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URBAN POLICIES AND DESIGN FRAMEWORK FOR INCLUSIVE REDEVELOPMENT OF HIGH-DENSITY INFORMAL SETTLEMENTS IN RAJAJI NAGAR, THIRUVANANTHAPURAM DISTRICT IN KERALA

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ABSTRACT- English

This thesis is based on evidence-based design approaches to sustainable and inclusive redevelopment of the high-density informal settlement of Rajaji Nagar (Chengalchoola Colony), Thiruvananthapuram, Kerala, using in-situ upgrading. Although there have been massive investments in terms of national programs such as JNNURM, RAY and PMAY, there have been implementation failures regarding informal settlement redevelopment in India like failure to properly involve the local communities and the displacement. The settlements in Kerala are characterized by unique features, such as smaller spatial procedures, decentralized governance, strong community institutions, such as Kudumbashree, which require specific approaches to these issues.

Rajaji Nagar experiences intensive density (400+ persons/hectare), poor infrastructure, frequent floods, insecure tenure, and social economic marginalization. This study is based on the recognition of key principles that apply, such as participatory design with authentic community decision-making, in-situ upgrading preserving social networks and employment opportunities, coupled infrastructure-plus-housing provision, safe tenure, culturally-sensitive housing typologies, and institutional coordination pursued through GIS spatial analysis, policy evaluation and comparative case studies (Yerwada, Baan Mankong, Parivartan).

A holistic framework deals with five overlapping clusters: (1) In-situ development with minimum displacement; (2) Housing upgradation with renovation, selective vertical extension and incremental core housing; (3) Infrastructure development with drainage hierarchy, canal restoration and flood mitigation (4) Long-term leasing and coordination of wards providing long-term leasing and ward coordination; (5) Community spaces creating pocket parks and multi-purpose hubs. This shows that through integrated interventions sustainable redevelopment can be achieved without massive demolition and displacement.

The study establishes key demands in Kerala, namely, a shift in models where market-based models are replaced by participatory ones, where housing is paired with a full infrastructure and social services, tenure security, climate resiliency, institutional commitment that is sustainable, and harnessing existing community institutions. This model will show that sustainable and socially fair alternatives to traditional forms of relocation are found in incremental, in-situ methods, which will support UN Sustainable Development Goal 11: Sustainable Cities and Communities.

Keywords: Informal Settlements; Slum Redevelopment; In-Situ Upgrading; Housing Improvement; Tenure Security; Urban Policies; Inclusive governance; Sustainable urban development; Design Strategies; Policy Frameworks

ABSTRACT- Italian

Questa tesi si basa su approcci di progettazione basati sull'evidenza per la riqualificazione sostenibile e inclusiva dell'insediamento informale ad alta densità di Rajaji Nagar (Chengalchoola Colony), situato a Thiruvananthapuram, Kerala, attraverso interventi di upgrading in-situ. Sebbene siano stati effettuati ingenti investimenti tramite programmi nazionali come JNNURM, RAY e PMAY, in India si sono verificati insuccessi nell'attuazione della riqualificazione degli insediamenti informali, come la mancata partecipazione effettiva delle comunità locali e i processi di dislocamento. Gli insediamenti del Kerala presentano caratteristiche uniche, quali procedimenti spaziali di dimensione ridotta, governance decentrata e forti istituzioni comunitarie — come il programma Kudumbashree — che richiedono approcci specifici a tali problematiche.

Rajaji Nagar presenta un'elevata densità (oltre 400 persone per ettaro), infrastrutture carenti, frequenti episodi di allagamento, insicurezza del possesso e marginalizzazione socioeconomica. Questo studio si fonda sul riconoscimento di principi chiave, tra cui la progettazione partecipata con reale coinvolgimento decisionale delle comunità, l'upgrading in-situ che preserva le reti sociali e le opportunità di lavoro, la fornitura congiunta di infrastrutture e abitazioni, la sicurezza del possesso, tipologie abitative sensibili al contesto culturale e il coordinamento istituzionale realizzato attraverso analisi spaziali GIS, valutazioni politiche e casi di studio comparativi (Yerwada, Baan Mankong, Parivartan).

Un quadro olistico affronta cinque ambiti interconnessi: (1) sviluppo in-situ con minimo dislocamento; (2) miglioramento abitativo tramite ristrutturazione, estensione verticale selettiva e costruzione incrementale dell'unità abitativa di base; (3) sviluppo infrastrutturale attraverso gerarchie di drenaggio, restauro dei canali e mitigazione delle inondazioni; (4) leasing a lungo termine e coordinamento dei ward per garantire stabilità e partecipazione; (5) creazione di spazi comunitari con pocket park e hub polifunzionali. Ciò dimostra che, attraverso interventi integrati, è possibile raggiungere una riqualificazione sostenibile senza ricorrere a demolizioni e spostamenti di massa.

Lo studio definisce le principali esigenze del contesto del Kerala, ossia la necessità di un cambiamento dei modelli attuali, sostituendo quelli basati sul mercato con approcci partecipativi, nei quali l'abitazione sia accompagnata da infrastrutture complete e servizi sociali, sicurezza del possesso, resilienza climatica, impegno istituzionale duraturo e valorizzazione delle istituzioni comunitarie esistenti. Questo modello intende dimostrare che alternative sostenibili e socialmente eque alle forme tradizionali di ricollocazione possono essere realizzate attraverso metodi incrementali e in-situ, in linea con l'Obiettivo di Sviluppo Sostenibile n. 11 delle Nazioni Unite: "Città e comunità sostenibili".

Keywords: Insediamenti informali; Riqualificazione delle baraccopoli; Riqualificazione in situ; Miglioramento abitativo; Sicurezza del possesso; Politiche urbane; Governance inclusiva; Sviluppo urbano sostenibile; Strategie di design; Quadri politici.

TABLE OF CONTENTS

4. INFORMAL SETTLEMENT REDEVELOPMENT IN INDIA: POLICY FRAMEWORKS

5. CASE STUDIES

PART B: SITE STUDY: RAJAJI NAGAR COLONY, THIRUVANANTHAPURAM

1. REGIONAL LEVEL ANALYSIS

2. SITE SPECIFIC SCALE ANALYSIS

3. CONCLUSION

BIBLIOGRAPHY

LIST OF FIGURES & TABLES

LIST OF TABLES

PART A: RESEARCH AND SCIENTIFIC BACKGROUND

Introduction

Literature Review

General Overview of Informal Settlements (Global and Indian Context)

Informal Settlement Policy Frameworks: Global and Indian Context

Case Studies and Lesson Learnt

CHAPTER 1
INTRODUCTION

1.1 Background and Context

The twenty first century is undergoing change of urbanization like never before. The global population is expected to have 68 percent living in cities by 2050 (UN-Habitat, 2015). Although urbanization spurs economic development and innovation, urbanization has posed major issues especially expansion of informal settlement and slums. It is roughly estimated that in 2024, around 24.9 percent of the world urban population, or approximately 1.1 billion people, will be living in slums and informal settlements (UN-Habitat & PSUP, 2016; UN-Habitat, 2025). The slum population alone increased by 191 million from 2020 to 2024, which is a clear indication of the worsening crisis that requires immediate attention from policymakers, urban planners, and civil society. Overcrowding, insecure housing, poor access to the basic facilities, like safe water and sanitation, poor land tenure, and poor environmental exposure are some of the traits of informal settlements (UN-Habitat, 2025; Habitat3, 2016). These shantytowns are the extreme types of urban poverty and social spatial marginalization, as inhabitants do not have only decent housing but also have a chance to develop socially and economically. The other facets of the programs aimed at solving informal settlements

constitute the key to the achievement of the United Nations Sustainable Development Goal 11 (SDG 11) to make cities inclusive, safe, resilient, and sustainable (UN-Habitat, 2015).

Figure 1. Linkages between SDGS and Informal settlements
(Source: Informal Settlements: No Longer Invisible, 2022)

This dissertation explores the potential of transforming densely packed informal settlements into sustainable, inclusive, and lively neighbourhoods through urban design and targeted policy, making. The study focuses on Rajaji Nagar (Chengalchoola Colony) in Thiruvananthapuram district, Kerala, India. This settlement has spatial, social, environmental and economic problems without losing its cultural identity and community aspirations. In order to put this local study into context, we need to know more about informal settlements in terms of the global, national and local level.

1.2 Problem Statement

In Thiruvananthapuram, years of policy inputs on achieving slum-free urban development are accompanied by the existence of very deprived informal settlements like Rajaji Nagar (Chengalchoola), which is right behind the State Secretariat. The severe housing deterioration in the colony, the

environmental threat and stagnant reconstruction reveal a huge disconnect between the progressive policy discourse and the real-life experience of the residents.

1. Unsafe and dilapidated housing

The housing in Rajaji Nagar, which had not been maintained even over the past decades, is now in a situation of practically collapsing, which exposes the 2000 families residing on less than 12.6 acres to intense physical risks. Toppling structures, leaky roofs, and debris have become normal life, where the residents such as 65-year-old Nalini report always being in fear of collapsing to death, particularly at times of the year when there is a higher risk during the monsoon (New Indian Express, 2023a; Times of India, 2024a).

2. Environmental degradation and health risks

The fact that Rajaji Nagar lies along the contaminated Amayizhanchan canal also contributes to the susceptibility of the citizens, who are subjected to long-term environmental and health risks. The canal serves as an open sewer because of the absence of sewage systems and waste disposal, and the health services around the areas are too miserable (Deccan Chronicle, 2018; New Indian Express, 2021a).

3. Human suffering and everyday insecurity

These negative effects on buildings and environment have a direct effect on the physical and psychological health of residents, and there have been reports of severe injuries related to collapses of ceilings and fans not being repaired even after constant requests. The seniors are shunned in fear, and this is an indication of how negligence and ineffective governance has made the day to day life a life of constant threat and fear (New Indian Express, 2023a).

Figure 2. Newspaper articles depicting the issues faced by the residents of the Rajaji Nagar colony.

(Source: New Indian Express. (2023, October 6; Deccan Chronicle. (2018, May 30))

4. Policy achievements vs. ground realities

In spite of Thiruvananthapuram being known nationally in terms of slum-upgrading activities under JNNURM and BSUP, the situation in Rajaji Nagar indicates the lack of contact between a successful policy and the real situation. The celebrated housing and community infrastructure model of the city have not yet penetrated the most vulnerable groups and the homes and services of Rajaji Nagar are in a deplorable state of neglect (Williams et al., 2019).

5. Stalled Smart City redevelopment

The redevelopment of the Rajaji Nagar by the Smart City Mission suffers because of the political differences, bureaucracy, and lack of trust in the relocation plans by the residents, the project costs 61.42 crore. The project was officially shelved in 2021 and still stagnated due to the lack of coordination and the continuity of funding (New Indian Express, 2021b; Times of India, 2024b; PropNewsTime, 2025).

6. Partial restart and prolonged delay

It was revived in 2024, with a reduced Phase I plan of 248 units, but with little success. As only 18 out of 189 families were willing to move, not much has changed or improved yet, and residents have to live in dangerous conditions until they eventually receive the promised redevelopment, which is still unimplemented (Times of India, 2024a; PropNewsTime, 2025; New Indian Express, 2024).

Figure 3. Newspaper articles related to the redevelopment situation of the Rajaji Nagar colony.

(Source: New Indian Express. (2021, August 24), Times of India. (2024b, September 10))

The example of Rajaji Nagar/Chengalchoola sheds light on the main issues of urban policy and planning in making inclusive redevelopment a reality. Large amounts of funding, international models, and promises of insitu upgrading are only some of the things initiatives keep failing to bring about timely or significant improvements in the living conditions of the inhabitants. Hence, the question arises as to whether strategies for redevelopment can move beyond the mere physical upgrading of quarters to deal with the social, economic, and governance aspects which, in the end, determine success. In particular, successful solutions have to combine community involvement, protection of livelihoods, and security of tenure so as to pave the way for safer and healthier living conditions without forcing the most vulnerable inhabitants to give up their homes and urban social networks.

1.3 Research Objectives

The specific objectives of this study are to:
- Analyze the spatial, social, environmental and infrastructural environment of Rajaji Nagar (Chengalchoola Colony) to see the prevailing challenges and opportunities of enhancing the living conditions in the area through in-situ interventions.
- Study policy frameworks and urban development programs in India that favour the redevelopment of informal settlements, including in-situ upgrading, housing improvement and infrastructural development.
- Review case studies of effective informal settlement redevelopment projects in India to determine the best practice, lessons, and transferable design strategies that can be applied in Rajaji Nagar.
- Compare the identified case studies with case studies of the Rajaji Nagar in order to grasp similarities in the contexts and differences as well as whether the strategies used in the case studies can be applied to the local context.
- Proposed evidence-based level design scheme of settlement enrichment of living conditions in Rajaji Nagar, in situ redevelopment, infrastructure upgradation, housing improvement and community space enhancement, in ground of appropriate urban policies.

