites & services case study: Ahmedabad, India. In *Open House International*, 9(1), 4-1334

Figure 3.1 Location of Indore

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO38

Figure 3.2 Housing shortage in Indore

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO38

Figure 3.3 Map of Indore Showing location of site

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO39

Figure 3.4 Site and its environments

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO40

Figure 3.5 Hierarchy of streets

Source: Rybczynski, W., Bhatt, V., Alghamdi, M., Bahamman, A., Niskier, M., Pathare, B., Pirani, A., Puri, R., Raje, N., & Reid, P. (1984). *How the Other Half Builds, Volume 1: Space*. Montreal, Canada: Centre for Minimum Cost Housing, McGill University. Retrieved from https://www.mcgill.ca/mchg/files/mchg/how_the_other_half_builds_space1_0.pdf42

Figure 3.6 Commercial activities in residential areas

Source: Rybczynski, W., Bhatt, V., Alghamdi, M., Bahamman, A., Niskier, M., Pathare, B., Pirani, A., Puri, R., Raje, N., & Reid, P. (1984). *How the Other Half Builds, Volume 1: Space*. Montreal, Canada: Centre for Minimum Cost Housing, McGill University. Retrieved from https://www.mcgill.ca/mchg/files/mchg/how_the_other_half_builds_space1_0.pdf42

Figure 3.7 House extensions along neighborhood streets

Source: Rybczynski, W., Bhatt, V., Alghamdi, M., Bahamman, A., Niskier, M., Pathare, B., Pirani, A., Puri, R., Raje, N., & Reid, P. (1984). *How the Other Half Builds, Volume 1: Space*. Montreal, Canada: Centre for Minimum Cost Housing, McGill University. Retrieved from https://www.mcgill.ca/mchg/files/mchg/how_the_other_half_builds_space1_0.pdf42

Figure 3.8 Nature of house extensions

Source: Rybczynski, W., Bhatt, V., Alghamdi, M., Bahamman, A., Niskier, M., Pathare, B., Pirani, A., Puri, R., Raje, N., & Reid, P. (1984). *How the Other Half Builds, Volume 1: Space*. Montreal, Canada: Centre for Minimum Cost Housing, McGill University. Retrieved from https://www.mcgill.ca/mchg/files/mchg/how_the_other_half_builds_space1_0.pdf42

Figure 3.9 Small shops and work places

Source: Rybczynski, W., Bhatt, V., Alghamdi, M., Bahamman, A., Niskier, M., Pathare, B., Pirani, A., Puri, R., Raje, N., & Reid, P. (1984). *How the Other Half Builds, Volume 1: Space*. Montreal, Canada: Centre for Minimum Cost Housing, McGill University. Retrieved from https://www.mcgill.ca/mchg/files/mchg/how_the_other_half_builds_space1_0.pdf42

Figure 3.10 Tress in a small square

Source: Rybczynski, W., Bhatt, V., Alghamdi, M., Bahamman, A., Niskier, M., Pathare, B., Pirani, A., Puri, R., Raje, N., & Reid, P. (1984). *How the Other Half Builds, Volume 1: Space*. Montreal, Canada: Centre for Minimum Cost Housing, McGill University. Retrieved from https://www.mcgill.ca/mchg/files/mchg/how_the_other_half_builds_space1_0.pdf32

Figure 3.11 Comparative land utilization between IDA's proposal and VSF's initial proposal	
Source: Vastu-Shilpa Foundation (1990). <i>Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore</i> . New Delhi, India: HUDCO	44
Figure 3.12 Changed population structure of Aranya township	
Source: Vastu-Shilpa Foundation (1990). <i>Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore</i> . New Delhi, India: HUDCO	44
Figure 3.13 Proposed plot size distribution of Aranya township	
Source: Vastu-Shilpa Foundation (1990). <i>Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore</i> . New Delhi, India: HUDCO	45
Figure 3.14 Evolution of Aranya project proposal	
Source: Vastu-Shilpa Foundation (1990). <i>Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore</i> . New Delhi, India: HUDCO	45
Figure 3.15 Levels of accessibility	
Source: Vastu-Shilpa Foundation (1990). <i>Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore</i> . New Delhi, India: HUDCO	46
Figure 3.16 Location of town center	
Source: Vastu-Shilpa Foundation (1990). <i>Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore</i> . New Delhi, India: HUDCO	47
Figure 3.17 Linkages to town center	
Source: Vastu-Shilpa Foundation (1990). <i>Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore</i> . New Delhi, India: HUDCO	47
Figure 3.18 Concept of spatial organization	
Source: Vastu-Shilpa Foundation (1990). <i>Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore</i> . New Delhi, India: HUDCO	47
Figure 3.19 Distribution of lower order facilities	
Source: Vastu-Shilpa Foundation (1990). <i>Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore</i> . New Delhi, India: HUDCO	47

Figure 3.20 The Aranya township – photograph of model

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO47

Figure 3.21 Basic road pattern

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO48

Figure 3.22 Hierarchy of road network

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO48

Figure 3.23 Plot sizes and plot distribution concept

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO49

Figure 3.24 Plot distribution in Aranya township

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO49

Figure 3.25 Sketch by B.V. Doshi showing built up areas and open spaces within a sector

Source: Minimum Cost Housing Group fonds. CCA, Montreal, Canada50

Figure 3.26 Distribution of open spaces

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO51

Figure 3.27 Sector road network

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO51

Figure 3.28 Concept of community

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO52

Figure 3.29 Concept at street/ cluster level

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO52

Figure 3.30 Formation of cluster

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO53

Figure 3.31 Street pattern- cluster level

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO53

Figure 3.32 Spaces for income generation

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO53

Figure 3.33 Permissible zone for house extensions

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO53

Figure 3.34 Character of internal streets

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO53

Figure 3.35 Conventional service systems

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO54

Figure 3.36 Service system design development

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO54

Figure 3.37 Formation of service cores

Source: Vastu-Shilpa Foundation (1990). *Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore*. New Delhi, India: HUDCO55

Figure 3.38 Service core construction	
Source: Minimum Cost Housing Group fonds. CCA, Montreal, Canada	55
Figure 3.39 Service core details	
Source: Vastu-Shilpa Foundation (1990). <i>Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore</i> . New Delhi, India: HUDCO	55
Figure 3.40 Construction of Aranya	
Source: Minimum Cost Housing Group fonds. CCA, Montreal, Canada	55
Figure 4.1 Evolution of house form	
Source: Vastu-Shilpa Foundation (1990). <i>Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore</i> . New Delhi, India: HUDCO	57
Figure 4.2 Phases of development- house form	
Source: Vastu-Shilpa Foundation (1990). <i>Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore</i> . New Delhi, India: HUDCO	57
Figure 4.3 Variations in house form	
Source: Vastu-Shilpa Foundation (1990). <i>Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore</i> . New Delhi, India: HUDCO	57
Figure 4.4 Transition from public to private spaces within a house	
Source: Vastu-Shilpa Foundation (1990). <i>Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore</i> . New Delhi, India: HUDCO	57
Figure 4.5 Character of built form	
Source: Vastu-Shilpa Foundation (1990). <i>Aranya: An approach to settlement design; planning and design of low-cost housing project at Indore</i> . New Delhi, India: HUDCO	58
Figure 4.5 Street character- house extensions	
Source: Minimum Cost Housing Group fonds. CCA, Montreal, Canada	59
Figure 4.7 Construction of houses at Aranya	
Source: Minimum Cost Housing Group fonds. CCA, Montreal, Canada	60

Figure 4.8 Design concept	
Source: Bhatt, V. (1988). Sites and services demonstration: Aranya housing project, Indore, India. In <i>Open House International</i> , 13(1), 37-43	61
Figure 4.9 Site plan for demonstration sector designed by CMCH- land use	
Source: Bhatt, V. (1988). Sites and services demonstration: Aranya housing project, Indore, India. In <i>Open House International</i> , 13(1), 37-43	64
Figure 4.10 Detail layout	
Source: Bhatt, V. (1988). Sites and services demonstration: Aranya housing project, Indore, India. In <i>Open House International</i> , 13(1), 37-43	65
Figure 4.11 typical HIG unit (Type F)	
Source: Bhatt, V. (1988). Sites and services demonstration: Aranya housing project, Indore, India. In <i>Open House International</i> , 13(1), 37-43	66
Figure 5.1 Aranya township, 2018	
Source: Author	67-68
Figure 5.2 Categorization of plots based on exposure and frontage.	
Source: Author	69
Figure 5.3 Plot A01	
Source: Author	72-73
Figure 5.4 Residence A01- exteriors	
Source: Author	76
Figure 5.5 Plot A02	
Source: Author	77-78
Figure 5.6 Residence A02- exteriors	
Source: Author	80
Figure 5.7 Plot A03	
Source: Author	82-83
Figure 5.8 Residence A03- interiors	
Source: Author	85

Figure 5.9 Residence A03- exteriors	
Source: Author	87
Figure 5.10 Plot A04	
Source: Author	88
Figure 5.11 Front and rear yard of residence A04	
Source: Author	92
Figure 5.12 Staircase construction	
Source: Author	92
Figure 5.13 Plot A05	
Source: Author	93-94
Figure 5.14 Residence A05- interiors of first floor	
Source: Author	96
Figure 5.15 Residence A05- steel staircase on terrace and interiors of second floor	
Source: Author	97
Figure 5.16 Residence A05- exteriors	
Source: Author	98
Figure 5.17 Plot B01	
Source: Author	100-101
Figure 5.18 Residence B01- interiors of second floor	
Source: Author	104
Figure 5.19 Residence B01- exteriors	
Source: Author	105
Figure 5.20 Plot B02	
Source: Author	106-107
Figure 5.21 Residence B02- interiors of the front section of the ground floor and the rear room	
Source: Author	109

Figure 5.22 Residence B02- exteriors	
Source: Author	111
Figure 5.23 Plans of residence B03	
Source: Author	112-113
Figure 5.24 Residence B03- interiors of first floor	
Source: Author	116
Figure 5.25 Residence B03- exteriors	
Source: Author	118
Figure 5.26 Plot B04	
Source: Author	119-120
Figure 5.27 Residence B04- balcony and exterior	
Source: Author	123
Figure 5.28 Plot B05	
Source: Author	124-125
Figure 5.29 Residence B05- exteriors	
Source: Author	126
Figure 5.30 Residence B05- interiors of second floor	
Source: Author	127
Figure 5.31 Plot B06	
Source: Author	129-130
Figure 5.32 Residence B06- access stairs, balcony and main entrance to the ground floor residence	
Source: Author	131
Figure 5.33 Residence B06- exterior	
Source: Author	132
Figure 5.34 Residence B06- exterior	
Source: Author	133

ABBREVIATIONS

CMCH	Center for Minimum Cost Housing
EWS	Economically Weaker Section
IDA	Indore Development Authority
MPHB	Madhya Pradesh Housing Board
POE	Post Occupancy Evaluation
RIBA	Royal Institute of British Architects
VSF	Vastu-Shilpa Foundation

CHAPTER 1: INTRODUCTION

1.1 Preface

In most cities of the Global South, close to half of the urban populations are found living in informal settlements (UN-Habitat, 2003). They pose overwhelming challenges to city officials and professionals dealing with housing and other urban issues, particularly in the Global South where the urbanization has taken place at more than double the speed of urbanization in the Global North (Wainer et al., 2016). This rapid, low-income urbanization has led to shortfalls in many elements that are key to urban success- infrastructure, education, financial access, and often most visibly, housing (Pieterse, 2013; Spence et al., 2009).

Share of urban population living in slums, 2014

Population living in slums is the proportion of the urban population living in slum households. A slum household is defined as a group of individuals living under the same roof lacking one or more of the following conditions: access to improved water, access to improved sanitation, sufficient living area, and durability of housing.

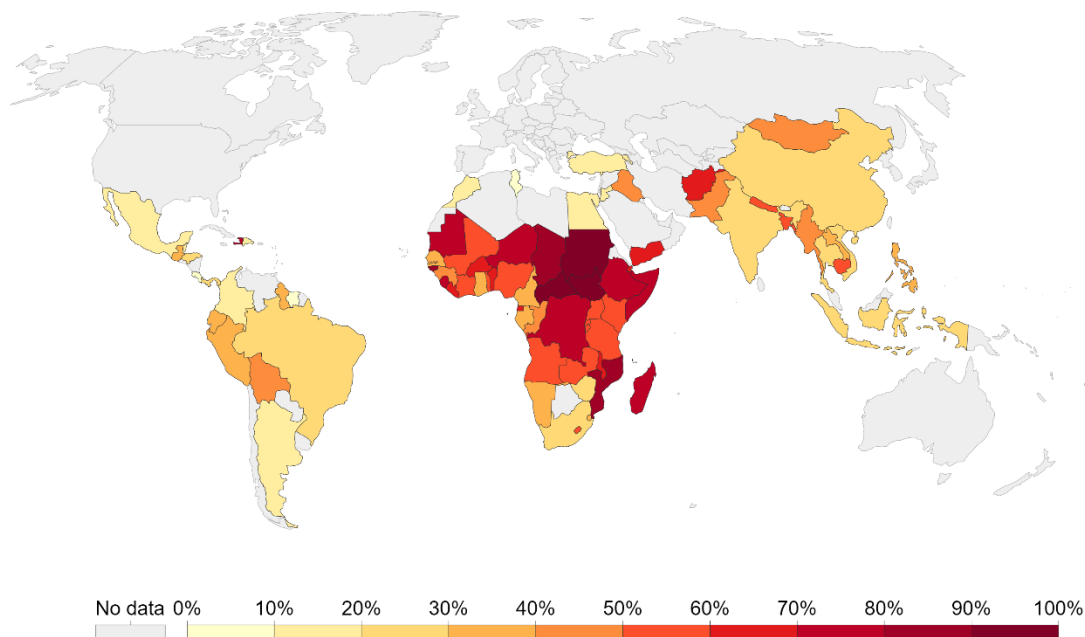


Fig. 1.1: Share of urban population living in slums, 2009.

The problem of housing has been threefold: firstly, majority of people moving to urban areas have lacked the necessary assets and income to acquire a 'decent' house (Wainer et al., 2016). Secondly, government programs aiming to provide, or improve access to, adequate housing units have often missed the mark of affordability for the poor (Bhatt, 1999). Finally, architects and planners have often ignored the user's actual needs and perceptions of their homes and disregarded their growing and changing needs. More than often, the results have been catastrophic; masses of rigid housing developments which were not only alien to the lifestyle of the occupants, but- in many cases- resisted transformation and adaptation (Habraken, 1972).

India is no different! The nation witnessed mass migrations to cities during the late 1970s primarily due to huge population growth combined with a lack of economic development at the rural base which continues until now (Curtis, 1988). Squatter settlements came up in and around most urban centers, typically made up of whatever was available such as cardboard or industrial waste. Even the lowest cost housing designed by architects was beyond the financial reach of these people (Curtis, 1988). The Aranya Township, however, stands out as a remarkable project in this regard. Conceived as a large enough project to tackle the city-level dearth of housing, the project reserved about 65% of the plots for what the Indian government categorized as the Economically Weaker Section of the society earning less than 2 dollars a day (Bhatt, 2018). Designed by architect B. V. Doshi, Aranya was developed as a 'sites-and-services' scheme with an urban design framework for the settlement where the people would progressively build their own homes. It was conceived for 6,500 families with a projected population of about 60,000 residents; today, it is home to 80,000 (Bhatt, 2018). The framework of Aranya evolved out of extensive studies conducted in understanding the lifestyles and the physical environments of its poor clients living in informal settlements. The designers further attempted to address the issues of identity and sense of community which were often missing in conventional sites-and-services projects. Since its inception and realization, Aranya has created unprecedented awareness in the professional and academic world. This township has set a standard of balanced and harmonious habitat and has emulated other organizations engaged in the field of low-cost housing (Sharma & Mehta, 2007). This stimulating housing project, along with the moral consciousness that is integral to affordable and culturally appropriate designs is what stems my interest for this research.

1.2 The Research

This report is a post occupancy review of the Aranya Township and focusses on how the residents took advantage of the urban design framework laid out by the designers. Being a progressive housing development, it is important to explore and document how the actual progressive designing was carried out by the residents of the project; to explore if and how the numerous variations in plot conditions and configurations shaped the actual layout of the individual dwellings and the community. For this study, only the houses built and designed by the EWS were studied.

1.2.1 Rationale of study

India as a newly independent country after the end of the colonial rule in 1947 faced many developmental challenges including housing and other urban issues. As an immediate response to the rising population and lack of housing, the government of India launched numerous housing projects. However, more than often, the norms and standards used in the formal housing projects were too high, making them beyond the reach of users (VSF, 1990). This resulted in the housing ending up in the hands of high-income people instead of the poor for whom it was intended. Some other more comprehensive and ambitious projects, such as Chandigarh, were also launched, primarily inspired by the grand vision of the modernist total planning and design. These projects were an important part of nation building efforts; however, ended up draining inordinate amounts of resources (Bhatt, 1990).

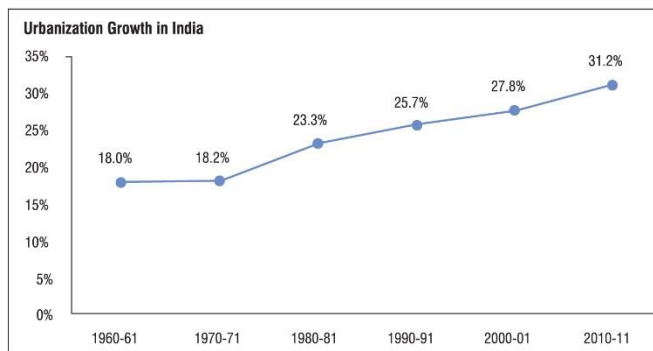


Fig. 1.2: Urbanization growth in India.

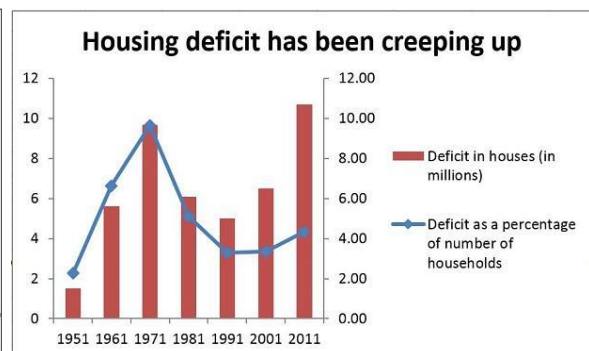


Fig. 1.3: Housing shortage in India from 1951-2011.

The lack of shelter and all its related problems continued to increase in scale and severity through the second half of the 20th century owing to rapid and extraordinary growth of metro centers as well as small and medium towns (Rybczynski et al., 1984). Consequently, issues such as lack of adequate basic services, including water supply and sanitation, were very common. The built-units produced and provided by the government or the private sector for low-income communities were not adequate, and

a radical approach was required to tackle the persistent dearth of low-cost housing (VSF, 1990). Starting from late 1970s and early 1980s, a gradual but substantial shift took place around the globe in the thrust of low-cost housing programs. A variety of innovative and unconventional ways of dealing with this problem were developed. Sites-and-services, along with slum upgrading were amongst the most significant approaches that aimed to engage with and harness the forces of the poor clients (Park et al., 2018). Slum upgrading involves regularization of informal settlements, provision of land use permits, leases or titles and the delivery and hookup of services. On the other hand, in a typical sites-and-services project, the serviced land is provided by the housing authority while the actual house building is left to the home owner (Bhatt et al., 1990). Generically, both these approaches are classified as “enabling” approaches since they provide the residents and communities with the tools and opportunities to solve their housing and related needs (Bredenoord, 2019). These approaches rely on the provision of resources such as finance, materials and technologies, leaving the actual production of the house in the hands of users. However, if seen through the lens of urban design and city making, slum upgrading appears to be a passive formal response to urban housing production as no new housing is built; which leaves city-making in the hands of the informal sector. As for sites-and -services, even though it seemed to be a popular approach advocated by several international aid agencies such as the World Bank and the United Nations and was adopted by many housing authorities in the developing countries, it still had a range of problems associated with it, such as lack of culturally appropriate designs, creation of impersonal urban environments, and lack of variety in plot sizes (Rybczynski et al., 1984; Bhatt et al., 1990). This made it critical for the urban development authorities to lead the way; design, build and bolster urban development through effective low cost and inclusive urban design. In this regard, Aranya stands out as a pertinent project. The residents managed to design and build their own dwellings, further creating places of work, business, rental properties and in various cases, additional housing on their plots. The design of the township reveals an innovative approach to integrated development creating a holistic environment, which is well rooted in the social, cultural and economic context of the place while being sympathetic to the lifestyle of the urban poor (Sharma & Mehta, 2007). The Center for Minimum Cost Housing at McGill University was closely involved with B.V. Doshi’s Vastu-Shilpa Foundation in this project to explore and understand the lifestyle, physical environments and aspirations of the poor clients. Their studies were critical in evolving a framework for the Aranya Township. Furthermore, the CMCH collaborated with the architect to design a few clusters within the township. Advancing further on Doshi’s approach, the McGill group developed a scheme that strategically varied in plot geometry, pattern, frontages, setbacks, and spaces to facilitate appropriation, house organization

and orientation. This study aims to explore how the housing in these clusters have evolved and how the opportunities provided by this urban design framework are different from that of B.V Doshi's.

The post occupancy studies relating to Aranya have looked at the exteriors and are related with the planning of the township, with less regard to the interiors or the design processes undertaken by the residents. This post occupancy study takes it a step further by understanding how urban design, especially of the housing clusters and plot layouts, has influenced and shaped individual dwellings. The study also becomes significant in the context of sites-and-services scheme, as not much work has been done to follow up the ideas or projects developed under the same. Hence, this research provides an opportunity to explore the growth of a significant progressive housing development conceived as a sites-and-services scheme.

1.2.2 Research Question

The post-occupancy study seeks to explore: If and how occupants were able to take advantage of the plan variations and locations of their plots and how these variations are reflected in the actual design and layout of individual dwellings?

1.2.3 Goals and Objectives

- To attempt to understand, through literature review, the post-occupancy evaluations conducted previously. This will help define the methods and models that have emerged from these evaluation studies which is critical in the production of this report.
- To analyze the Aranya project proposal, deciphering the program and the project critically.
- To research and explore the Aranya project and produce a post occupancy review of the township.
- To attempt to understand, through case study analysis, how the urban design framework of Aranya influences and shapes individual dwellings and neighborhoods.

1.2.4 Intended audience

This post-occupancy study should benefit researchers, architects and designers, especially those who are working with or are related to low cost housing projects. The study aims to understand how urban design can influence and shape individual dwellings by focusing on the design processes of the residents of Aranya. Such insight could help designers and planners in future housing projects to create inclusive and responsive urban environments that meet community needs effectively.

1.2.5 Methodology

The proposed methodology for the research is as follows:

- A comprehensive scan of the literature on post-occupancy studies, followed by an analytical and in-depth review on key pieces.
- A thorough understanding of the urban design framework laid down by architect B.V Doshi and the variation designed by the Minimum Cost Housing Group by studying the program and proposal of Aranya Township. This will be attained through primary research at the Canadian Center for Architecture (CCA) and by drawing on various projects and studies previously undertaken by others.
- A case study of the Aranya Township by selecting two segments of the project- one designed by architect B.V Doshi and the other designed by the Minimum Cost Housing Group.
- Approximately, 5-6 houses were selected in both segments based on their location, orientation, edge conditions, frontages, and sizes, further allowing for variation in the selected samples. The selected houses were observed, photographed and their internal layouts drawn to understand how the location and the geometry of the plot influenced and shaped the design process of the homes that the residents of Aranya have built themselves.

1.2.6 Scope and limitations

- The research deals with a specific project, that is, the Aranya Township and a specific group of people, the Economically Weaker Section.
- Prior permission was obtained from the institution to conduct interviews and click photographs. Also, the inhabitants of the township were explained the entire process to let me enter their house for documentation and provide their signature on the consent forms.
- Since the township is located in Indore, India, multiple visits to the project site were not possible, the fieldwork was carried out from 17th December 2018 to 20th December 2018.
- Furthermore, due to time constraints, only a small segment of the project with a limited number of houses were chosen for an in-depth analysis.

1.3 Research outline

The research is divided into six chapters.

Chapter one introduces the research topic and provides an understanding of the general approach to the study including the research question, the rationale, the intended audience, proposed methodology, the scope and limitations of the study along with an outline of the report.

Chapter two contains the literature review on post occupancy studies. This chapter defines in more detail the field of post occupancy research and describes the methods and models that have emerged from previous evaluation studies. This is central to understanding the gap between design intentions and the actual outcomes in use, and pivotal in understanding the wider socio-economic, environmental and cultural impact of the project.

Chapter three analyses the Aranya housing project. It starts by looking at the expanded urban context of the *Aranya* township including the city of Indore and its living environments. The study then focusses on the level of the township itself, considering different sectors of the town to understand the key elements of the master plan, including infrastructure, recreation and sports facilities, community services, cluster, block, sequence of streets and open spaces, and so on.

Chapter four focusses on the design of the EWS dwelling within the *Aranya* township. Various aspects such as house form, climate sensitivity, efficiency, house extensions and materials are analyzed. It is followed by an analysis of the dwelling/ cluster variation designed by the Center for Minimum Cost Housing, McGill University, Canada.

Chapter five contains the assessment of the case study. This includes the correspondent documentation, such as photography, drawings and interviews. The study draws upon two different segments of the Aranya Township; one designed by B.V Doshi and another by the Minimum Cost Housing Group at McGill. The selected samples within both segments demonstrate the opportunities and influences of the urban design framework.

Finally, Chapter six concludes the discussion for the development of this subject.

Chapter 2- Literature review

The aim of the present chapter is to discuss in more detail post occupancy evaluation research and its significance as a necessary stage in architecture and related fields. It examines the milestones in post occupancy evaluations of housing projects by describing the methods and models that have emerged from these evaluation studies, followed by analyzing relevant literature relating to the field of progressive housing.

2.1 Introduction

A completed building is ought to expound functions to the optimal satisfaction of its users. However, they do not always perform or function as they are intended to, or even as they should. Often the over-valuation of architectural statement of design or prioritization of aesthetics, along with the miscalculation of social considerations results in an architectural product that fails to satisfy its occupants. A key to solving this problem is the capability to learn from and improve on previous projects. In this context, the benefits of post-occupancy evaluation are well-rehearsed.

“It may be defined as the process of ascertaining the quality and standards of design and construction (including space planning, internal environmental quality, resource consumption, maintenance and occupancy costs, user comfort, satisfaction and outcomes); and the continual learning and dissemination of post-occupancy evaluation knowledge to shape future architectural projects and practices”

-(Hay et al, 2017)

A post occupancy study is a systematic evaluation of completed and occupied buildings. The basic notion that a POE elucidates is to determine the level of satisfaction of the building for its end users along with expounding myriad ways in which design, performance and fitness for purpose can be bolstered (Turpin-Brooks & Viccars, 2006). Although technical building evaluations including structural testing, mechanical systems performance checks etc. maybe conducted routinely, POE differs in that since it addresses the needs, activities, expectations, goals, and perspectives of the people and organizations using a building (Preiser & Vischer, 2005).

Zimmerman and Martin (2001) look at POE as a rational and logical concluding stage of the design process, allowing lessons to be learnt from occupiers. This includes two aspects, firstly how the existing space could be used more efficiently and secondly, the feedback that may guide future design of similar buildings. Vischer (2002) recognises the usefulness of POE in not only understanding users' and clients' satisfaction, but also to accomplish other objectives such as identifying building defects, determining

errors that could lead to increased operating and maintenance costs, supporting performance measures for asset and facility management, enhancing performance, supporting design and construction criteria and clarifying design objectives.

Cooper (2001) argues that without a valuable platform in place to obtain feedback from a building's performance, built with new systems, in new ways and with unknown outcomes, the building effectively remains a prototype. Feedback needs to be obtained from those using it in order to fully understand if the building is truly effective.

The worth of POE can be understood from several different perspectives, in particular from the eye of architectural professionals and facilities management. The Royal Institute of British Architects view POE as a systematic means of gathering invaluable information on the performance of their designs, allowing them to build on design guidelines to achieve continuous improvement (RIBA, 1991, as cited in Riley, Moody & Pitt, 2009). From the viewpoint of facilities management, POE proves to be a diagnostic tool for assessing the performance of a building once it has been occupied (Preiser, 1995).

Having discussed what post occupancy evaluation is and what it seeks to achieve, it is appropriate to consider the historical evolution and application of the process.

2.2 History of post-occupancy evaluation

As a term and practice, POE originated from the post-construction inspection process which was necessary for granting the occupancy permit to confirm that a building was fit for inhabitation once completed (Bechtel, 1997 as cited in Brown, 2018). The earliest occupancy permits for inhabited spaces in North America can be traced back to 1915 with the passing of the Occupancy Permits Act of the 63rd United States Congress (Von Drehle, 2003, as cited in Brown, 2018). Shortly after, in 1916, the country introduced the first building code which was implemented in New York City. The code specified a set of rules that governed the design, construction, repair and alteration of buildings. Hence, the building inspectors conducted the earliest forms of 'POE' to evaluate compliance to these building codes that were implemented as standards for occupancy (Brown, 2018).

Post occupancy evaluations, as we know it today, however, has its roots in the early 1960s. It was during this time that this methodology was adapted by architectural practitioners in U.K as both viable and necessary to the practice (Riley, Moody & Pitt, 2009). They recognized that a lack of 'scientific exploration' existed to examine the strengths and shortcomings of construction projects, primarily of the technical aspects (Riley, Moody & Pitt, 2009). Hence, the POE methodology was incorporated by the

RIBA into its first handbook in 1965, including it in the final stage of 'Plan of Work', Part M: feedback. This stage of evaluation was considered essential as it was a cost-effective way of 'improving service to future clients' (RIBA, 1965, as cited in Brown, 2018). During 1970s and 1980s, POE became a widely established model within the field of design and construction (Riley, Moody & Pitt, 2009). However, the success of POE was short-lived as its implementation declined due to the associated fees, liability, insurance and its failure to be seen as an architect's responsibility (Cooper, 2001). Consequently, RIBA eliminated Part M stage from their handbook as it was noted that their clients were not agreeing to pay additional costs associated with the evaluation and RIBA was not keen on giving the impression that this stage of the design and construction process was mandatory (Preiser & Vischer, 2005). With this decline of POE in professional acceptance by designers and architects, academicians – particularly those in the field of environment psychology - developed the initiative further with the aim of broadening the availability of scientific knowledge (Cooper, 2001).

The term 'POE' was initially coined in the first official publication of Herb McLaughlin of KDM Architecture in San Francisco (Preiser & Nasar, 2008). His studies which focused on hospitals of Utah and San Francisco were published in the AIA journal issue of 1975. Other pioneers in the 1960s-1980s include Thomas A. Markus of University of Strathclyde, UK; David Kernohan and his colleagues at the Architecture Research Group at Victoria University of Wellington, New Zealand; Gerald Davis at the International Center for Facilities in Ottawa, Canada; Sim van der Ryn of University of California, Berkeley and Victor Hsia of University of Utah in United States. The terminology and concept of POE became more mainstream when Preiser, Rabinowitz and White wrote a POE textbook in 1988. Another milestone study was "Building Evaluation Techniques" by George Baird et. al in 1996 which introduced 120 evaluation concepts, techniques and tools in terms of "how to do" POEs. As a result of this renewed interest in POE and the consequently changing industry perspectives and perceptions to sustainability, RIBA reintroduced the Part M stage to their plan of works section in 2006 (Bordass & Leaman, 2005).

At its inception in the 1960s, POE was primarily associated with the assessment of non-domestic buildings (Brown, 2018). Institutional buildings such as nursing homes, mental hospitals and correctional facilities were considered of prime concern as it was thought that these facilities were not performing well and were contributing negatively to the proper rehabilitation of patients and inmates (Preiser, 1995). Hence, during the early stages of POE, several studies significantly focused on the social and psychological issues produced and facilitated by these built spaces. Due to the post-war housing boom, the early application of POE was also prevalent within residential environments. According to Preiser and Vischer (2005), this mass production of housing and rapid building caused both architectural and

social issues, leading to the requirement of a systematic evaluation of buildings and how they were being used. The evolution of POE can be traced from the case studies of single standalone building projects to structured studies of varied building forms with sound cross-functional results that set a benchmark for further comparative studies (National Research Council, 1987 as cited in Riley, Moody & Pitt, 2009).

Although POE was initially concerned with assessing the performance of a building or facility based on user experiences, it has now developed to consider a more complete, process-oriented evaluation (Preiser & Vischer, 2005). Due to this holistic approach, the evaluation considers, in addition to the building, the aspects which have influenced the project in terms of economic, social, political and organizational forces.

POE is well established within academic research and has produced a rich body of work on the complex interactions between design and occupied buildings (Hay et al, 2017). However, post occupancy evaluation studies may be conducted at various levels depending on the intent and depth of evaluation. Hence, to better position the research in the field of evaluation studies, one needs to understand the different levels of POE.

2.3 Types of Post Occupancy Evaluation

POE is a systematic and formal process which requires different levels of effort based on the amount of time, personnel, resources, and depth of evaluation. Three levels of POE can be distinguished: '*Indicative*', '*Investigative*', and '*Diagnostic*' (Preiser et al, 1988).

2.3.1 Indicative POE

Indicative POE forms the basic level of POE where the evaluation is carried out over a short period of time using only a few resources to indicate major failures and successes of an architectural project.

2.3.2 Investigative POE

Investigative POE forms a higher level of POE. This method is carried out over a relatively longer time span, requires more resources and is more complicated. An investigative POE is often conducted after an indicative POE has identified issues that require further investigation, both in terms of a facility's physical performance and the users' response to it. The investigative POE establishes research criteria that are objectively and explicitly stated before the evaluation is carried out which is unlike the indicative POE, in which performance criteria are partly based on the evaluator's experience.

2.3.3 Diagnostic POE

The final level is the diagnostic POE which is an in-depth and comprehensive investigation requiring a high level of effort. It employs a multi-method approach in data collection which includes (may not be limited to) questionnaires, surveys, and physical measurements. Furthermore, since diagnostic POEs are frequently large-scale projects concerning many variables, the attempt is often made to develop results that indicate relationships between variables. Research forms an important part of diagnostic POEs, which is aimed at the correlation of physical, environmental and behavioral measures. The findings and recommendations of this approach are long term oriented and are not limited to improving only particular facilities, but also the state of the art in a building type through improvement of the design criteria and guiding literature.

Having discussed the various levels of POE, it may be stated that the present work deals with post occupancy evaluation at a diagnostic level. A few key pieces relating to diagnostic evaluations of housing projects will be discussed further.

2.4 Milestones in Post Occupancy Evaluations of Housing Projects

Perhaps the earliest effort at systematic building evaluation in the area of housing research was made by Markus (Markus, 1965) and his colleagues in the 1960s at the Building Performance Research Unit at the University of Strathclyde, Scotland. The first influential and significant work came exclusively from Britain, particularly from the Architectural Research Unit at the University of Edinburgh and the Sociological Section of the Ministry of Housing in London (Cooper, 1977). Both social scientists and architects were employed by the Architectural Research Unit with the aim of setting up a practice, research and teaching unit which would initiate a fresh approach to the field of housing by considering user needs and by combining the findings of research studies with actual design work (Behloul, 1991). The Ministry of Housing and Local Government (later renamed as the Department of the Environment) conducted a series of housing evaluation studies through its Sociological Research Station. Some of these studies were longitudinal studies aimed at monitoring housing preferences and needs before and after moving to new prototype dwellings (Ministry of Housing and Local Government, 1969; DOE, 1972, as cited in Behloul, 1991). Some other studies had compared several housing developments of the same type of density concerning a specific aspect of the environment (DOE, 1972, as cited in Behloul, 1991).

A milestone in the field of post occupancy evaluation is a study published in 1972 called “Lived-in Architecture, Le Corbusier’s Pessac Revisited”, by French architect Phillipe Boudon. The author focused on *Quartiers Modernes Fruges*, a low-cost workers housing development located in Pessac, France. The study was aimed at systematically analyzing changes both outside and within the dwelling and understanding attitudes towards the architecture by carrying out a series of non-directive interviews with occupants. Instead of focusing on one particular aspect of Pessac, Boudon kept the study as wide as possible so as not to sacrifice the universal quality of ‘living’ as revealed by the day to day activities of the occupants. The study was extremely significant as Pessac was considered ‘destroyed’ by most people due to the extensive modification carried out by the occupants – photographs of small shuttered windows where there once were large expanses of glass, garages replacing open terraces, endearing touches of kitsch and tile roofs were cited as evidence of architectural failure (Huxtable, 1981). Boudon’s conclusion, however, was exactly the opposite. “The Quartier Modernes Fruges were not an *architectural failure*” he wrote. “The modifications carried out by the occupants constitute a positive and not a negative consequence of Le Corbusier’s original conception. Pessac not only allowed occupants sufficient latitude to satisfy their needs, by doing so it also helped them to realize what those needs were” (Boudon, 1972).



Fig 2.1: Le Corbusier Pessac- before and after.

He demonstrated that Le Corbusier's open plan could be subdivided and reorganized in several ways; occupants could choose their own windows which could be accommodated into the large openings without tearing down a wall; they could add another room to the house by simply roofing over the terrace. There was no sense of "architect's will imposed," or of a rigid, authoritarian design. The houses evolved and adapted with time (Boudon, 1972). All this made possible because the planning was good, letting each owner have a sense of privacy while maintaining the collective ensemble. These conclusions of the study were based on the results of the interviews combined with the author's observations.

Another significant study in the diagnostic evaluation of housing called "Easter Hill Village: Some Social Aspects of Design" was carried out by Cooper in 1975 who stressed upon the application of observation techniques, interview and survey in POE data collection. Easter Hill village was the only low-income housing project that was evaluated by Cooper. The study addressed numerous specific design features that contributed to the success or failure of the evaluated housing scheme. The study analyzed space utilization both inside and outside the house and provided an extensive series of recommendations. Cooper, along with Sarkissian in 1976, analyzed nearly one hundred studies of low-rise housing estates concerning what people like and dislike about their housing environment and offered several guidelines for the design of similar housing projects (Behloul, 1991).

A study published in January 1995 called "Wartime Housing and Architectural Change, 1942-1992", carried out by Annmarie Adams and Pieter Sijpkens focused on the architectural changes made to individual houses in the second half of 20th century in Ville St- Laurent, Montreal, Canada. In-depth interviews were conducted with occupants of the wartime neighborhood along with a comprehensive photographic survey of the area, which was carried out over a span of two years. Following the interviews, detailed plans were drawn of each residence, accompanied by photographs of each room. The houses to be studied were carefully chosen from both external evidence of extensive renovation and a conscious attempt to include original owners of the wartime houses (Adams & Sijpkens, 1995). This study was modelled on the above-mentioned study by Phillipe Boudon- "Lived-in Architecture, Le Corbusier's Pessac Revisited". The study was not aimed at offering any typology of architectural change. Rather, it focused on a small sample of 25 houses in much more depth and employed methods more commonly used in the fields of anthropology, cultural geography, and folklore than in traditional architectural research.

Another significant study was conducted by Rafik Salama in 1995 as part of his Master of Architecture thesis at McGill University, Canada, called "User Transformation of Government Housing Projects: Case

Study, Egypt". The study investigated the development of transformations in several different public housing projects in Egypt and attempted to identify some of the implicit factors that govern change at both dwelling and community levels. A wide range of transformation activities were documented during a survey of twenty housing projects in Cairo and Alexandria. The aim of this survey was to establish a typology of transformations and distinguish the patterns through which they take place. Eventually, *Ain el Sira* was chosen as a case study for examining both internal and external aspects. The study revealed that the transformation of public sector housing projects was related to a complex set of interrelated determinants linked with both context and dwelling characteristics. These transformations created dynamic multi-functional estates that not only increased the range of used spaces inside housing developments but were also able to better respond to changing needs of households.

Grahame Tipple's "Extending Themselves: User Initiated Transformations of Government-built Housing in Developing Countries" is a relatively recent study published in 2000. The book analyses User-Initiated Transformations (UIT) to government-built housing in Bangladesh, Egypt, Ghana and Zimbabwe. The post-evaluation study argues that transformations are a valid activity in housing supply and should be encouraged as a means to renew government housing. The book begins by describing and comparing the characteristics of transformation in the selected case study areas along with identifying the advantages and disadvantages of transformation as a housing supply mechanism. The presentation of important findings and arguments does not necessarily follow a linear and chronological methodology instead, they are grouped according to myriad issues. The author attempts to counter the negative arguments readily used against transformations by establishing empirical evidence. The study mostly uses univariate analysis and the tables presented use the median and inter-quartile range (IQR) to represent centrality and spread rather than the usual mean and standard deviation. The author also uses gamma diagrams in some of the analysis. Finally, the study leads to recommendations and policy suggestions which could be applied to transformations to maximize the benefits and minimize the costs to owners, users and neighbors. These include "provision of loan finance; the encouragement of co-operation between neighbors, especially in multi-story residential buildings; and the planned colonization of open space next to the dwellings where plots are not provided" (Tipple, 2000). The case studies along with the multivariate analysis form the appendices. The case studies divide transformers into sub-samples depending on two factors- firstly, the age of their extensions and secondly, the house characteristics. This stage of the study encompasses detailed photographs and plans instead of clubbing it with the main argument. This section also includes the conclusions and recommendations specific to each case study.

POE studies are done to evaluate the effectiveness of completed designs, buildings and their environments. The findings from built projects may better inform projects still in the conception phase. POE studies are an efficient tool to provide information on what works and what does not work in architecture and the allied professions. Evaluation provides organized information for the designer and reduces the uncertainty in which he or she works. The process of evaluation research is of a descriptive nature (using questionnaires and observation as research tools) and is most often aimed at application. Although past few decades have witnessed a significant amount of evaluation research in the field of housing, there is still continual need for housing research that develops and tests basic theoretical models of housing satisfaction.

Specific to Aranya, there have been very few systematic evaluation studies to assess how the actual progressive designs of architects were carried further by the residents of the project and the extent to which the housing environment was responsive to their needs. This study provides an opportunity to explore the growth of a significant progressive housing project conceived as a sites-and-services scheme and learn from its strengths and shortcomings.

2.5 Progressive housing

Aranya township was conceived as a low-income progressive housing development using the sites-and-services approach. The residents of Aranya progressively build their own homes within the urban design framework provided by the designers. Hence, to better understand the project, it is important to discuss relevant literature relating to the theme of progressive housing.

Progressive housing is a step-by-step process of housing development whereby the residents incrementally build or extend their homes themselves based on household needs and resources (Bredenoord & van Lindert, 2010). It is a gradual process that begins with a core house which is slowly upgraded in size or quality over time under the control of the residents (Goethert, 2014). It is a construction method that is used by millions of individual households across the globe (Bredenoord, 2019). In Literature, various terms are used to describe house construction methods that in principle have the nature of self-construction of houses by households. Instead of progressive housing, one may use 'self-help housing', 'self-managed housing', or 'incremental housing'. The incremental process offers flexibility to residents in terms of improving and/or enlarging their homes in response to modifications in family size, structure, and financial capability. Hence, the novelty of the homes produced through this process lies not in the outcome, but in the process itself (Hamid & Elhassan, 2014).

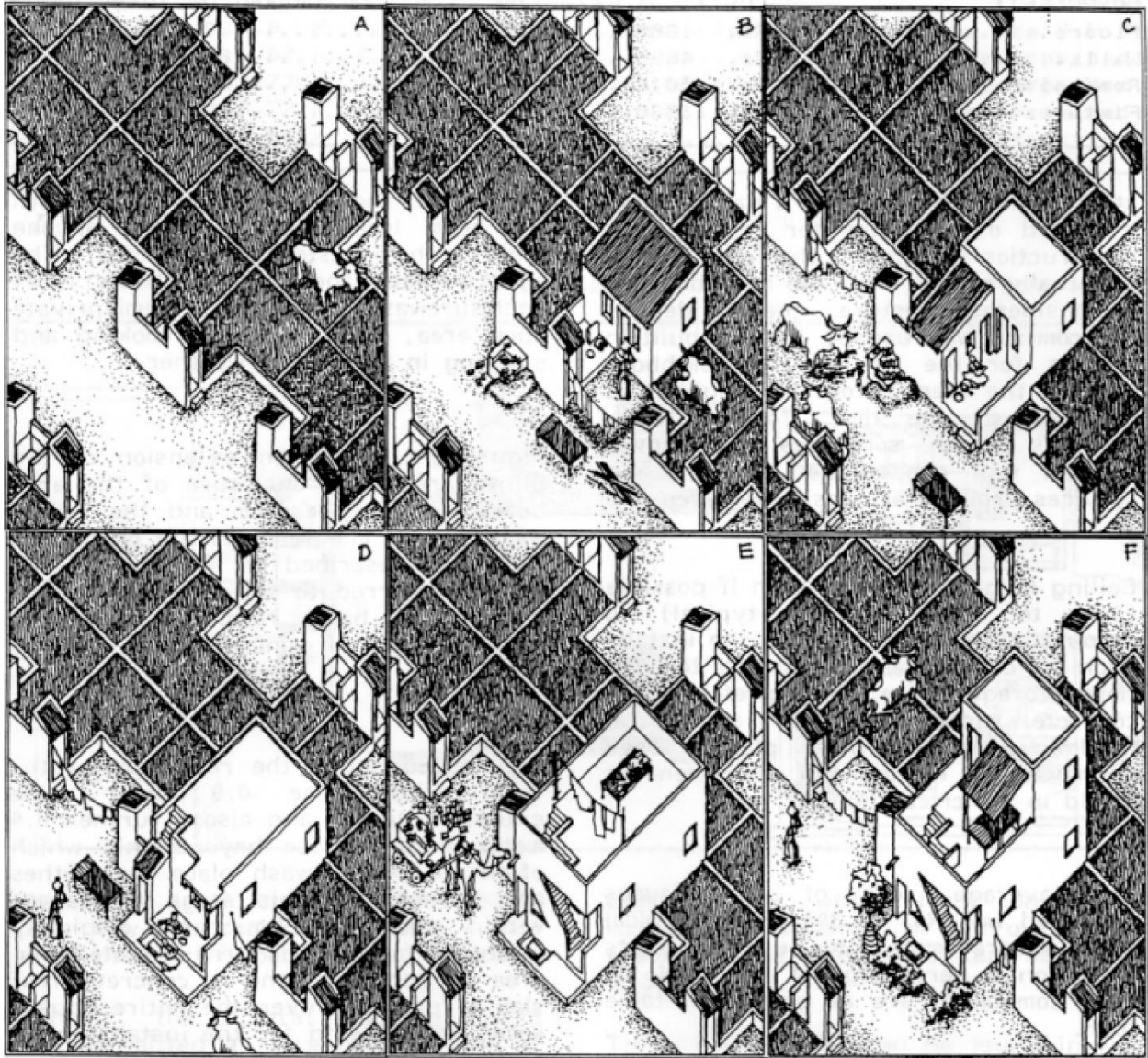


Fig 2.2: Incremental construction process.

Since the 1950s and 60s, self-help progressive housing has been widely recognised as an important factor in housing production. The groundwork for this concept was laid by John Turner, a British architect who wrote extensively on housing and community organisations (Park et al., 2018). His writings were influenced by his time in Peru between 1957-65 where Turner researched and advised on several reconstruction and slum upgrading programs which were part of a nationwide community development initiative (Bredenoord, 2019). He argued that rather than housing being centrally administered by the state, it should be provided and managed by those who are to dwell in it (Turner, 1967). Through a number of empirical studies, Turner revealed that housing neighbourhoods designed by local groups worked better since people were experts on their own situations. He also claimed that

squatting was not a social malaise, rather a triumph of self-help, and promoted the terms 'housing as a verb' and 'freedom to build' (Turner, 1982). The so-called informal housing solutions in the 1970s and 1980s were further supported by Abrams (1966) and Mangin (1967) who criticized the conventional approach of expensive standard housing projects and advocated the capability of slum dwellers to build their own homes provided that the governments lift oppressive regulatory systems like land tenure issues. International institutions such as the World Bank and UN-Habitat have also recognised the vital role of self-help housing in providing affordable housing solutions to (and by) the urban poor. This is primarily due to its effectiveness in being affordable, providing an opportunity to develop skills and offering flexibility for the spatial needs and financial ability of households (Park et al., 2018).

Marcussen (1990) stresses upon the practical effectiveness of progressive housing in terms of 'use value', and Jimenez (1982) emphasizes that progressive housing offers a possible opportunity to escape poverty by acting as an economic motor and becoming a means of asset accumulation. Bredenoord and van Lindert (2010) highlight vital qualitative aspects of progressive housing such as use value of the house due to relative safety; the house being a platform for income generation with various scales of enterprise; the commercial value of the property; and an alternate source of income from letting and sub-letting.

This trend of self-help progressive housing in the 1970s and 1980s influenced policy transformation from slum eradication to more 'enabling approaches' such as slum upgrading and sites-and-services. Pro-self-help policies were adapted in most developing countries following the Habitat Conference held in 1976 (Fernandez-Maldonado, 2007 as cited in Park et al., 2018). *Aranya* in Indore, India; *Belapur Incremental Housing* in Mumbai, India; *Ciudad Bachue* in Bogota, Colombia; and *Villa el Salvador* in Peru were among the many examples of incremental housing projects developed during this period.

The progressive housing approach, however, encountered various criticisms in the 1980s and 90s (Burgess, 1982; Mathey, 1992; Ward, 1982). This included difficulty to secure land in urban areas for residential use along with requiring vast capital to develop this land; and that self-help efforts impose a double exploitation on slum dwellers. In addition, most projects that advocated the progressive housing approach were located on the periphery of urban areas, requiring high costs to develop connecting infrastructure (Bredenoord & van Lindert, 2010). Hence, this approach was believed to be less effective in coping with the urban challenge of affordable housing. Furthermore, apart from the acute mismatch between high demand and short supply, the little housing that was provided under this approach often lacked many qualitative aspects such as not being conducive to the traditional lifestyles, lack of identity and privacy, inappropriate open spaces, lack of informal character, and others (VSF, 1990).

The progressive housing development at Aranya, however, reveals an innovative approach to integrated development. It is well rooted in the social, cultural and economic context of the place, while at the same time being sympathetic to the lifestyle of its poor clients. The project has allowed residents to leverage the modest formal sector investments many times over. Conceived as a large enough project to tackle the city level dearth of housing and developed as a community with the highest level of services within a tight budget, Aranya proves to be a significant case study in the field of progressive housing.

Before embarking on the POE of Aranya, it is important to understand the design of the project. The following chapter discusses the Aranya housing project in detail. It analyzes the project proposal by deciphering the program and the project critically.

CHAPTER 3 – READING ARANYA

3.1 Introduction

The Aranya Township is an innovative experiment of settlement planning conceived as a large enough project to tackle the city-level dearth of housing in Indore, India (Bhatt, 1990). What makes it special is the *idea of planning and urban design framework of the settlement where the people would build themselves* (VSF, 1990). The design of the township was entrusted to Balkrishna Doshi, director of Vastu-Shilpa Foundation for studies and Research in Environmental Design by Indore Development Authority. Apart from being the developer, the IDA played a leading role in this project and was responsible for preparing the initial project brief, appointing consultants, financial and legal administration, contract monitoring, site and technical supervision, identification of user groups and allocation of houses and plots (VSF, 1990).

The designers were responsible for providing only “sanitary cores”, each comprising of plumbing, washroom, kitchen and a single room. These could eventually be expanded as the inhabitants established themselves. However, the provision of these cores played a crucial role in the project as it was the sole “architecture” provided by designers (Curtis, 1988).

Furthermore, the conventional sites-and-services approach was redefined by VSF to include models for future dwellers, house types, material suggestions and steps for implementation, while at the same time remaining flexible (Badshah, 1992). The project was conceived for about 6,500 families in various income groups, but predominantly for the EWS with about 65% of the plots reserved for them (Bhatt, 2018). Aranya was developed with the highest level of services within a tight budget. Cross subsidies were used within the project to attain the best level of services for all. The efficient site planning, a fresh approach to infrastructure, and the use of strong traditional urban design principles of the context have made *Aranya* an ideal living environment for its residents making it a compelling example of good urban design.

3.2 Housing situation in Indore

The city of Indore, the industrial and commercial center of the state of Madhya Pradesh in Central India, had a population of about 827,000 in 1981; which has now risen to over 2 million (Census, 2011).

Housing in Indore is the key responsibility of two government agencies- the Indore Development Authority (IDA) and the Madhya Pradesh Housing Board (MPHB). According to a study carried out by the IDA in 1981, about 51,000 families in Indore were either homeless or living in illegal settlements (VSF, 1990). Between 1971-81, both public and private agencies combined produced only 25,000 units as against the additional demand of 51,000 units, which further added to the growth of slums and squatter settlements in the city (VSF, 1990). With the resources of the local authorities already stretched, the provision of ready built houses was nearly impossible, presenting an even stronger case for a sites and services development on the part of the public agencies. It was on this basis that the proposal for Aranya was formulated.



Fig 3.1: Location of Indore

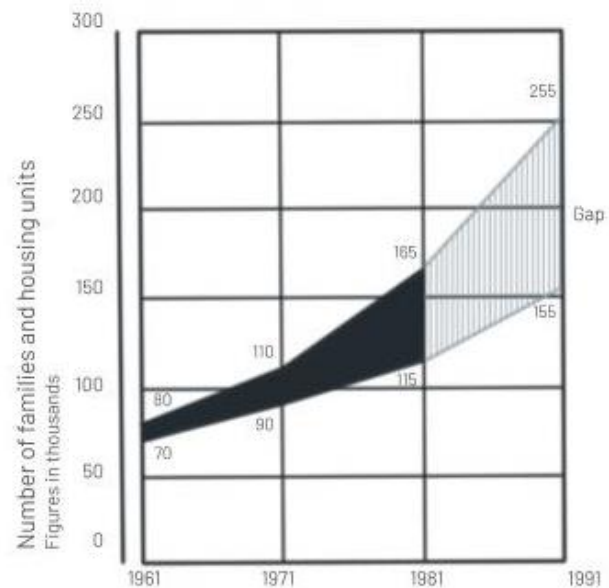


Fig 3.2: Housing shortage in Indore

3.3 Site Context and Characteristics

The site chosen for Aranya was located on the Delhi-Bombay highway, approximately 6 kms north from the city center of Indore (VSF, 1990). The site was well-linked to the city and was located near employment areas, having both existing and proposed industrial areas within a radius of 2kms (Ekram, 1995). Suburban growth of Indore had almost reached the southern boundary of the site, though the areas toward the east and north of the site were used as agricultural land earmarked for future growth (VSF, 1990).

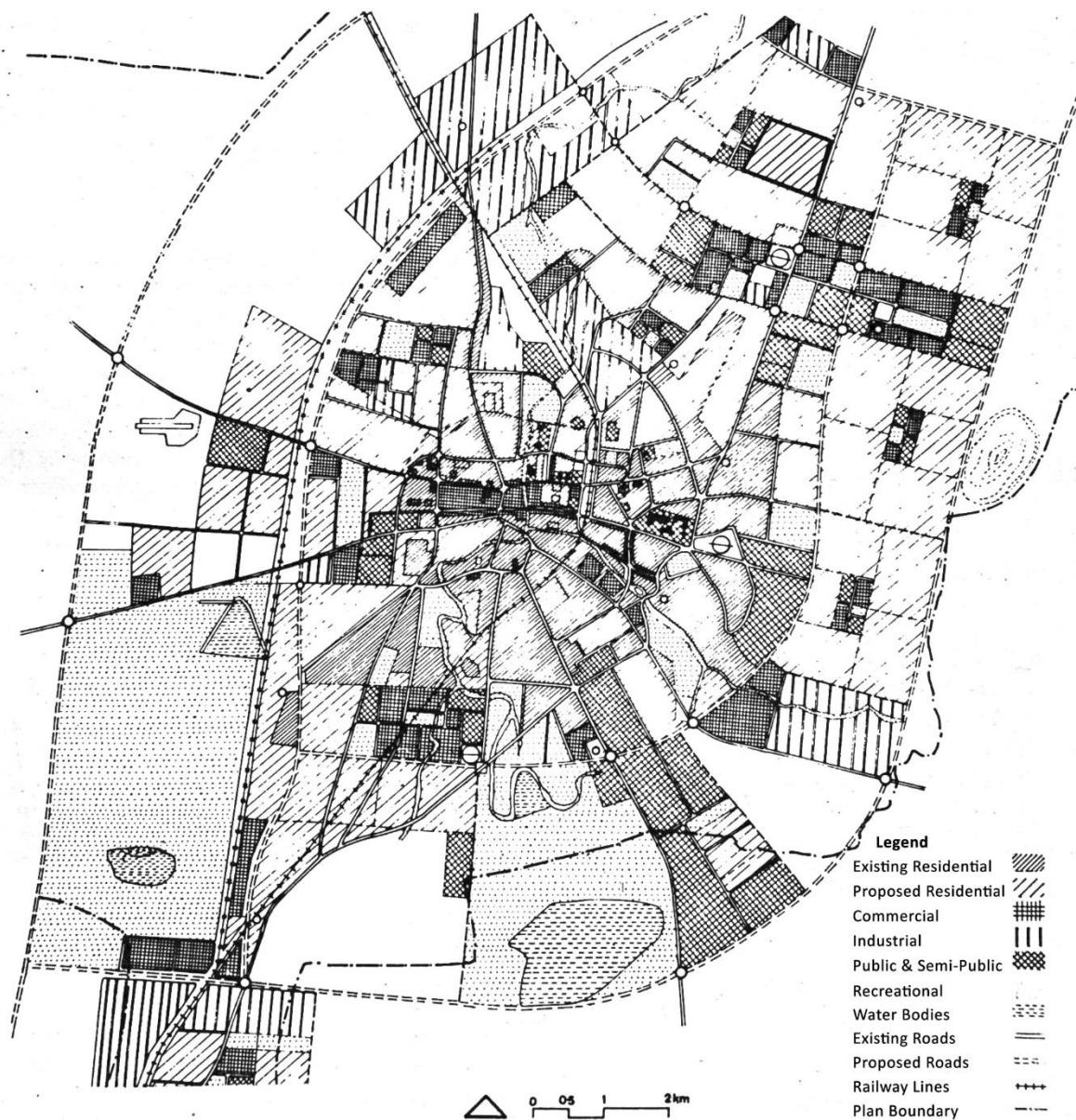


Fig 3.3: Map of Indore showing location of the site.

The site was rectilinear and measured approximately 1km by 1km. The highway formed the eastern boundary of the site, along with a 30-meter wide internal city road that flanked the northern, southern and western boundaries (Ekram, 1995). In terms of the topography, the site was relatively flat with no notable features, except for a rainwater channel that ran diagonally across the site from east to northwest (VSF, 1990).

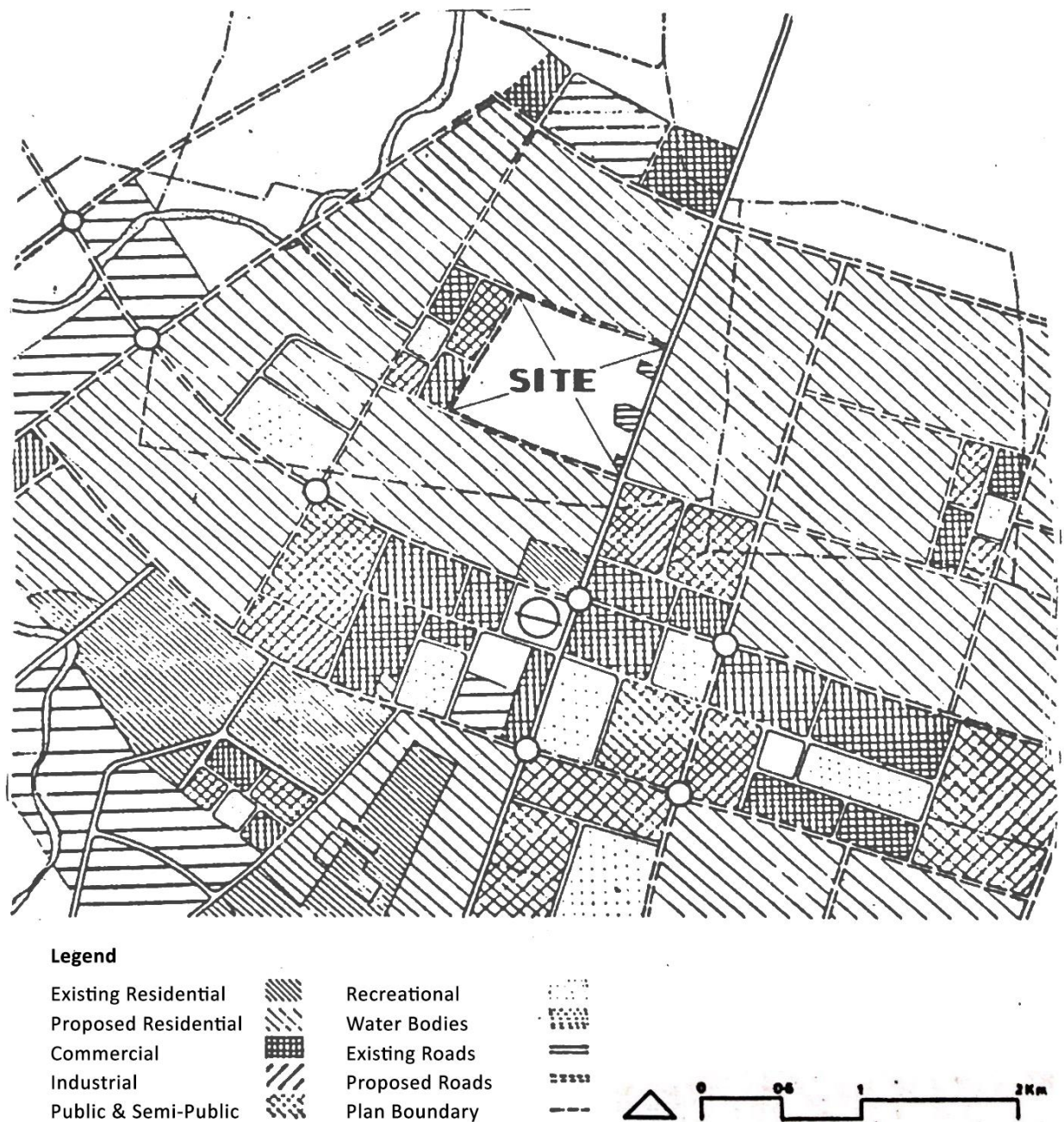


Fig 3.4: Site and its environments

3.4 Reference and studies

The Vastu-Shilpa Foundation set up a team in the early 1980s with the aim of studying squatter settlements and how they worked (Curtis, 1988). Major emphasis was laid upon the study of traditional habitat in the Indian context and thus evolve design and planning guidelines to suit the prevailing social, economic and technological conditions. Several documents were produced including “Low-Cost Housing”, “Integrated Rural Development Plan for the Village Chharodi”, “Center for Community Welfare and Employment Training”, and “The Tribal Training Center at Surat” (Curtis, 1988).

Another Study, conducted in collaboration with the ‘Center for Minimum Cost Housing’ of McGill University, Montreal, Canada, looked at the existing slum settlements in Indore. The Study was called “How the Other Half Builds” and provided great insight into how the poor build houses for themselves even in the face of severe land and resource constraints. The study highlighted key features of the lifestyles and physical environments of the poor and was based on the following aspects:

1. Access streets
2. House extensions
3. Small shops
4. Work places
5. Trees
6. Public structures
7. Vehicles

The study of neighborhood streets revealed that they accommodated various social, economic and domestic activities rather than acting as mere corridors for movement (Rybczynski et al., 1984). Relevant street hierarchies along with their desirable physical characteristics were also identified. The study on house extensions identified them as spaces in front of the house. It was highlighted that although these extensions were located in the public realm, they acquired a private character through their use and physical modifications (VSF, 1990). In addition to acting as a means to expand the house, they also enhanced the quality of the living environment. The study of small shops stressed on their significance in the neighborhood as a means of earning a livelihood with minimum investment. The study of economic activities identified the nature of space requirements along with highlighting how the design of streets and public spaces can accommodate these activities (Rybczynski et al., 1984). These studies were not only helpful in evolving a design framework but also contributed in detailing out the design process for the Aranya Township.

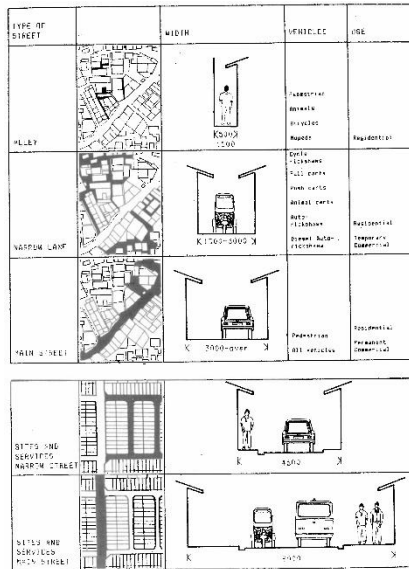


Fig. 3.5: Hierarchy of streets

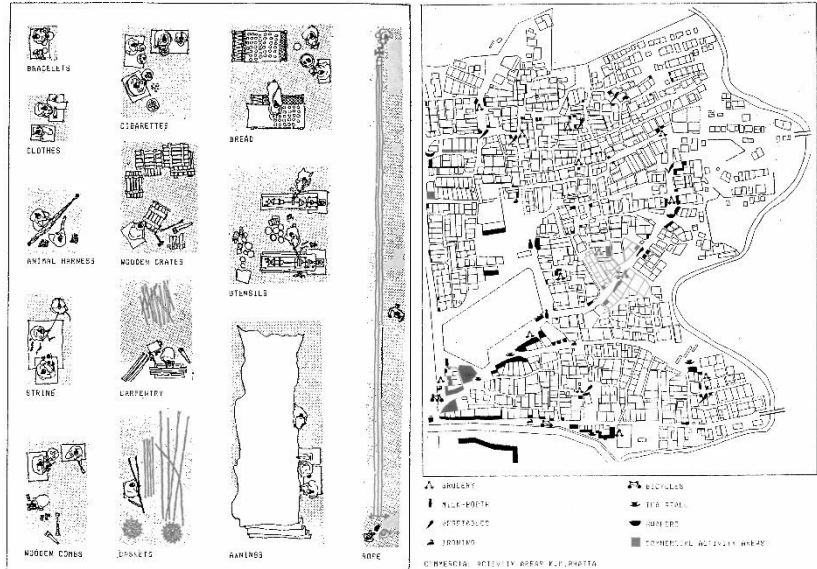


Fig. 3.6: Commercial activities in residential areas (K.K. Bhatta)

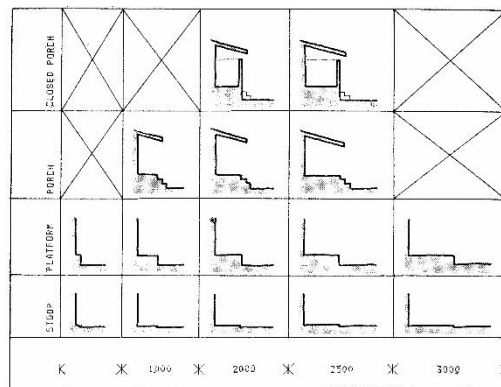


Fig. 3.7: House extensions along streets

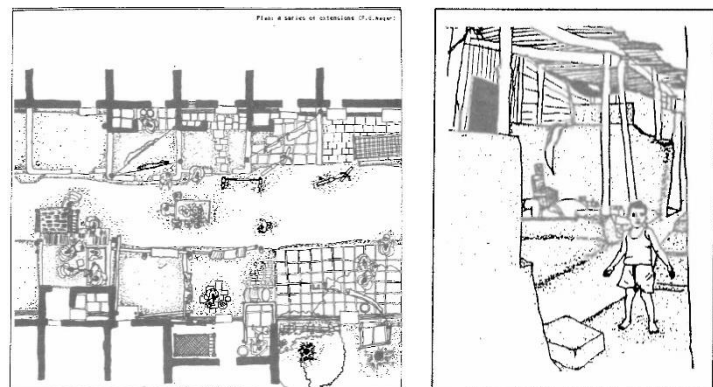


Fig. 3.8: Nature of house extensions

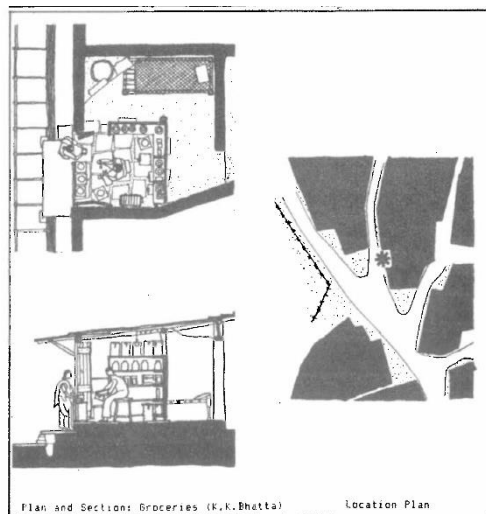


Fig. 3.9: Small shops and workplaces

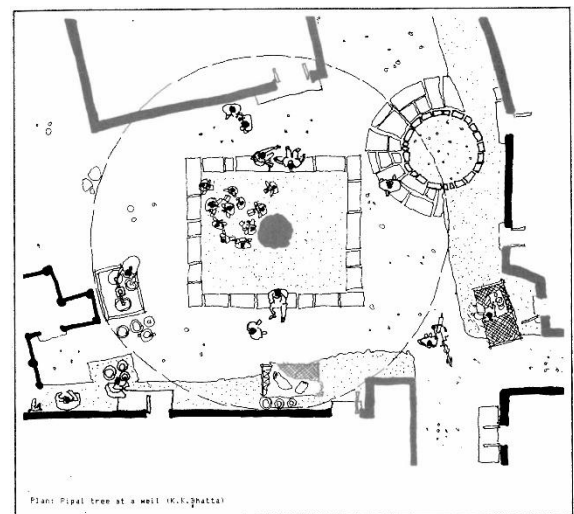


Fig. 3.10: Tree in a small square

3.5 Broad objectives and Philosophy

The main goal of the Aranya housing project was to create an integrated human habitat suited to the lifestyles and cultural background of the people. It was noted that much of the urban low-cost housing that was provided during the 1970s and 1980s generated unpleasant and unbalanced environments while completely disregarding the traditional lifestyles of the poor (VSF, 1990). Inappropriate open spaces, inadequate infrastructure, lack of identity and privacy, lack of informal character and lack of community, recreational and commercial support were among the major fall backs of such proposals (Sharma & Mehta, 2007). There was rarely any provision for flexibility and elasticity of spaces, particularly in the poorest pockets, where dwelling densities were the highest. Aranya was thus an opportunity to address some of these issues and provide an inclusive urban environment well suited to the lifestyles and living environments of the poor. Special focus was given to specific features such as the indigenous character of built form, use of new standards and norms, optimization of land use, creation of a homogenous mixed-use community, use of cross subsidy, and provision of low-cost service infrastructure (VSF, 1990). All these considerations contributed to creating an integrated human habitat well suited to the cultural, economic and social context of the place.