1.4 Research Questions

Primary Research Question:

How can integrated design, infrastructure policy, and participatory governance frameworks work in harmony to make sure that the in, situ redevelopment of Rajaji Nagar (Chengalchoola) brings prompt improvements in housing, livelihood security, and community well, being without the implementation failure and resident resistance, which have always been the features of the past interventions?

Secondary Research Questions:
- What are the existing spatial, environmental, social, housing, infrastructural, and environmental risk challenges in Rajaji Nagar, and how do relevant Indian urban policies and programs (such as JNNURM, RAY, PMAY, LIFE Mission) currently address or fail to address these issues?
- Which integrated in-situ design and implementation strategies for infrastructure, housing upgradation, and community spaces—drawn from successful informal settlement redevelopment case studies in India—are most transferable to Rajaji Nagar, and how should they be adapted to its specific context while minimizing displacement and ensuring community participation?

1.5 Research Methodology

The study has a qualitative and secondary data-based approach to its research, which implies a policy analysis, comparative case study analysis, and GIS-based assessment of space, which will help to create

a unified redevelopment approach to Rajaji Nagar, Trivandrum. The research is not based on any primary data collection using interviews and field surveys, but the desk-based research and spatial analysis based on the publicly available datasets and documented case studies.

1.5.1 Research Design

The research process is based on a five-step sequential research methodology:
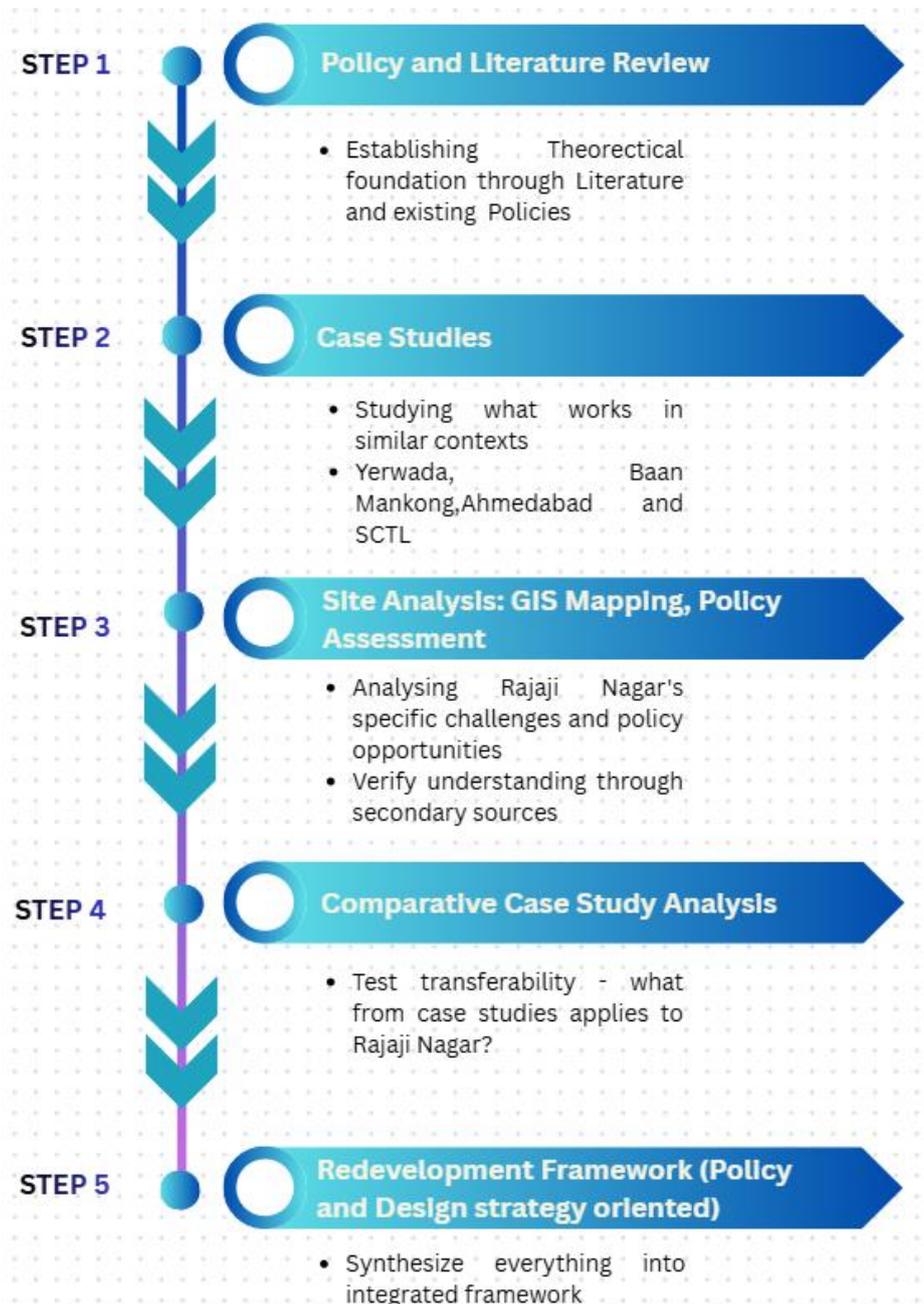
Step 1: Policy and Literature Review

To produce the theoretical and regulatory background, a thorough analysis of international, national, and state-level policies that may regulate the redevelopment of informal settlements was done. These also covered frameworks like Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Rajiv Awas Yojana (RAY), Pradhan Mantri Awas Yojana (PMAY), and Punargeham scheme of Kerala. The conceptual framework was informed by academic literature on the participatory planning, in-situ upgrading and models of sustainable redevelopment.

Step 2: Comparative Case Study Analysis

Four redevelopment projects were chosen according to their applicability to the informal settlement situations like Rajaji Nagar:

- **Yerwada, Pune** – participatory informal settlement upgrading
- **Baan Mankong, Thailand** – community-led in-situ upgrading model
- **Ahmedabad Slum Networking Programme** – infrastructure-focused redevelopment
- **Chengalchoola Colony/SCTL, Trivandrum** – local precedent of relocation-based redevelopment

The cases were examined in terms of governance mechanisms, community participation strategies, design interventions and outcomes. The lessons that could be learned during these cases were derived and generalized to find out transferable principles that could be applied to the Rajaji Nagar.

Step 3: Site Analysis through GIS Mapping and Policy Assessment

To comprehend the physical, environmental, and socio-spatial features of the area, the ArcGIS Pro was used to analyze secondary spatial data about Rajaji Nagar.

Data sources included:
- USGS Earth Explorer Digital Elevation Model (DEM) of terrain and flood hazard maps.
- OSM map data of roads and buildings.
- Google Earth Pro image in land use classification and built-up density analysis.
- Government reports and Census of India (2011) on demographic and socio-economic background.
- Infrastructure and policy data of the Municipal Corporation of Trivandrum (MCT).

Analytical maps were created to pin-point areas prone to floods, drainage, access network, typologies of buildings, distribution of open space and density of trees. The policy documents pertaining to the redevelopment of Rajaji Nagar were studied to evaluate the current proposals and regulatory limitations.

Step 4: Comparative Analysis and Transferability Assessment

The results of the site analysis were cross-examined with the findings of the case studies to assess the transference of the interventions and strategies. This step was done by finding the contextual similarities and differences and examining the viability of implementing certain approaches and finding out the changes required to fit the external models to the peculiarities of Rajaji Nagar.

Step 5: Development of Redevelopment Framework

The conclusion step bundled up findings of policy examination, case studies, and site analysis into an all-inclusive redevelopment framework. This framework is structured into strategic clusters focusing on governance, community involvement, physical design, provision of infrastructure and environmental resilience. It is policy-based and spatially knowledgeable and provides practical suggestions to planners and policymakers.

1.5.2 Data Collection and Sources

Since the study did not involve primary data collection, it was solely based on secondary sources:

Policy Documents: government acts, schemes, master plans, development control regulations, project reports.

Academic Literature: Journal articles, conference papers, theses and books on informal settlements and urban redevelopment which are peer reviewed.

Case Study Documentation: Publicized reports, reviews, news coverage and documentary films of redevelopment projects.

Spatial Data: Open-source GIS data (DEM, OSM, satellite imagery), census, government spatial databases.

Grey Literature: NGO reports, consultancy reports and local government reports.

1.5.3 Data Analysis

Three parallel streams were involved in data analysis:

Content Analysis: Policy documents and case reports are thematically coded to derive the models of governance, the mechanisms of participation, the strategies of design, and the difficulties of implementation.

Spatial Analysis: Processing of raster and vector data in GIS to create maps that depict topography, flood risks, land use, building density, infrastructures and other environmental elements. Spatial relationships were also studied in order to determine site constraints and opportunities.

Comparative Framework Analysis: This compares case study data on analytical dimensions of tenure security, community involvement, design quality, infrastructure adequacy, and livelihood integration to each other, in a matrix format. This made it easy to identify the best practices and lessons that are applicable at Rajaji Nagar.

1.5.4 Limitations

The paper is dependent on secondary sources to obtain qualitative data on resident experiences, livelihood patterns, and social dynamics and does not offer primary fieldwork including resident interviews, household surveys, participatory mapping exercises, and ethnographic observation. The reliance on secondary data presents several limitations:

Lack of Primary Stakeholder Feedback: The project does not involve the interviews with residents, municipal officials, or NGOs operating in Rajaji Nagar. As a result, results lack both lived experiences, community visions, and implementation issues in the ground.

Temporal Data Gaps: The last Census data is as of the year 2011. Population estimates, the number of households and demographics might not be up to date, especially with the continuous migration and settlement dynamics.

Spatial Data Resolution: Construction of footprints and land use categories based on satellite imagery and OSM data might not be precise. There was no possibility of verification on ground which curbed the precision of some spatial analyses.

No Direct Observation: The research was unable to record informal spatial practices, social networks, livelihood patterns as well as microclimatic conditions that affect day-to-day life in the settlement because it was not conducted on-site.

In spite of these limitations, the research methodology is appropriate to the research goals. The research is focused on the development of a conceptual and spatial framework based on the existing knowledge and recorded precedents, but not on the original ethnographic or participatory research. The constraints are admitted and in the final chapter; recommendations are categorically made that require participatory validation and community involvement in any subsequent implementation of the suggested framework.

1.6 Thesis Structure

PART A
1. Introduction
2. Literature Review
3. General Overview of Informal Settlements (Global and Indian Context)
4. Informal Settlement Policy Frameworks: Global and Indian Context
5. Case Studies and Lesson Learnt

PART B
1. Regional level Analysis
2. Site Specific Scale Analysis
3. Comparative Study of the Site with Case Studies

PART C
1. Integrated Design and Policy Framework For Redevelopment Of Rajaji Nagar (Chengalchoola Colony)
2. Discussion & Critical Debate
3. Conclusion

CHAPTER 2
LITERATURE REVIEW

2.1 Understanding Informal Settlements

2.1.1 Characteristics and Dynamics of Informal Settlements

Informal settlements are an important and long-lasting part of the urban structure of India and are the habitat of nearly 31.2% of the urban population. These settlements are also defined by complicated socio-cultural fabrics, dynamic economies, and high infrastructural deficits that identifies them as distinct to formal urban development. Instead of being viewed as a momentary anomaly, modern literature is beginning to acknowledge the informal settlements as a cornerstone in the patterns of urbanization in the world, especially in the Global South. Studies of informal settlements indicate that there are multi-layered problems that are not limited to physical inadequacies alone but also social exclusion, economic marginalization and even cultural identity issues. The morphological analysis reveals complex associations of social conditions to spatial fabric in which the economic conditions are directly expressed in the spatial forms. Such settlements tend to have high communal living cultures such as the chawls found in Mumbai where culture identity and social networks are the basis of community resilience. This interaction of the socio-economic and cultural landscape in informal settlements forms distinctive urban ecologies that are difficult to fit into traditional planning systems. According to (UN-Habitat, 2025), informal settlements have their own spatial logic and social structure that is often not identified by the interventions of a formal nature. It alters the way of perceiving informal settlements as locations of deprivation to perceiving these as localities in which both formal and informal systems come to meet, inhabitants of these places evolve complex forms of coping, and alternative ways of urban citizenship are shaped. Empirical evidence records the manner in which informal settlements offer cheap housing but are typified by overcrowding, lack of tenure and continuous water, sanitation, drainage and social infrastructure shortages. Descriptive typologies indicate significant internality in the attributes of building typologies, densities, and socio-economic profiles, and warn against making all slums the same. With dense settlements such as the ones at Rajaji Nagar in Thiruvananthapuram, this would mean the fine-grained socio-spatial analysis of the various differentiated vulnerabilities and capacities and subsequently suggest redevelopment structures.