3.6 The Planning and Design of Aranya

Vastu-Shilpa Foundation undertook comprehensive planning and design of the Aranya township, which was conceived as a mixed-income progressive housing with a large component of service plots for the EWS. In the design of Aranya, several conventional architectural, planning and engineering approaches were discarded to incorporate appropriate, often highly innovative solutions. This gave rise to several distinct features, such as a very clear organizational hierarchy of plots, spaces and activities, imaginative clustering, efficient land use and a high standard of services within a tight budget (VSF, 1990).

3.6.1 Residential and Activity Structure

The preliminary proposal for Aranya was developed by IDA in 1981. This included income distribution, plot sizes, and requirements for various facilities and amenities (VSF, 1990). This initial proposal was improved upon by VSF to enhance land use, marketability and project surplus.

It was noted that the proposal developed by IDA had very little financial surplus and left a very small margin for cost overruns and contingencies (VSF, 1990). VSF believed that the marketable areas and the overall land use must reflect economic planning. Furthermore, it was observed that the EWS plot size was too small and hence, the plot sizes for EWS I, EWS II, and EWS III were increased from 33.45 sqm to

35.32 sqm. For EWS IV, the plot size was further increased to 44.65 sqm and renamed as Lower Income Group (LIG) I. This modification was incorporated with the goal of providing people, particularly of low-income strata with a wider range of options matching their affordability (VSF, 1990).

To enhance the economic viability, an increase in the commercial area was proposed. This resulted in a drop of the number of plots to be provided in the township from 7271 plots to 6543 plots, though the proportion of plots for the EWS was not reduced (VSF, 1990).

Sr. No.	IDA proposal			VSF proposal			Total
	Type of plot	Income range (Rs. / month)	Plot sizes (sqm)	Type of plot	Income range (Rs. / month)	Plot sizes (sqm)	
1	EWS I	150-200	33.45	EWS I	200	35.32	1962
2	EWS II	200-250	33.45	EWS II	300	35.32	1500
3	EWS III	250-300	33.45	EWS III	400	35.32	800
4	EWS IV	300-350	33.45	LIG I	450	44.65	182
5	LIG I	350-450	55.76	LIG II	500	55.82	617
6	LIG II	450-600	92.93	LIG III	600	93.03	296
7	MIG I	600-1100	139.40	MIG I	1100	139.54	626
8	MIG II	600-1100	223.04	MIG II	1800	223.26	265
9	HIG I	1100-1500	325.27	HIG I	1800+	325.59	180
10	HIG II	1500+	474.00	HIG II	1800+	474.43	75
11	Flats	1500+	613.40	HIG III	1800+	613.94	40
Total							6543

Fig 3.11: Comparative land-utilization between IDA's proposal and VSF's initial proposal.

The population structure of the township was also modified to allow for future growth. The most significant modification made to the population structure was the increase of EWS population from 49.64% (IDA) to 66.35% (VSF). In principle, the proposed population structure of the township was similar to Indore City.

Categories	Initial Population Structure				Changed Population Structure			
	Assumed population per plot	No. of plots	Population	% to total	Changed population per plot	No. of plots	Population	% to total
EWS I	5	1962	9810	49.64	10	1962	19620	66.35
EWS II	5	1500	7500		10	1500	15000	
EWS III	5	800	4000		10	800	8000	
LIG I	5	182	910	16.21	5	182	910	10.82
LIG II	5	617	3085		5	617	3085	
LIG III	10	265	2960		10	265	2960	
MIG I	10	626	6260	20.75	10	626	6260	13.87
MIG II	10	265	2650		10	265	2650	
HIG I	10	180	1800	13.19	10	180	1850	9.02
HIG II	10	75	750		10	75	750	
FLATS	80	40	3200		80	40	3200	
TOTAL			42925				64231	

Fig 3.12: Changed population structure of Aranya township.

Though the land use within Aranya was predominantly residential, a considerable proportion of community and institutional use was also provided, including basic social services like education, health, recreational areas; essential infrastructure and amenities like water supply, sewage, storm water drainage, roads, electricity; and activities like commercial and other service establishments (VSF, 1990). Each activity system was analyzed in terms of its population threshold and area requirements. To account for growth and change in facilities over a period of time, a population of 65,000 formed the basis to determine the total area requirements for various facilities and amenities (VSF, 1990).

Particulars	IDA's Proposal		VSF's Proposal	
	Area in Hectare	Percentage	Area in Hectares	Percentage
Net Planning area	88.75	100.00	88.75	100.00
Residential use	51.59	58.13	52.28	58.80
Roads	22.98	25.90	20.58	23.12
Open spaces	7.42	8.36	7.50	8.45
Social Facilities	5.07	5.72	6.05	6.81
Commercial	1.68	1.89	2.50	2.82
Total marketable	58.34	65.74	60.73	68.43
Total Non- Marketable	30.40	34.26	28.02	31.57

Fig 3.13: Proposed plot size distribution of Aranya township

VSF's proposal was much more efficient compared to IDA's proposal. They managed to increase the area provided for residential use, open spaces, social facilities, and commercial use by carefully reducing the circulation area.

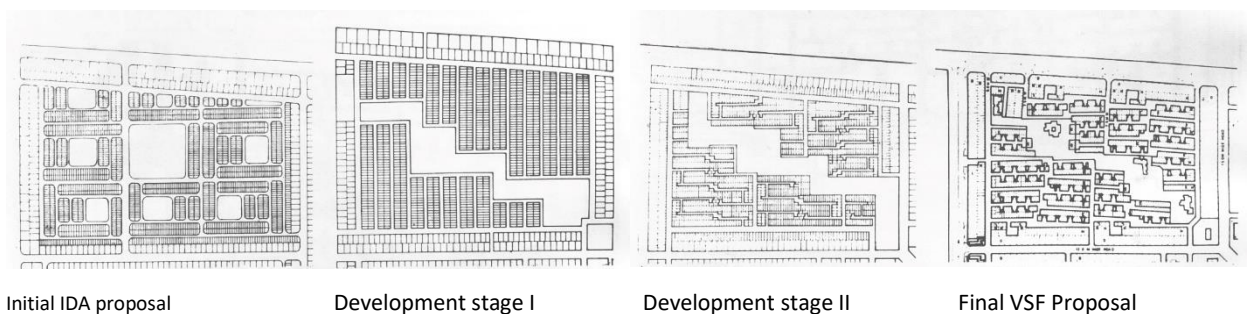


Fig. 3.14: Evolution of Aranya project proposal

Once the residential and activity structure of the township was determined, the next step in the planning process involved the spatial organization of the township.

3.6.2 Planning at the township level

Aranya was designed to give due importance to pedestrians and bicyclists while at the same time discouraging thorough vehicular traffic through the township. The location and form of various activities, the system of road network, open spaces and the nature of built form reflect this concept (Sharma & Mehta, 2007). Hence, accessibility in terms of walking distances from home to various activities became the prime measure of consideration at all levels.

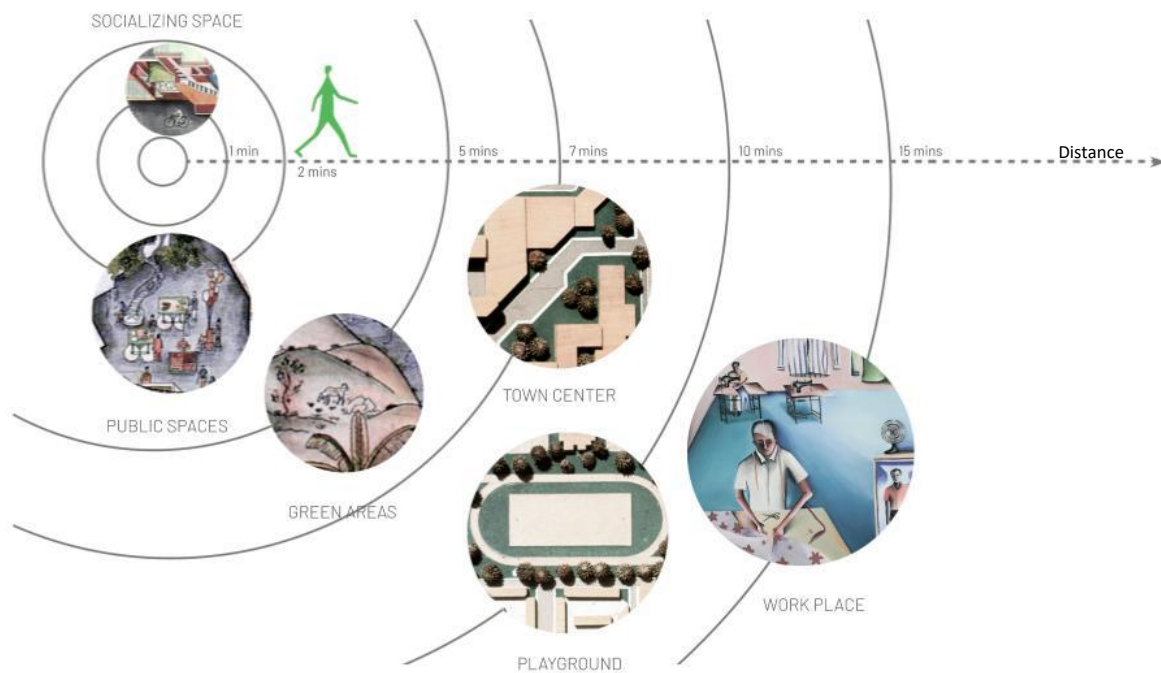


Fig 3.15: Levels of accessibility

Though Aranya had to fit within the urban fabric of Indore, it was designed so that it would acquire its own identity as a township in which social and economic activities could flourish. The multi-story commercial, residential and community complex was designed to rise above the low-rise housing to accentuate the physical as well as the functional center of the town (Badshah, 1992). In terms of linkages, a central activity spine was proposed that would pass through the town center, linking the north and south boundaries of the site. The vehicular and pedestrian networks, along with the system of open spaces were organized to converge at the town center binding the sectors with it. Similarly, the lower order facilities and amenities were organized to maintain a strong link with the town-center, while at the same time being evenly distributed throughout the township (Bhatt, 1990).

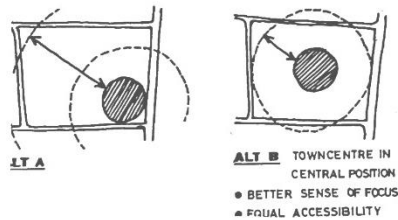


Fig 3.16: Location of town-center

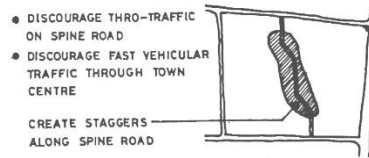


Fig 3.17: Linkages to town-center

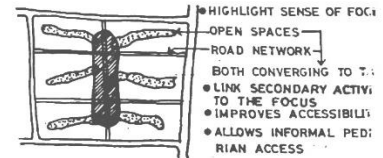


Fig 3.18: Concept of spatial organization

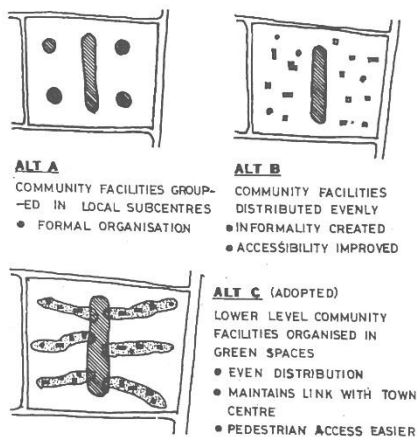


Fig 3.19: Distribution of lower-order facilities

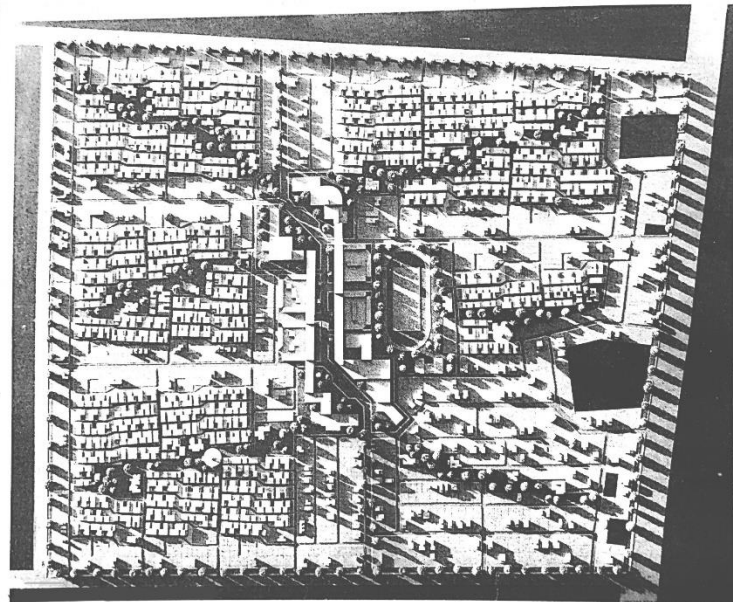


Fig 3.20: The Aranya township (photograph of model)

3.6.2.1 Road network

The system of road network was designed to follow a clear hierarchy in terms of width, linkages to various activities and the expected volume of traffic. The road network divided the township into six sectors. Both the central road and the sector roads incorporated staggers and twists to discourage thorough traffic. The central spine was proposed to be 15m wide with a bus stop and car parking, whereas the sector roads were 12 m wide which fed into the spine from the site boundaries (VSF, 1990). 9m wide collector roads were designed for vehicular traffic whereas 7.5 m and 6.1 m wide access roads lead to upper income dwellings (VSF, 1990). The 4.5 m wide EWS internal roads were largely for pedestrians and bicycles, but they were kept wide enough for emergency vehicles (VSF, 1990). The hierarchy in the road network was implicit in the organizational pattern, in which minor roads fed into local streets, which fed into arterial roads, which in turn fed into the city road network.

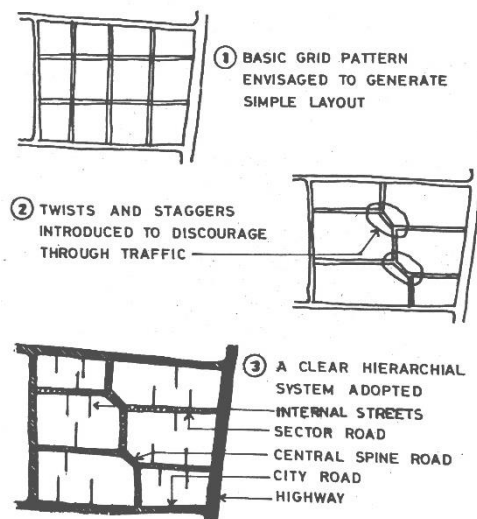


Fig 3.21: Basic road pattern

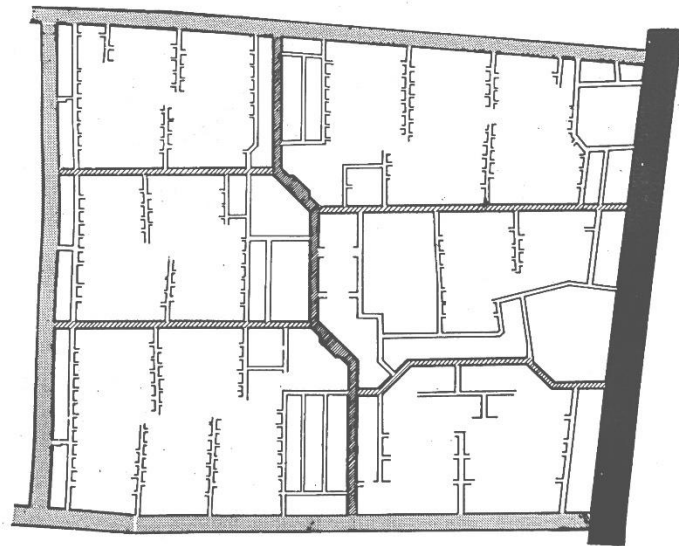


Fig 3.22: Hierarchy of road network

3.6.2.2 Distribution of Residential areas

The designers of Aranya adopted the concept of a balanced community where all groups were finely mixed and were members of a single community. However, the marketability of plots, especially bigger plots for upper income groups depended on the level of exclusiveness offered to them. Hence, larger plots were located in the south east corner of the site along the major highway in order to command better prices due to locational advantages (VSF, 1990).

All the other five sectors had a mix of income groups in established proportions. To avoid strict segregation of different income groups in these sectors, plots were arranged in concentric circles of diminishing sizes (Bhatt & Scriver, 1990). The outer rings of larger and more expensive plots had good vehicular access, while the lower income plots were clustered around open spaces with an emphasis on pedestrian traffic (VSF, 1990). The clustering pattern of the smaller plots reduced the effect of the high density while at the same time it took advantage of the lower site costs and encouraged social interaction.

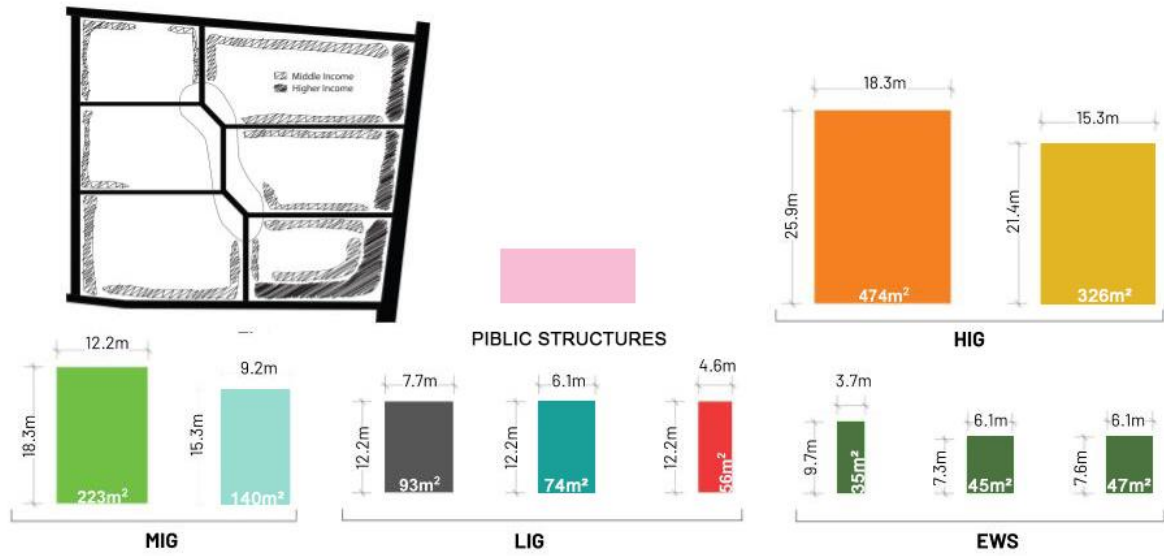


Fig 3.23: Plot sizes and plot distribution concept



Fig 3.24: Plot distribution in Aranya township

3.6.3 Planning at Sector Level

Each sector within the township was designed and developed as a self-sufficient community. Except for the sector located at the south east corner, all sectors had a mix of income groups in established proportions, the highest being that of EWS. The road network was carefully designed to define entry points in these sectors while at the same time discourage thorough traffic within them.

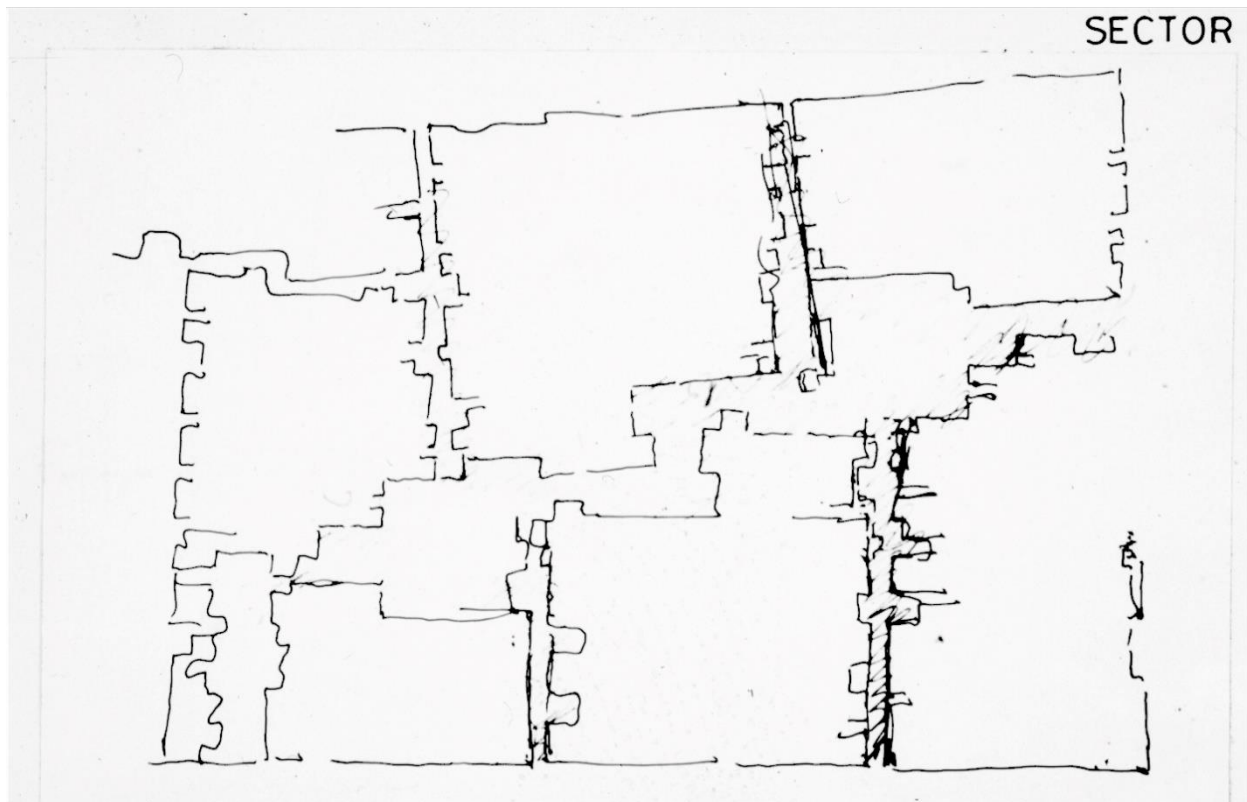


Fig. 3.25: Sketch by B.V. Doshi showing built up areas and open spaces within a sector

The open spaces within each sector were purposely organised in a linear way so as to lend a sense of continuity (VSF, 1990). These linear open spaces also acted as pedestrian pathways, short-circuiting the formal road pattern of the township. The green area within each sector further subdivided it into recognizably different spatial units while at the same time maintaining a strong link with the town center (VSF, 1990). Additionally, the pattern of open spaces and their distribution within each sector was closely interlinked with the location of various local facilities, amenities and the road network, which further helped to evolve a structure for the township (Sharma & Mehta, 2007). Thus, at the sector level, community activities were integrated with public spaces, putting the land to optimal use without loss of spaciousness. These linear open spaces were also linked to the housing clusters through smaller networks of public squares and street widenings, thus ensuring a proper hierarchical order.

In terms of the road network, a capillary system was adopted for the sector level roads. This formal vehicular network was complemented by a pedestrian network which linked all the service buildings and the town center. This was again based on a strong hierarchy, where each minor street was to terminate in the linear open space and connected to the whole only through a succession of merging branches. The road network thus developed enhanced visual character, addressed variation in topography, facilitated diagonal movements and excluded fast thorough traffic on internal streets (VSF, 1990).

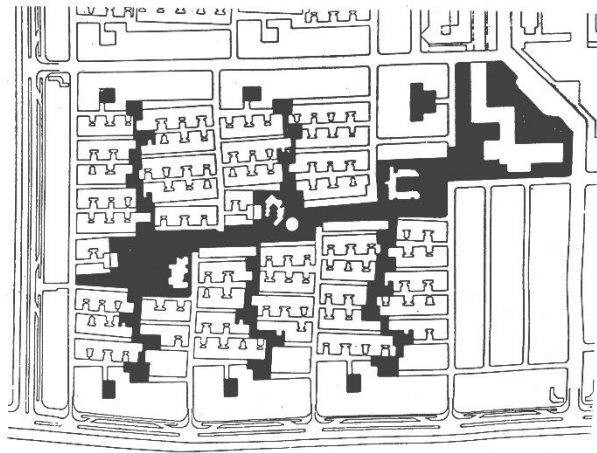


Fig. 3.26: Distribution of open spaces

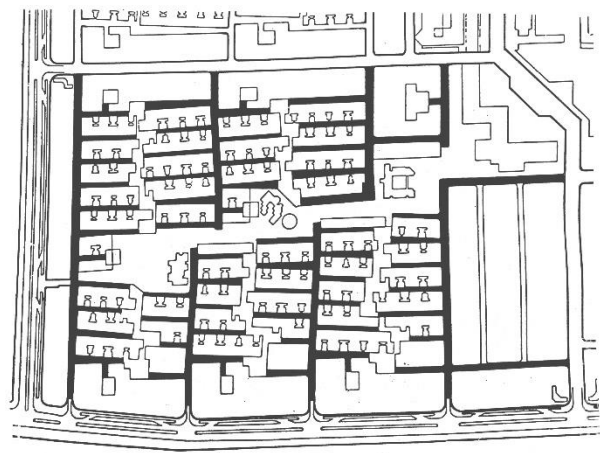


Fig. 3.27: Sector road network

Climate was another significant consideration at the sector level for providing a conducive living environment. Since the plots were designed as part of a row house development, the longer side of the row was given a north-south orientation to reduce solar radiation on the building facades (Sharma & Mehta, 2007). The plot sizes were worked out to accommodate semi-private open spaces within the built form. These semi-private open spaces were also oriented north-south in order to be adequately shaded by the adjoining buildings.

3.6.4 Planning at Cluster level

At the cluster level, a series of spatial hierarchies varying in scales were used to organise the layout. Encouraging social interaction and promoting spaces for income generation were two of the most important considerations for designing the clusters. Moreover, to impart a unique identity to each cluster, numerous public squares, landmarks, twists and staggers were incorporated in the street pattern (VSF, 1990).

A linear cluster model was developed, with groups of houses organised around small, semi-private spaces, which also acted as service lots, providing access and an efficient single connection point for water and sewage to as many as six units at a time (Bhatt & Scriver, 1990). This innovation further allowed for service mains to be carried only every second street and thus reducing the projected infrastructural costs by almost 30 percent (Bhatt & Scriver, 1990). In terms of social consequences, these semi-private spaces acted as safe-play areas for children while at the same time providing settings for social and domestic interaction.

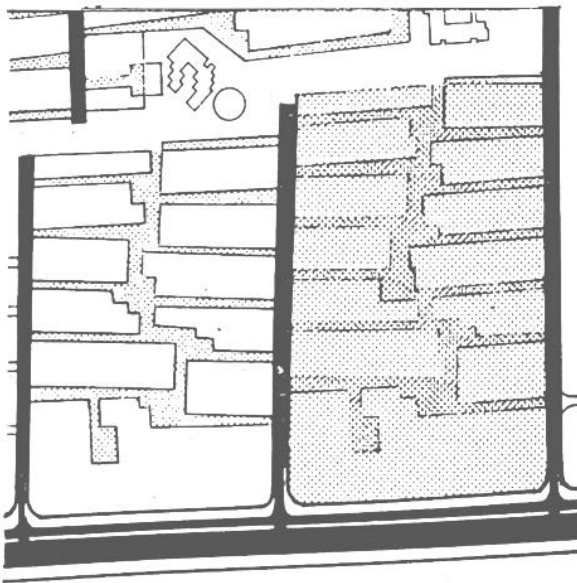


Fig. 3.28: Concept of a community

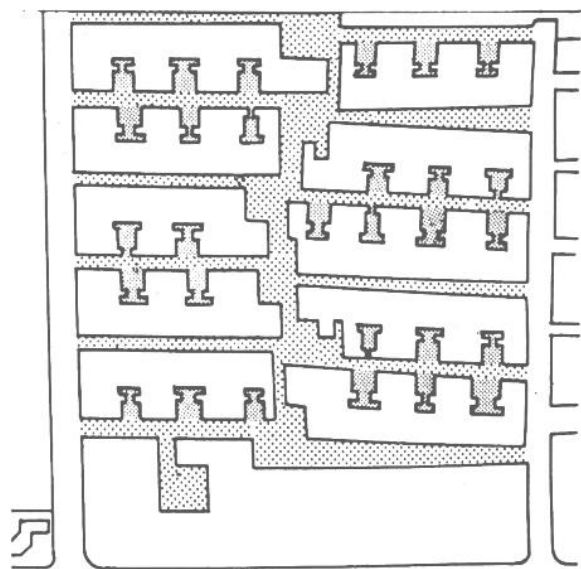


Fig. 3.29: Concept at street/cluster level

A flexible housing layout capable of accommodating income generating activities becomes an important consideration when designing low-income communities. In Aranya, this flexibility was provided through the organisation of public spaces. Income generating activities, in the form of small shops or work places located either at home or on spaces adjacent to houses were encouraged (VSF, 1990).

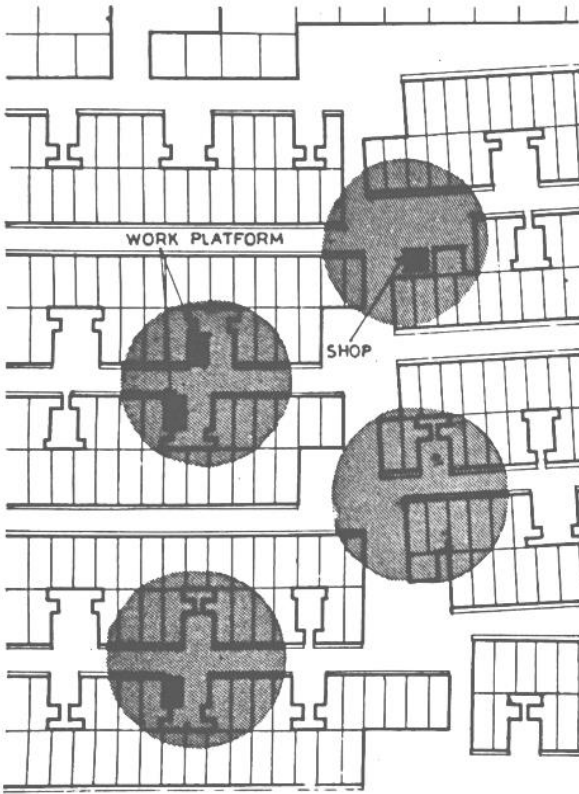


Fig. 3.30: Formation of clusters

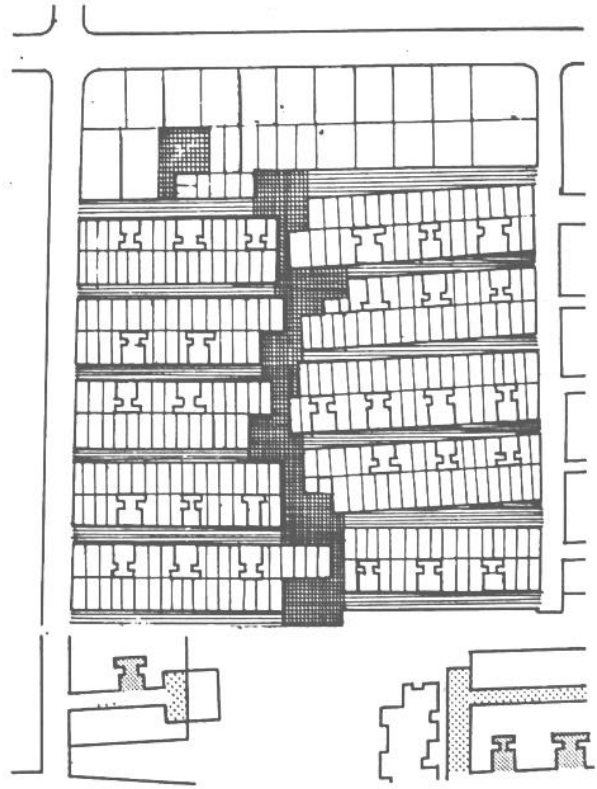


Fig. 3.31: Street pattern- cluster level

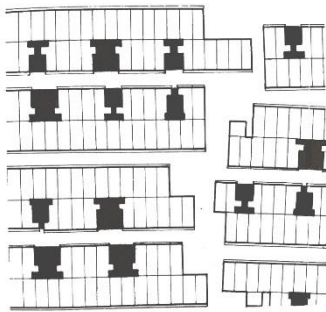


Fig. 3.32: Spaces for income generation

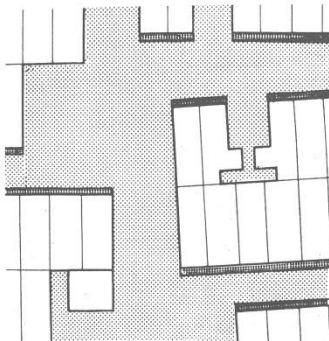


Fig. 3.33: Permissible extensions

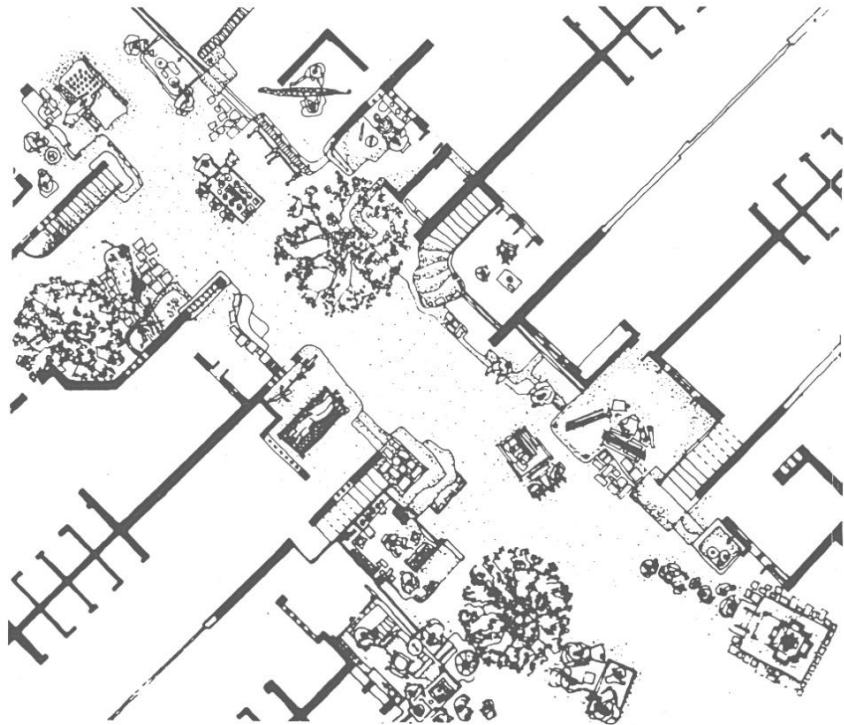


Fig. 3.34: Character of internal streets

3.6.5 Service Core

Water supply and sanitation constitute the major cost components of any sites and services scheme, making the design of the service core and the supporting infrastructure critical elements of the development. Provision of service infrastructure at the front face of the house was particularly avoided. Individual toilets and wash facilities for each dwelling were decided to be placed at the rear of the dwelling unit to isolate them from other household activities (VSF, 1990). In conventional approaches, this meant providing the main lines under the streets and running secondary service lines under the houses to reach the core. However, this wasn't a very efficient system. Another way was to provide main lines at the rear of the house, but this further posed issues of accessibility and maintenance of the service infrastructure. Ultimately, the designers of Aranya decided to eliminate one or two plots from the regular back-to-back configuration of plots in a block. These were to be service lots that allowed service lines from the cores to be kept short; manholes to be reduced to one per 18 dwellings; and the number of main service lines to be halved by providing them at every alternate street. For maximizing common walls and minimizing foundations, the service cores were grouped into fours over suspended platforms. The idea was to link maximum service cores to a single manhole to reduce cost and remove minimum number of EWS plots to accommodate service access alleys. Simple, repetitive, pre-cast components were used to encourage the 'self-help' spirit.