2.1.2 Socio-Cultural Dimensions and Community Identity

The socio-cultural context of informal settlements includes heritage, traditions, and social networks that play a significant role in designing the identity of the community and its unity. Overall, studies have continued to assert that maintaining community identity and social capital is more important because displacement is usually followed by deep dissatisfaction because of the loss of existing relationships and support networks. The cultural identity in these settlements is expressed in tangible and intangible elements of heritage. Vernacular urbanism and localized culture enhance the resilience of socio-cultural attributes and the adaptive capacity thus providing solutions to issues of contemporary urban contexts in a way that is contextually responsive. The fact that the traditional knowledge systems have been integrated shows that informal settlements preserve the continuity of cultures and how they adapt to new conditions.

Open spaces in communities and neighbourhoods play some of the most vital roles in the creation of social cohesion and the preservation of cultural practices. These places enable everyday engagements that make social networks, facilitate informal economies and reinforce communal identity. Such spaces that are lost during the redevelopment process often lead to social fragmentation and loss of community resilience. This also applies to individual cultural typologies such as the chawls of Mumbai,

where the resettlement policies do not consider any aspect of communal living that has been core to the chawl culture, leading to a high resident resistance to resettlement (Gawde, R. R., & Paliwal, S. , 2023). Critical discourse analyses underscore the fact that citizens of informal settlements are typically characterized as encroachers or illegal occupants, which can justify eviction-based or market-oriented redevelopment that dislocates the low-income population. In reaction to this rights-based approaches underline the right to the city and claim that society needs to value the social and economic benefits of the informal inhabitants and give precedence to security of tenure and integration into planning systems. These discussions become a conceptual point in the approach to include redevelopment as a purely technical task of design but as a project of transformation in terms of its planning that focuses on citizenship and justice.

2.1.3 Economic Structures and Livelihoods

The economies in informal settlements are typified by a high reliance on the employment in informal sectors, livelihood opportunities that are based on proximity, and multifunctional patterns of land use. There are also economic factors such as effects on livelihoods, commuting, and affordability, emphasizing the necessity to consider redevelopment strategies that promote local economies and cultural survival. Studies reveal that the redevelopment is associated with positive economic results in the cases of livelihood prospects and community self-determination. The geographical distance to the work places turns out to be the pressing issue of economic feasibility. The models of self-redevelopment emphasize the opportunities of the enhanced autonomy and the living standards based on the community-led economic projects. Nevertheless, the informal settlements are still limited on the opportunities available to them, due to the policy failures and poor integration with formal urban economies. Although the informal sector supports their livelihood through basic livelihood services, their activities are not well recognized or guarded and therefore the people are more exposed to economic shocks when the redevelopment interventions go on. Evidence on a global scale has proven that peripheral relocation affects livelihoods and burdens financial constraints of the relocated households. Through a prospect theory research Yan and Bao (2018) record that the housing satisfaction among the relocated residents is critical to both the fulfilment of expectations and access to the economic opportunities with lower effects of loss aversion being the most evident when the result of relocating is lower than expected.

2.1.4 Infrastructure and Service Delivery

The infrastructure conditions in informal settlements show a wide range of variation in situations, and a continuing lack of basic facilities. Research reports report lop-sided infrastructure developments among Indian states, where there are policy effects that are minimal in spite of the intervention programs. The infrastructural problems include poor water supply, sanitation, drainage, electricity and solid waste management systems. Studies have found that shortages in infrastructure are a direct cause of social exclusion and poor livelihood. Infrastructure adequacy is not limited, however, to technical provision and includes the perceptions of residents and their correspondence with socio-cultural requirements. Studies prove the participatory mapping techniques by showing that intricate links exist between infrastructure provision, community spaces, and social dimension of sustainability which traditional planning usually ignores. Several reports measure infrastructure improvements as a key to successful redevelopment with focus on accessibility, sustainability, and service quality. The recent literature has seen the incorporation of green infrastructure and sustainable design concepts into the infrastructure planning process in a way that balances the environmental sustainability goals with the social equity goals. (UN-Habitat, 2025) frameworks state that informal housing crisis requires climate-responsive infrastructure, especially to communities at risk of flooding, heat stress, and extreme weather conditions. However, the process of infrastructure development is still skewed and the voices

of communities are usually sidelined when making decisions about their area. Regarding states at risk, such as Kerala, which face the flood risk, making climate adaptation and risk reduction strategies a part of informal settlement upgrading is especially urgent, as the low-income population is particularly vulnerable to the effects of flooding and heat waves.

2.2 Redevelopment Strategies: Global and Indian Case Studies

2.2.1 Global Approaches to Informal Settlement Redevelopment

The available literature on informal settlement redevelopment around the world shows that there are varying strategies based on geographical, socio-political, and economic realities. The comparative studies in several countries show that there are consistent trends in which residential dissatisfaction follows the relocation of peripherals even with the enhanced physical housing conditions. Among the essential aspects that influence the results are broken social connections, discrepancies in the typology of new housing and the needs of residents, spatial distances between work and social facilities. Studies show that despite the benefits of relocation such as giving them more well-constructed houses, this can in most cases result into disruption of their social and economic lives such as loss of livelihoods, strained community relationships and access to city facilities. These initiatives have failed many times as new housing has become unaffordable or inappropriately located, and people go back to informal living (UN-Habitat, 2025). All these international cases prove that even physical improvements are not enough to successfully redevelop some areas, as socio-cultural and economic integration is an essential factor that determines the level of resident satisfaction and project sustainability.

Yan and Bao (2018) give theoretical background on the interpretation of the relocation satisfaction in terms of prospect theory, which shows that relocated households compare the results with the internal and external samples to the peer groups. Their investigation evidences its loss aversion impacts in which negative changes away of reference points (further distances to work or higher living expenses) render decreases in satisfaction pro rata milder than similar positive changes bring on increases in satisfaction. The discovery contributes to the current understanding about the disappointment among the relocated residents who find satisfaction in objective housing improvements.There is further complication in Asian and African settings. Relocation program studies indicate that although housing conditions are likely to increase, the adequacy of facilities in the neighbourhood, livelihoods, and community integration often continues to be problematic issues, indicating that the infrastructure delivery should be accompanied by physical housing enhancement in a holistic manner. Moving to the outer city areas continues to be especially difficult, since the distance to work centres continues to play against the economic sustainability of resettlement.

2.2.2 Indian Case Studies: Diverse Contexts and Approaches

The situation in the Indian redevelopment of urban regions is very diverse across urban areas, which can provide valuable comparative knowledge. The experience of Mumbai dominates the literature since it is very large and complex. Research explores the redevelopment of Dharavi as a massive area and the development of the metropolitan housing environment in Mumbai and captures the difficulties in revitalizing old and decaying buildings and balancing between the partnership between the state and the corporate sector.

Figure 4. Shanty dwellings, Railway tracks and Mosque in Dharavi Slum Mumbai India February 2010

(Source:https://commons.wikimedia.org/wiki/ File:Shanty_dwellings,_Railway_tracks_and_Mos que_in_Dharavi_Slum_Mumbai_India_February_ 2010.jpg)

The Mumbai chawls are especially rich cultural heritage that may be lost in redevelopment. Gawde, R. R., & Paliwal, S. (2023) record how resettlement policies fail to take into consideration communal aspects of living with the chawl culture leading to high resistance to resettlement by the residents. The architectural typology and social structure of the chawl allow certain cultural activities and economic functions that the normal housing is not able to accommodate. The case has provided some important lessons regarding the relevance of housing typology that matches in the process of redevelopment.

Figure 5. Mumbai chawl tenements in Worli.

(Source: Getty Images, Ronojoy Mazumdar (2023))

Empirical studies of slum rehabilitation programmes in Mumbai indicate that the majority of the residents are happy when the redevelopment takes place in-situ and the social networks and access to livelihoods are maintained. Nevertheless, relocation-based schemes will also display much less satisfaction rates, especially in terms of place, employment opportunities, and community amenities (Alam, S. S. B., & Matsuyuki, M. (2018)). In the study, the design of dwelling unites is not sufficient to achieve satisfaction, locational factors, and community continuity are also as important. The same happens in other cities in India. In a study, participatory mapping techniques are used to measure liveability in slum upgrading schemes and it was found that the perceptions of residents with respect

to community spaces and belongingness are core determinants of engagement and satisfaction. Sociocultural marginalized settlements. Post-occupancy reviews of marginalized low-income settlements illustrate that through participatory design procedures, it is possible to incorporate socio-cultural requirements, albeit constraints on economic viability in the long run.

2.2.3 Kerala Context: Thiruvananthapuram

Kerala is a region that produces different patterns of urban development with a comparably low urbanization level, a much better social welfare tradition, and a unique settlement morphology. The critiques by Nair, A. K., & Basu, S. (2016) are important because they are based on a case study of the regeneration of the historic core of Thiruvananthapuram with regard to the regeneration of the historic chala. This regeneration of this mixed-use area can be illustrated to show how localized inclusive methods can maintain high cultural identity and deliver economic re-vitalization through mixed-use development and infrastructure renewal that sustains the urban core. The Chala case presents especially pertinent lessons to improve in Rajaji Nagar as the geography and culture are similar within the same city. The paper focuses on the advice to engage communities and to integrate the heritage conservation with modern requirements. Some of the success factors have been recognized as the preservation of mixed-use character, consideration of the existing social networks and ensuring that the improvement of infrastructures add to the urban patterns instead of transforming them. A current literature discusses community involvement in land and housing delivery in urban areas in Kerala with its experiences in other nations. The study identifies the unique background of powerful community institutions and decentralized traditions of governance in Kerala, which results in avenues of participatory strategies that might not be available in other parts of India. Nonetheless, there is a paucity of Kerala-specific literature, which leaves knowledge gaps as to the effects of the unique socio-political environment, elevated levels of literacy levels, stronger institutions of the community, and different typologies of housing on the outcomes of redevelopment. This is due to the fact that the relative lack of mass forced migrations in the urban centers of Kerala dictates that the experience of other Indian cities should be tailored to the specific situation.

2.2.4 In-Situ Redevelopment and Self-Redevelopment Models

In-situ redevelopment models strive to reduce the amount of displacement and secure improvements in housing and infrastructure, although the role of community participation is one of the most important mitigating elements. Studies examine the proposition of self-redevelopment to attain sustainable urban futures and how processes led by communities contribute to the improvement of social cohesion and economic autonomy (Nasiruddin, 2025). This method offers residents more power over the result of redevelopment, and maintenance of social networks and practices of cultures through this method is better than externally enforced interventions. The models of self-redevelopment exhibit moderate to high levels of inclusiveness in terms of community-led development, and social cohesion is improved with the help of participatory processes. There are economic profits associated with freedom and quality of living depending on where the policy is on their support. These methods are characterized with high community involvement, which is different with top-down alternatives.But in-situ redevelopment through gradual relocation creates complicated socio-spatial dynamics that have to be navigated. Very little literature has been done on phased relocation strategies that focus on proximity, preservation of social networks and preferences of residents. According to the literature, implementation needs to be successful and entails:

- Phased approaches maintaining social network continuity,
- Minimal spatial displacement from original neighbourhoods,
- Housing typologies aligned with resident needs and cultural practices,

- Livelihood support systems, and
- Sustained community participation throughout processes.

The evidence reviews among the international community point to the fact that effective large-scale upgrading programmes are based on the concept of long-term state support to the organized communities, flexibility in the finance, and the local powerful institutions. Models based on community leadership in Indian cities the negotiation of resettlement or on-site upgrading with higher security and more positive social results have been documented in community-led models that include organizations in Indian cities.