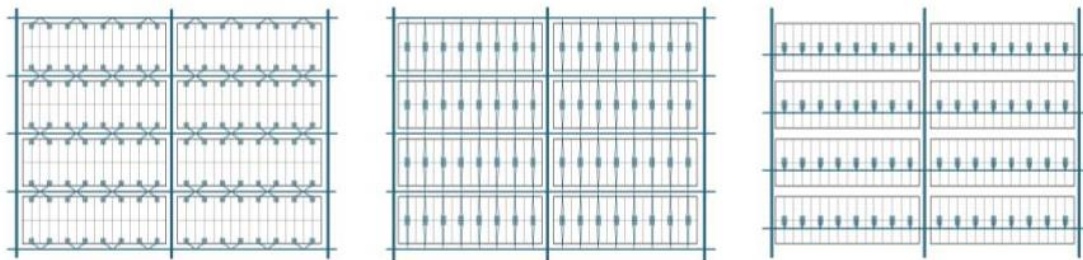


Fig. 3.35: Conventional service systems

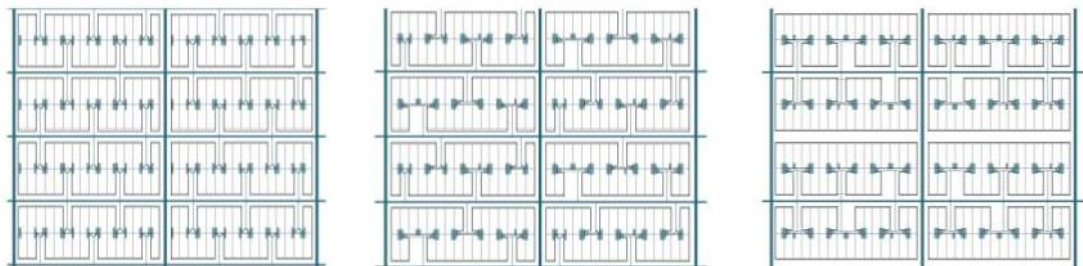


Fig. 3.36: Service system design development

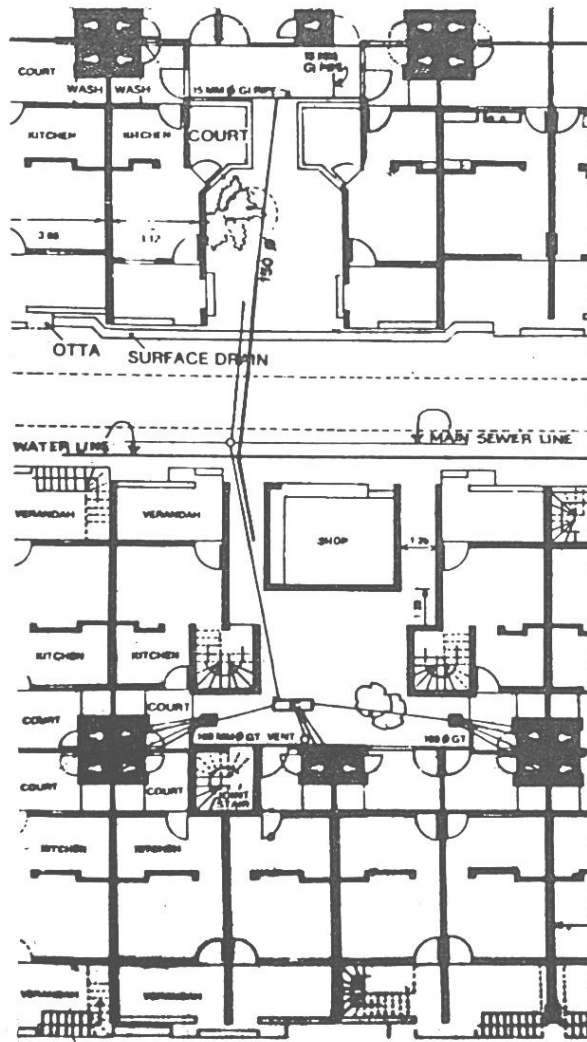


Fig. 3.37: Formation of Service cores



Fig. 3.38: Service core construction

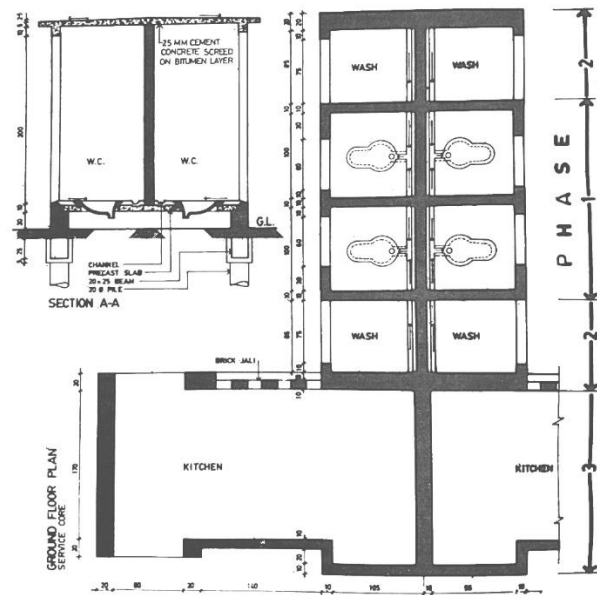


Fig. 3.39: Service core details



Fig. 3.40: Construction of Aranya



The following chapter will focus on the most important component of the Aranya township, the EWS dwelling with the aim of understanding its design and planning approach.

CHAPTER 4- EWS DWELLING

The design of EWS dwellings plays a crucial role in the success of Aranya township. Since it constitutes major portion of the project, it was carefully planned to suit its future clients- culturally, socially and economically. Most of the Aranya housing was envisaged to be plotted development. Since major portion of the population was going to be the EWS, a range of options were developed for them varying from site with a service core, kitchen and plinths. For the other income groups, only plots were to be sold.

4.1 House Form

The dwellings incorporated traditional design features to better suit the lifestyle of the people. To compensate for the small plot sizes of the EWS dwelling, inexpensive outdoor spaces were promoted such as platforms, porches, courtyards and roof terraces (VSF, 1990). A verandah or a house extension was considered a semi-public space which could be used for various work activities while a rear courtyard could become the more private domain of the house. Most of the houses were provided with an additional access at the back, which allowed them to keep vehicles or even rent a part of the house to augment income. It could also act as an access to upper floor extensions.

The internal subdivision of each dwelling was kept simple in order to provide maximum efficiency with minimum circulation space. The idea was to design a dwelling that could be easily enlarged and progressively upgraded. At the initial stage, the dwelling would consist of a basic service core and a room. This basic core could be merged into the future ground floor extension. Space was provided to accommodate a staircase in the front porch or the rear courtyard to provide access to the roof terrace which would eventually serve the first floor, built to cater to the growing needs of the family (VSF, 1990). The use of traditional elements like ottas, platforms, balconies, doors and windows were promoted in the same layout to impart a unique character to each house.

The house form was carefully considered to follow a gradual transition from public to private spaces. This began with the house extensions and the most public parts of the house and led to the more private areas such as toilets and rear yard. The spaces were so arranged that the house became progressively private.

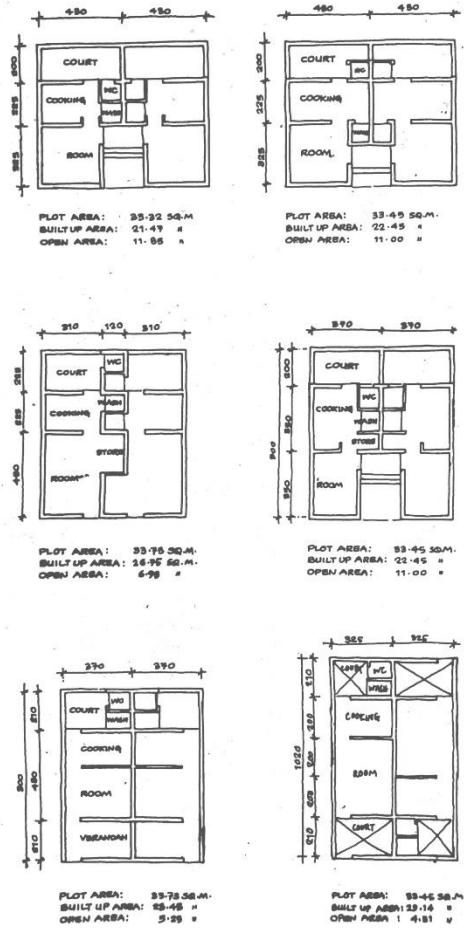


Fig. 4.1: Evolution of house form

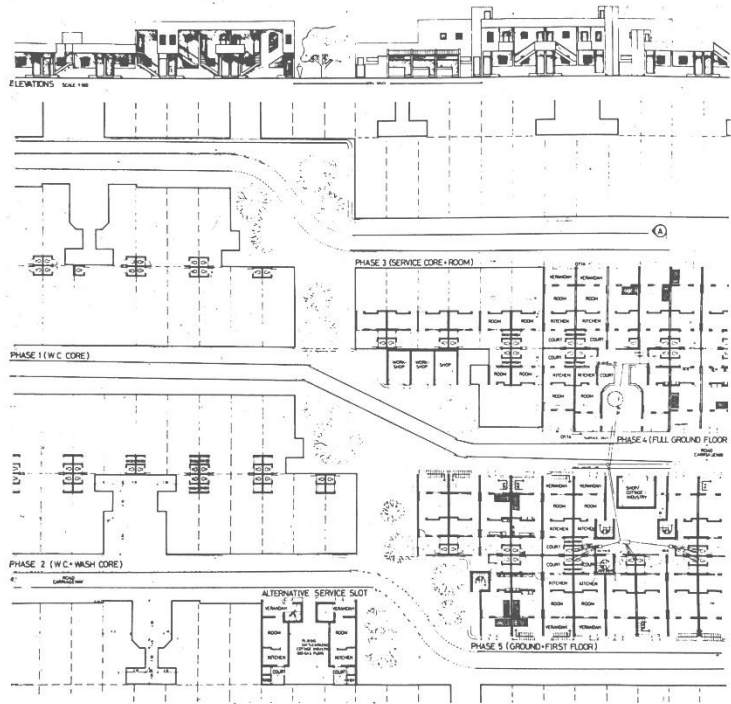


Fig. 4.2: Phases of development- House form



Fig. 4.3: Variations in house-form

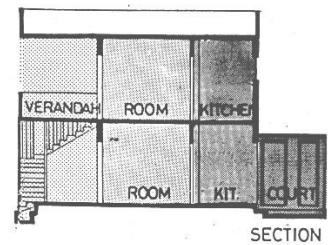


Fig. 4.4: Transition from public to private spaces within a house

4.2 Climate responsive design

Indore lies on a borderline between a humid subtropical climate and a tropical savanna climate. The major climatic factors affecting the nature of built form are solar radiation, ambient temperature, relative humidity, prevailing wind and rainfall (VSF, 1990). Hence, each dwelling was oriented to reduce the amount of incident solar radiation during summer days. The dwellings with narrow frontages facing north-south allowed for minimum exposure of wall surface, and thus prevent overheating (Ekram, 1995). Moreover, most houses had at least two faces to permit natural light and ventilation. The semi-private courtyards provided along the dwellings further helped in climate control. These spaces were effectively shaded by adjacent houses and remained relatively cool.

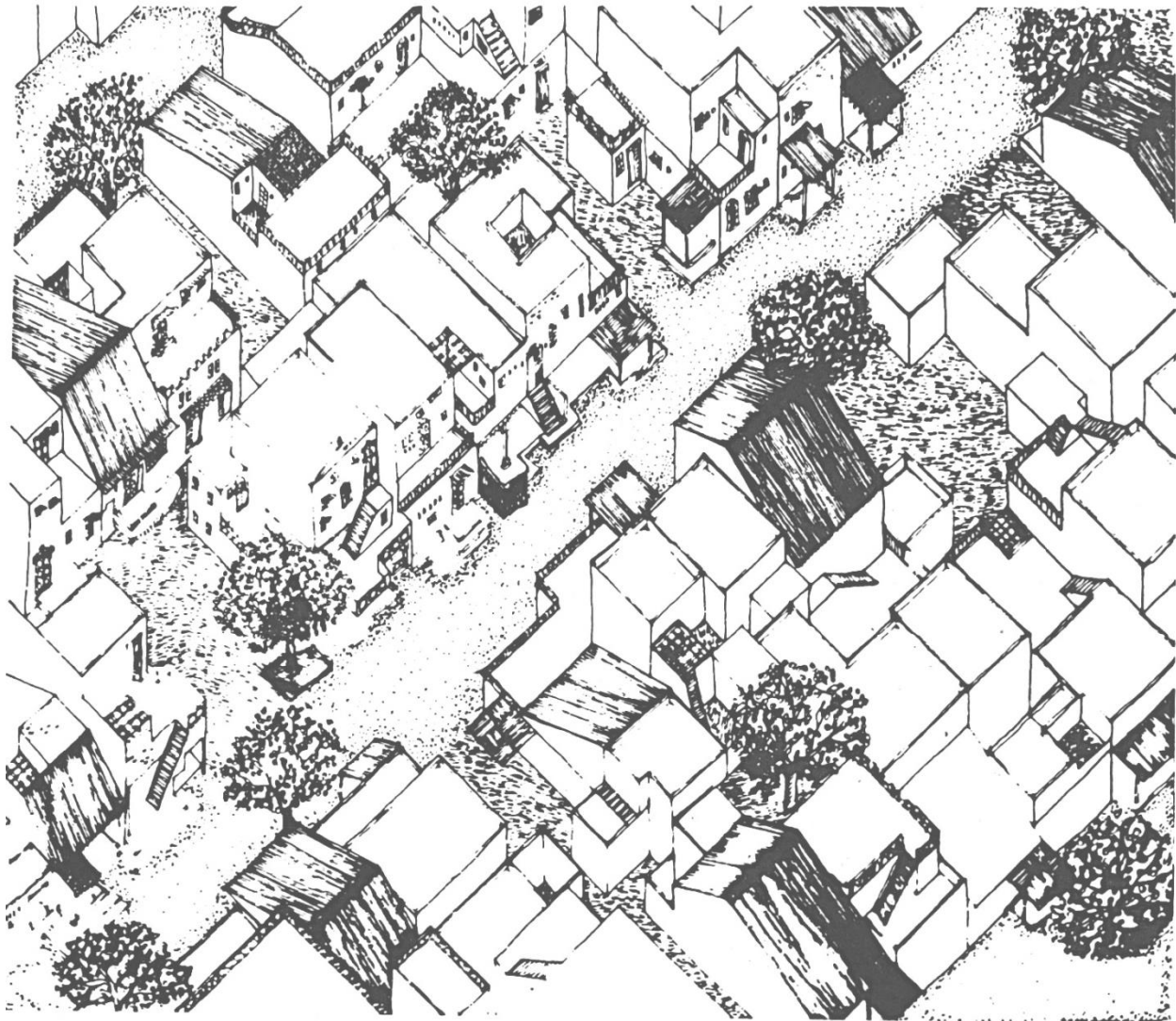


Fig. 4.5: character of built-form

4.3 House Extensions

The study “How the Other Half Builds” conducted on slums of Indore revealed that house extensions were an important part of the dwelling in informal settlements as they not only provided means to expand the house, but in doing so, they also enhanced the quality of the public space (Rybczynski et al., 1984). This significant, though often neglected feature of habitat planning was given due importance in the design of the EWS dwelling for Aranya. The nature of house extensions in several sites and services projects, in other planned housing projects and in informal settlements were studied to evolve and incorporate appropriate guidelines. This led to a modification in the conventional building and zoning regulations (VSF, 1990). A transition zone of 0.5m width was proposed between the street and the house to allow people to build house extensions. These permissible house extensions could be stoops, platforms, porches, balconies and open stairs, which would further help in creating an interesting street character (VSF, 1990).

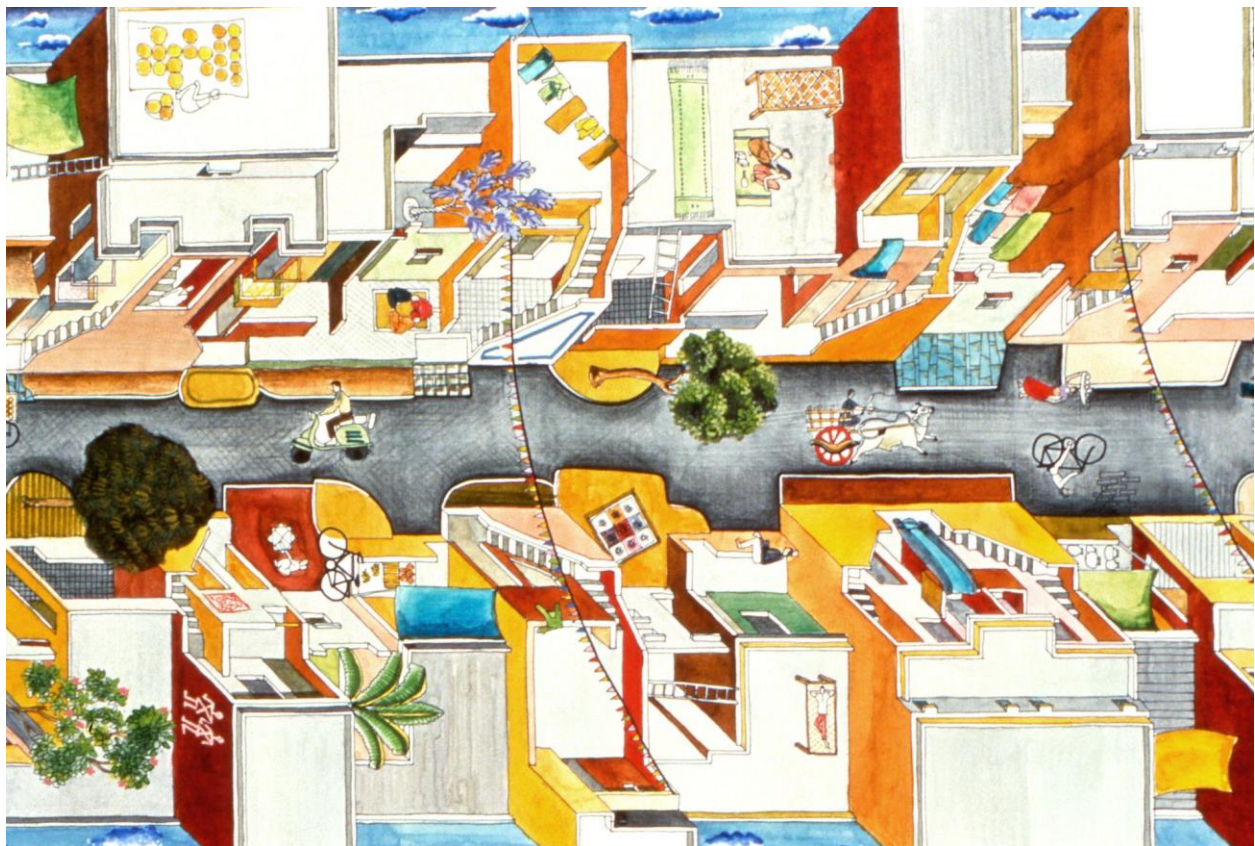


Fig. 4.6: Street character- house extensions

4.4 Efficient designing

The EWS dwellings were designed with narrow frontage and common party walls in order to use land more efficiently. The linear row house development optimised built-up areas in relation to plot areas and plinth parameters (VSF, 1990). The common party walls and the shared foundations further maximised efficiency in terms of cost.

An important consideration regarding the plot proportion and organisation was to reduce road lengths and thus infrastructure costs (VSF, 1990). A reduction in road lengths also allowed for an increase in the net area available for housing. Hence, Plots were designed narrow and deep to reduce the length of access roads. However, it was ensured that the proposed plot proportion allowed efficient house design and did not create residual spaces.

Another aspect influencing the plot proportion was the marketability of plots for higher income groups. Hence, the HIG plots were not made narrow and deep in order to avail better market prices.

4.5 Materials and Construction techniques

Conventional building materials and construction techniques were used in view of the standard tendering and contract letting processes adopted for the project. The structures were done in load bearing brick work. Wherever possible, boxed walls or single skin folded walls were used as load bearing members (VSF, 1990). Black cotton soil at the site required pile foundations, even for single or two-storied structures. Low-cost, hand augured, under-reamed piles were used.



Fig. 4.7: Construction of houses at Aranya

4.6 Dwelling Variation Designed by Center for Minimum Cost Housing, McGill University, Canada

The Center for Minimum Cost Housing at McGill University, Canada was closely involved in this project with B.V. Doshi's Vastu-Shilpa Foundation. Their studies were critical in evolving a framework for the Aranya township. In addition, the CMCH collaborated with Vastu-Shilpa Foundation to design a few clusters within the township. Advancing further on Doshi's approach, Prof. Vikram Bhatt and his team developed a scheme for the demonstration sector that strategically varied plot geometry, pattern, setbacks, frontage, and spaces to facilitate appropriation, house organisation and orientation. The EWS plot sizes were increased within this sector along with increasing the frontage of each plot by carefully reducing road widths (VSF, 1990). Instead of having just one type of EWS plot of 35 sqm which was long and narrow, a variety of EWS plots were considered.

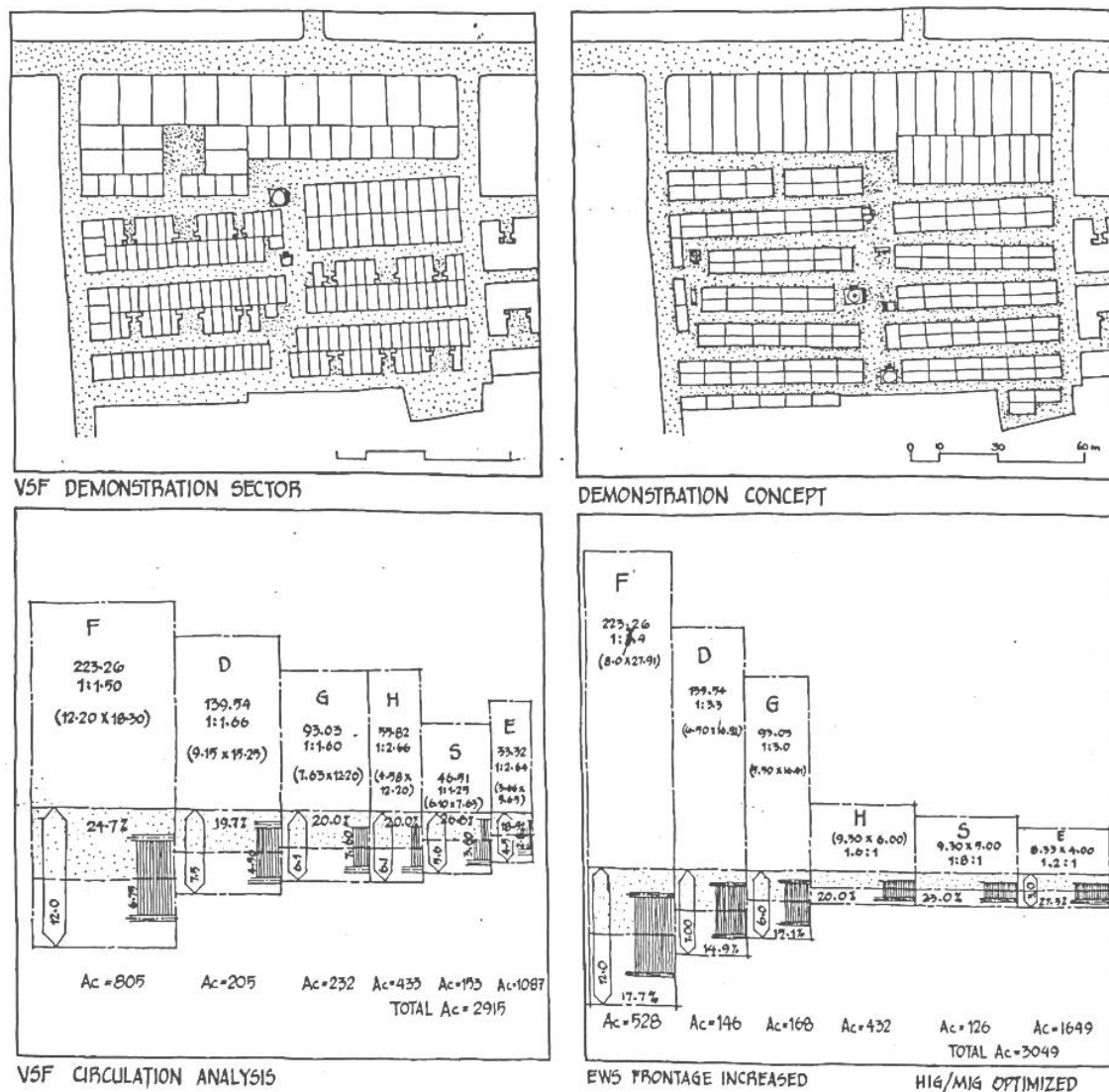


Fig. 4.8: Design concept

4.6.1 Reference and Studies

The design of this alternative layout was highly influenced by the study entitled “How the Other Half Builds, Volume 2”. The study is the second volume of the continuing series, part of the long-term research project- How the Other Half Builds- undertaken by McGill University’s Center for Minimum Cost Housing. It tried to understand how and why plots in informal settlements acquire certain physical characteristics by adopting a quantitative approach. The main aim of the study was to examine the physical characteristics of plots in informal settlements. Six settlements were surveyed in Indore, India based on the following aspects-

- **Area**
Determined by multiplying plot frontage by plot depth
- **Space**
Determined by dividing built plot area by the number of plot inhabitants
- **Ratio**
Determined by dividing built plot depth by built plot frontage
- **Frontage**
Determined by measuring that side of the plot that fronts on the main access street
- **Exposure**
Determined by counting the number of sides of the built plot that are contiguous to public open space

Eventually, a random sample of 200 plots was drawn to study in further detail. The sample was drawn proportionately to the number of plots in each slum. Since many of the plots considered for the study contained more than one family, the results were presented in two categories- single-family plots and multi-family plots. Frequency distribution graphs were drawn for each of the five plot characteristics studied. In addition to the above-mentioned plot characteristics, family income was also considered when analyzing the random sample and when looking at correlations.

The analysis of plot areas revealed that although the average plot area for the six settlements studied was 32.57 sqm, the actual areas of individual plots varied from 5 sqm to 200 sqm in the settlements, hinting designers to provide a variety of plot areas when designing for the poor to provide them with a wider range of options matching their individual family needs. The study of space availability highlighted a strong correlation between space and area for both single- and multi-family plots, indicating that

larger plots were generally not less crowded than smaller ones. This was an important consideration which influenced the decision to increase EWS plot sizes within the sector design by CMCH, McGill University. The analysis of plot ratios revealed a rather narrow range for the six settlements- between 1.07 to 2.05. There was no correlation between plot ratio and plot area of multi-family plots. However, there was a strong and direct correlation between plot ratio and built plot area for single family plots. According to the survey, the single-family plots grew towards the front or rear making larger plots acquire narrower proportions, whereas multi-family plots grew sideways, keeping a more constant ratio. Hence, the designers maintained the plot ratios within the same range for designing the alternative layout at Aranya. In terms of frontage, the average in the six settlements fell between 3.05m to 5.61m for single-family and multi-family plots respectively (total average was 4.78m). Hence, increasing the frontage of EWS houses was also an important consideration. The survey further indicated a clear pattern between the number of sides of the plot that were adjacent to public open space. Irrespective of plot area, plot ratio and plot frontage, the number of exposures fell between 2 to 3. This suggested that multiple exposure was an important plot characteristic. The fact that most plots in unplanned settlements had 2 to 3 sides adjacent to public open space demanded more open space than in planned settlements where almost all the plots were back-to-back houses with single frontages.

The study was crucial in understanding plot characteristics of unplanned settlements in Indore, India and proved to be a major influence in the design of the sector by Center for Minimum Cost Housing.

4.6.2 Design of Demonstration Scheme



Fig. 4.9: Site plan for demonstration sector designed by CMCH- land use

As mentioned above, the CMCH team believed that low-income people needed more frontage along with having multiple plot exposures because of their use of the street and to get the most use out of the plot allocated. Hence, EWS plots were made wider, and at times the longer sides of the plots were made to face the access streets. Furthermore, orienting more of the house to the street also allowed for more natural light and ventilation while at the same time making it appear much larger. Certainly, such modifications would reduce the efficiency of the street layout. Hence, to offset this imbalance, the plot sizes of all income groups in the demonstration were revised.



Fig. 4.10: Detail layout

The CMCH designed the Higher Income Plots narrower and deeper to further optimise on road lengths and infrastructure costs (VSF, 1990).

This variation in design of the dwellings and the cluster designed by CMCH provided the people, particularly of the low-income strata with a wider range of opportunities to develop their own house.

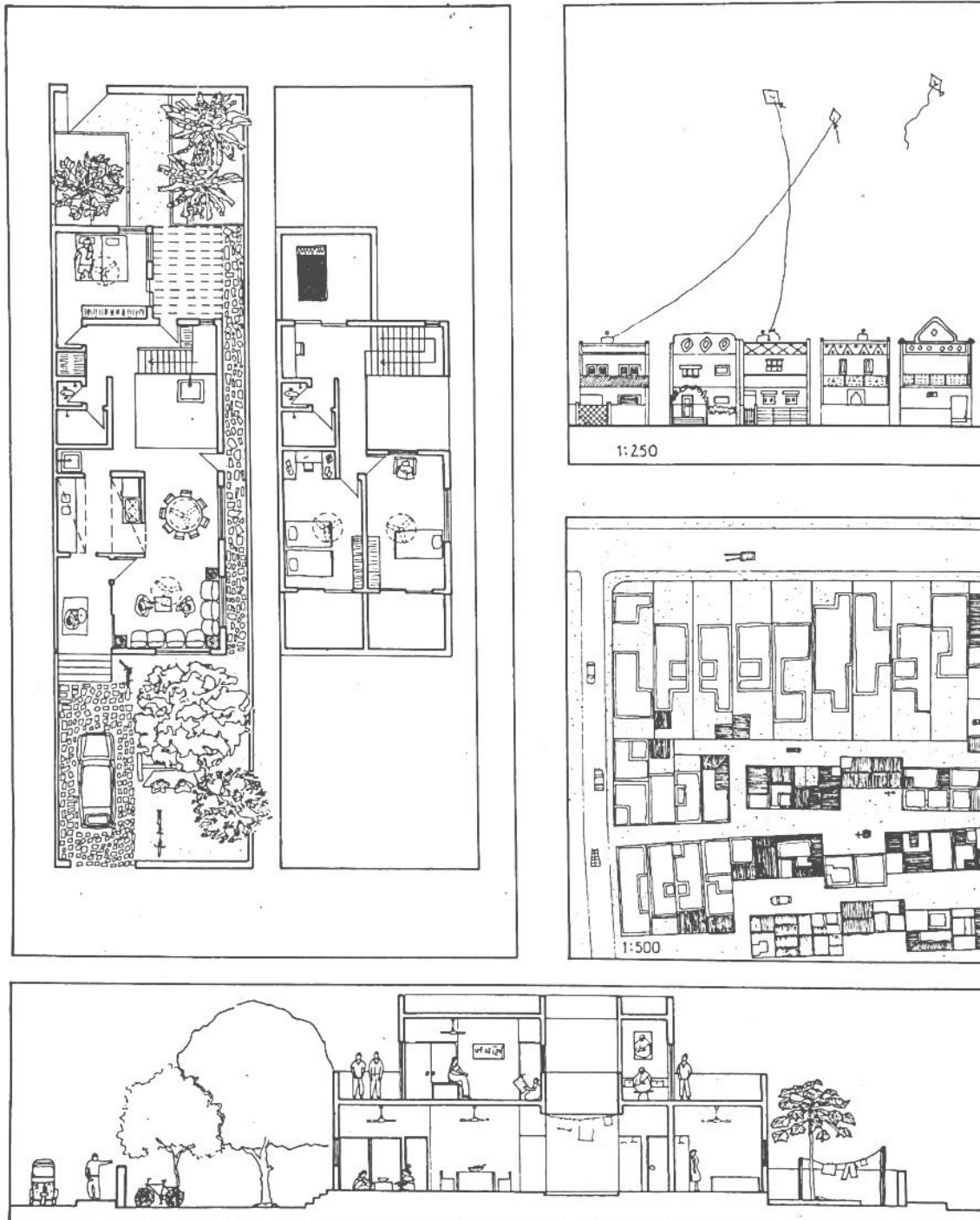


Fig. 4.11: Typical HIG unit (Type F)

CHAPTER 5 CASE STUDY

5.1 Introduction

"If you empower people, then what happens is that it creates incentives for people that are self-generated. The promise of a home is not a limited hope, but the sky becomes the limit."

-B.V. Doshi (as cited in Beaumont, 2018)

Architect B.V. Doshi's settlement plan for Aranya created a new role for an architect in housing- a supporter of people's initiative to build for themselves. The progressive housing project at Aranya provided an urban armature where a variety of open spaces and pedestrian pathways intersect and link residential clusters to a central spine. Intelligent site planning along with the creation of mechanisms to encourage people in their own efforts, Doshi structured space to address community issues and strengthen a social framework (Beaumont, 2018).

After almost 30 years since its inception, one would expect Aranya to look different, but that it could have transformed so much appears quite incredible. It seems that everybody has now modified the mere 'service cores' provided by the designers into an unbelievable housing stock exhibiting overwhelming variety in color, form, and material. The residents of Aranya were able to leverage the modest formal sector investments many times over. In addition to managing and designing their own homes, the residents have also created places of work, business, rental properties, and in numerous cases, additional housing on their plots.

This chapter focuses on the EWS houses surveyed in Aranya township with the aim of exploring how the occupants took advantage of the plan variations and locations of their plots and how these variations are reflected in the actual design and layout of individual dwellings.





Fig 5.1: Aranya township, 2018.

5.2 Methodology/ Procedure

The first step of the survey was to select the houses to be studied in detail. For this purpose, two segments within the Aranya township were selected; one designed by architect B.V Doshi and the other designed by CMCH, McGill University, Canada. After having chosen the clusters, the houses were sequentially numbered, so as not to use any identifying information. Within each cluster, plots were categorized based on plot exposure and frontage. Plots were selected from different categories. This method allowed for variations in the plots selected.

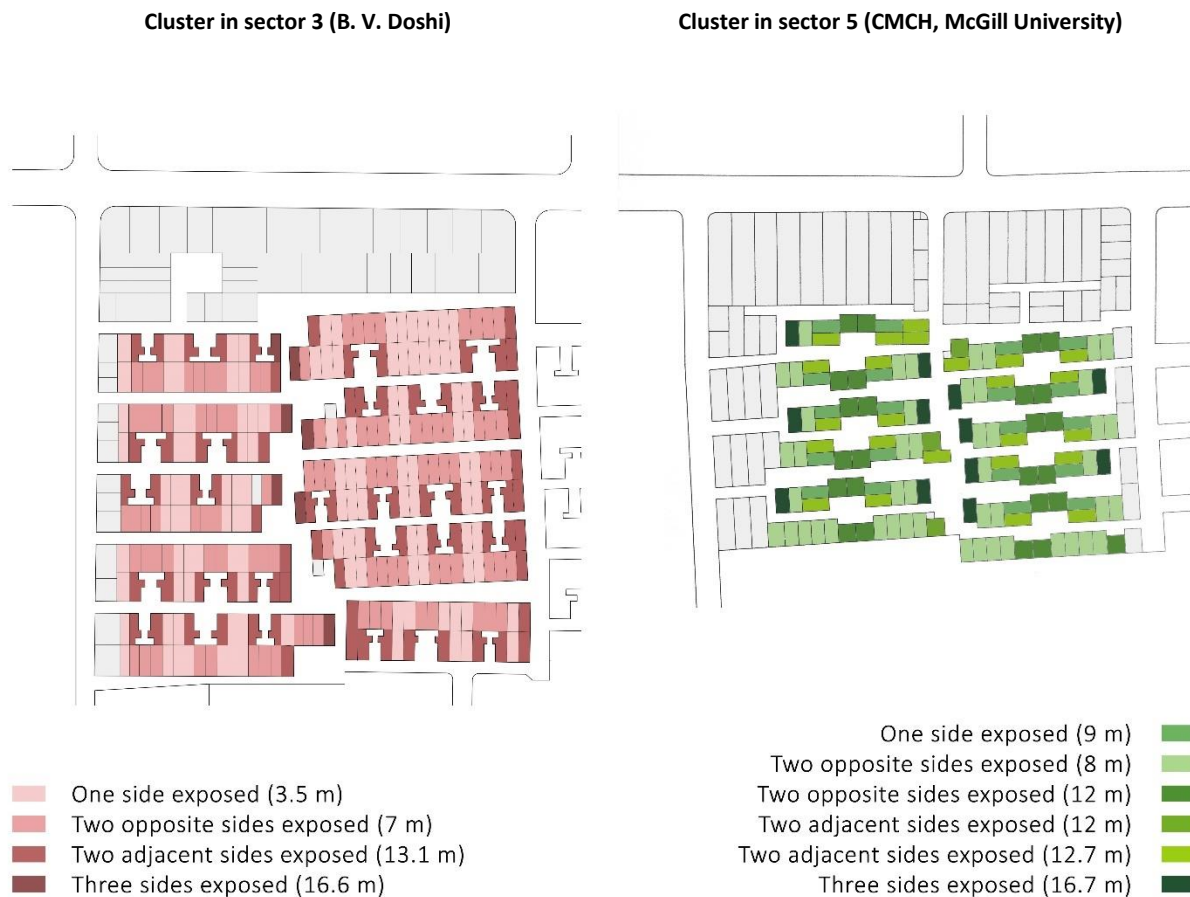


Fig 5.2: Categorization of plots based on exposure and frontage.

After having categorized the plots, I approached the respective owners/ residents by visiting their homes. I introduced myself and verbally elaborated on the purpose of my research. I briefly informed them about the questions included in the interview to make them aware about the nature of interaction that would occur. After doing so, I provided them with a written consent form to sign if they were willing to participate in the study. Once I had the permission of the home owner, I proceeded with the interviews.

A set of open-ended questions were prepared to help better understand the design processes carried out by the residents. The open-ended formats avoid influencing answers of the participants and helps gain valuable information as the participants are free to express what they feel and what they think. A sample of questions that were asked is provided below. After completing the interview, I drew the plan of their homes and clicked photographs for observation. The combination of different data collection methods allowed me to gather a significant amount of information. Since the research dealt with understanding the plan of the dwelling, it took place both inside and outside the participants home entirely on a voluntary basis.

Sample questions-

- a) How long have you been living in Aranya?
- b) How did you construct your house? Were you involved in the building process or did you hire a contractor/builder?
- c) When did you add the last floor to your house or made the last modification?
- d) Is there anything that you believe could have been designed differently? For example, the size, frontage, orientation?
- e) Given a choice, would you choose a different plot within Aranya? If Yes, why?
- f) How do you find the design of the township?
- g) How do you use the open spaces in Aranya, such as streets, public squares and green corridor?
- h) Do you think the design of the township responds to your needs, if yes how?

Most interaction with the residents took place in Hindi language. The extracts of the interviews that are used in the study are my translations. I have tried to translate the interviews to the best of my ability. Being from India and knowing the language well, I had a great advantage.

The survey was carried out over a span of 4 days, starting December 17, 2018 to December 20, 2018. Since my time in Aranya was limited, I used to start my day as early as 7 am and walk within the selected clusters and the rest of the township until at least 7 pm. This way it was possible not to have to sacrifice the universal quality of 'living' as revealed by the day to day activities of the residents. To be completely prepared and use my time at Aranya efficiently, the categorization of houses was done prior to arriving in Indore based on the master plan of Aranya. Moreover, since the sizes of the EWS dwellings were already known, I carried a base map with the outline of the plot already drawn. This made the documentation process quick and relatively easy. The average time for the entire interaction was about

twenty to twenty-five minutes. However, there were some cases where the interaction lasted for about forty-five minutes because the participants wished to add free comments and were encouraged to do so.

5.2.2 Potential harms and risks of the survey

There were no harms caused during the survey. Since the interviews and documentation took place within the home of the participant, there were negligible chances of the participant getting subjected to any harm or feeling uncomfortable or isolated. Furthermore, I took tutorials on conducting interviews to be better trained as a researcher and as an investigator. Even the questions used for the interviews were very generic to not cause any harm to the participant.

5.2.2 Privacy and confidentiality of data collected

No personal identifying information such as names or addresses are used or published in the study. The photographs were clicked carefully to not include the participant or the address of the house. All data was stored in a password protected laptop and hard drive. All houses observed or photographed were numbered A01, A02, A03 or B01, B02, B03 and so on depending on the sector surveyed to avoid the use of addresses, names or any kinds of identifiable data. A similar system was used for human participants. No real names were used, and data was recorded as AR01, AR02 or BR01, BR02 and so on based on the two sectors studied. The survey strictly dealt with the design of the dwellings and not with the identity of the residents.

5.3 Case studies

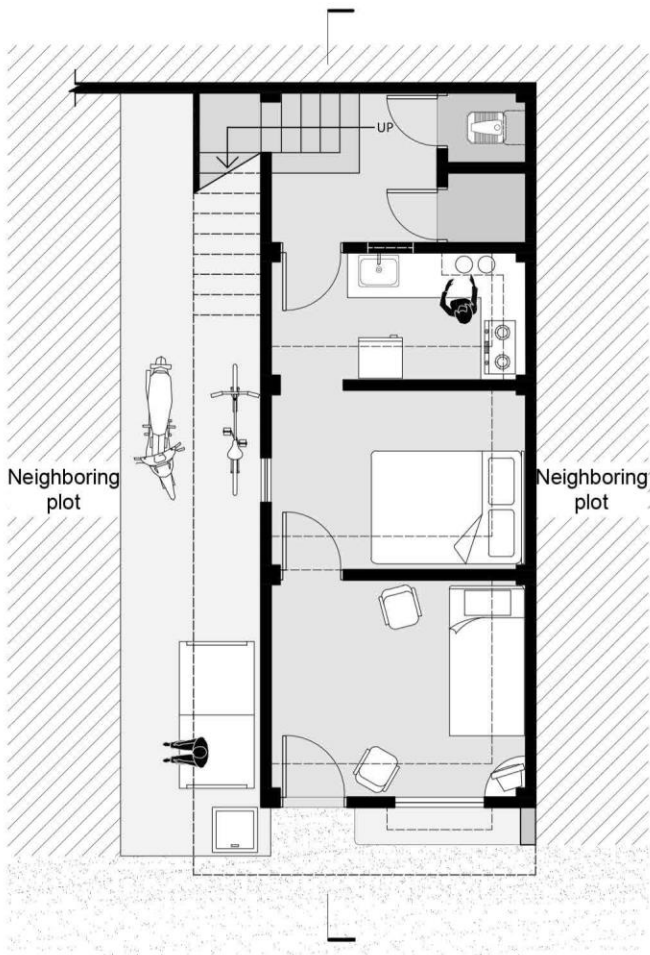
This section discusses the design of the individual dwellings and highlights resident's responses to the design of their individual plots and the design of the township. The extracts from the interviews have been set in from the margin of the text and are, therefore, clearly discernible. All plans included in this section are presented north up. I will follow a similar pattern as I followed in chapter 4, presenting the houses studied in the clusters designed by architect B.V. Doshi first, followed by the houses studied in the clusters designed by CMCH, McGill University.

5.3.1 Cluster surveyed in Sector designed by B.V. Doshi

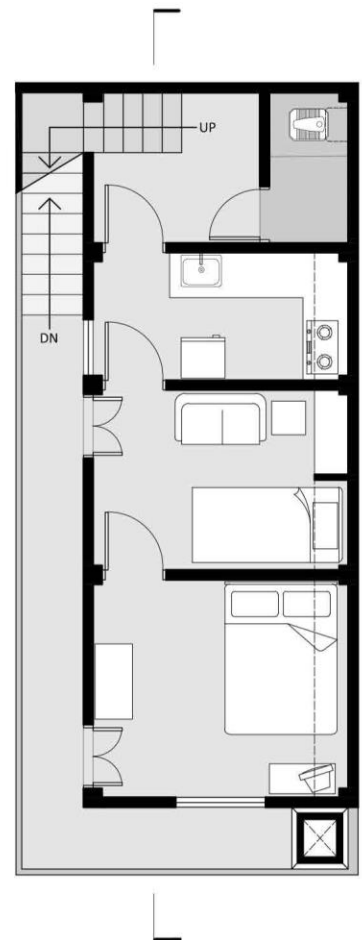
A01



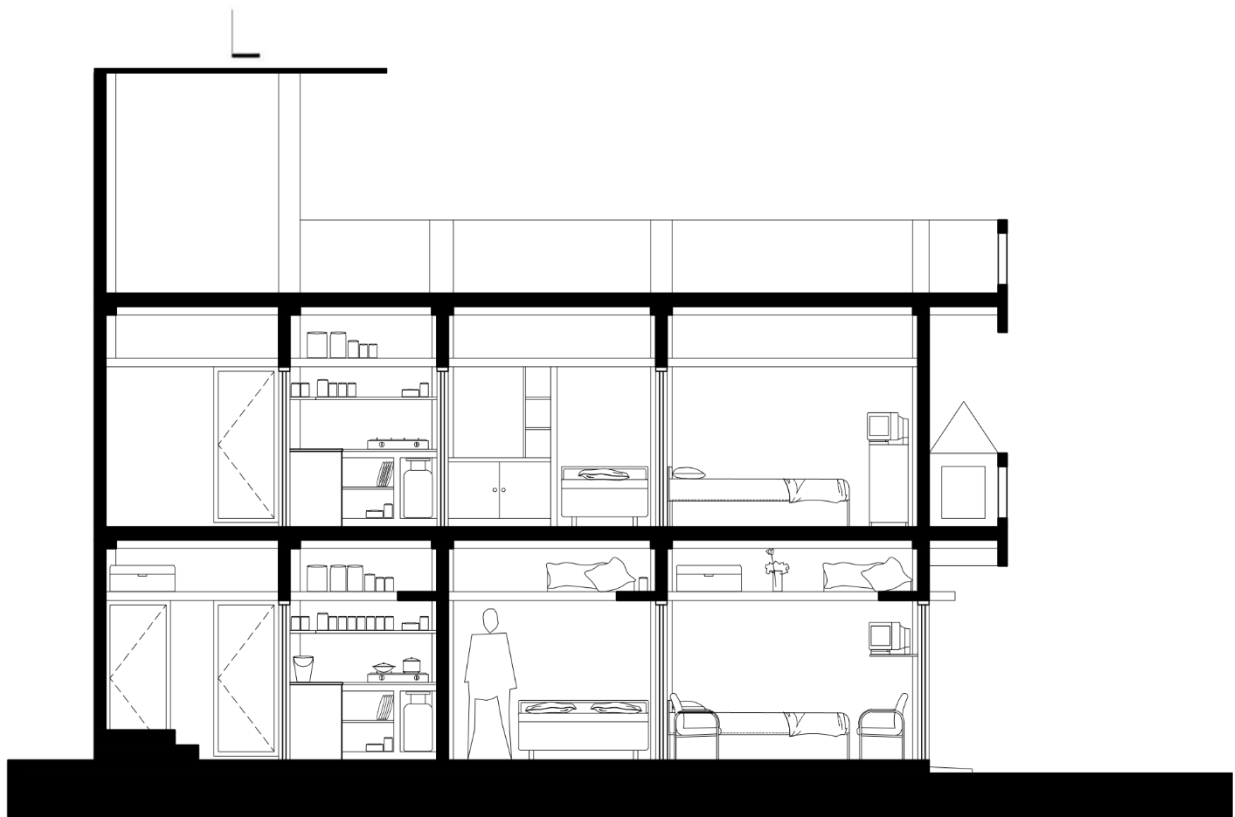
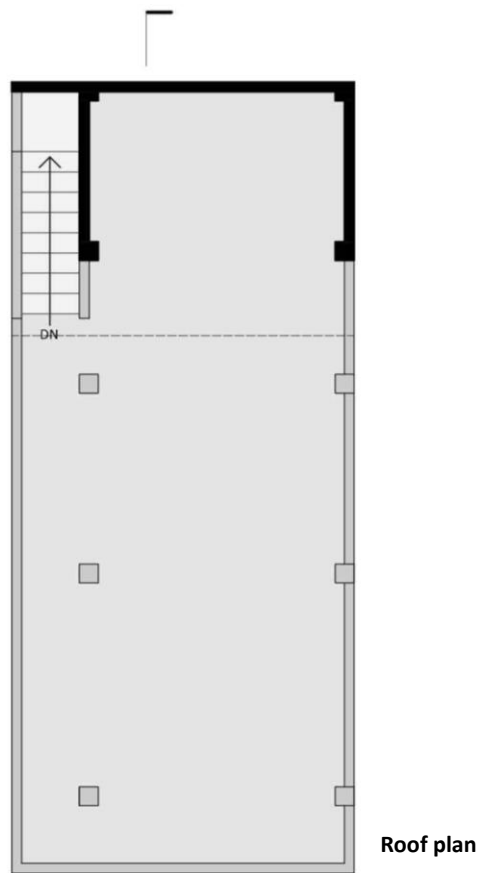
Context plan



Ground floor plan



First floor plan



Cross section

Fig 5.3: Plot A01

This was one of the first houses that I encountered when I arrived in the area. Located at the far end of the street that fed from the southern boundary road, the house was located adjacent to a service lot. It was inhabited by a family of five people, with the parents occupying the ground floor and the son, his wife and their daughter occupying the floor on top. The plot was owned by the eldest male in the family, though he was not the first owner of it. The family had purchased the plot around 2001-2002. Since I interacted with the daughter-in-law of the owner, the exact moving date was not known. I had initially gone to survey the house on the other side of the service lot. As I discussed my research and survey intentions with the people of the neighboring house, the lady from plot A01 overheard our conversation. After seeing that I was denied permission by her neighbors, the curious lady approached me to know more about my research and my purpose for being in the area. Being extremely kind, she agreed to have a conversation with me and show me around her house.

To my surprise, nobody who inhabited the house was inside it when I arrived. The owner and his son had gone to work. The owner's granddaughter had gone to school. The wife was busy bargaining with the street vendor and the daughter-in-law, who was conversing with me, was drying clothes in the service lot adjacent to the house. The layout of the house was almost exactly as one would imagine after looking at the design proposal for Aranya, or probably more. The plot was located next to a service lot, with its southern side facing the street and the western side facing the service lot. The family had created stoops or extensions on both exposed sides of the house. A foldable bed was placed on the extension that faced the service lot and remained shaded during most hours of the day. The same platform accommodated an underground water tank to store water. In addition to being a sitting or resting space, the extensions also acted as a parking space, a place for drying clothes or having an interaction with street vendors and neighbors.

AR01- We spend a lot of time outside the house... But it doesn't feel like we are outside you know. We wash the clothes inside and come to dry them outside. After completing the morning chores of the house, we usually come out to have tea with our neighbors. It is also the time for the vegetable vendor to come so we usually only go back inside after buying our vegetables. The afternoons we spend inside, mostly resting. Then in the evening, after my husband and his father come back from work, they prefer to have tea outside while our daughter plays with other children on the street.

One doesn't need to be a professional architect to realize the importance of these semi-public extensions and how extensively the family uses it. Almost the entire interaction that I had with this lady

concerning her home happened on the front extension. It is a space that is physically outside in the public realm yet confines to social norms of safety and privacy. The lady went on to explain how the family had intentions of expanding the house by adding another story.

AR01- We do plan to extend the house. But not anytime soon. Maybe after 10 years... When our daughter is 16-17 years old. We can add another story and sublet it. This way we will be able to pay for her education and marriage, or at least some of it. Right now, it is open with just a temporary roof over the backside and the staircase. We use it mostly on Independence Day!

The last sentence was meant as a joke, referring to the kite flying tradition that takes place on 15th August on India's Independence Day. After our conversation on the platform, the lady gave me a tour of the house.

The house had a simple layout, almost identical to what the designers of Aranya had envisaged. It became gradually private as one moved through it, starting from the living room, to the bedroom, to the kitchen and finally, to the toilet and wash spaces. A series of steps from the service core provided access to the upper floor which had an identical layout. However, on this floor, the room in the center served as the living room while the room facing the street was the bedroom. The family had also established a small temple on the front balcony of this floor. Being adjacent to the service lot, the balcony wrapped the house on the western and southern facades. Both the living room and the bedroom on the first floor had doors opening onto this balcony which acted as a circulation gallery.

In terms of efficiency, not an inch was wasted in the house. Every room had overhead shelves built into the wall, the first step of the stairs was extended to act as sitting platform within the house, and the treads were kept narrow while the risers were kept high to fit the staircase within a small area. The bedroom on the ground floor had a latticed window on the western wall, while the rooms on the upper floor had doors on the same façade which opened onto the balcony. The house was breezy and adequately lit, while having a satisfactory size. Moreover, it was still in process, with the family having intentions to expand it further.

AR01- I don't have any problem with the size or the design of the house. The interiors are pleasant. I don't think it requires any more openings... too many of them would make it hot during the summers. So yes, I would say I am happy with the current situation. I wouldn't want to change my house, except if we had a big plot like the ones at the main road

(referring to the HIG plots along the boundary road). We have a temple in front of the house, a variety of shops just in the next street, a park for our children to play, what else do we need! Water is sometimes a problem, but that is different.

The lady seemed satisfied with the house and the housing environment. Shops, open spaces, public or religious structures, were all mentioned as attractive qualities in the neighborhood and in fact, they were!



Fig 5.4: Residence A01- exteriors.

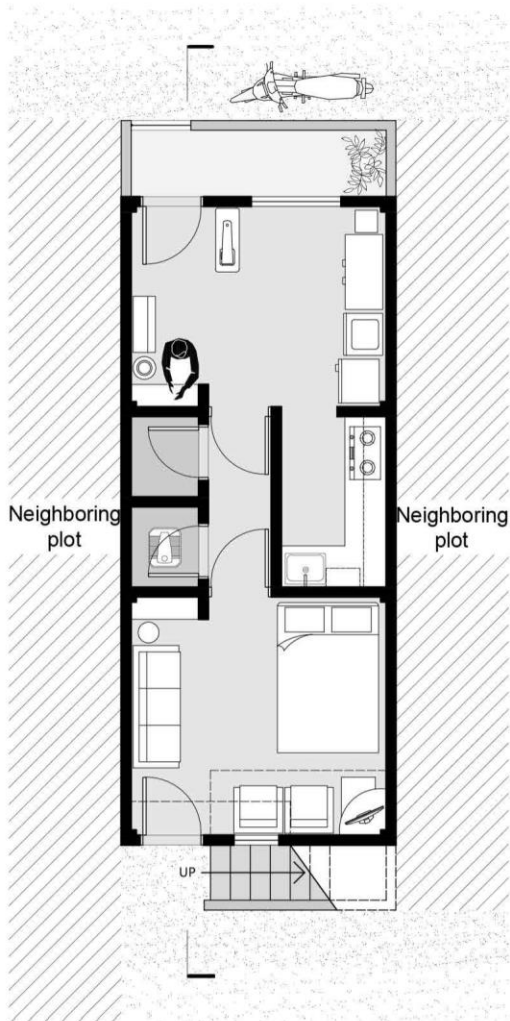
(left)- The image shows the service lot adjacent to the surveyed house, which is on the right side. One can see how the two neighboring houses have merged their extensions. The resulting space is used for parking, resting, and drying clothes along with accommodating an underground water tank.

(right)- The image shows the stoop extended on the front side of the house. It also highlights the balcony which acts a circulation gallery on the upper floor. The small temple established at the end of the balcony is also visible in the image.

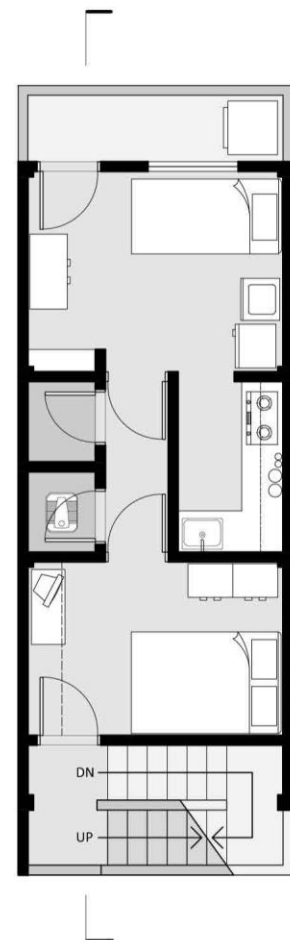
A02



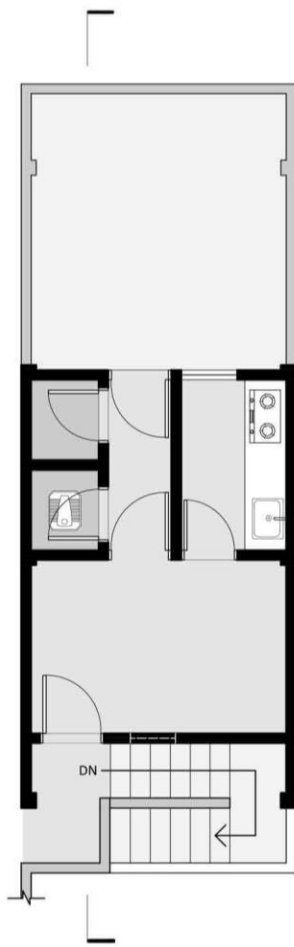
Context plan



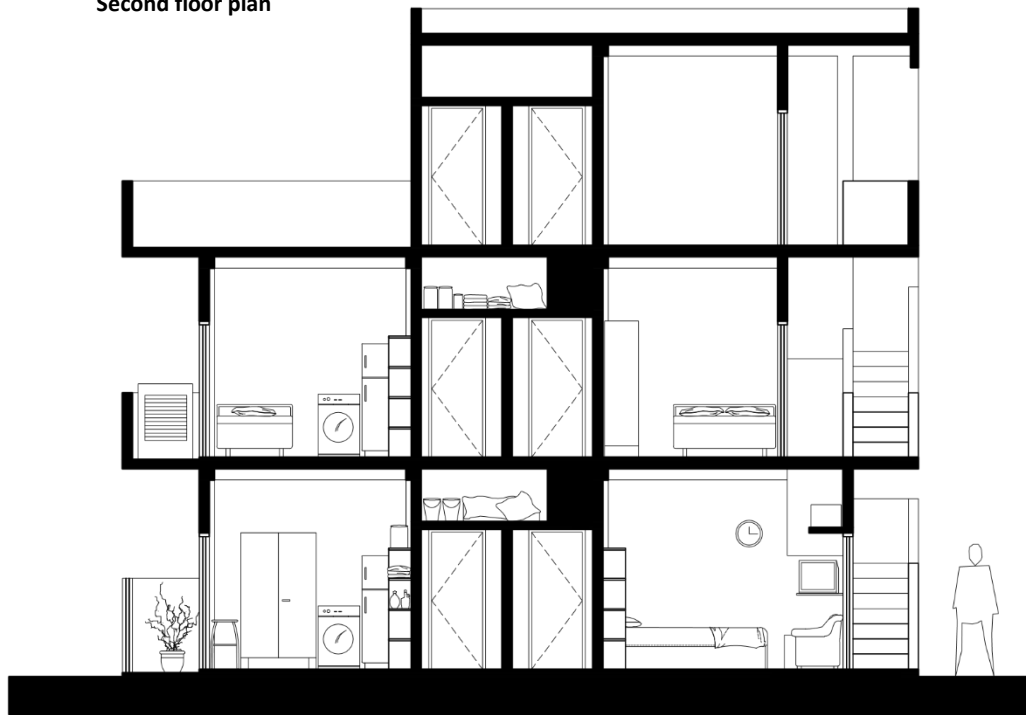
Ground floor plan



First floor plan



Second floor plan



Cross section

Fig 5.5: Plot A02

The second house I surveyed was sandwiched between two other houses, with its north facade facing the street and the south facade facing the service lot. This dwelling was similar to an apartment building, having three floors, each owned or rented by a different family. I interacted with the residents of the ground floor as they were sitting outside on their foldable beds in the service lot, relaxing in the winter sun while enjoying some snacks and tea with their neighbors. The family, consisting of three people, moved to this apartment in 2011. I interacted with the lady while her husband was away for work and her daughter had gone to school. She told me that the parents of her husband lived in Aranya as well, residing with the eldest son in sector 1, though she came from another part of the city. She told me she had never met the original owner of the plot as her husband's family took care of all the legal formalities. The ground and first floor were owned by two different families, while the third floor was still owned by the original owner of the plot who had now rented it to a young couple.

AR02- We used to live with my husbands' parents in sector 1. Their family had bought this house before we got married around 2006-2007. We moved here in 2011. My husbands' elder brother and his children still live in sector 1. So, we don't have to worry about the parents. We like it here, having our own space. We know most people in the neighborhood now.

AR02- We didn't really make many changes to the house except painting the walls. We find the space sufficient for us. Since our daughter is very young, we all sleep together in the same room. We use the other room to sleep if we have guests. In that scenario we give the main room to them since there is only one bed. We don't really plan to expand the house. We don't even have space for it now, except for covering the front yard, but we don't intend to. Maybe our daughter can use the other room when she is old enough. But we haven't really thought about these things for now. We are a small family and the house seems to be enough for us.

The house had a simple layout. To my surprise, the position of the service core was moved from its original location. It was no longer situated at the rear end, but in the center of the house. I entered the house from the southern façade, into the living room. This room was also used as the main bedroom by the family. From this room I entered a narrow passageway as I moved forward, which had the toilet and wash spaces on one side and the kitchen on the other. Though located opposite the toilet, the kitchen had access from the room ahead and not through the passageway. The last room facing the street was a multipurpose room. It had storage spaces, a sowing machine, a washing machine and a Fridge along

with having enough space to place mattresses on the floor when hosting guests. The family would often sleep here on the ground, while giving the main bedroom to the guests. The lady explained to me that once her daughter gets old enough, she could occupy this room. This room was also connected to a small yard that faced the street on the north side.



Fig 5.6: Residence A02- exteriors

(left)- The image shows that façade of the house which faces the service lot. Since the house had two sides exposed, one could accommodate the staircase on one side and allow multiple access while maintaining the privacy of each unit. It can be seen how the design of this stair is working in sync with the neighboring houses.

(right)- The image shows the north façade of the house which faces the street. A yard has been extended towards the street on the ground floor, which is painted in blue, while the upper floors are extended to accommodate balconies. This further stresses on the importance of house extensions in low-income neighborhoods.

The house was extended on both the north and the south facades, accommodating the yard on the side of the street and the main staircase on the side of the service lot. The lady highlighted that they didn't really have any plans of expanding their home as it was enough for their needs. The layout was simple, modest and sufficient; having good cross-ventilation in addition to being well-lit. The service lot was also

used to park two wheelers, apart from being used as a space for sitting or drying clothes. It was a shared space used mostly by the ground floor residents of all the four houses surrounding it.

AR02- It is the same upstairs. Their bedroom is slightly smaller, because the staircase takes that space on the upper floors. But apart from that it's the same. The people on the top floor moved just a few months ago. They are married and must be out for work now.

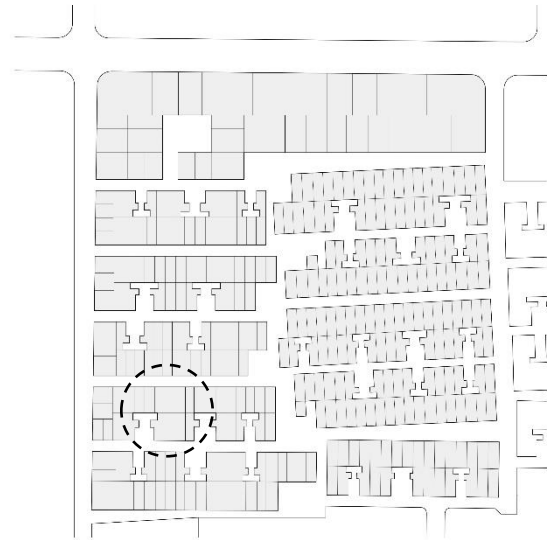
She went on to explain that the first-floor was identical to her home in terms of the layout, though the main living/bedroom room was a bit smaller. The family that resided on the first floor had two children. The elder one used the rear room that faced the street as the bedroom. On the second floor, this rear room was missing and the entrance to the kitchen was through the first room. Unfortunately, I couldn't visit this floor, since the residents had gone to work.

AR02- We don't really have a lot of complaints about the house. Though, I do not like the park in front of our house. It is such a good place for children to play but the IDA hasn't maintained it at all. They brought individual pieces for swings, but nobody ever came to assemble them. Apart from that, nothing really! Maybe better drainage of the street in the front. It becomes clogged in the mornings. A lot of people, and also my husband, wash their two wheelers on the streets and the water doesn't drain properly. Otherwise its good. Shops, school, temples, another park nearby... I don't think I would say anything is missing really. Even our neighbors are very friendly. We didn't really face any major problems when we moved here.

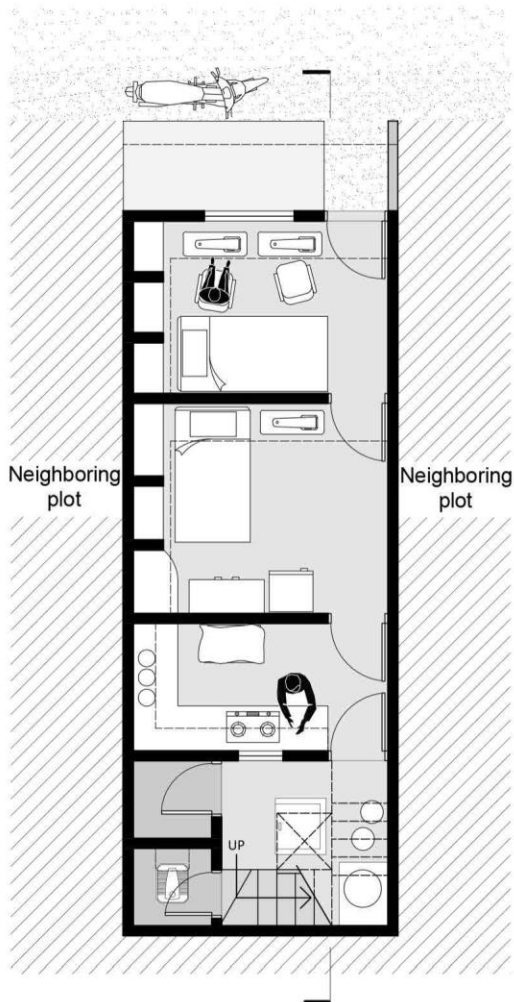
The service lot adjacent to the house faced a small park. The lady, along with the other neighbors, wasn't very satisfied with the condition of the park. She went on to explain that it was owned by the IDA and was not kept very clean, which otherwise would prove to be a good place for children to play. She also highlighted poor drainage. The original proposal for Aranya used permeable materials for streets in the EWS sectors, reducing the cost for installing drains while still allowing water to percolate to the ground. However, all the streets are paved with impervious materials now. Hence, drainage poses a major problem in the area that is mentioned by almost all the participants of the study.

Usually after surveying a dwelling, I would stroll in the neighborhood for some time and casually interact with the residents. After having my lunch and indulging in some 'small talk' with the people in the area, I moved on to study my third plot in the neighborhood.

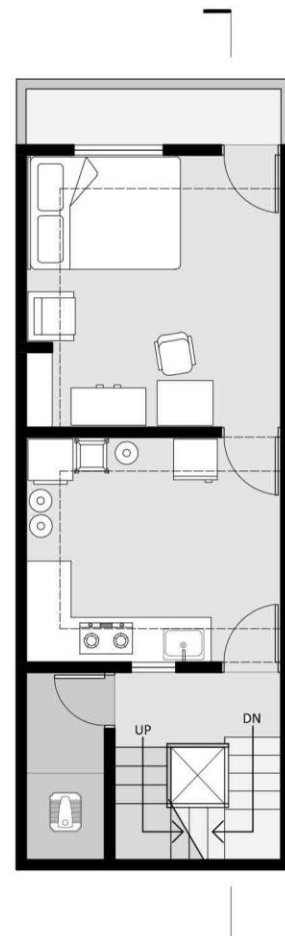
A03



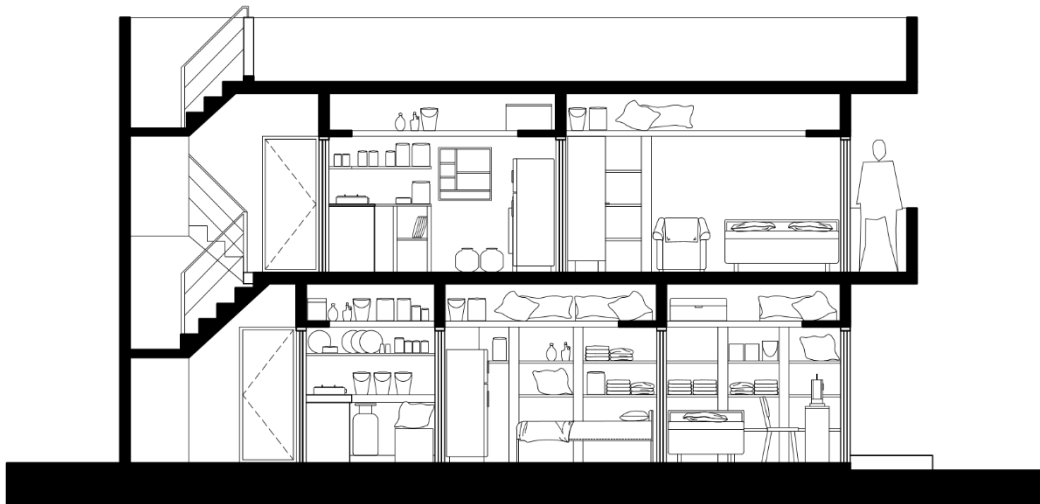
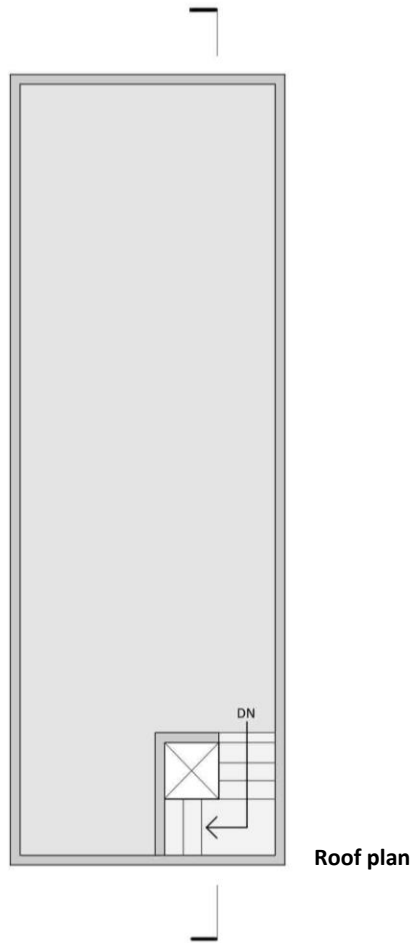
Context plan



Ground floor plan



First floor plan



Cross section

Fig 5.7: Plot A03

Occupied by a family of seven people, this dwelling was open from only one side and accommodated a small shop at the ground floor. The design of this dwelling was a clear example of how the residents of Aranya have created places of work or small shops within their modest homes. I interacted primarily with the owner of the plot, who ran the tailoring shop on the ground floor alongside his wife. He lived there with his mother, his wife, his son and his wife, and two grandchildren. In short, the house was providing for four generations. The owner, who had moved to the plot in 1994 with his wife and his parents, had been actively involved in the construction and design of the dwelling.