2.2.5 Heritage-Led and Culture-Based Redevelopment

Studies point to the need to incorporate heritage conservation in the redevelopment process of urban areas as vital in cultural sustainability and civic pride. Heritage-based strategies take tangible and intangible cultural resources as sources of inclusive regeneration to prevent cultural dislocation that goes hand in hand with metropolitan transformation. Critical reviews of the inclusive city heritage revitalization strategies, in old historic centers in Asia, reveal high potential of socio-cultural integration in heritage areas when concerns of stakeholders are key factors in development of policies, and that the infrastructure upgrading of heritage sites are also supported by policy. The heritage valorization of economic benefits offers sustainable financing structures and preserving cultural integrity. Culture-based development in Indian cities is studied, demonstrating how cultural resources of the community promote economic gains besides increasing community engagement and pride. This strategy sees culture not as a thing to maintain but as something that can take part in urban development today. Cultural assets infrastructure also allows community to use their uniqueness to get economic opportunities without losing their identity. The studies examine redemption of marginalized heritage in terms of comparative spatial politics, narrative power and through governance analysis. This study underscores the importance of the inclusive governance paradigms to acknowledge the various narrative powers in order to reach equity in heritage incorporation. Marginalized heritage should be specifically included in policies so that the redevelopment process does not repeatedly favour those dominant cultural histories at the expense of the subaltern past.

2.2.6 Renovation vs. Demolition Approaches

New research proposes renovation and incremental redevelopment as alternative economically and environmentally feasible models of demolition-reconstruction. Research places renovation as an instrument of urban housing renewal, which maintains the neighborhood character with less displacement. The policy encourages inclusiveness through renewal as opposed to demolition, which helps to preserve the social networks but community engagement is still minimal in implementing the policy.Renovation strategies prove to be economically efficient and do not focus on community character destruction. Infrastructure enhancement is geared towards sustainability, and it will not cause the sizable upheaval and resource drain, which comes with wholesale destruction. This strategy is especially applicable in the situations when cultural heritage and social capital found in the existing built environments deserve to be preserved. The studies record the use of hybrid mechanisms to strike a balance between the infrastructure modernization and community continuity in the context of Mumbai. Nonetheless, cultural factors tend to be subordinated to economic objectives in policy-based redevelopment where residents is not a major factor. Such a conflict of interests between the economy and socio-cultural maintenance is a typical feature of modern redevelopment practice. The concept of green infrastructure and sustainable design is becoming part and parcel of renovation strategies. These tenets balance the sustainability of the environment and a social equity agenda because development

of infrastructure should be in place to multi-purpose, meet physical sufficiency, cultural suitability, financial sustainability, and environmental accountability.

2.3 Policy and Regulatory Framework (India/Kerala)

2.3.1 National Urban Policies and Programs

The Indian urban policy has changed greatly in the past decades based on the developing paradigms shifting the practices of sheer physical interventions to more integrated approaches. Among such milestones is the Jawaharlal Nehru National Urban Renewal Mission (JNNURM). Studies examine the performance of JNNURM where it has been revealed that it is moderately inclusive with significant gaps on the need to holistically consider social and cultural aspects. Although improvements in infrastructure are also important, they are not consistent across situations, and community involvement, though it is acknowledged as important, is also shallow in its application. The Rajiv Awas Yojana (RAY) was a paradigm shift to the slum-free India based on in-situ redevelopment, provision of property rights, and providing affordable housing to urban poor launched in 2011. RAY also placed a lot of emphasis on community involvement in the development of Detailed Project Reports and bottom-up planning, unlike previous eviction-oriented methods. A study investigated the case study of RAY implementation and revealed that community involvement created rational solutions and valid designs that represented the aspirations of residents. Nevertheless, the study noted that the creation of credibility and long-term involvement take long-term investment instead of brief consultation processes. In 2015 the Pradhan Mantri Awas Yojana (PMAY) further mainstreamed low-cost housing by four components, in-situ slum redevelopment, credit-linked subsidy, affordable housing in partnership, and beneficiary-led construction. PMAY focused on the participation of the private sector in the provision of affordable housing, such as slum rehabilitation plans with the use of the Transferable Development Rights provision and other incentives (Ministry of Housing and Urban Poverty Alleviation, 2016).

Nonetheless, recent studies cast doubt upon the efficiency of PMAY. Assessments find much to be done in certifying and providing housing units, but observe the deficiency in targeting, poorest affordability, and lack of livelihoods and social infrastructure integration. The rising focus on models of the private sector has brought into question the affordability, displacement of residents, and the question of whether the approaches that rely on markets are sufficient to address the needs of the poorest groups. The critical views on the aggressive slum upgrading schemes by Indian government express that although the aggressive scheme accommodates close to 70 million population in the urban slums, it has not properly understood the household views of individuals.

2.3.2 Policy Inclusivity and Implementation Challenges

Policy inclusivity audit shows that there is a great gap between the declared goals and the actual situation on the ground. Several studies record that although policies are rhetorically designed to promote the interests of the marginalized groups, the structures of implementation do not achieve fair results. The most vulnerable groups are often excluded by the exclusionary eligibility criteria, bureaucracies and its lack of transparency often hinder policy benefits. The literature presents the effects of forced eviction under redevelopment policies that leads to low inclusivity, social cohesion and cultural identity. Vulnerability is heightened by economic troubles following eviction, infrastructure in resettlement areas is unsatisfactory, and the participation of residents in planning is weak. This same tendency is repeated in a variety of settings, indicating structural and not individual failures. The presence of political factors and absence of scientific emphasis on the selection of the location during the process of resources allocation are also a hindrance to the equitable allocation of resources. The policy frameworks are not effective in attaining true inclusivity because social exclusion

exists, economic inequality lacks any solution, infrastructure shortages create further marginalization, and there is a weak community participation system. These are aggravated by institutional weaknesses. The proponents of research believe that the city should implement more inclusive policies associated with political accountability, and that social inclusion demands institutional changes. Inclusive urban planning studies have highlighted that national policies have acknowledged the requirement of inclusivity but there are still considerable gaps in implementation. Research indicates that urban policies are moderate to low in inclusivity, and mostly do not cover the needs of the marginalized residents, especially when it comes to relocation issues.

2.4 Gaps in Existing Approaches and Research

In both theory and practice, despite the considerable academic interest in informal settlement redevelopment, there are still critical gaps in the information. First, even though the strategies of participation are becoming more promoted, they are still implemented in intermittent and superficial ways. Significant community involvement entails long-lasting involvement over prolonged durations yet the majority of the interventions have compressed schedules that run within political cycles or funding limitations. Second, the conflict between housing as a human right and as a commodity in the marketplace has not yet been fully resolved at the policy levels. There has been more involvement by the private sector in affordable housing delivery but there are tensions that signal that the maintenance of affordability, displacement of residents and whether the market-based strategies are sufficient to serve the poorest groups of people. Third, the cultural and social aspects are given less inclusion into the technical redevelopment planning. Although heritage-led approaches have potential, they are more of an exception to the rule. Dislocation of the social networks, loss of community spaces, and the eviction of culturally-specific housing typology remain typifying of most redevelopment projects, in spite of the studies that have recorded adverse consequences. Fourth, the concept of climate resilience and disaster risk mitigation is still insufficiently embedded in informal settlement upgrading even though low-income communities are disproportionately exposed to climate-related effects. The susceptibility of Kerala to floods and coastal erosion especially necessitates the frameworks of redevelopments that are sensitive to climatic conditions. Fifth, the existing Kerala-specific research is insufficient to fill knowledge gaps about the impact of the unique socio-political setting, the high levels of literacy, the well-established community organization, and the decentralized traditions of governance in the state on the redevelopment processes and the outcomes. The comparative lack of massive forced migrations in the cities of Kerala implies that the experience of other Indian cities should be adjusted to local circumstances. Lastly, there is a need to be more explicit to gender dimensions in redevelopment structures. Although gender sensitive solutions are conceptually accepted, the practical incorporation in the design and implementation is uneven. The unequal accessibility of women to participation, decision-making power, and housing security means that special approaches are necessary during the processes of redevelopment.

CHAPTER 3
AN OVERVIEW ON INFORMAL SETTLEMENTS

3.1 The Global Context of Informal Settlements

3.1.1 Scale and Distribution

By 2024, more than 1.1 billion individuals are living in slums and informal settlements all over the world, and at the same time, it is estimated that 1.6-2.8 billion individuals are unable to live in proper housing (UN-Habitat & PSUP, 2016). The geographic distribution is very unequal in regions. The world slum population has been estimated to be approximately 80 percent concentrated in three regions, which include Eastern and South-Eastern Asia (362-370 million people), Sub-Saharan Africa (238-265 million people), and Central and Southern Asia (226-334 million people) (UN-Habitat, 2015; UN-Habitat and PSUP, 2016).

Figure 6. Urban population living in slums or informal settlements, 2018 (millions of people)

(Source: — SDG Indicators)
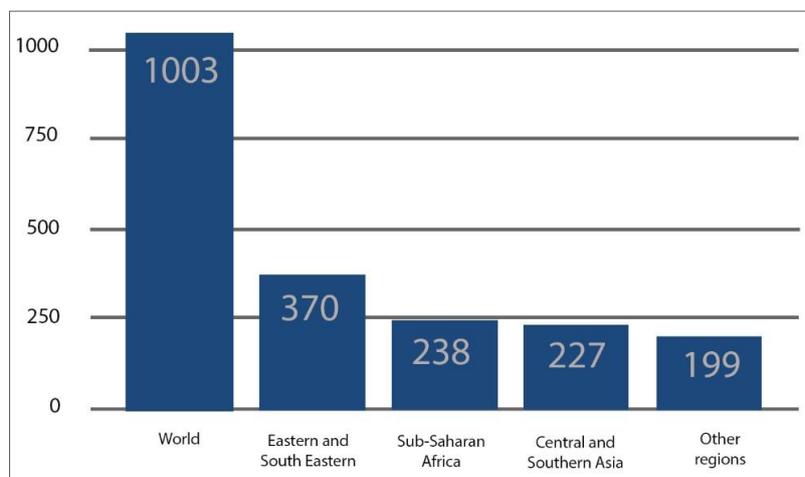
Figure 7. Proportion of global urban population living in slums, 2020 and 2022 (percentage)

(Source: https://unstats.un.org/sdgs/report/2024/Goal-11/)
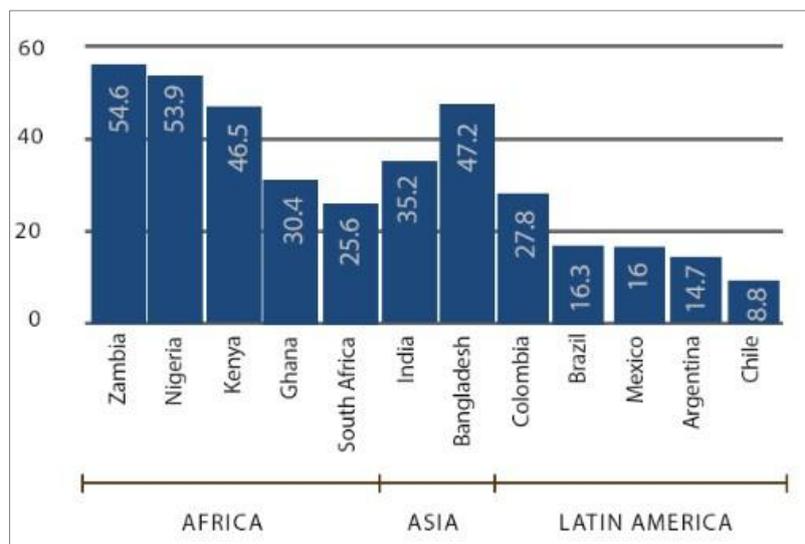
In South Asia, 58 percent of the urban population is in informal settlements, 36.4 percent in East Asia and 28 percent in Southeast Asia (UN-Habitat, 2015). The trend has changed after decades of developments that have shrunk the percentage of slum dwellers in urban population by almost a quarter in 2000 to 23 percent in 2014. It has increased to 24.9 percent in 2014-2024 and the number of absolute slum population has increased by 130 million in 2015-2022 (UN-Habitat, 2015). This

overturn shows that current urbanization and housing provision policies are not adequate to support the needs of the rapidly increasing urban population.

3.1.2 Definitions and Characteristics

(UN-Habitat, 2025) characterizes informal settlements as residential neighbourhoods in which (1) inhabitants feel no security of tenure over either land or housing (2) neighbourhood lacks or has inadequate accessibility to basic services and infrastructure and (3) housing does not match contemporary planning and building criteria and is frequently in geographically and environmentally problematic locations. The most marginalized type of informal settlement is the slums. Five household deprivation indicators developed by the UN Expert Group on Slum Definitions helped inform MDG Target 7.D and SDG Target 11.1 (UN-Habitat, 2025; Habitat3, 2016). A slum family is one that does not possess one or more of the following: permanent house that shields them against harsh climate; decent living space (fewer than three people living in a room); better access to better water supply; better access to better sanitation; and ownership against unlawful eviction. These informal settlements are known by different local names: favelas in Brazil, villas in Argentina, campamentos in Chile, and colonies in Kerala, but are similar in that they are overcrowded with poor living conditions, unstable land tenure, lack of civil infrastructure and susceptibility to disasters (Habitat3, 2016; UN-Habitat, 2025).