AR03- I made this house... I designed it, I built it. I was here. We hired a few people yes, but we designed it. My late father was also involved in the construction. But because I was young, I took part more actively. First, we only made the ground floor, with no skylight or open court because the plot on the side was empty. We kept an opening at the end opposite the toilet to allow for ventilation. Later, after my son was born, we expanded the house on the upper story. That is when we put the staircase and created an open court at the back. Otherwise, there would be no light or ventilation. I don't like the plot that much. It is narrow and deep with only one face open. One doesn't have to be well-read to understand that this is not the best design. If you see the other houses, they have the staircase in the front. This way they have been able to rent certain floors. We can't do that... if we put the staircase in the front, there will be no light inside the house. But yes, I do like how we have made it now. Because of the open court at the back at least we can breathe. I designed it myself you know? Now there is plenty space for everyone in the family, and whenever required, we can add another story. But renting a floor would remain impossible.

The first room of the house was used as a place of work during the day, and as a bedroom during the night. The owner and his wife slept here. The second room was another bedroom which was used by the owner's mother. The third room in line was the kitchen, followed by the service core. This core accommodated a staircase that provided access to the upper floors along with having an open-to-air staircase well. The kitchen on the ground floor had a window opening onto this space. Even though the house had only one side open, it remained pleasant inside due to the presence of this open court. It also allowed for plenty natural light to reach the ground floor.



Fig 5.8: Residence A03- interiors

(left)- Since the house had only one side exposed, it accommodates a staircase with an open-to-air stairwell at the rear side in front of the toilet and wash spaces. This open court allows for ventilation within the dwelling while keeping the inner areas lit. The staircase is carefully designed to fit within a tight space. This space also includes an underground water storage. Moreover, it is used for washing kitchen utensils on the ground floor.

(right)- The image shows the bedroom on the ground floor, which like the rest of the house, is designed for maximum efficiency. The shop in the front of the house is similar to this room in terms of storage. All other rooms accommodate overhead storage.

The upper floor layout was slightly different from the one at the bottom. Instead of three small rooms, it accommodated two very spacious rooms. One was the kitchen facing the court and the other was the main bedroom facing the street. The floor also accommodated a small balcony that faced the street. Such a layout provided adequate sunlight in both the rooms. The toilet and wash spaces were combined into one big room on this floor. This floor was occupied by the owner's son, his wife and their two children. In terms of storage, all rooms of the dwelling had overhead shelves, allowing for maximum storage without wasting any 'living' space.

The owner explained to me that having only one side of the plot exposed limited the design of the house. It was almost impossible for them to rent a floor for extra income as the staircase was located at the rear, next to the service core. He explained to me that this situation was not ideal for renting as one

would have to cross the entire house to access the floors on top. He further explained that moving the staircase to the front was not a good idea as it would limit natural light and ventilation inside the house.

AR03- We used to sleep on the terrace sometimes... me and my father... in the summers for a few years after we moved here. We had a wooden ladder. My wife and my mother slept inside. We don't do that anymore... times have really changed. I can tell you there was not much here when we came. Most of what you see right now has been built in front of my eyes.

AR03- We don't use the outside platform that often. My mother sits there to have tea, or the customers stand there. But usually we call everyone inside where we work. Our shop does the work for the platform. Everyone is welcome!

The owner got a bit nostalgic while speaking with me about the house. He spoke about the times when him and his father used to sleep on the terrace during hot summer months. However, they no longer use it for that purpose. Another interesting characteristic highlighted by the owner was how the tailoring shop was 'open to all'. This way it acquired a semi-private character similar to the house extensions. Even when I approached the owner to participate in the study I was directly called inside the shop to carry the conversation further.

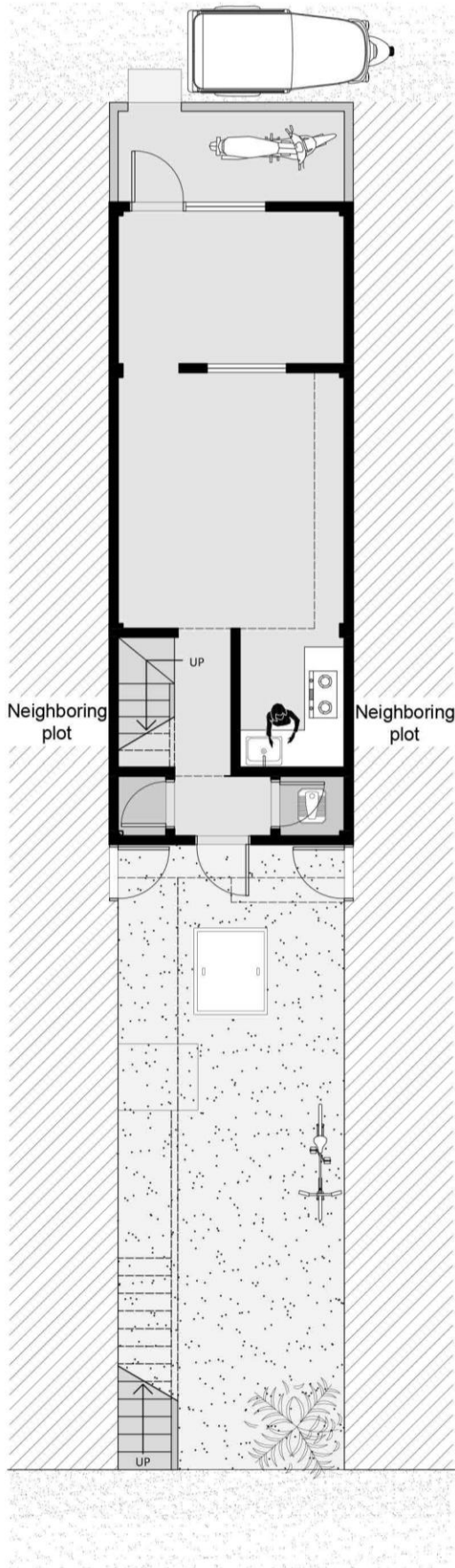
The owner took great pride in the design of the house. And I believe he should. It was indeed a very efficient layout, allowing light and cross ventilation inside the house, accommodating a family of seven and still having enough space to run a tailoring shop. An example that shows how low-income people can transform their dwellings and their lives if given the right opportunities and tools.



Fig 5.9: Residence A03- exteriors

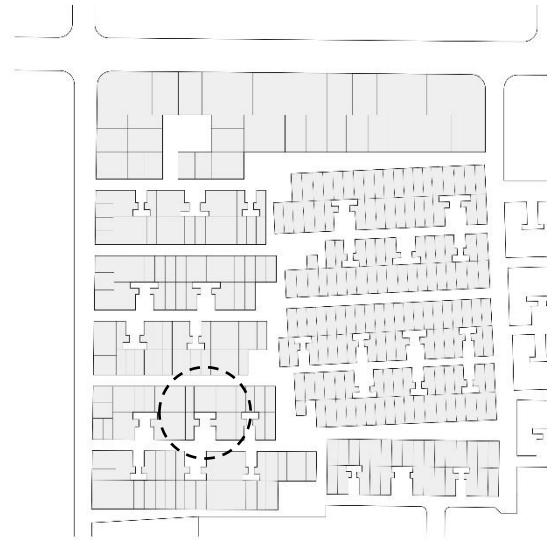
One can see how the internal storage design gets transformed in the external elevation. The overhead storage in the shop extends to become the overhang above the main window on the ground floor. The extensions in the form of a stoop on the ground floor and a balcony on the first floor are also visible in the image.

A04

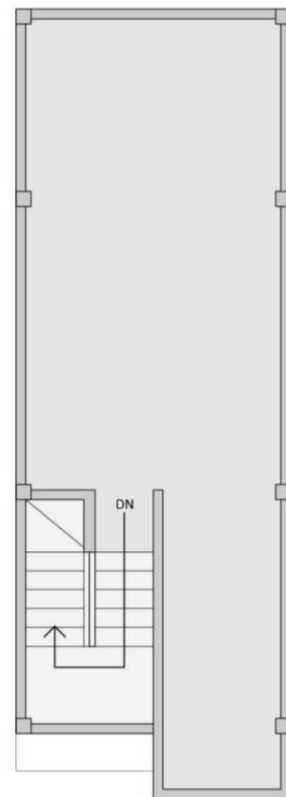


Ground floor plan

Fig 5.10: Plot A04



Context plan



Roof plan

This dwelling was a special one, as it was still being constructed while I visited it. The owner of the plot was present during my interaction with the residents of House A03. He was curious to know more about my research and offered to show me his home. He wasn't the original owner of the plot and had moved to Aranya in 2006. Not completely satisfied with the previous design, he was reconstructing his entire house.

AR04- I moved to Aranya in 2006. The design of the old house was not bad. But the construction was not good enough to add more floors. I also felt some space was being wasted in the house... or unnecessary you know? I had made minor renovations to my home in 2011, but I realized it was time to do it properly now. I have a wife and a son. My son is still in school. The primary reason for reconstructing my home is to be able to add more stories. I am not doing it right now as it is very expensive. I drive an autorickshaw for a living... and this is what I can afford for now. But surely, I'll do it in the future when my son grows older.

AR04- If you look at other houses in the street, most of them have three rooms in a row. Usually the kitchen is the last room before the toilet. It's not a very good design. During summers when it gets humid sometimes, it becomes difficult to even breathe in the kitchen. Moreover, we are just three people in the family. We don't require so many rooms.

AR04- You see we have two main rooms now. One is small and is located at the entrance. This can be used to greet people. After that is the main room. We can eat and sleep here. This way both rooms will get more light and will remain better ventilated. If someone is staying for the night, they can easily be accommodated in the first or the second room.

The owner explained to me that the old layout resulted in space wastage and that the construction was not good enough to add more floors to the dwelling. He expressed his intentions to expand the house in the future, though he wasn't doing it right away due to financial constraints. He further highlighted that having more rooms of smaller size resulted in poor ventilation. And hence, he was changing the layout of his home to keep it airier.

The house had two opposite sides exposed- the north wall facing the street and the south wall opening onto a service lot. The owner designed the layout to keep the dwelling simple and efficient. The first room was a small living room. This room could also be used as a guest bedroom. The next room was a big one with an open kitchen. This room would be used for both eating and sleeping purposes.

AR04- Right now, we all will sleep in the same room. Later, when my son gets married and we add the upper floor, him and his wife can live upstairs.

AR04- I like the house. We also have a backyard. We use it a lot. Two other houses also open onto it. Sometimes in the summers if we have a lot of guests, or even if our neighbors do, all of us together make sleeping arrangements for them in the backyard. If you see there is also a small washing area. We use it to wash clothes. All three houses dry their washed clothes in the yard. My neighbor parks his bike also there. It's a very useful space you see... it's like extra space. We don't own it, but we can always use it. It also permits good light and ventilation from the rear side. This way our home remains pleasant.

AR04- In my opinion, the toilet and bathroom were wasting space. We didn't know what to do in the space in front of it. So, I moved the bathroom under the stairs. This gives me more space for the room in the middle and the kitchen. This also allows me to have a staircase there.

The owner explained to me how significant the rear yard was to the family and even to the neighbors. It was like 'extra space', none of the families living around it owned it, yet everyone had the option of using it. It shows how low-income families use open spaces around their house to compensate for the relatively small size of their dwellings. This yard was used for a variety of purposes- washing and drying clothes, occasional meals, sleeping, parking, and it also acted as a safe-play area for children. He also highlighted that the design of the service core was carefully modified to utilize space more efficiently. The toilet remained in its original location. The space originally provided for washing was incorporated in the kitchen. Right opposite the toilet and under the staircase, was created a small bathroom. This service space opened onto the rear yard. In this dwelling, the rear yard was fenced and was being used as a shared open space by the three houses surrounding it.

AR04- I am happy about my house. I like it. If you see carefully I have created a lot of storage space as well. In the dining room, in the kitchen. It's much more efficient now. Also, if you observe carefully now, it's difficult to look directly inside the house from the yard. This way our privacy is also maintained.

The owner went on to explain how the new layout of the house allowed for more storage. The entire eastern wall of the dining/ bedroom accommodated an overhead shelf. Even the roof of the kitchen was

lowered to make space for storage above. The layout also provided more privacy to the inhabitants by obstructing a direct view of the dwelling from the rear yard.

AR04- I like the neighborhood. Though I don't appreciate how some people have really extended their houses onto the street. It's not right to extend it so much. But what can we do?... The streets are clean. In fact, the entire city is clean since the past two years. I like it how everyone makes a collective effort to keep things clean. In terms of problems, water is one! Both for availability and drainage... but it's everywhere. I can't say its only my house or my street. It's Everywhere! We have to store as much water as possible as the water pipelines are very irregular.

Left unchecked, a few people in Aranya have extended their houses beyond the permissible zone. A characteristic common to houses of all income groups within the township. The owner also pointed out 'cleanliness'. This was a unique characteristic about the city of Indore. It was regarded as 'India's cleanest city' for the years 2017 and 2018 under the 'Swacch Bharat Abhiyan' (Clean India Initiative). All residents of Aranya took great pride in the fact that Indore was the cleanest city and made efforts to keep it that way. Water clogging and water availability, both were mentioned as pervasive problems in the township.

During my interaction with the owner, he seemed satisfied with the plot and the neighborhood. In my opinion, the new layout of the dwelling was making good use of the plot conditions. Better light and ventilation, more internal living space and storage along with better privacy, and a multipurpose rear yard, all worked well to provide a congenial living environment.



Fig 5.11: Front and rear facade of residence A04

(left)- The image shows the front façade of the house- simple and modest. A small yard has been extended towards the street, which is also used to park two wheelers at night.

(right)- The rear (south) side of the house opens on to a service lot. This space is shared by two other houses. It is used for washing/drying clothes, parking, and occasionally eating and sleeping. It also acts as a safe-play area for children.



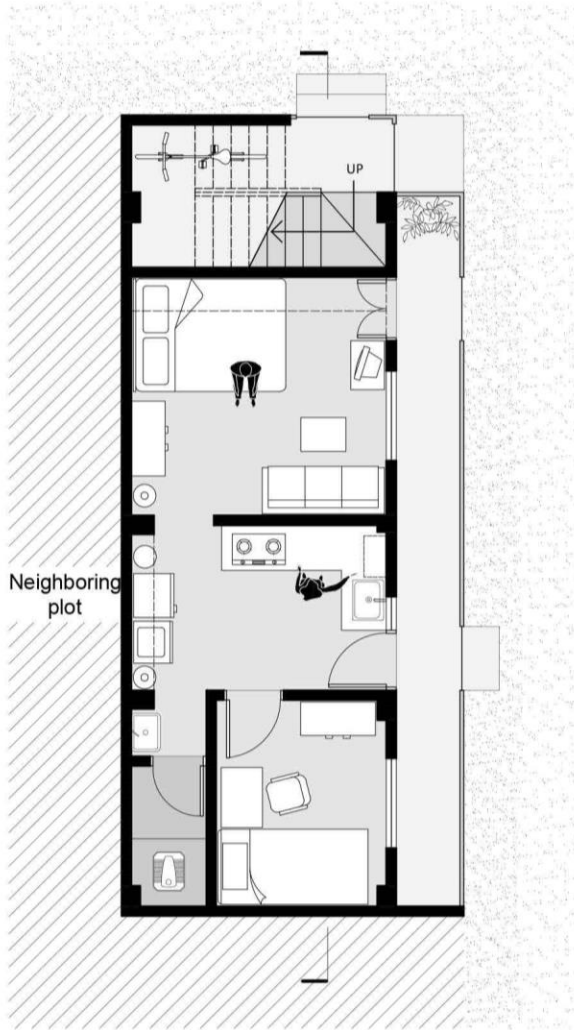
Fig 5.12: Staircase construction

The images show the construction of the staircase. The risers are kept high while the treads are kept short to accommodate the staircase within a tight space.

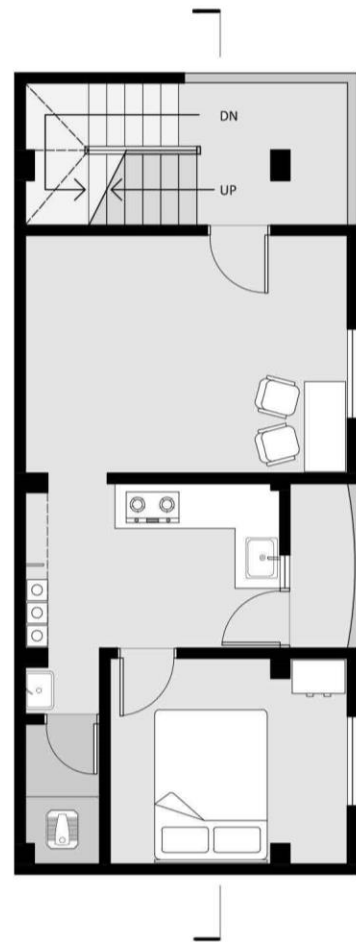
A05



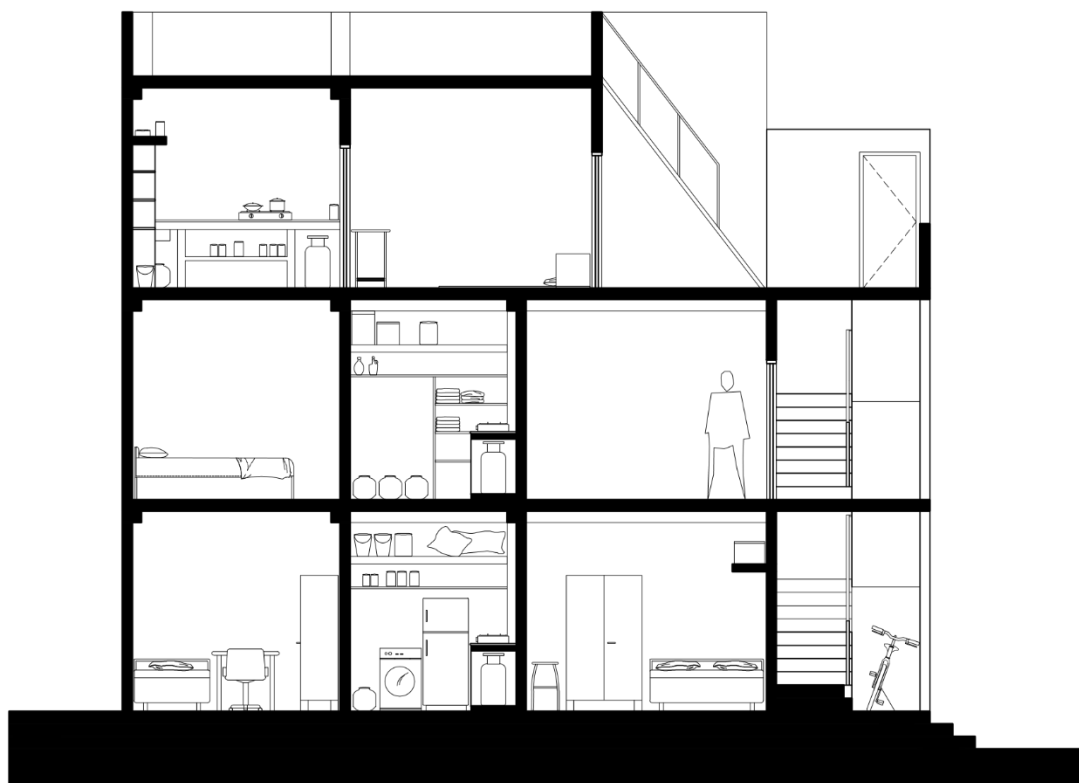
Context plan



Ground floor plan



First floor plan



Cross section

Fig 5.13: Plot A05

This was the last plot I surveyed in the area. Constructed in 2011, the dwelling used a concrete framework completed with brick walls. While the actual owner of the plot lived elsewhere, his son resided on the first floor of the building. Similar to A02, this too functioned like an apartment building. Having separate access points, the ground floor was rented to a family of three while the second floor was occupied by two students. The owner's son, who was also a student, was kind enough to participate in the study and show me around the entire building.

AR05- I've been living here since more than a year now. The house belongs to my father. I don't know when he bought it or from whom, but I do know that we were the first one to build something on this plot. There was nothing on this plot before we made something here.

AR05- I live on the first floor. A couple and their daughter occupy the ground floor. The second floor has just one big room. So, we usually rent it out to students. Right now, there are two people living there.

AR05- I like the house. I mean I am alone, and I have two rooms, so its big enough for me. But I guess a family of three or even four can live comfortably here. The rooms are spacious... There is also plenty open space around the house... This way all rooms have a good view too.

The plot was located next to public square at the corner end of a linear cluster. Since it was constructed relatively recently, a few elements of the adjacent homes were replicated to make the building better fit the context. The building was extended on both open sides; the north façade accommodated the main staircase and the east façade contained a stoop on the ground floor and balconies on the upper floors.

The first apartment I visited in the building was that of the owner's son. I entered into a big and spacious living room, which for the time being was used as a study. Diagonally across the main entrance was the entrance to the kitchen, which was well lit and had a balcony attached to it. The toilet was located at the south east corner of the dwelling, away from the open facades. The washbasin was provided outside the toilet, so it could still be used while the toilet was occupied. Next to the washbasin was the entrance to the bedroom. Both the bedroom and the kitchen had overhead storage spaces. The living room, the bedroom and the kitchen were laid in a linear manner to accommodate windows which faced the public square, making all three rooms well-lit and well ventilated.

AR05- The toilet doesn't have a window. But its fine, I've seen a lot of other houses that don't. I'm not saying it's the best scenario, but it works alright. We spend most time in the rooms and they are well made. I like the house. Its big, breezy and gets ample amount of natural light. We don't use any artificial lights during the day.



Fig 5.14: Residence A05- interiors of first floor

The images show the interiors of the first floor which is inhabited by the owner's son. The house is exposed on two adjacent sides. Hence, the interiors remain well-lit. Use of artificial lights is not required during the day. The toilet is located at the south-west corner of the plot with no ventilators or windows. It is not the most ideal scenario as the foul smell passes through the kitchen. Though the rooms remain well-ventilated and airy.

After looking at the apartment on the first floor, we went to see the one on the second floor. Simply put, it was a large room constructed on the terrace with a small kitchen and a toilet. The area of the rooms on this floor didn't even occupy the entire area of the plot.

From the staircase, I entered onto the terrace. There was a steep steel ladder fixed to one wall to provide access to the roof of the rooms on this floor. I then entered a large living room which was also used as the main bedroom. Right across the main entrance was the entrance to the kitchen. The other corner on the same wall had the toilet arranged in a similar manner like the one on the first floor.



Fig 5.15: Residence A05- steel staircase on terrace and interiors of second floor

The images show the rooms on the terrace which is habited by two students. The furniture is kept minimal. The students sleep on floor mattresses. Both the room and the kitchen are well-lit and well ventilated, while the problem of ventilation in the toilet persists. A steep steel staircase gives access to the terrace of these rooms.

AR05- I don't think my father has any intentions of expanding the house. We don't even live here. I think it's more like an investment. Moreover, it was built less than 10 years ago and works alright for everyone living in the building.

AR05- I wouldn't want to change my house. I like the neighborhood. All the shops are here, the main road is just a few steps away. We have space around the house to park the car as well. So, I can't think of any specific reason why I would want to change my house or anything about it.

The home on the ground floor had a similar layout as the one on the first floor, but with slightly smaller rooms. In my opinion, the building worked well, serving individual tenants adequately. However, I do believe the placement of the toilet could have been better to allow for better ventilation. As based on the present scenario, the foul smell from the toilet would flow out through the kitchen window, which in my opinion was not the most ideal situation.

I casually interacted with the students on the second floor and the family living downstairs. All of them seemed satisfied with the design of their homes and the neighborhood. All of them mentioned that the presence of a small public square next to the house becomes an added advantage. Instead of being sandwiched between other plots, the corner-plot layout provided them with additional breathing space. To my surprise, none of them mentioned about water clogging on the streets. This was probably because the adjacent public square had a large area. So even if water would clog some parts of the square, there would still be enough space for the residents to be able to pass through comfortably.



Fig: 5.16: Residence A05- exteriors.

(left)- The house is located next to a public square at the end of a linear cluster, having two adjacent sides exposed. The ground floor is extended towards the square to accommodate a narrow but long yard, while the upper floors are extended on this side to accommodate balconies and more space inside the rooms.

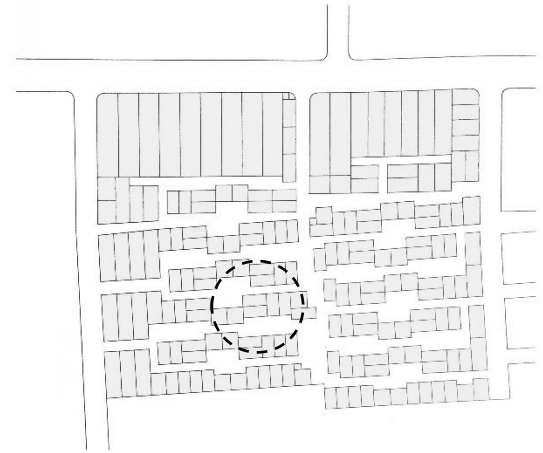
(right)- Since the house was constructed relatively recently, it replicates the façade design of the adjacent house to fit well within the context. The house is extended on this side (north) to accommodate the main stairway. This stairway provides access to the upper floors while maintaining the privacy and sanctity of each unit.

The public spaces and the variety of dwellings in the sector were breathtaking. The commercial spaces and the small work places inside homes, the public spaces and structures, the house extensions- Aranya achieved everything but more than what was expected. The design of the township proves that Doshi was not only the architect, but the social, economic and the cultural designer as well. It was hard to believe that these people belonged to the lowest income group at one point in time. The opportunities provided by good urban design also proved to be vital in the economic upbringing of the residents of Aranya.

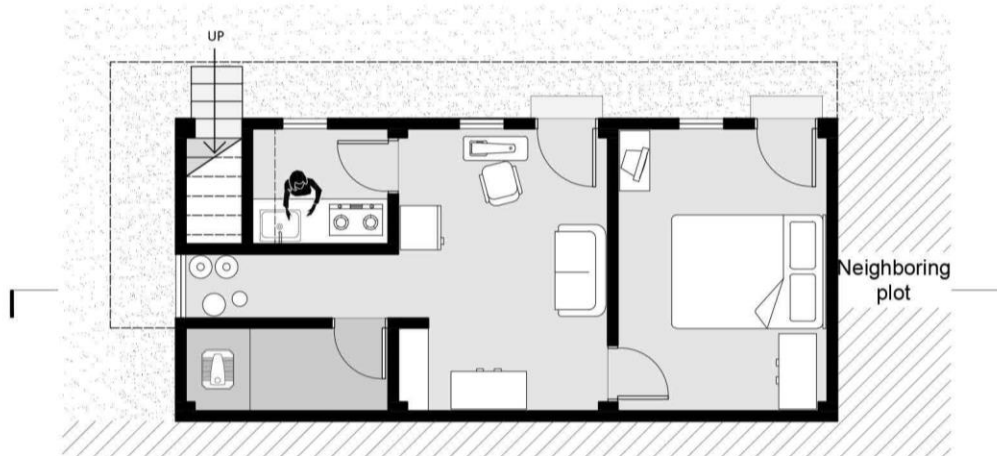
After having discussed the dwellings surveyed in the sector designed by architect B.V. Doshi, I move on to analyze the dwellings surveyed in the sector designed by CMCH, McGill University. This sector was surely different in appearance from the one discussed above, however, the environment of the place, the daily activities of the residents, and the basic elements of urban design remained similar. It was, as if, the same story was being told by a different orator. The dwellings in this sector showcased greater variety in both form and orientation owing to the carefully designed plot variations by CMCH, McGill University.

5.3.1 Cluster surveyed in demonstration scheme

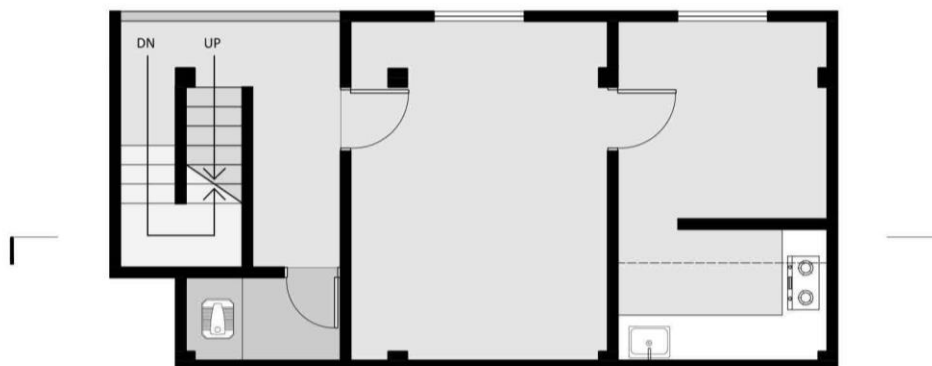
B01



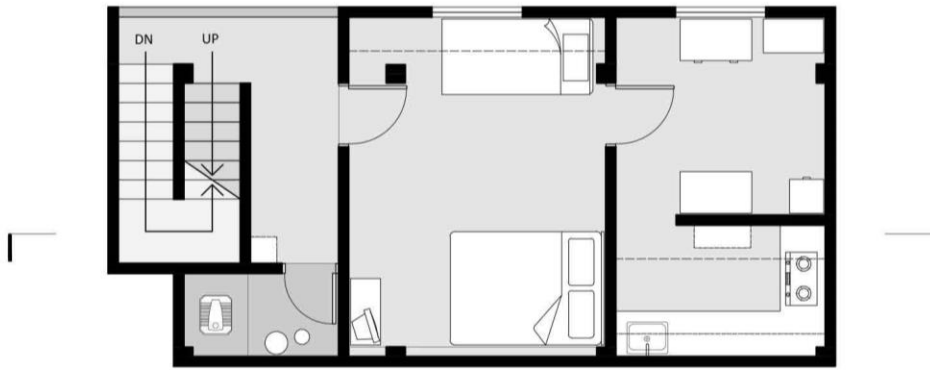
Context plan



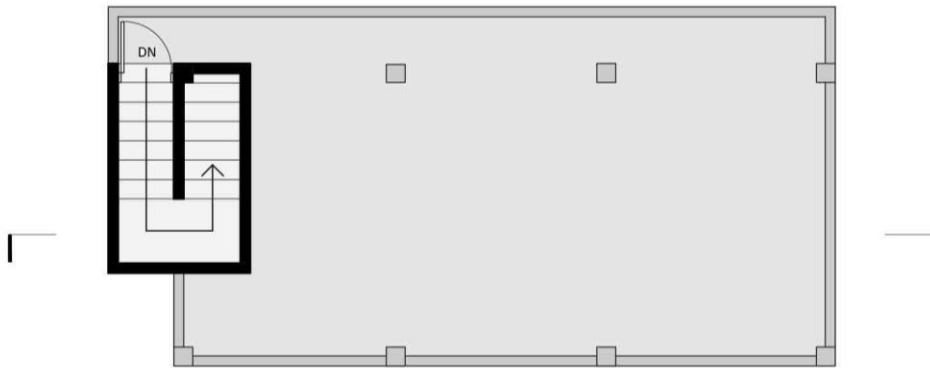
Ground floor plan



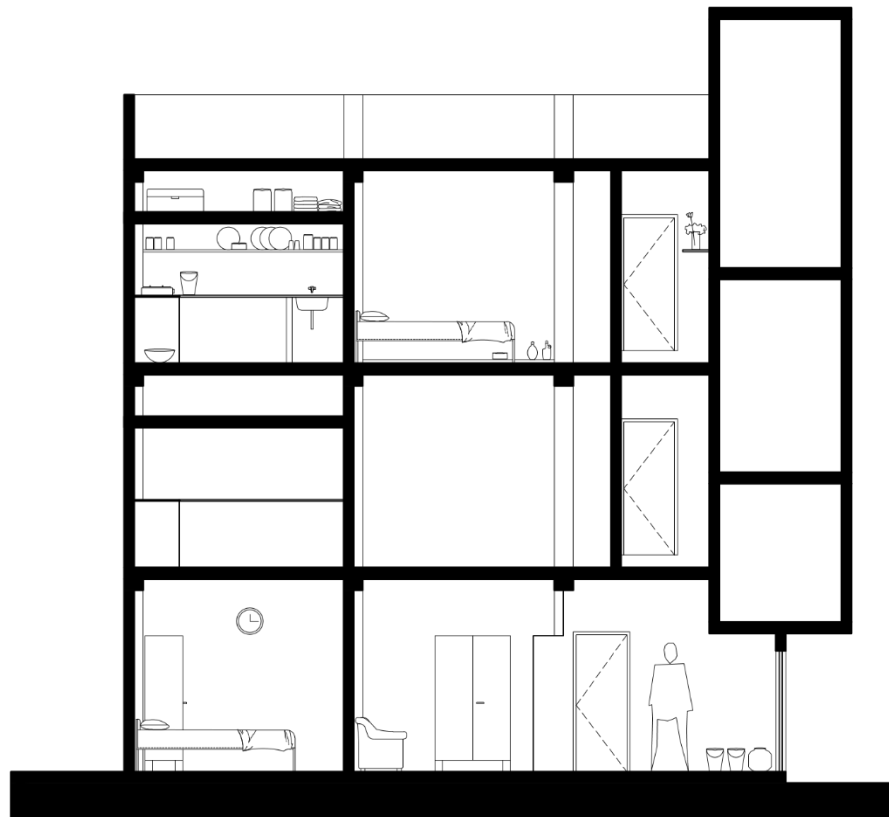
First floor plan



Second floor plan



Roof plan



Cross section

Fig 5.17: Plot B01

The first house I surveyed in this sector was located next to a small square, having two adjacent sides of the plot exposed. Like many other homes in Aranya, this building had three floors, each rented by a different family. I interacted with the lady who lived on the second floor with her husband and daughter. She was also responsible to convince the tenants on the ground floor to allow me inside their house. Unfortunately, the people residing on the first floor were not home. However, the lady explained to me that the first-floor layout was identical to her home. The building was extended on the west façade to accommodate the main staircase while the upper floors were extended on the north façade to provide for more space inside the house.

BR01- I have lived here for 5 years now. But I have lived in Aranya since I got married. Me and my husband used to live in another sector before. We don't have enough money to buy a house right now, so renting is our only option. It becomes extremely difficult at times, to manage our children's education, our daily meals, and the rent along with all other expenses... But it has worked for us till now and I hope it continues to work in the future.

BR01- I don't know when this house was made, but I do know the owner lives in Aranya itself. My husband usually manages these things. I take care of the house and our daughter.

BR01- I like the house. You can see it for yourself. The room is big, we have a TV, there is enough natural light inside the house during the day... you can see we haven't turned on any artificial lights right now. If there is a power cut in the summers, we sleep outside on the terrace. I like the fact that the bathroom here is away from the kitchen and is kept outside. In my previous house they were next to each other, and sometimes that didn't work very well. I like this house much better if I compare it to my previous house. You haven't seen it but I'm sure you can imagine it. It was long, and the rooms were back-to-back with very less light in the last room. Here you see its much more open and freer. Also, the sun is on the opposite side after noon, so we can sit outside and it's not too hot. In winters we only sit outside during mornings when the sun falls on the terrace.

From her description one could understand that her previous home in Aranya was a dwelling with only one side open and touching other plots on the remaining three sides. She further explained that the scenario of placing the kitchen right next to the toilet wasn't an ideal situation. Her present house was in fact well-lit and well planned, in my opinion.

Her home was linked to the main staircase through a terrace, which acted as a vestibule. The toilet and

wash spaces were also accessed from this terrace. Having a separate entrance for the service core worked very well in this layout, since the foul smell never entered the main rooms, while the service core remained well ventilated. The first room of the house was a large living room which was also used as the main bedroom. This is where the family would greet guests and sleep at night. It accommodated three single beds. Right across the main entrance was the entrance to a small room, which acted as a buffer space between the main room and the kitchen. The lady explained to me that if they were hosting guests at night, they would usually give the beds to the guests and spread mattresses in this small room for themselves. This buffer room also provided for better ventilation of the kitchen. The layout of the house was simple and efficient. Having plenty natural light and ventilation, along with having overhead storage spaces in all rooms, the house seemed to satisfy the family's needs.

BR01- I like the house, just like I said before. I wouldn't want to change it. I like the people around as well. There is also a temple... you must have seen it, it's hardly a minute away. The markets are also nearby, so we don't have to go far for our necessities. There is also a small park close to our house. My daughter has to study a lot this year, so she doesn't use it often. But sometimes we go there for a walk.

BR01- The home on the first floor is the same as ours. I've seen it before... Exactly the same! I can take you to the ground floor, that is different. It's because they don't have the space for the terrace that we do... but they have an additional room.

The entrance to the ground floor was from the north façade of the building. I entered into the living room which was centrally located in the dwelling layout. On one corner of this room was the entrance to the bedroom, which faced the access street. Directly opposite that was the entrance to the toilet and wash spaces. The kitchen also faced the access street and could be entered through the living room itself. An opening had been kept next to the toilet, facing the small square, to keep the space well ventilated. This adequately-lit space carefully carved under the main staircase landing was used for washing clothes. A family of five resided in this house. I casually interacted with the residents and they all seemed satisfied with the layout of their dwelling. However, they did mention about water clogging the streets in the mornings and in the evenings. The streets of this sector were relatively narrower allowing for buildings to mutually shade each other. The streets too remained shaded and pleasant throughout the day. However, these streets clogged easily and left less space to walk owing to their narrowness.



Fig: 5.18: Residence B01- interiors of second floor

(left)- The image shows the toilet on the second floor, which has a separate entrance from the terrace. This allows for better ventilation.

(middle)- The image shows the main room of the house which is used for eating, sleeping and hosting guests. At the rear is a small room beside the kitchen. This acts as a buffer between the kitchen and the living spaces. It is mostly used for storage. Although, the family sleeps here when hosting guests at night.

(right)- The image shows the entrance to the kitchen. Although it is located away from the external façade, it remains well-ventilate because of the small buffer room beside it. The furniture is minimal, and the house is modest in design. However, it is well made and remains well-lit and well ventilated.

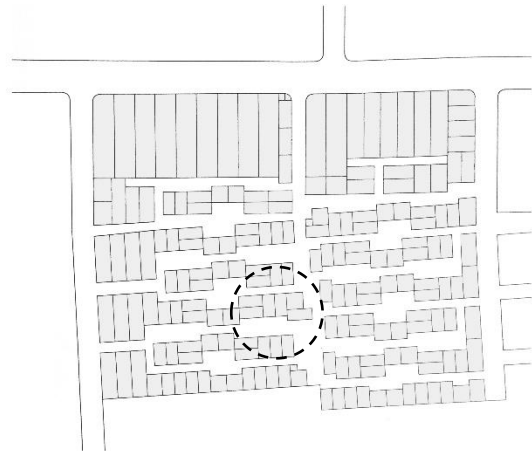


Fig 5.19: Residence B01- exteriors.

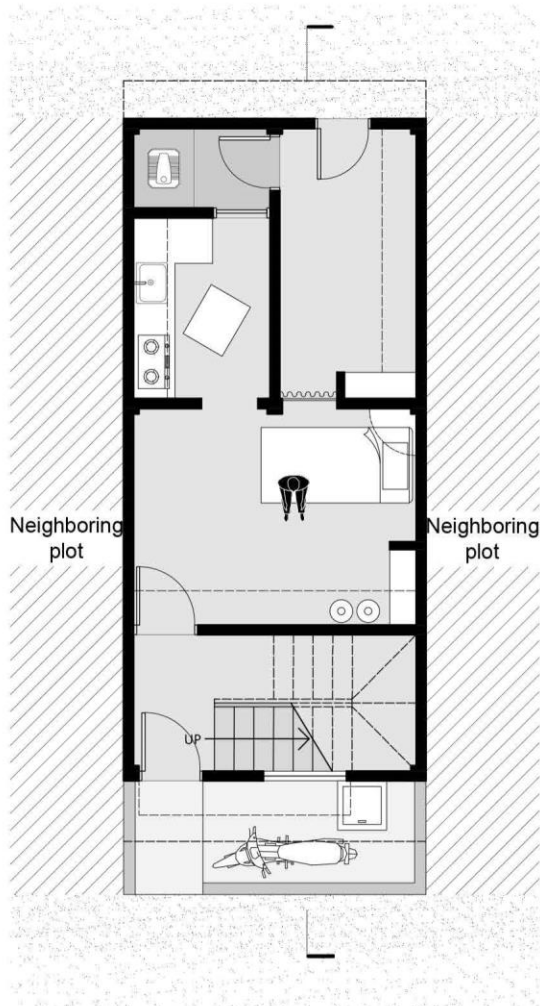
(left)- The house is located next to small public square. Although the ground floor remains within the plot boundaries, the upper floors are extended to accommodate the stairs on one side and more space inside the rooms on the other side. The terrace on the upper floors acts as a good breathing space. The residents use it for drying clothes, resting and at times, having meals. The house represents how the scenario of having enough frontage and two adjacent sides exposed works well and produces quality housing.

(right)- The image shows the entrance to the main stairs. The risers are kept high while the treads are kept narrow. This allows for additional space on the ground floor under the first landing of the stairs.

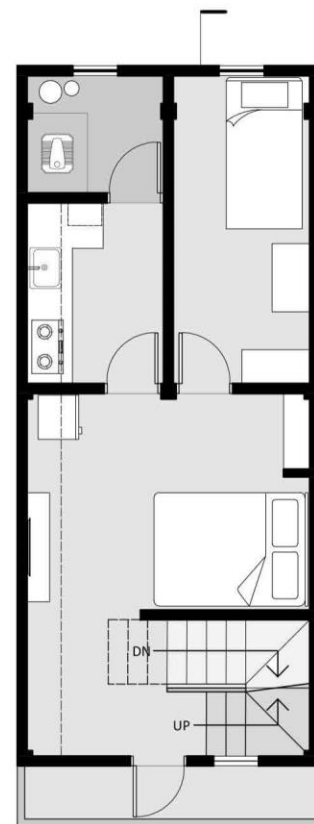
B02



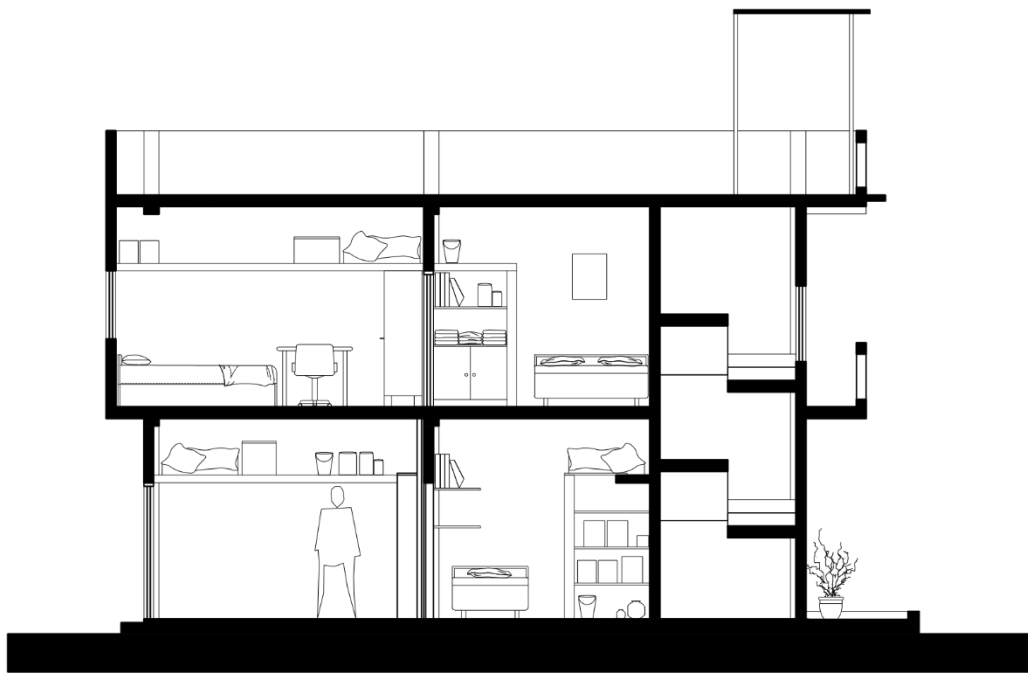
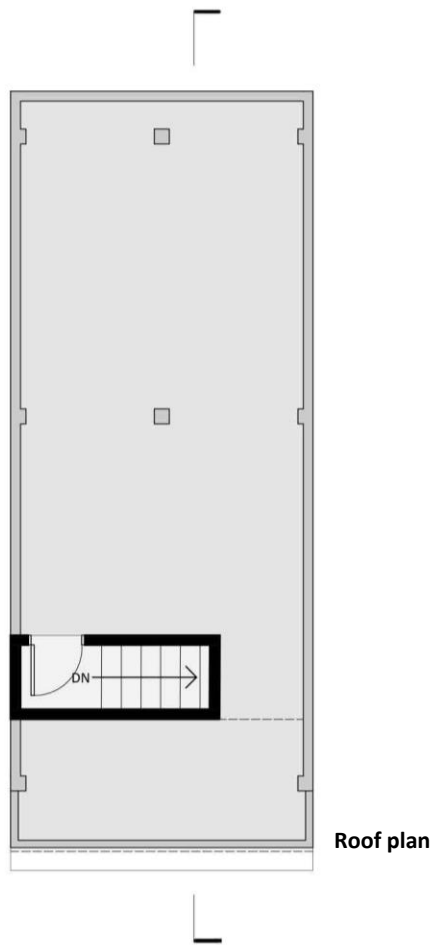
Context plan



Ground floor plan



First floor plan



Cross section

Fig 5.20: Plot B02

The next house I surveyed in the area was sandwiched between two other dwellings while having its front and back exposed. This dwelling was owned by the family who inhabited it. I interacted with the owner of the plot who, along with his wife and son lived on the first floor. His elderly mother occupied the ground floor. Interestingly, they had sublet a room with a toilet to a small family on the ground floor. This was accessed from the rear side of the house.

BR02- We moved to Aranya in 1995. There was not much here back then. Except for a few plots, most of this sector was vacant.

BR02- We didn't construct the building on our own. We took part in designing the layout of our home, but we hired a contractor to build it. We built both the floors at once. We did make a few renovations or some minor changes, but the core remains the same. My mother and father always lived on the ground floor. I live with my wife and son on the first floor. We recently added the temporary blue colored roof on the terrace that you see... It wasn't there before.

BR02- Right now, my mother lives on the ground floor. But she's getting old. She spends the entire day with my wife on the first floor. She only goes down to sleep. Soon we will shift her to my son's room on the first floor and my son can shift to the floor below. It's getting difficult for her to climb the steps. So, it would be better if she lived with us.

BR02- We don't really have any plans to extend the house further. I mean you can see it for yourself. We have plenty space. Even if my son gets married and has children, there will still be enough space to accommodate everyone.

The owner didn't express any intentions to expand the house. However, with the changing family structure, he did mention about altering the living arrangements. This highlights a unique characteristic of the layout, and of progressive housing development in general- *adaptability*. It is not a rigid design, but one that can transform with evolving family needs and changes in family structure.

The dwelling had an extended platform on the ground floor facing the street, which was used to park two-wheelers. This platform also accommodated an underground water tank, an element common to most dwellings in Aranya. This south-facing façade of the dwelling accommodated the main staircase. As I entered the dwelling, the first thing I encountered was this staircase which gave access to the upper floors. I walked past it to enter the first room on the ground floor. It was a small room with a single bed occupied by the owner's mother. This room was attached to the kitchen and another room, but the

entrance to the other room was closed to be able to rent it separately. Except for the main entrance on the front, there was no other opening on this floor. This was because they had rented out the rear room to a family of three who had access from the rear side. They had a single room with a small cooking area. A toilet was attached to this rear room facing the street.

BR02- The room at the back is occupied by a small family. It's a couple with a young daughter. We weren't using that room at all and so we thought it would be better to rent it to someone. We don't really need that extra money, but it's good you know. My mother's monthly medicinal and other expenses are taken care from that. It's like her own home is paying for her. Although the family will be leaving soon, and as I mentioned earlier, my son will shift to this floor.

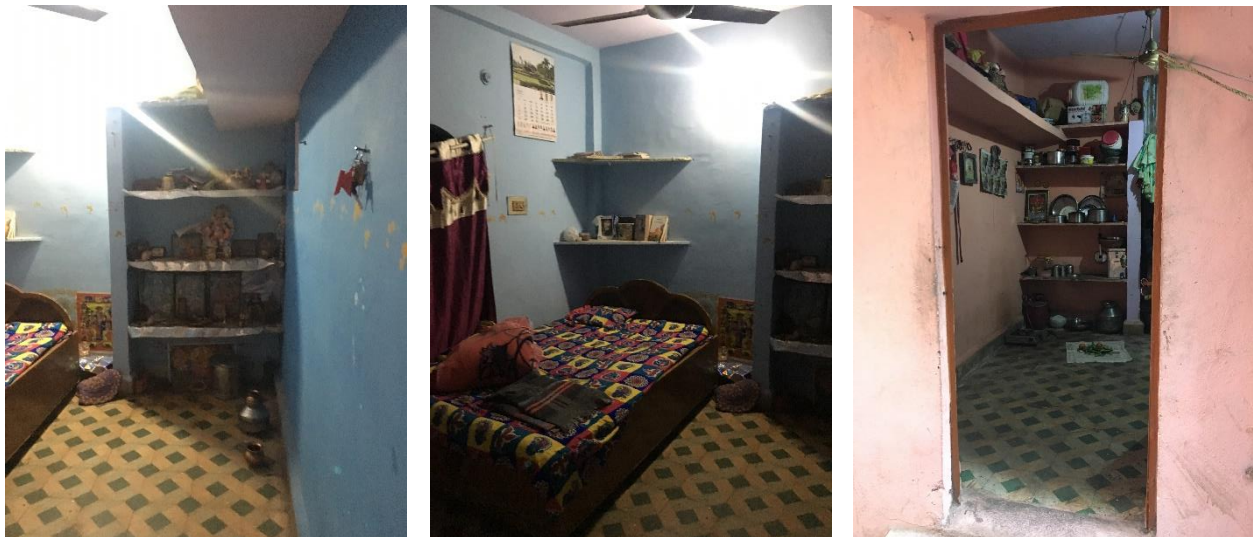


Fig: 5.21: Residence B02- interiors of front section of the ground floor and the rear room.

(left & middle)- The images show the first room on the ground floor which is occupied by the owner's mother. The space is used efficiently and allows for plenty storage. However, it remains poorly lit as it is located behind the staircase. The room doesn't have any windows.

(right)- The image shows the rear room that is rented by a small family. It has a separate entrance and a small toilet attached to it. One can see how such a small space is used so efficiently to accommodate storage spaces and a small stove while being used for sleeping purposes at night.

The layout of the floor above was similar. I entered the living room which was also used for sleeping purposes by the owner and his wife. The rear part of this floor was divided into two sections, both accessed from this room. On one side was the kitchen followed by the toilet while on the other side was a bedroom occupied by the owner's son. For some reason, this floor did not have windows at the rear side, only ventilators with lattice walls. This slightly affected the ventilation along with majorly affecting the amount of natural light inside the dwelling. The owner explained to me that this was primarily for privacy reasons, so the people inhabiting the neighboring plot on the rear side were not able to see inside the house. I do believe that windows could have been accommodated on the rear façade with shutters or some other closing device. This would make the house airier and better lit.

BRO2- There used to be windows on the rear side initially. Then we extended the upper floors from the back, and so did our neighbors. If you go to the back, you would see there is not much distance between the upper floors of the two dwellings. That's when we decided to not have windows. And it works fine for us. Me and my son are usually away during the day. My wife and my mother use the room and the terrace in the front. On weekends when me and my son are here, we are always sitting outside on the terrace or watching television in the main room. I understand that it may seem a bit inconvenient but trust me it works fine.

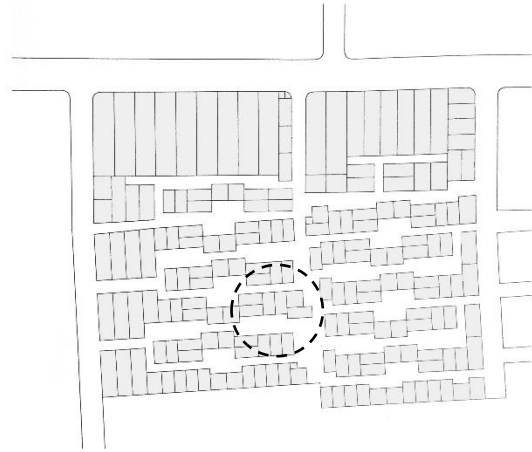
The owner explained to me that even though the house did not have rear windows, it worked fine based on their usage of the home. The family overall seemed satisfied with the design of their plot and the neighborhood. An interesting aspect was the small rear sublet and how the owner highlighted that “*her own home is paying for her*”. It's like the dwelling had become a source of income. And this was true for most dwellings in Aranya. People had found a wide range of options to augment their income using their dwellings. Some entirely depended on their homes for a living, accommodating shops or work places. Some preferred to rent a few rooms or a few floors, or at times the entire dwelling while themselves living elsewhere. Some had sold their plots and moved out. This shows that Aranya not only enabled its residents to build their own homes, but also helped them better their financial conditions. It's hard to imagine looking at this elaborate township that its residents were at one point the poorest of the poor.



Fig 5.22: Residence B02- exteriors.

The images show the south façade of the residence that faces the street. On the ground floor, a stoop is extended to accommodate an underground water tank, while a balcony is extended on the upper floors.

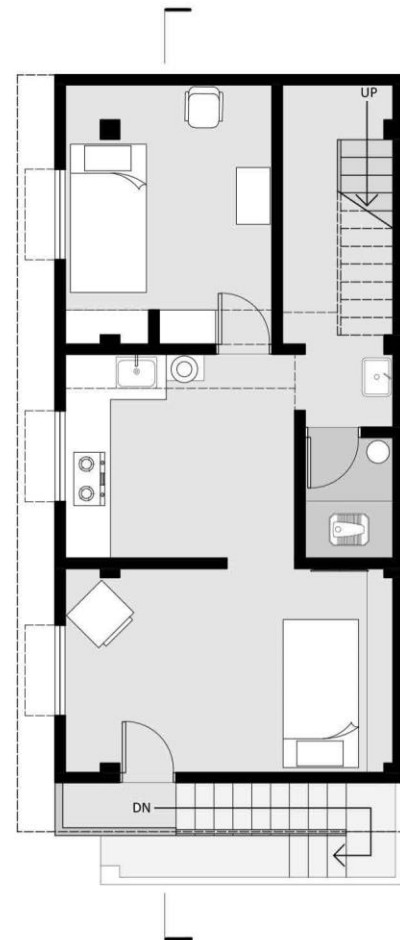
B03



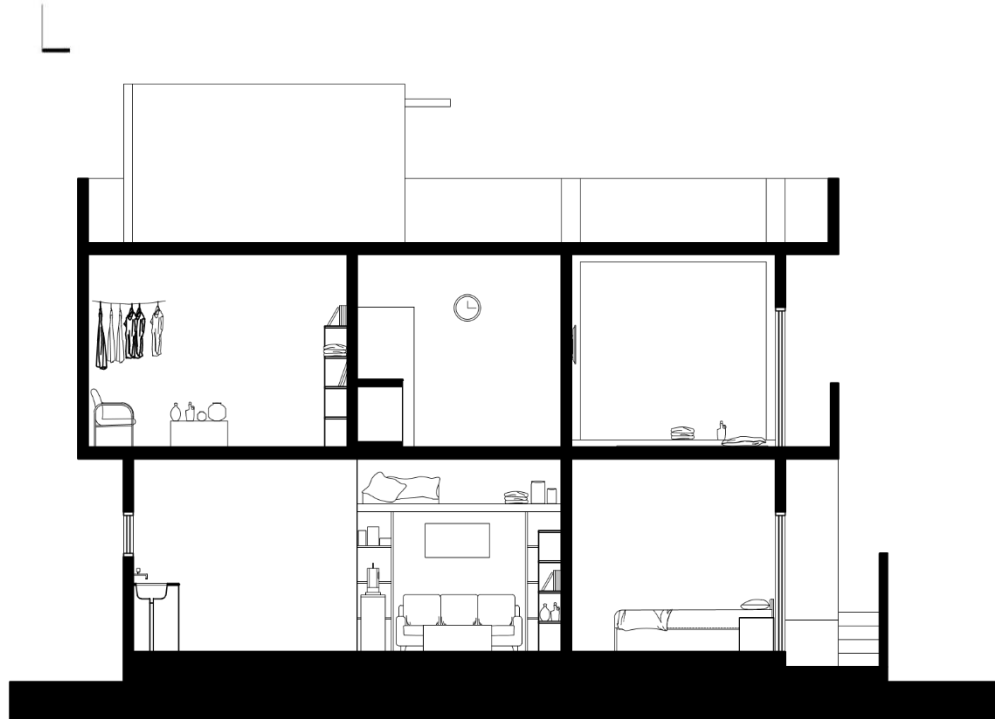
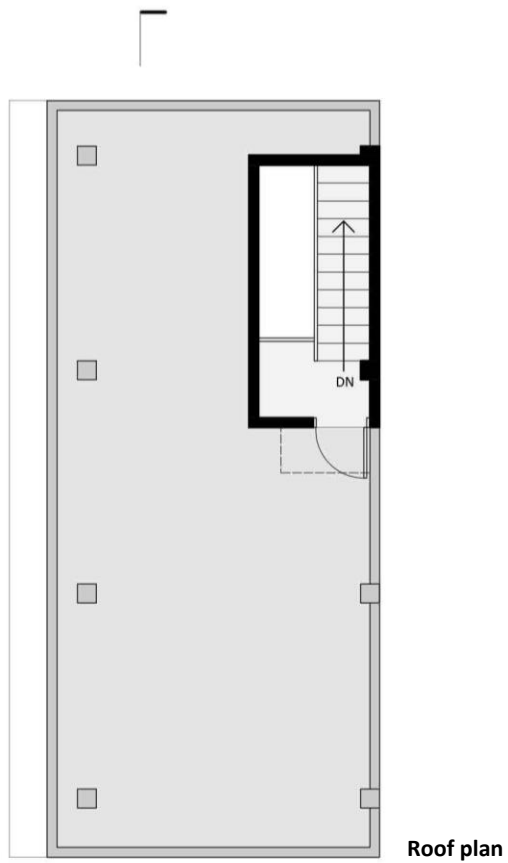
Context plan



Ground floor plan



First floor plan



Cross section

Fig 5.23: Plot B03

A very interesting thing happened during the survey of this dwelling. Instead of approaching the resident and following my usual procedure, the resident of this dwelling approached me seeking permission to participate in the study. He had been watching me the entire day go from one home to another and was very curious about my research. He enquired in the neighborhood about what the study was about from other participants and was enthusiastic to be a part of it.

BR03- I've been looking at you since this yesterday. You have been approaching homes for some college project. You can also have a look at where I live, if that's alright. I saw a lot of people didn't give you permission. They are all scared, some may even think that you're here to fine them for illegal extensions.

Author- And you're not scared about that?

BR03- It's because I'm not the owner of the house. I live on rent... but also, if you were here to fine people for illegal extensions why would you ask for their permission. You would just do it!

After our little conversation we went up to the first floor of the dwelling where the participant lived. He was kind enough to offer me water and show me his residence.

BR03- I can't really tell you when it was made or how it was made. I moved here about two years ago. I live with my mother. But yes, since the time I have moved here I haven't witnessed any renovations being made to the house. The family who lives below owns the house. You can try asking them about it.

The dwelling was located at the corner of a linear cluster facing a public square. The plot had three sides exposed, a rare opportunity provided to only a few plots in Aranya. The dwelling was extended on the south façade to accommodate an external staircase that provided access to the upper floor. The west and north facades were extended on the upper floor to provide for more space inside the rooms. After arriving at the first floor, I entered the living room, which was also used for sleeping purposes by the mother of the participant. The next room located in the middle of the dwelling was the kitchen. From the kitchen, located on the eastern wall was the entrance to another room. This room gave access to the toilet and accommodated a steel staircase to reach the terrace. The last room located at the northern end was the main bedroom used by the participant. The furniture in the house was minimal. They did not even have beds and were using only mattresses to sleep on the floor. In terms of the plot layout, having three facades exposed made the dwelling extremely well-lit and well ventilated.

BR03- I like the house, you get a feeling of openness inside. I am not an architect, so I can't really say much, but as a resident I have no complaints with the house. It's just a few minutes away from the main highway, so even commuting within the city becomes easy. If I had the money I would buy the house.

BR03- I don't really have any problems with my home or with the township. The streets are a bit narrow, so people complain about parking or driving inside. I don't have a car, so I wouldn't know. Although I like it like this. Its quieter without the cars. Moreover, you don't require one, everything can be reached via walking. I'm sure you have seen the area around by now, there are 2 schools, shops, park, bus stop... everything!

BR03- Water clogging is a problem here. You see there are no drains. I don't understand how they could design a township but not have drains. You walk a little bit and you would see drains on the outer road. But not here. That's something everyone complains about. I mean its fine during mornings and evenings because the water is not that much, and it eventually evaporates, but it's difficult during the monsoons... that's when water really clogs around here. That's something I would say is a problem faced by everyone in the area.

The resident was overall satisfied with the design of his dwelling. Accessibility in terms of walking distances from home to various activities was an aspect highlighted by almost every single participant of the study. As mentioned earlier, Aranya was designed to give due importance to pedestrians and cyclists while at the same time discouraging thorough traffic within the township. Hence, the location of various activities, the system of road network, open spaces and nature of built form reflect this concept.



Fig: 5.24: Residence B03- interiors of first floor.

(left & middle)- The images show the interiors of the first floor. The furniture is kept minimal. The floor is occupied by just two people. The house has three sides exposed and hence, remains pleasant with plenty natural light.

(right)- The image shows the steep steel ladder that provides access to the terrace from within the first-floor residence.

After interacting with the first-floor residents, I went on to survey the ground floor. The family that resided below was leaving to visit their relatives in another city. Yet, they were generous enough to have a quick interaction with me and show me around the house.

BR03A- The house was made at once. We didn't make it ourselves. We hired someone to do it. We moved here in 2006.

BR03A- We don't plan to extend the house. We are only using one floor. Tomorrow if it's necessary, we will start using the upper floor as well.

The entrance to the ground floor was centrally located on the western façade which faced the public square. From here I entered the living room of the house. On one side of this room was the kitchen and a bedroom and on the opposite side was the toilet and another bedroom. All rooms on this floor had windows, making them well-lit and well ventilated. Though the rooms were not very large, they seemed spacious owing to the plot being exposed on three sides. The toilet didn't have a window, but it accommodated a ventilator to keep the foul smell out of the house. The bedroom adjacent to the staircase opened onto a small yard. This space was used for washing and drying clothes and it accommodated the underground water tank.

BR03A- the house is not big if you see, but it works fine. There is so much open space around it. All kinds of street vendors come here and so we don't have to go anywhere to look for things. And even if we must, it's hardly any distance. I'm happy with my house and the way I have built it. Look at it yourself, I wouldn't say there is anything missing in it. There is also a terrace on top. But we don't use it because the access is from inside the upper floor.

BR03A- Parking and water- two major problems in the area. I have to park my car away from the house because there is no space here. If there is an emergency, how will the ambulance reach the interiors... you tell me! And water, there is nowhere it can go. Come to see the area in monsoons, you can't even walk here.

The owner complained about parking issues and water clogging. The use of automobiles has grown over the past years in most Indian cities. This is the primary reason why a lot of residents are now complaining about parking issues in the township. Such an extensive use of automobiles is not only reconfiguring streets but threatening the open areas and landscaped parks within Aranya. In terms of drainage, EWS streets were originally designed to be used as open trough drains. Permeable materials were used for the streets to reduce costs while still allowing water to percolate to the ground. However, over the years with all the construction that has happened in the township, streets are now paved with impervious materials, leading to water clogging. Both these issues have been a common concern among the participants of the study. The owner further highlighted issues regarding accessibility of emergency vehicles. The minimum road width in Aranya was kept 4.5 meters to allow for emergency access. However, a few residents have extended their houses beyond the permissible zone, reducing the road widths further. This has been a common trend throughout the township and has made certain areas inaccessible to emergency vehicles, posing a major threat.

In terms of the layout of the plot, it seemed to work well and the residents on both the ground and the first floor were satisfied with it. The location being adjacent to a small square was also highlighted as an advantage by the owner. Having three sides exposed worked very well, making the dwelling bright and well ventilated. It also made the dwelling appear much larger and comfortable.

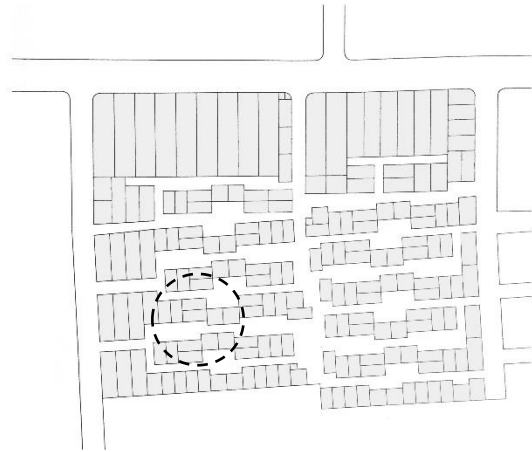


Fig: 5.25: Residence B03- exteriors.

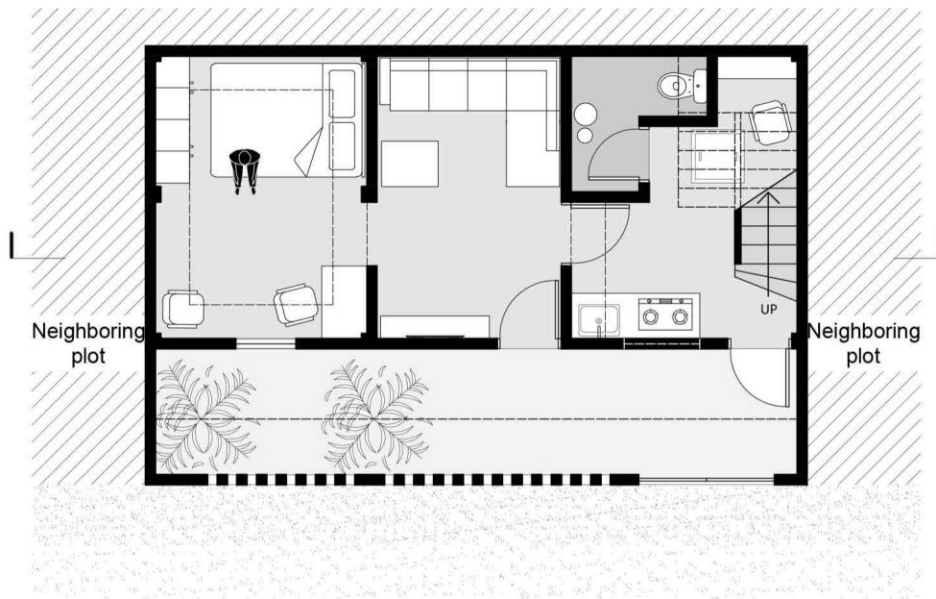
(left)- The east façade of the house faces a public square. The ground floor is accessed from this side. The upper floor is extended on this side to accommodate more space inside the rooms.

(right)- The ground floor is extended on the southern façade to accommodate a small yard. This yard provides a secondary entrance to the residence. It further accommodates an underground water tank and the main stair that provides access to the upper floor.