3.1.3 Key Drivers

The major driving factor is rapid urbanization and rural-urban migration. Economic opportunities, education, medical care, and migrants come to cities to flee rural poverty, drought, floods, and wars (UN-Habitat, 2015). Nevertheless, urbanization is always in advance of affordable houses and urban infrastructure. Structural barriers are formed by failures in the housing market. The formal housing markets cannot engage the low- and middle-income population on the necessary scale, at the necessary price, quality, and place (McKinsey Global Institute, 2014). Formal housing is unaffordable due to expensive land, zoning policies, and inappropriate building codes, and a slow approval process. As a result, informality becomes not a choice, but the only possible option of shelter in the areas around employment centers. These are aggravated by weak urban governance and insecurity of land tenure. In most developing economies, tenure systems do not specify or enforce the land tenure systems, which denies low-income households an opportunity to own land (UN-Habitat, 2025). Households are under the threat of eviction at all times, without tenure security, this discourages investment in housing improvements and leads to poverty and informality cycles. Informal settlements grow more and more due to climate changes and forced migration. Extreme weather and droughts, floods, and rise in the water level drive people away to cities (Anierobi et al., 2023; SEI, 2020). Conflicts have an internal displaced population to the slums in cities. Emergency shelters tend to transform into informal permanent settlements.

3.1.4 Impacts and Policy Responses

There are dire health, environmental and social impacts of informal settlements. Lack of sanitation, overcrowding, insufficient water and accumulation of wastes promote the spread of diseases. The slum dwellers are affected by increased incidences of diarrhoea, respiratory diseases, tuberculosis, and diseases caused by vectors (UN-Water, 2015). Especially children are exposed to high risks of death, malnutrition and retarded growth. The exposure to environmental risks is high, with informal settlements often having marginal and dangerous location, e.g., floodplains, steep slopes, or polluted territories (SEI, 2020; Anierobi et al., 2023). The poor drainage system increases flooding and breeding areas of mosquitoes. Climate change increases the current vulnerabilities to deteriorate health, livelihood, and food security (SEI, 2020). The social exclusion and marginalization is the characteristic

feature of the life of the residents of informal settlements. In the absence of official speeches, residents find it difficult to receive education, healthcare, banking, official jobs and law enforcement (UN-Habitat, 2025; Habitat3, 2016). The inability to engage in urban planning and policymaking usually renders the residents invisible politically. SDG Target 11.1 is geared towards providing adequate, safe and affordable housing and basic services to the whole population by 2030 (UN-Habitat, 2015). Nevertheless, it has been a slow, uneven process. The solutions to this need multi-stakeholder solutions that include the governments, multilateral organizations, non-governmental organizations, the business sector, and, most importantly, the inhabitants of the informal settlements (SEI, 2020; UN-Habitat, 2025). Community-based policies have become useful in terms of settlement upgrading, climate risk mapping, and coming up with locally suitable innovations.

3.2 Informal Settlements in India

3.2.1 Urbanization and Slum Scale

The urban population of India constituted 377.1 million in 2011 which is 31.16 percent of the total population (Census of India, 2011). It is estimated that India is among the fastest-urbanizing countries in the world as 600 million urban inhabitants are projected to live in this country during the next several decades. In 2011, 65.49 million recorded people were residing in 13.92 million slum households in 2,613 towns in 31 states and union territories and this constituted 17.4 percent of the urban population (Census of India, 2011). Current estimates indicate that there is an approximation of 14.2 million slum households which are supporting about 65 million people. Nevertheless, these numbers are probably understated since the Census definition of slums and enumeration blocks that qualify as such only require that they be officially reported and that they meet the certain criteria, not covering a wide range of informal settlements (MHUPA and NBO, 2015; Census of India, 2011).

3.2.2 Distribution and Characteristics

The populations in slums are unevenly distributed in India. The greatest number of slum dwellers is in Maharashtra, then Andhra Pradesh, Uttar Pradesh, West Bengal and Tamil Nadu (Census of India, 2011). Mumbai, Delhi, Kolkata, Chennai, Bengaluru, Hyderabad, Pune and Ahmedabad contain large concentrations of slums and some of the cities have slum populations of more than 30-40 percent of their urban population (Census of India, 2011; MHUPA and NBO, 2015). In Census 2011, the slums were classified into three categories: notified slums (including those recognized by government), recognized slums (including the ones recognized by local authorities but not notified) and identified slums (including the ones recognized by conducting the 2011 census under particular criteria). Although 83 percent of slum residents live in permanent houses, 12 percent in semi-permanent houses, and 3 percent in temporary houses, permanent housing is in most cases poorly ventilated, lacks lighting, and space (Census of India, 2011). There is a congestion of slums as most families in the slums live in one or two rooms with many family members. The availability of the basic services also is poor. The access to the piped water supply, closed drainage, and electricity by slum households is substantially lower than by non-slum urban households (MHUPA & NBO, 2015). A large number of families use shared or community toilets. Most of the slum dwellers do not have formal land titles or property rights and this contributes to the prevalence of tenure insecurity whereby they are at risk of eviction, credit access, and government subsidies (Census of India, 2011; Williams et al., 2019). Historical disadvantages in receiving economic opportunities and discriminatory policies in formal housing and labor market are represented by the overrepresentation of Scheduled Castes (SC) and Scheduled Tribes (ST) in slums compared to their share in the overall urban population (Census of India, 2011).

3.2.3 Key Drivers in the Indian Context

One of the leading causes is rural-urban migration when people raise their expectations of economical opportunities, education, and healthcare and leave agricultural misery, drought, floods, and poverty (Institute for Social and Economic Change, 2016; Census of India, 2011). Nevertheless, the labor markets in the urban areas find it difficult to accommodate the unskilled and semi-skilled individuals and they are pushed to the informal settlements. The housing affordability crises exist. Official housing markets do not offer affordable solutions at the level and areas that are needed by low-income groups (Census of India, 2011; McKinsey Global Institute, 2014). Limiting land use policies, stamp taxes and rent controls limit the supply of affordable housing. Poor city planning and management exacerbate these issues. The population growth of urban areas has exceeded the Urban Local Bodies (ULBs) ability to plan and regulate the areas and provide services (Census of India, 2011; MHUPA & NBO, 2015). Although the Constitutional Amendment Act of 1992 (74 th) has aimed at decentralization of powers to ULBs, various states have not devolved functions, funds, and functionaries to the ULBs thoroughly, meaning that they have no sufficient resources to overcome the difficulties of housing and infrastructure. New pressures are caused by economic informality. India has a high percentage of urban population working in the informal sector without social insurance, periodic income, or formal access to credit (Institute for Social and Economic Change, 2016; Census of India, 2011). Informal jobs involve a physical closeness to the working places usually in urban areas or close to factories where formal accommodation is not accessible.

3.2.4 Policy Framework and Challenges

Multiple policies and programs have been put in place to support slums in India, but have been disproportionately under-funded and unevenly distributed (Census of India, 2011; MHUPA & NBO, 2015). Jawaharlal Nehru National Urban Renewal Mission (JNNURM), introduced in 2005 was a watershed moment with investment commitments of 500 billion to combine urban infrastructure development and reduction of poverty. It had a sub-mission, Basic Services to the Urban Poor (BSUP), which focused on offering affordable housing, water, sanitation, health, education, and social security to slum dwellers (Williams et al., 2019). In 2011, Rajiv Awas Yojana (RAY) was expected to establish a slum-free India by providing tenure security, affordable housing, and basic services (MHUPA & NBO, 2015; Williams et al., 2019). But in 2015, RAY has been abolished and has been substituted with Pradhan Mantri Awas Yojana (PMAY). PMAY (Housing for All by 2022) will work under four verticals, which are in-situ slum redevelopment, credit-linked subsidies, public-private partnerships, and beneficiary-led individual construction of houses (Ministry of Housing and Urban Poverty Alleviation, 2016). Regardless of the fact that PMAY mobilizes a significant number of resources, it faces difficulties in terms of quality, location, affordability, and access to the most vulnerable populations. Significant gaps persist. The actual extent of the problem is obscured by undercounting and the definition (Census of India, 2011; MHUPA & NBO, 2015). The lack of a unified government; the duplication of roles within both central, state and local government, impedes concerted effort. There is a lack of capacity and funding of the ULB level, limiting implementation (MHUPA & NBO, 2015; Williams et al., 2019). The lack of authentic community involvement and grassroots solutions leads to the fact that the projects do not respond to real needs and priorities of residents (Williams et al., 2019).

3.3 The Kerala Context

3.3.1 Kerala's Distinctive Urbanization

Kerala is an unusual example of urbanization that can be described as the rural-urban continuum in which the boundary between rural and urban territory is indistinct (Institute for Social and Economic Change, 2016). The patterns of settlement are linear, highly agglomerated, but dispersed and

interdependent. It is an in-situ urbanization that entails the development of rural areas into urban settlements without the massive movement into the urban centers (Institute for Social and Economic Change, 2016). This change has been occasioned by the weakening agricultural activity, rising non-agricultural employment and the relatively equal distribution of infrastructure between rural and peri-urban areas. Therefore, Kerala has high social development indicators such as literacy, life expectancy, and gender equality, but has rather low statutory urbanization (Institute for Social and Economic Change, 2016). Numerous panchayats in the country are urbanized in a de facto sense but not necessarily urban.

3.3.2 Informal Settlements in Kerala

Informal settlements exist in Kerala, albeit in less numbers as compared with other Indian states, despite the good social development. According to the 2011 Census, Kerala has the lowest share of slum population in the country at 1.5 percent, in comparison to the national average of 17 percent, and about 45,417 slum households (Census of India, 2011). Nevertheless, these official data conceal a more sophisticated truth. The informal settlements in Kerala are very small, scattered, and they form part of mixed neighbourhoods (Williams et al., 2019; Institute for Social and Economic Change, 2016). They are usually found along the canal banks, railroads, industrial fringe, market back streets, and empty land adjacent to the infrastructure. They are small in scale and therefore politically convenient to ignore, and administratively difficult to deal with. There are also varied typologies of informal settlements that are popularly referred to as colonies and have a connotation of castes in Kerala. According to government reports, there are about 26,198 Dalit colonies, 8,000 Adivasi colonies, 10,000 layas (informal settlements) and 500 fishermen colonies (Institute for Social and Economic Change, 2016). These residential areas are home to caste-marginalized, tribal, occupationally particular, and economically disadvantaged groups.

CHAPTER 4
INFORMAL SETTLEMENT REDEVELOPMENT IN INDIA: POLICY FRAMEWORKS

4.1 International Multilateral Policies for India

The redevelopment of informal settlements in India is a sphere of work in a broader international policy framework conditioned primarily by the UN-Habitat and the World Bank. Both UN-Habitat and the World Bank turn the international commitment for adequate, safe and affordable housing and basic services for all and the upgrading of slums as the development of housing and urban infrastructures under SDG target 11. 1 into concrete policy guidelines, screening mechanisms and financing instruments which have a direct impact on Indian urban missions such as JNNURM, RAY, PMAY and LIFE Mission (UN-Habitat, 2022; World Bank, 2019). Multilateral arrangements such as these concentrate on in, situ upgrading, gradual tenure security, provision of basic services and city, wide planning as the core values of national and local policies, besides just considering slums as a lack of housing (UN-Habitat, 2023; World Bank, 2010).

4.1.1 UN-Habitat
Global context:
UN-Habitat is the main UN agency that is engaged in promoting socially and environmentally cities and towns as well as supporting the implementation of SDG 11 and the New Urban Agenda. Hence, since SDG indicator 11.1.1 (proportion of urban population living in slums, informal settlements or inadequate housing) is the direct target of UN-Habitat, the agency has been collaborating with the UN Statistics Division in monitoring and reporting on the global achievement level (UN-Habitat, 2022; UN Statistics Division, 2024). The annual and thematic reports, among the identified emphasis, are the fact that the global housing gap is widening and rights, based large, scale redevelopments of informal settlements are the precondition for inclusive, resilient and low, carbon cities (UN-Habitat, 2022; UN-Habitat, 2024a). UN-Habitat has come up with a set of global policy tools in order to operationalise this agenda. The ***Global Action Plan: Accelerating to Transforming Informal Settlement and Slums by 2030*** is a proposal to support a twin-track approach:

- in-situ upgrading of current informal settlements, provided with infrastructure and services, with public spaces and tenure security; and
- preventing new slums by increasing the supply of affordable and well-located housing and serviced land (UN-Habitat, 2023).