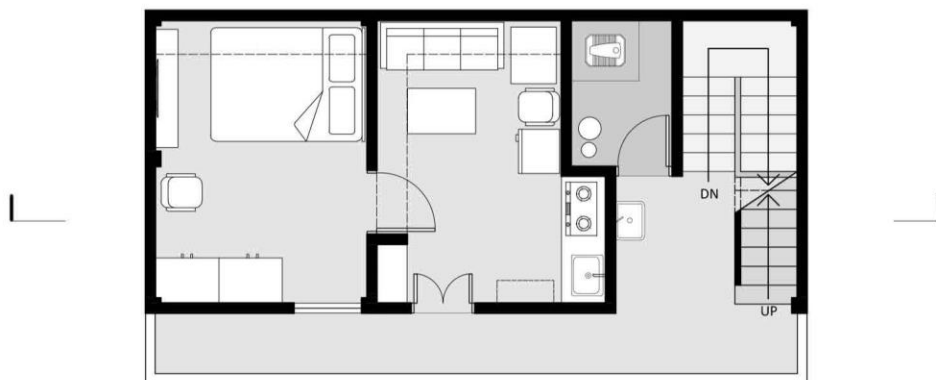
B04



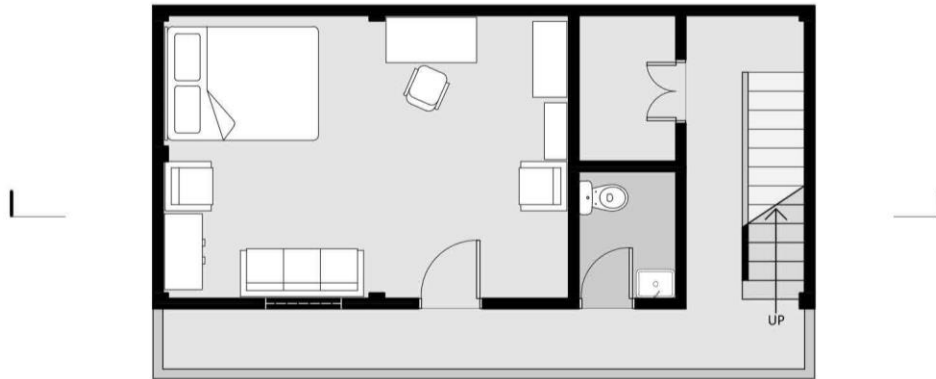
Context plan



Ground floor plan



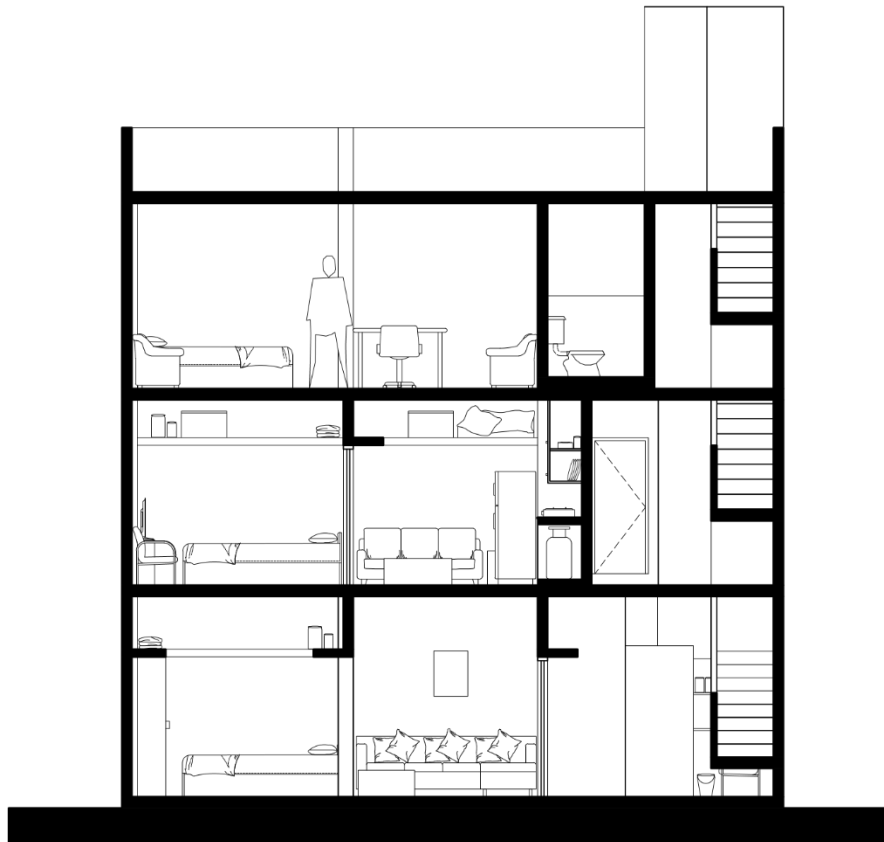
First floor plan



Second floor plan



Roof plan



Cross section

Fig 5.26: Plot B04

The next house I surveyed was exactly the opposite of B03 in terms of plot exposure. Instead of three sides exposed and one side covered, this dwelling had three sides covered and one side exposed. Nestled subtly on a narrow street among other homes, it stood out owing to its exterior façade which was painted in vibrant shades of blue. It was inhabited by a single family. My interaction happened with the owner's son, who was studying interior design and took great interest in my research. He agreed to take part in the study almost immediately and enthusiastically gave me a tour of his home.

BR04- We usually rent out the ground floor. However, this year my cousin brother is living here. He is working in the city... you can have a look. We usually give it to young professionals. My parents live on the first floor, whereas I live on the second floor.

BR04- The house is small, but it is well made. I am studying interior design, so I can say that. The layout works well for us. Our home remains airy and well-lit throughout the day.

BR04- I don't think my father has any plans to expand the house. You see we don't even use the ground floor. Tomorrow if we require more space, we can always use that and not rent it. Right now, there is more space in the house than it is required.

The house had an extended yard on the southern façade facing the access street. This yard was used to park two wheelers. Though only a single side of the house was exposed, its layout was designed to provide optimum frontage. The plot was shaped like a narrow rectangle with its longer side facing the street. The staircase along with the main entrance to the dwelling was located on the eastern side. The ground floor had another entrance located in the center, which opened directly into the living room. I entered from the eastern entrance into the kitchen. The bathroom could also be accessed from this space. Surprisingly, this room accommodated the underground water tank as well, an element usually located on the extensions. The next was the living room followed by the bedroom. The layout was simple and efficient. No space was wasted in the house. Apart from accommodating overhead shelves in most rooms, even the space under the main staircase was used for storage on all floors.

The first-floor layout was slightly different. Both the first and the second floors were extended on the southern façade to accommodate balconies, which acted as circulation galleries. The entrance to the toilet was beside the staircase. The washbasin was provided outside the toilet in order to be used even when the toilet was occupied. The entrance to the dwelling was from the balcony, located in the center. The first room was a living/ dining area with an open kitchen. This is where the family would host guests. Just opposite the kitchen was the entrance to the main bedroom. The owner's son explained to me that

they usually take meals in this room while watching television. Daily activities such as washing and drying clothes also take place on this floor in the balcony.

The second floor belonged to the owner's son. There was a store room provided next to the staircase on this floor. The entrance to the bathroom was again kept separate from the main room. The layout of this floor was extremely simple. It was just one big room without any internal partitions or kitchen area.

BR04- My floor has nothing much. I usually take the meals with my parents on the first floor.

If we have guests, they are always hosted there. It's easier to cook tea and snacks for them.

I like my floor though. It feels more private. Nobody usually comes here.

The layout of the dwelling allowed for better ventilation of the toilet as its entrance was kept separate from the living spaces. All rooms had windows facing the street and this kept the interiors pleasant. If compared to the dwelling AR3 from the sector discussed above, which also had one side exposed, this plot layout worked a lot better. With its longer side oriented along the street, the house received ample amount of sunlight and remained well ventilated. It further provided for a larger area to be extended in front of the house, allowing for more semi-private space. While the dwelling AR3 was well made with an open-to-air rear court for light and ventilation, the rooms in the middle still required artificial lighting during the day, which was not the case for this dwelling.

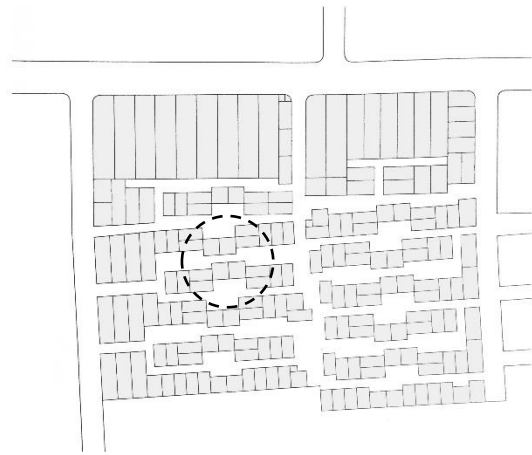


Fig: 5.27 Residence B04- balcony and exterior

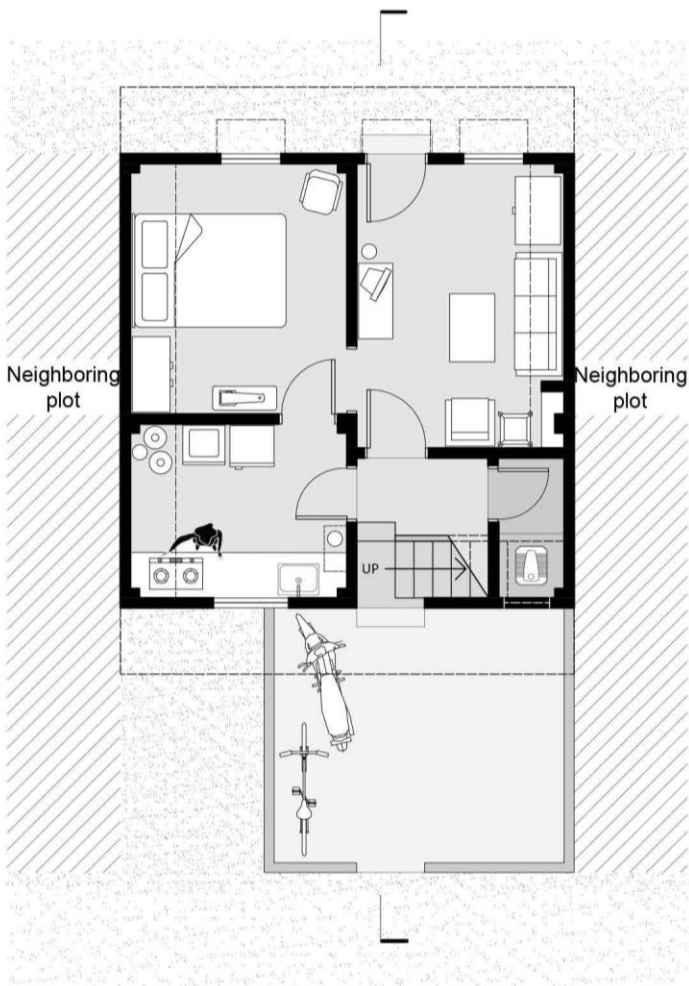
(left)- The image shows the balcony on the first floor that acts as a circulation gallery. It provides access to all the rooms on this floor. The space is also used for washing and drying clothes.

(right)- The house is exposed on only one side. However, its longer side is oriented towards the street. This allows for more frontage (9 meters) which is an important characteristic that influences the house design. Such an orientation allows for plenty natural light inside all rooms while keeping them well ventilated. However, the family had extended their plot on the ground floor beyond the permissible zone.

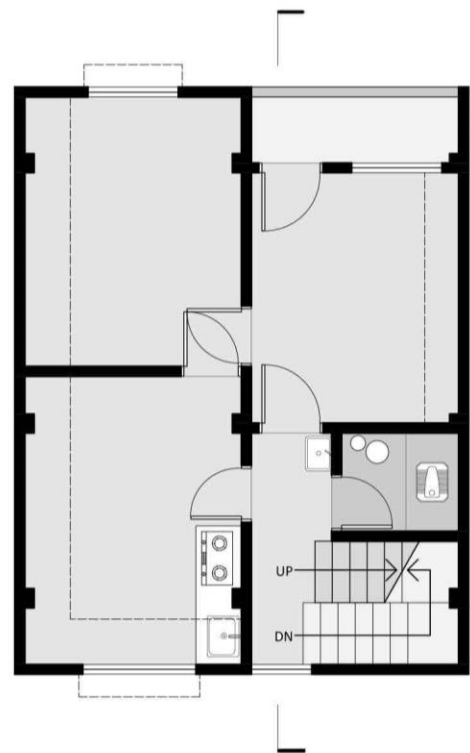
B05



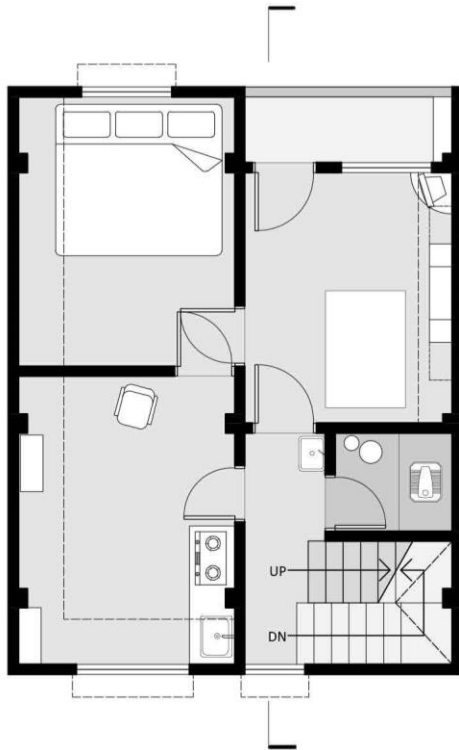
Context plan



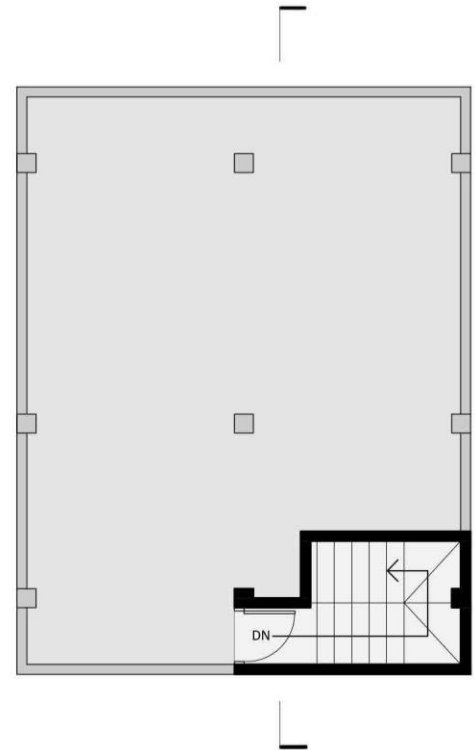
Ground floor plan



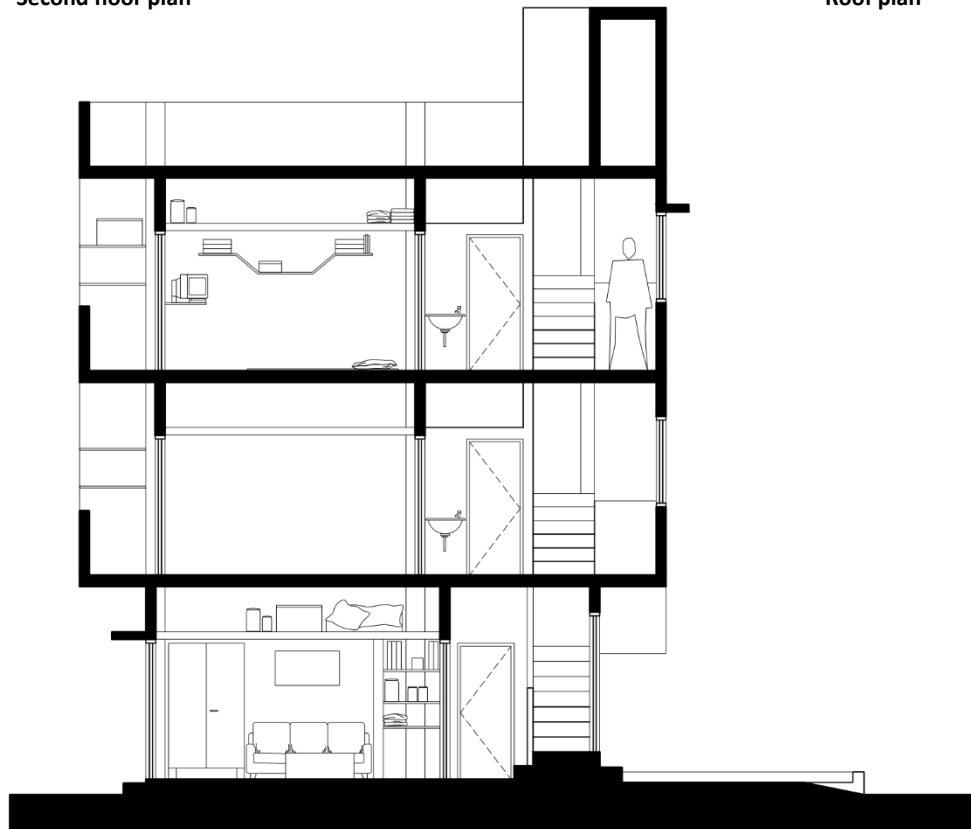
First floor plan



Second floor plan



Roof plan



Cross section

Fig 5.28: Plot B05



Fig: 5.29: Residence B05- exteriors

(left)- The image shows the south façade of the house that faces a small public square. A stoop is extended on the ground floor until the street. This space is used for parking purposes and for drying clothes. The plot is square in shape and has a proportion of 1:1. This scenario allows for more frontage, but in doing so one loses control of the public realm. Hence, the extensions often cross the permissible zone and occupy the public space.

(right)- The image shows the north side of the house. The plot is exposed from two opposite sides. This scenario, when coupled with the plot proportion of 1:1 produces quality housing. Such opportunities allow for more freedom in designing the layout. It also allows for good ventilation and natural light inside the dwelling.

This dwelling was located on one of the internal streets facing a small public square. The plot was square shaped and had its front and rear side exposed. On the front side, a stoop was extended with a curb around it reaching the street, covering the entire area of the square in front of the plot. The upper stories were extended on both the front and the rear side. The front extension accommodated the main staircase while the rear extension allowed for more space in the rooms along with having a balcony. The house replicated an apartment building, having three floors- each rented to a different family. I interacted with the students occupying the top floor of the building.

BR05- All of us study in Indore. We are three students who live in this house and it's enough for us. If you see, we have two spacious bedrooms and a big kitchen. We also have access to

*the terrace. Sometimes during summers, me and my friends we sleep on the terrace.
Nobody usually comes there.*

The staircase was located adjacent to the square. It was designed to cantilever on the upper floors. I visited the top floor first, where the students resided. The toilet on this floor was placed adjacent to the staircase having its entrance separate from the living spaces. Similar to the other dwellings surveyed, the wash basing was kept outside the toilet. The students explained to me that this scenario worked a lot better for them as one could still wash their hands or brush their teeth while toilet was occupied which saved them time in the morning. Right opposite the toilet, was the entrance to the kitchen. This was a spacious and well-lit room with the kitchen counter on side of the room and enough space to accommodate a dining table on the other side. Since the house belonged to the students, the furniture was kept minimal. From this room I entered the bedroom, which was further connected to the second bedroom. The second bedroom accommodated a balcony and had another entrance to the house. This room could even be used as a living room in different living arrangements.



Fig 5.30: Residence B05- interiors of second floor.

(left & middle)- The images show the kitchen of the second-floor residence. The house was occupied for a short-term rental by three students and hence, the furniture was minimal. The interiors remain pleasant with plenty natural light due to the plot having a square shape and being exposed on two opposite sides.

(right)- The image shows the bathroom on the second floor. The entrance is kept outside the house to allow for better ventilation. The washbasin is placed outside the toilet so it can be used by others even when the toilet is occupied.

BR05- We don't have a lot of furniture. We don't require it. We usually have the meals on our mattresses. And it works fine. We don't want to waste money on buying furniture since this is not our permanent house.

BR05- I like the house. Its open from both sides so there is good ventilation. Unfortunately, It's the top floor and so it gets hot in the summers, but we really can't do much about that. The area is nice, people are very friendly in the neighborhood. The lady who lives on the ground floor often gives us breakfast on Sunday mornings when they prepare some special meal. The bus stop and the main highway are also nearby. So, it works well for us. Sometimes when we are bored we go to play cricket in the park behind the temple.

The students highlighted the proximity to public transport and a park as positive aspects of the neighborhood. They informed me that they had no idea about how the building was made or when. They further explained to me that the first-floor layout was identical to theirs. I couldn't interact with the residents of the first floor as they were not home. So, I moved on to the ground floor. It was occupied by a young couple and their baby daughter. The layout of this floor was only slightly different. The orientation of the toilet was changed to accommodate it under the staircase landing, while still maintaining a separate entrance from outside the house. Keeping the toilet separate from the living spaces also worked well in terms of ventilation. Since none of the toilets in this building had windows, keeping them outside prevented the foul smell from entering the house.

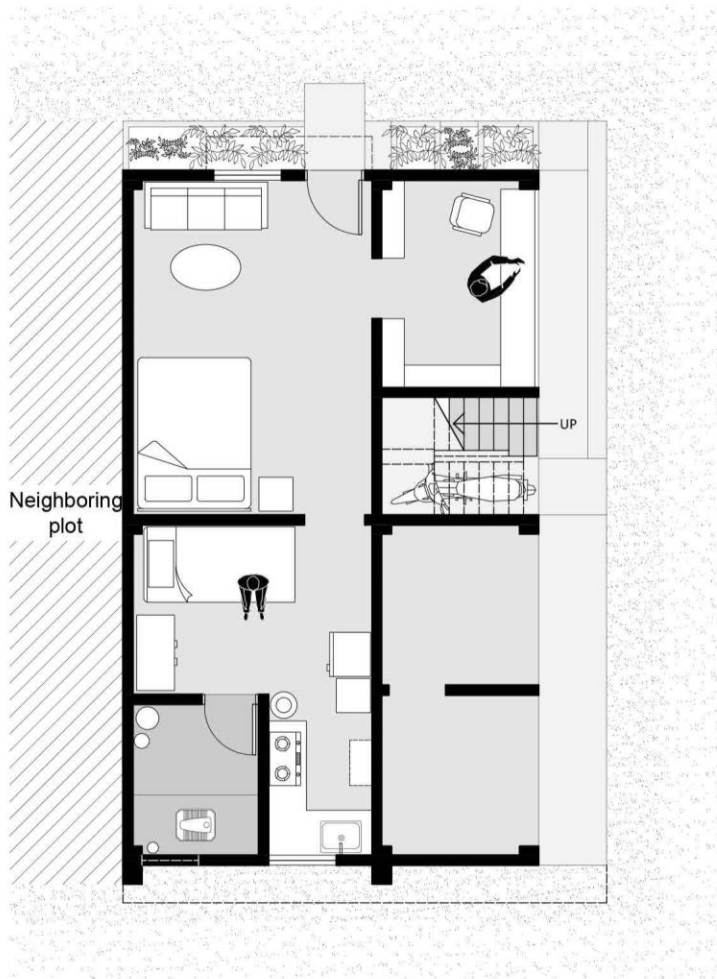
The ground floor had a relatively smaller kitchen. Unlike the houses on the upper floors which were extended from the rear side, this house maintained its plot boundary. The main bedroom was accessed from the kitchen, which was connected to the second room. This second room was used as a living room in this house. The lady who resided in this house explained to me that they only required one bedroom for now since their daughter was just 2 years old. The second room was used to host guests or have meals and watch television.

The plot ratio of this dwelling was 1:1, and in my opinion it worked well. The layout was simple and efficient making good use of the space. The rooms were spacious and well lit. The students on the top floor highlighted that they don't use any artificial lighting during the day. The house had good cross ventilation as the front and the rear sides were exposed. The inhabitants seemed satisfied with the layout and the neighborhood highlighting similar aspects like other participants of the study- access to public transport, proximity to open spaces, religious spaces and shops. This was one of the last EWS dwellings that I studied in the neighborhood.

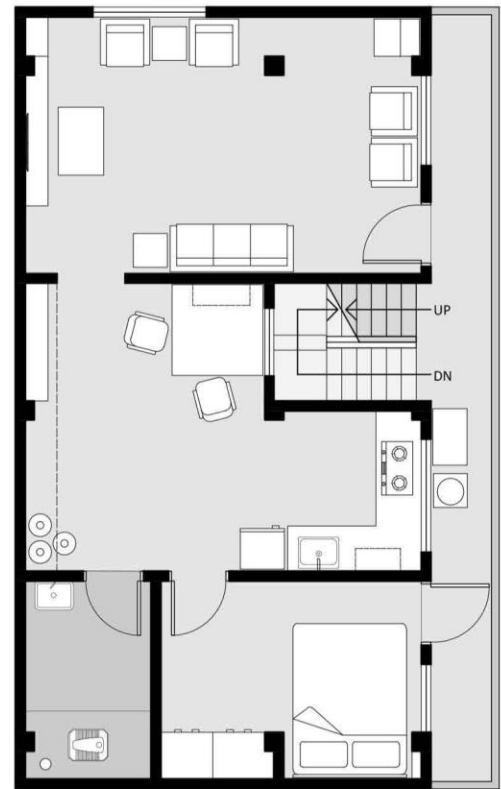
B06



Context plan



Ground floor plan



First floor plan

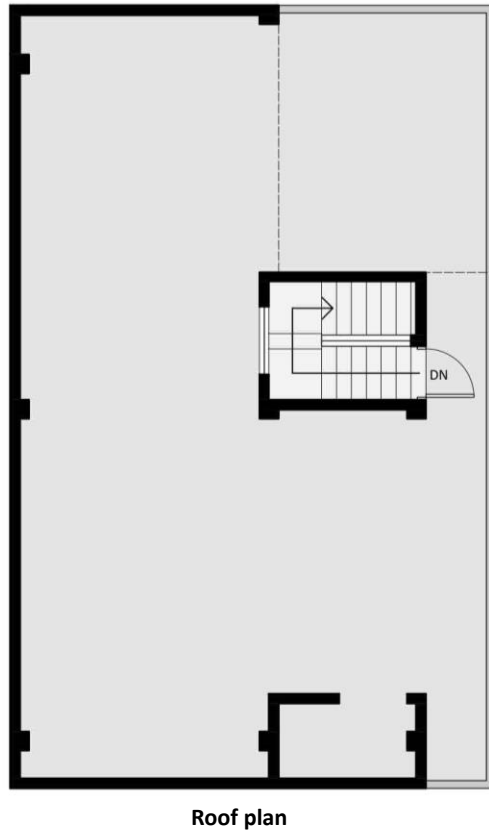


Fig 5.31: Plot B06

The last dwelling I surveyed in the area belonged to the category of LIG houses. It was a corner plot located at the end of a linear cluster. The house accommodated two shops at the ground floor. Although the focus of my survey was on EWS dwellings, I still decided to go ahead with the survey of this dwelling making an exception. Being a corner plot, the dwelling had three facades exposed.

I approached the owner of the shop who was also the owner of the plot. He told me that they had moved to the plot in 1994 and had gradually build their home since then. At first, they only build the ground floor with the shop in it. The most recent addition was made to the top floor about 8 years back.

BR06-We moved here in 1994 and have been living here since then. This shop is where I spend most time of my day and it is what sustains this home. Initially, we just made the ground floor. As my son got older and the family size grew, we added another story to the house. Now my son, his wife and their son live on the upper floor. Me and my wife we still live on the ground floor. But we have the meals on the first floor... All of us together. You can go with my wife and she will show you the house. I would have come but I can't leave the shop.

It was incredible how the dwelling supported the family financially. A single floor allowed them to develop a place of work along with providing the opportunity for a small sublet. The front façade on the ground floor had two shops. The owner managed one shop and gave the other for rent. The two shops were separated from each other through a central staircase. In addition to providing access to the upper stories, this space was also used to park a two-wheeler. The residential spaces were located behind the shops, with an entrance from the north façade. The first room was the main living room. This room accommodated a bed and was also used as the main bedroom. This room was internally connected to the owner's shop. The second room was a small bedroom followed by a kitchen and a toilet. The second shop wasn't internally linked to the dwelling. Such a layout could only have been possible with the three-side exposed opportunity. All rooms had windows and received plenty natural light, making the dwelling comfortable and well lit.

The second floor had a balcony running along the longer side of the plot. The first room I entered was the main living room. The room was big and bright, accommodating two wide windows. This is where the family would host guests. The second room was the kitchen along with a small dining space. This space provided access to the bedroom and the toilet. The bedroom also had a secondary entrance directly from the balcony.



Fig 5.32: Residence B06- access stairs, balcony and main entrance to ground floor residence.

(left)- The image shows the main stair that provides access to the upper floor. The space under the stair is used for parking purposes.

(middle)- The image shows the balcony on the first floor that is extended on the east façade with faces the access street. This balcony acts as a circulation gallery and provides access to different rooms on the first floor.

(right)- The image shows the main entrance to the ground floor from the north façade of the residence. The ramp is used by the residents to carry and park their two wheelers inside the house. It is common to most houses in Aranya. Several people park their two wheelers inside their house or inside their private yards at night for additional security.



Fig 5.33: Residence B06- exterior.

BR06- Earlier, my parents used to sleep in the middle room and me, my wife and my son slept in the bigger room.

BR06- I like the house. It's just opposite the school and so my shop works a lot better. This is what we have, and it has given us everything. It was one of the best decisions of my life to have moved here.

The owner was very proud and emotional about his dwelling. And he had all the reasons to be that way. The house had accommodated four generations of his family while being a constant source of income. I believe the owner had designed the plot layout very efficiently. The entire dwelling was airy and felt extremely spacious. All rooms had windows and/or ventilators. They had recently added a temporary roof on the terrace to use the space for leisure. This was a fine example of the live-work-play concept, accommodating all zones on the same plot.



Fig 5.34: Residence B06- exterior.

The image shows the front (east) façade of the residence. The house has three sides exposed and this provides flexibility in designing the layout. Two shops are accommodated on the ground floor, while keeping the rear rooms well-lit and well ventilates. The upper floor is extended on all exposed sides to provide for more space. The terrace is covered with a temporary roof to keep it shaded. The residents use it for leisure purposes.

This sector exhibited a wide variety in plot conditions, which were further reflected in the layout of individual dwellings. The planning of this sector, and even the entire community, the scale, and the creation of public, semi-public and private spaces are evidence of the designer's understanding of how cities work and the significance of good urban design. A few open spaces have been encroached upon and are being used as parking lots due to the extensive use of automobiles, however, the very characteristic of these spaces being transformative is a special one. Aranya has been adapting and evolving steadily since its completion in 1988, and in my opinion, it will continue to do so in the future years.

CHAPTER 6 – CONCLUSION

Starting from the 1970s, several developing countries have promoted the “sites-and-services” approach- an attempt to develop low-cost housing through user initiative (Bhatt, 1999). The very basis of the sites-and-services approach is economical. The primary goal is to provide minimum resources to everyone in order to serve the maximum number of people. Due to this reason, however, several sites-and-services projects suffer from issues such as having extremely small plots and tight layout plans along with having culturally inept designs and substandard allocations (Bhatt, 1999).

Most sites-and-services projects are located on the periphery of urban areas where land prices are cheap, but both job prospects and transportation links are poor- as a result, many have remained empty. Additionally, due to limited resources invested in such projects, designers and planners often tend to compromise the social and cultural aspects of housing development. Oftentimes, social problems of poverty are intensified by these projects as they ghettoize the poor, by stripping them off opportunities to work for higher-income neighbors or in ancillary service industries that organically grow out of mixed-income neighborhoods (Bhatt, 1999). Finally, plot sizes and designs, along with street layouts are often standardized with no regard for the variety of housing that could be built on such plots. At Aranya, however, the designers’ efforts to create good housing and encourage real community have produced inspiring results. In addition to criticizing the conventional architectural, engineering, and planning norms of sites-and-services projects, the designers of Aranya altered them to develop innovative solutions. A new set of planning standards was developed, recommending mixed-uses, replacing large open spaces with a system of smaller ones, keeping the streets short, and incorporating private protected areas- which could be used as places of work, social gatherings, and mobile commercial activities at the level of clusters of plots (Bhatt, 1999). The designers also attempted to address the issues of identity and sense of community which were often missing in conventional sites-and-services projects. The township was planned as a collection of self-contained “villages” where people would live, work, play and socialize within walking distance of one another. Each neighborhood contains schools, medical centers, shops, workshops, and a variety of open spaces- ranging from those serving seven to ten EWS plots, to larger plots for work areas, to even larger open spaces surrounding community facilities (Bhatt, 1999). The low-rise, high density development at Aranya provides its residents unmediated contact with streets and open spaces that results in the overlap of social, domestic and community functions. This further vitalizes social interaction and emboldens traditional

customs. In the design of the neighborhood, a relatively informal street layout- with varying widths and a range of open spaces- was chosen to accommodate a lively mixture of activities. However, the most important aspect of Aranya townships remains the 'EWS dwelling', which constitutes more than 65% of the township. Careful consideration was given to the design of the EWS plots to suit its future clients. Instead of assuming social homogeneity, the designers of Aranya acknowledged that every income group and all the different religious and ethnic subdivisions had their own requirements (Bhatt, 1999). Hence, a wide range of plots with distinct opportunities in terms of frontages, shapes, sizes and exposures were developed to match individual needs.

Clearly, certain design decisions were more influential in shaping the dwellings on these plots as compared to others. These include frontage and exposure. Both these plot characteristics greatly affect the progressive development of houses at Aranya township. Almost 60% of the plots designed by architect B.V Doshi had more than one side exposed, which allowed multiple access to the dwellings. This significantly influenced both the quality and the design of housing produced on these plots. The remaining plots, however, which had only one side exposed and a 3.5-meter frontage, eventually produced substandard housing. This was due to the limited design opportunities that these plots had to offer to its residents. On the other hand, in the demonstration scheme, 85% of the plots had more than one side exposed. The remaining 15% were oriented in a way to allow for 9-meter frontage. This provided a wider range of opportunities and relatively more freedom in terms of designing layouts as compared to the plots having a 3.5-meter frontage. For instance, two plots, both having one side exposed were discussed in the previous chapter, one from the sector designed by B.V Doshi and another one from the demonstration scheme designed by CMCH, McGill University. The first one had a plot frontage of 3.5 meters while the second one had a frontage of 9 meters. Orienting the longer side along the street greatly influenced the quality of housing produced on the plot. Having more frontage allowed the house to receive more light and better ventilation, while also allowing the family to sublet one floor. This was particularly difficult in the plot with just 3.5-meter frontage, where relatively inferior housing was produced due to limited opportunities. However, it needs to be acknowledged that when wide frontages are opened up, one tends to lose control of the public realm. This is evident in the size and scale of encroachments in the demonstration scheme. The house extensions in Doshi's sector, however, remain relatively controlled and within limits.

Plot shape and proportion were other significant aspects that played a crucial role in the design of the housing produced. Most houses surveyed in section 5.3.1 were designed on rectilinear plots having a

proportion of 1:2.64, mostly producing houses where rooms were arranged back to back in a linear manner, unless where other factors such as plot exposure or frontage dominated the design. However, in plots surveyed in section 5.3.2, the plot proportions varied from 1:2.1 to even 1:1 at times. This allowed for more freedom in terms of designing layouts and arrangement of rooms, preventing back-to-back placement of rooms and hence, producing quality housing.

Another aspect that gets highlighted in the survey is that out of all the plots only two were occupied by a single family, although all plots were planned as such. Today, they are inhabited by two, three or even four families. This signifies that about 35 sqm. dwelling size is satisfactory in urban India. The residents of Aranya have successfully managed to create additional housing on their plots. What becomes paramount in the design of these superposed flats is to maintain the privacy and identity of each unit while allowing multiple access.

The evolution of Aranya has been invigorating since its completion in 1988. It has propelled generation of varied spaces in streets and neighborhoods- spaces that are homogenous to traditional towns. The smooth transition of traditional structures with new building traditions and technologies has been commendable. Use of reinforced concrete and pre-cast concrete elements such as grills, fences, and railings have produced an impressive mix of housing designs, which is visible in its variety, and in house layouts with more than one side exposed, where houses have extra porches and balconies or new orientations (Bhatt, 1999). It's clear that both architects and planners have much to learn from this benevolent and multi-layered project as it matures.

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