In line with this, the 2025 Proposed Recommendations on Informal Settlement standardise terminology expanding the difference between housing informality, informal housing and informal settlements and proposing area-based, participatory upgrading, progressive tenure regularisation and climate-responsive infrastructure rather than eviction-led slum clearance (UN-Habitat, 2025). These documents together provide a normative blueprint to national governments on how to formulate laws, programmes and financing mechanisms to informal settlement redevelopment.

Policy engagement in India:
The country strategy of UN-Habitat in India describes its assistance as an integrative and demand-driven approach with a focus on urban planning reforms, infrastructure-upgrading policies and demonstration projects that can be implemented at national missions (UN-Habitat India, 2023). The strategy is structured based on five pillars:
- Safe, inclusive, resilient and sustainable urban and regional environments
- Low, cost, sustainable and environmentally friendly housing

- Well-serviced, planned, and safe neighbourhoods;
- Effective and responsible city management;
- Localisation of SDG-11 in knowledge systematisation and learning (UN-Habitat India, 2023)

The above pillars are directly related to slum upgrading, social housing, and provision of basic services, and are more aligned to India programmes i.e. Smart Cities Mission and Housing for All (Urban) / PMAY, that also have components of in-situ slum redevelopment and affordable housing. One major recent event is the signing of a Memorandum of Understanding between the Ministry of Housing and Urban Affairs (MoHUA) and UN-Habitat in November 2024 at the twelfth world urban forum (MoHUA & UN-Habitat, 2024). The MoU binds the two entities to work together on:
- Knowledge production, policy counseling and technical support to sustainable urbanisation;
- Not less than the efforts to tackle the challenges of inadequate affordable housing and spatial inequalities including those inequalities in slums and informal settlements;
- Designing of the Urban RAASTA framework. It aids in the development of Indian cities that is SDG, compliant, climate, adaptive, and inclusive, with a focus on the mid, range cities (MoHUA & UN, Habitat, 2024).

Through these channels, UN, Habitat can substantially influence Indian policy in three ways: first, it would make the language of Indian national missions and policies align with the SDGs and be rights, based; second, it would promote in, situ and participatory upgrading as the preferred model; third, it would support Indian cities technically and capacity, wise by providing the tools and training necessary for them to conceive and implement slum, upgrading projects that are globally recognized as best practices (UN, Habitat, 2023; UN, Habitat India, 2023).

4.1.2 World Bank
<u>Global policy role</u>
Informal-settlement policy is made by the World Bank by utilizing diagnostic analysis, SDG monitoring and development finance in the urban and housing industries. Based on the SDG indicator 11.1.1 by UN-Habitat, the Bank monitors the proportion of urban population living in slums and relies on this to guide its urban policies and Systematic Country Diagnostics (UN Statistics Division, 2024; World Bank, 2023). In its international practice, the Bank views slums as an expression of messy and hidden urbanisation that emerges under the influence of the rapid demographic expansion, limited land and housing markets, and ineffective urban governance and advocates the combined reforms of land administration, urban finance, service delivery and housing finance instead of isolated housing efforts (World Bank, 2015; World Bank, 2019). Analytical research on slum-improvement programmes in other urban areas such as welfare assessments of slum-improvement projects in Mumbai reveal that even when physical housing quality is enhanced, relocation or all-subsidy-based construction can result in welfare losses in cases where livelihoods and social networks are affected (Takeuchi et al., 2008; World Bank, 2010). Such findings have propelled the Bank towards prescribing the wholesomely in-situ upgrading, gradual tenure security and community involvement that resonates closely with the advice given by UN-Habitat.

<u>Policy engagement in India</u>
The policy note *Leveraging Urbanization in India* and the *World Bank South Asia Urbanization Review* puts the national and state-level reforms in context in the Indian context. The Bank describes Indian urbanisation as both messy (poorly-developed sprawling settlements) and hidden (high populations residing within urban-like conditions but not indicated on statutory urban areas), and emphasizes the fact that national census and policy tools fail to capture most informal settlements (World Bank, 2015). Instead of suggesting an independent slum policy, the Bank suggests to consider slum upgrading within

the context of more far-reaching changes in metropolitan planning, land use policies, infrastructure financing and housing markets, and emphasizes that slum interventions must not jeopardize access to livelihoods and social networks (World Bank, 2015; World Bank, 2019).
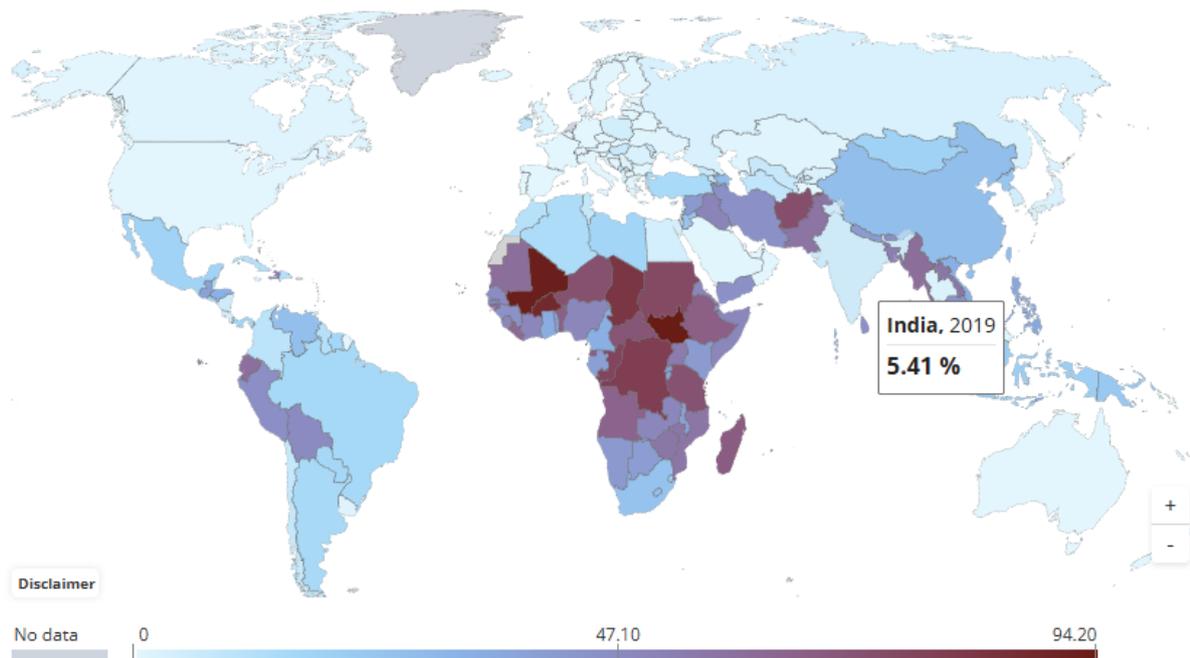
Figure 8. Population living in slums as a share of urban population, India compared with global average 2019

(Source: World Bank (World Development Indicators:
https://data360.worldbank.org/en/indicator/WB_WDI_EN_POP_SLUM_UR_ZS?view=map&country=IND))

Within this conceptual framework, India features prominently in World Bank urban and housing operations. The Country Partnership Framework for India (FY1822) identifies more resource, efficient and inclusive cities as a primary focus area and commits the Bank to support urban infrastructure, basic services, and institutional reforms which directly affect low, income and informal settlements (World Bank, 2019). A major example is the India Low, Income Housing Finance Project (P119039) and subsequent affordable, housing operations which extend long, term finance through the National Housing Bank and other intermediaries to increase mortgage and housing, improvement loans for low, income households (World Bank, 2013; World Bank, 2018). Project documentation recognizes that a large proportion of beneficiaries reside in settlements with informal tenure and incremental, self, built housing, and they explicitly aim to tailor financial products and underwriting standards to this reality instead of excluding such households from formal housing finance (World Bank, 2018). Moreover, World Bank analytical work on Rajiv Awas Yojana and other slum, free city initiatives contend that subsidised construction alone will not be able to clear the current slum backlog in India even if done for a generation, and therefore city, wide in, situ upgrading, tenure regularisation and realistic, context, sensitive building standards are necessary (World Bank, 2010). These recommendations have informed national debates on the design of JNNURM-BSUP, RAY and PMAY and provide an external benchmark against which Indian policy reforms are assessed. Overall, UN, Habitat and the World Bank, in their collaboration, formulate the global policy framework for the redevelopment of informal settlements in India. UN, Habitat provides standard, setting guidance and frameworks aligned with the SDGs that stress rights, based, in, situ upgrading, whereas the World Bank provides diagnostic analysis

and financial tools that drive Indian policies further towards holistic, city, wide strategies and the use of housing finance solutions (UN, Habitat, 2022; UN, Habitat, 2023; World Bank, 2015; World Bank, 2019). The following section on national and state frameworks can therefore be read as India's contextualised response to these multilateral agendas.

4.2 National and State Policy Frameworks for Informal Settlement Upgrading

The informal settlements are the essential characteristics of the urban environment of India. Having 65 million individuals residing in slums in 13.92 million households, including 65 million in 2011 Census, informal settlements need policy interventions on a multi-level basis by national, state, and local levels, i.e. Urban Local Bodies (ULBs). This part will briefly describe the main policy frameworks which have influenced slum redevelopment in India since 2005, both on a national scale and the unique state policies of Kerala.

Figure 9. Timeline of Slum upgrading policies at a national level in India
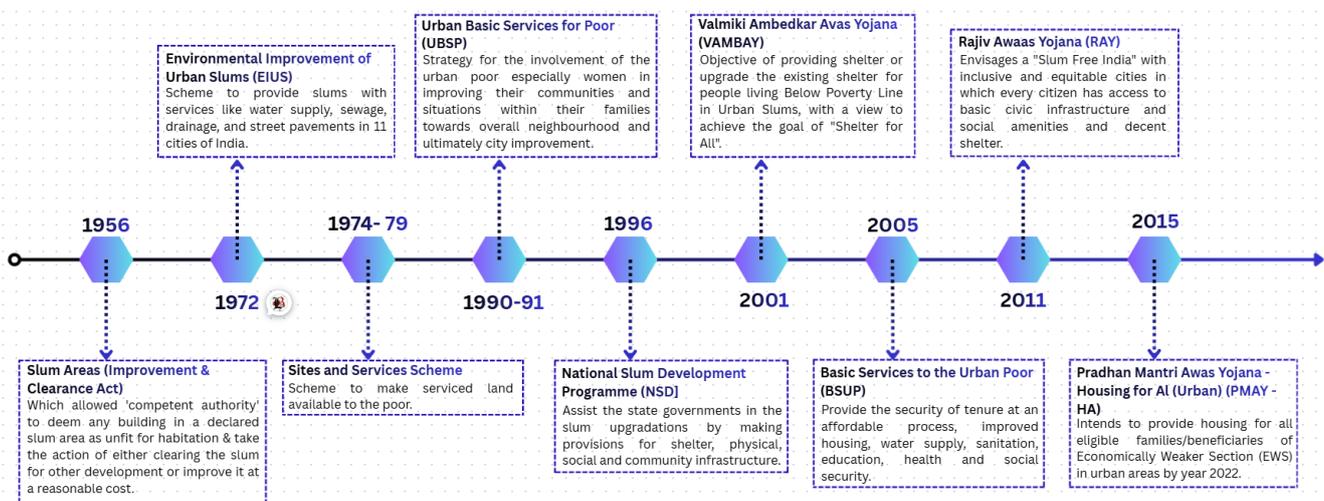
(Source: Nath, 2020, Re-illustrated by Author)

4.2.1 National Urban Housing Policies (2005–Present)

The strategy that India has developed to upgrade informal settlements has taken three significant centrally sponsored plans in the last two decades each with its priorities and implementation models.

Policy	Period	Key Objective	Approach	Implementation Structure	Outcomes
JNNURM-BSUP	2005–2012	Integrated slum development in 63 cities	In-situ upgrading with community participation (policy rhetoric)	State govts as nodal agencies; ULBs implement; 50:50 central-state funding	64% completion rate; Low occupancy; Contractor-built high-rises dominated despite participatory rhetoric (SPARC, 2012; Mitra, S. (2022))
Rajiv Awas Yojana (RAY)	2013–2015	"Slum-Free India" through tenure security	Citywide Slum-Free City Plans of Action (SFCPoA); biometric surveys; land tenure (pattas)	State govts as nodal agencies; City-level planning	Discontinued after 2 years; Most cities completed only planning/survey stages (Mitra, S. (2022))

Pradhan Mantri Awas Yojana (PMAY-Urban)	2015–Present	"Housing for All by 2022" (extended to 2024)	Market-driven PPP redevelopment (ISSR vertical); 4 verticals total	Central guidelines; State/ULB implementation; Private sector partnerships	Only 22% of sanctioned ISSR units constructed; Notable failures (Dharavi: zero construction after 20 years) (Mitra, S. (2022); Land Conflict Watch, 2023)

Table 1. Evolution of National Slum Redevelopment Policies
(*Sources: MoHUPA (2015),* Mitra, S. (2022)*, SPARC (2012), Government of India (2013), Land Conflict Watch (2023)*)

4.2.1.1 JNNURM-BSUP (2005–2012): Participatory Rhetoric, Top-Down Practice

The Basic Services to the Urban Poor (BSUP) aspect of JNNURM was focused on 63 million-plus cities, providing subsidies on integrated slum development which included shelter, water, sanitation, drainage, and social infrastructure (MoHUPA, 2015; Mitra, S. (2022)). Formal policy guidelines took up in-situ upgrading and community participation, which were indicative of the international best-practice frameworks (UN-Habitat 2025, Cities Alliance, 2008) (Patel, 2013). Implementation Reality: According to a SPARC (2012) review of 11 BSUP cities, most of them sought to construct high-rise apartments built by contractors (on-site or via relocation) instead of participatory incremental upgrading. The mass-produced apartments disregarded cultural behavioral patterns (accessibility to the ground, home-based businesses), and this led to a low level of occupancy and beneficiaries rejecting allocations (SPARC, 2012; Mitra, S. (2022)). Others: There were few projects (Yerwada-Pune, in selected neighborhoods of Madurai) that employed participatory in-situ strategies and that showed greater satisfaction and occupancy, albeit as exceptions, which were not repeated with further policies (Munot, 2023; SPARC, 2012).

4.2.1.2 Rajiv Awas Yojana (RAY) (2013–2015): Tenure-Focused but Discontinued

RAY clearly defined the objective of making a Slum, Free India by integrating all types of slums (notified, recognised, identified) into the regular urban fabric, with an emphasis on secure tenure (pattas) and In-situ upgrading rather than relocation (Government of India, 2013). Urban areas were willing to draft Slum, Free City Plans of Action (SFCPoAs) and perform biometric surveys for beneficiary identification (Government of India, 2013; Williams et al., 2019). Premature Discontinuation: The lifespan of RAY has been two years, which was equivalent to a change in the central government in 2014. The majority of cities had completed only planning/survey phases by the time the programme finished in 2015, which did not allow implementation on large scale (Mitra, S. (2022); Williams et al., 2019).

4.2.1.3 PMAY-Urban (2015–Present): Market-Driven Redevelopment Model

PMAY set an ambitious target of constructing 10–20 million dwelling units through four verticals (MoHUA, 2015):

- In-situ Slum Redevelopment (ISSR):
  This strategy is aimed at renovating slum neighborhoods while the residents continue to live there. The mechanism of operation is through public, private partnerships (PPP). Furthermore, the very land becomes a source of value for development. In order to make the projects self, sustaining and profitable, such schemes as permission to grant higher Floor Space Index (FSI) or issuing Transferable Development Rights (TDR) are implemented, which allow developers to cross, subsidize costs and retain affordability.

- Affordable Housing in Partnership (AHP):

This strategy envisages the government teaming up with private developers to provide affordable housing units. Housing complexes are either constructed on government or private land. Governments extend subsidies so that the construction cost is lowered and that the financially weaker sections (EWS) can afford these homes.

- Credit Linked Subsidy Scheme (CLSS):
  The CLSS extends its helping hand to families belonging to different strata of society, EWS, Lower Income Group (LIG), and Middle-Income Group (MIG) in their dream of owning a home. It does so by granting an interest subsidy on housing loans, which basically means that it lightens the burden of monthly repayments and thus makes housing finance more affordable. Beneficiary-Led Construction/Enhancement (BLC): Subsidy for households owning land to build/upgrade houses.

- Beneficiary, Led Construction/Enhancement (BLC):
  Families that already own a plot of land but financially constrained to build or renovate their homes are assisted under this component. With financial support coming from central government grants, the beneficiaries will be able to get a house or upgrade the one they already have, thus, housing self, sufficiency and human dignity will be enhanced through this initiative.

Implementation Problems: PMAY focused more on market-based ISSR vertical by borrowing the SRA model in Maharashtra. Nonetheless, of the total number of approved ISSR units built to date these failures are most high-profile (Dharavi: none built since 2020; low occupation rate in completed projects) (Mitra, S. (2022); Land Conflict Watch, 2023). CLSS and BLC verticals do not include landless/tenure insecure households, most of the slum dwellers (Mitra, S. (2022)).
Policy Change: PMAY discusses slums as spaces of inadequacy to be eradicated by modern housing provisional services, leaving the paradigm of upgrading in BSUP/RAY and renouncing the ideals of participation (Mitra, S. (2022)).

4.2.2 Kerala State-Level Policy Framework
The Kerala idea of informal settlement upgrading is unlike in most Indian states, which lacks the same socio-political conditions: high literacy (96%), high levels of decentralisation (1,200+ Local Self-Government Institutions) and well-developed networks of civil society (especially Kudumbashree) (Government of Kerala, 2011; CRP, 2021). Policies at the state level offer institutional and regulatory framework in which national schemes are formulated and executed.

Policy Instrument	Year	Scope	Key Provisions	Implementing Agencies
Kerala Slum Areas (Improvement and Clearance) Act	1981	Legal framework for slum recognition, upgrading, and clearance	• Power to declare slum areas • Execute "works of improvement" (infrastructure, structural alterations) • Order slum clearance and demolition • Acquire land for rehabilitation • Tenant protection provisions	Municipal Corporations, Municipalities (as "competent authority")
Kerala State Housing Policy	2011 (Updated 2022)	Overarching framework for housing across rural/urban, EWS/LIG/MIG	• Decentralised implementation through LSGIs • In-situ slum upgrading prioritised • Participatory planning emphasis • Multi-scheme convergence	Local Self-Government Department (LSGD), ULBs, Kerala State Housing Board (KSHB), Kerala State Nirmithi Kendra

| LIFE Mission (Livelihood, Inclusion and Financial Empowerment) | 2016–Present | "Zero-homeless" state; comprehensive housing for landless and homeless | • Phase I: Life-threatening conditions (66,000 families)
• Phase II: Families with land but no resources (214,000 families; Beneficiary-Led Construction)
• Phase III: Landless families (158,000 families; apartments on govt land) | LSGD (policy), ULBs (implementation), Kudumbashree (State-Level Nodal Agency for PMAY-LIFE) |

Table 2. Kerala State Housing Policy Framework - Key Instruments
(Source: Tabulated by Author)

4.2.2.1 Kerala Slum Areas (Improvement and Clearance) Act, 1981

The 1981 Act offers a legal basis of slum recognition and intervention in Kerala (Government of Kerala, 1981). Areas can be declared slum zones by competent authorities (Municipal Corporations/Municipalities) and two routes of intervention can be selected:

- "Works of Improvement" (Section 6): These refer to provision of infrastructure (water, drains, latrines, paving, street lighting), structural alterations, and service connectionsan incremental upgrading approach.
- "Slum Clearance" (Section 11): This involves the declaration of "Slum clearance areas" that have to be demolished and redeveloped when the clearance is considered to be the "most satisfactory method".

Policy Ambiguity: The contradictory nature of the Act's framing enables the authorities to perform the role of either incremental upgrading, or wholesale clearance, thus, giving flexibility and uncertainty to the residents. Selection is based on political intent, economic factors in land and administrative interests instead of established criteria (Government of Kerala, 1981).

4.2.2.2 Kerala State Housing Policy, 2011 (Updated 2022)

According to the State Housing Policy, the housing needs of all income groups are defined by the principles of reference to slum dwellers and categories of EWS/LIG (Government of Kerala, 2011; Ministry of Housing and Urban Poverty Alleviation, 2016)

Key Principles:

- Decentralised Implementation: Through the 73rd and 74th constitutional amendments, Kerala has therefore decentralized housing implementation by delegating the responsibility to Local Self Government Institutions (LSGIs). Primary executing agencies became the Urban Local Bodies 93 municipalities and 6 municipal corporations techincally supported by various state departments (Government of Kerala, 2011).
- In-Situ Slum Upgrading Prioritised: If one reads the policy documents, it is quite clear that the Government has decided to prioritize In-situ upgrading of slums rather than moving slum dwellers. This commitment can be seen as a statement: first, by the state in supporting community, based redevelopment that leads to better services, tenure security and active participation of the residents (Government of Kerala, 2011).
- Participatory Planning: The community is involved mainly through the Neighbourhood Groups (NHGs) set up by Kudumbashree, which carry out activities such as planning, monitoring of implementation and social auditing (Government of Kerala, 2011; Kudumbashree, 2024).
- Convergence Approach: The housing policy has adopted a convergence approach that links housing with infrastructure programs such as AMRUT and Swachh Bharat, livelihood missions like NULM and Kudumbashree, and various other social welfare schemes. This integrated approach

facilitates the coordinated provision of multiple benefits through a single institutional mechanism (Government of Kerala, 2011).

Implementation Mechanisms:
- Kerala State Housing Board (KSHB): The Board was formed in 1971 and is engaged in the implementation of various housing schemes, building rental housing, and carrying out slum redevelopment projects (KSHB, 2025).
- Kerala State Nirmithi Kendra: It was set up in 1987 and has been at the forefront in the development of cost, effective construction technologies (rat, trap bond brickwork, filler slabs). It also conducts training on disaster, resistant construction (Government of Kerala, 2011).
- Local Self, Government Department (LSGD): The department is the nodal agency responsible for coordinating different urban housing schemes, PMAY, LIFE, Smart Cities Mission, and AMRUT convergence (LSGD Kerala (2023).

4.2.2.3 LIFE Mission (2016–Present): Kerala's Flagship Housing Programme

LIFE Mission is the most ambitious housing project in Kerala, the goal of which is a state with zero homelessness (Government of Kerala, 2017). A survey conducted by the State Planning Board in 2016 revealed that there were 432,000 homeless people and a three-phase programme was developed (Government of Kerala, 2017; LSGD Kerala (2023):

Governance Structure:
- *State Level:* LSGD plays an advisory role in policy making; LIFE Mission Secretariat is responsible for coordinating the inter, departmental convergence.
- *ULB Level:* 93 Urban Local Bodies are responsible for carrying out activities like identifying beneficiaries, approving plans, releasing funds (digital portal, instalment, based), and conducting quality checks.
- *Kudumbashree Mission:* As the State, Level Nodal Agency for PMAY(U), LIFE, Kudumbashree has a network of 334, 509 Neighbourhood Groups (NHGs) which represent 4.5 million women.
- Activities: community mobilisation, construction monitoring through NHG volunteers trained for the purpose, social audits (Kudumbashree, 2024; CRP, 2021).
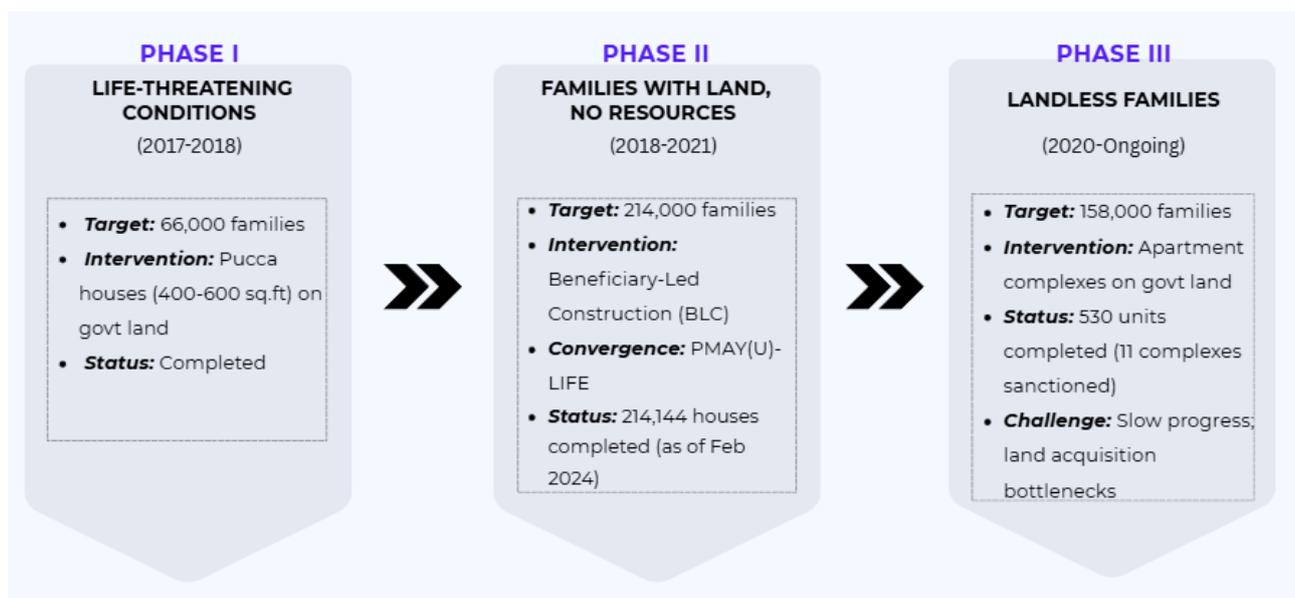
Figure 10. LIFE Mission - Three-Phase Structure
(*Source: Government of Kerala (2017), LSGD Kerala (2023), CRP (2021) Illustrated by Author*)

Achievements: 365,531 houses were built, 125,086 were under construction and 480,302 houses were sanctioned (94 percent approval rate), as of December 2023, the highest per-capita state housing programme in India (LSGD Kerala (2023); Government of Kerala, 2024).

Implementation Challenges: Phase II (BLC) was very successful, but Phase III (apartments for landless) had low (530 units instead of 158,000 need) success because of land acquisition bottlenecks, expensive building construction, preference of beneficiaries to detached houses, and sustainability of O&M in collective housing (CRP, 2021; LSGD Kerala (2023)).

CHAPTER 5
CASE STUDIES

5.1 Yerwada In-Situ Slum Upgrading, Pune (2009–2012)

5.1.1 Context and Background

Yerwada is a huge informal settlement group in eastern Pune, Maharashtra, which has seven neighbourhoods, namely, Kasarwadi, Wanjale Vasti, Bodke Vasti, Mukundnagar, Laxmi Nagar, Ganesh Nagar and Indira Nagar, which take up about 12 hectares together and accommodate approximately 1,200 families (Munot, 2023; Nath, 2020). It was founded in the 1960s when migrant labour force in rural Maharashtra settled in unproductive state-run land in areas close to industrial workers, creating a permanent settlement although without formal tenure (Nath, 2020; SPARC, 2012). By early 2000s, Yerwada boasted of classic features of mature informal settlements: high density (mean 350-400 persons per hectare), poor infrastructures (shared water taps, open drains, none sewerage), mixed quality of housing (primarily semi-pucca housing with some pucca extensions), and an active livelihood system, based mostly on home-based businesses, street-vending, construction labour, and domestic work (Nath, 2020; Munot, 2023). Being in the vicinity of the remuneration areas, the settlement is located 2-3 km away from the industrial areas, commercial hubs, and residential colonies that are inhabited by middle-income groups, which was economically convenient due to the low incomes of low-income households (Munot, 2023).

Figure 11. Yerwada - Location of seven slums
(Source: Srivatsa (2015))

(a)   (b)

Figure 12 (a) Typical Kucha house (b) Cluster of Kucha houses
(Source: Srivatsa (2015))

Yerwada upgrading project was conducted in 2008-2015 as one of the few BSUP projects in the country to successfully apply participatory in-situ upgrading instead of high-rise relocation constructed by the contractor as required under the Basic Services for the Urban Poor (JNNURM-BSUP) scheme (SPARC, 2012; Munot, 2023).

5.1.2 Policy and Institutional Framework

The Yerwada project worked according to the schemes of BSUP but changed the common patterns of the implementation significantly with the tripartite collaboration of Pune Municipal Corporation (PMC), civil society organisations (SPARC, Mahila Milan), and the architect Prasanna Desai (Munot, 2023; Desai, 2013).

Governance Structure:

Pune Municipal Corporation (PMC): Pune Municipal Corporation (PMC) has given land (which is currently occupied by residents), arranged for BSUP funding (3 lakh per household: 50% central, 40% state, 10% beneficiary contribution), and provided 99, year leases accompanied by Completion Certificates and individual nameplates, thus, offering slum, dwellers in Maharashtra with an unprecedented level of tenure security (Munot, 2023; Nath, 2020).

SPARC and Mahila Milan: Carried out widespread mobilisation of the community, participatory enumeration (household surveys, spatial mapping), design workshops, where the residents in the area voted on typologies (rejecting apartments 90:10 in favour of individual houses), and helped the establishment of Community-Based Organisations (CBOs) to remain engaged (SPARC, 2012; Munot, 2023).

Prasanna Desai Architects: Designed incremental housing models, one-on-one design consultations that generated 2,000 tailored plans, 1:1 scale mockups of housing that allowed residents (in particular women) to test out layouts prior to construction and post-construction technical advice services (Desai, 2013; Munot, 2023).

Security of the tenure: The 99-year leases offered unprecedented security, but were non-transferable (commercial sale not possible but could be inherited) which restricted their use as an economic object (Nath, 2020).

5.1.3 Physical and Social Strategies
Participatory Design Process:

The design process represented a real involvement at various phases (Munot, 2023; Desai, 2013):

Figure 13. Interactive Planning Meeting
(Source: Desai, P. (2010))

Typology voting: Residents voted against the multi-storey apartments, which contractors proposed as the modern way of living, and voted in favour of plot-based individual houses, which fit the cultural demands of ground-level accessibility, privacy and the opportunity to expand slowly (Munot, 2023).

One-on-one meetings: More than 2,000 customised plans were made based on individual consultations through discussions between the architect, family members (especially women controlling domestic spaces), and the representatives of the CBOs, taking into account the functioning of the family needs, including the possibility of tailoring space, shops at the ground floor, access to the elderly, and the structure of joint families (Munot, 2023; Desai, 2013).

1:1Mockups: Full-size physical mockups gave families (in particular, women who would visit a kitchen, courtyard and storage) a chance to walk around the layouts, test functionality, and make changes before they were built, and the effect was virtually unanimous success (Munot, 2023).
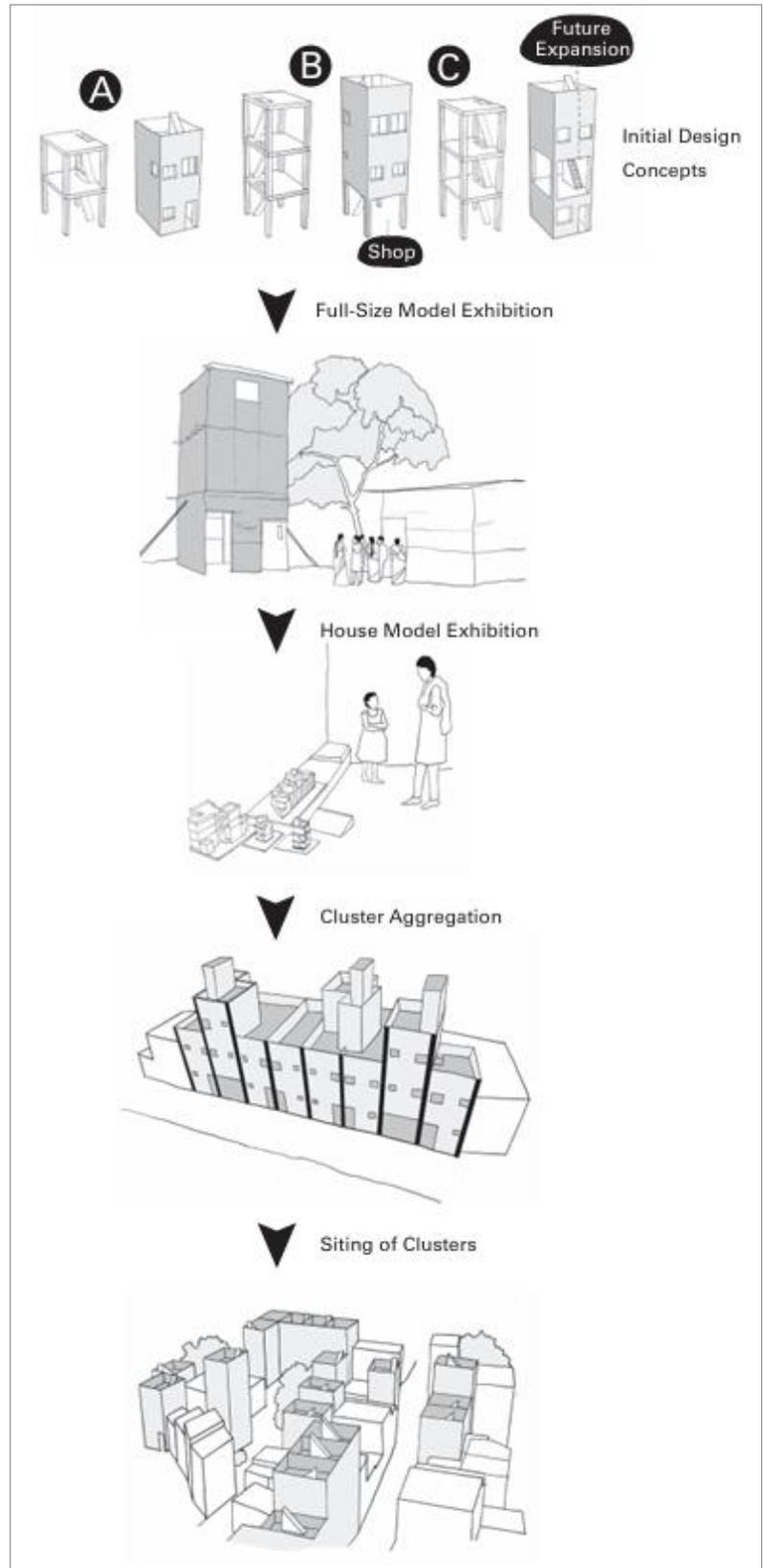
Figure 14. Participatory design process for SPARC/Mahila Milan upgrading
(Source: Lamb & Vale, 2024))

Housing Typology:

Incremental Core Housing:

The design strategy provided 270 sq.ft (25 m^2) core housing units on over-structured RCC frames explicitly designed for incremental vertical expansion up to G+2 (Desai, 2013; Nath, 2020):

Form: RCC columns and beams with the sizes G+2 and the exteriorised plumbing and electrical circuits that can be easily added and an exteriorised without interior demolition (Desai, 2013).

Flexible plans: Ground floor: Living room, kitchen, toilet and small courtyard/otah (semi-open entrance area, culturally important to women when working or socializing); external staircases to be provided to facilitate easy access to the upper floor, with this area being rented or children of married couples (Munot, 2023).

Climate responsiveness: Monsoon drainage, cross-ventilation provided by opposite windows, microclimates in the courtyard with less heat island effect (Desai, 2013).

Infrastructure Provision:

To protect housing construction, infrastructure delivery was scheduled and was delayed because of inter-departmental failure on coordination (Munot, 2023; Nath, 2020):

- Water supply: Personal connection but intermittent (alternate day supply, 2-3 hours); shared taps but continued to be used in not all neighbourhoods (Nath, 2020).
- Sewerage: Underground sewerage not finished yet parts of it were open lanes (Nath, 2020).
- Roads and drainage: Internal lanes are paved but poorly drained and lead to waterlogging during monsoons at low lying places (Munot, 2023). Community facilities:
- Community halls and Anganwadi centres that are scheduled but not implemented (Munot, 2023).

5.1.4 Outcomes and Critiques

Scale and Completion: 1,200 households were handed out core housing units in seven neighbourhoods with 99-year leases, Completion Certificates and individual nameplates granting unprecedented tenure security (Munot, 2023).

Post-Occupancy Evolution: Longitudinal research has revealed significant incremental growth in communities enhanced over the years (Munot, 2023; Nath, 2020). In eight years of upgrade, 82 percent of residences continued to add vertical extensions like a new room, extra-floor unit, terrace, or staircase, which indicated flexibility of the space and the changing family requirements (Munot, 2023). Approximately 35 percent of these households rented high-rise storeys to family or migrants, earning them additional monthly revenues (Munot, 2023). Meanwhile, there was thriving business at the ground floor, with tailoring and grocery stores as well as tiffin shops, beauty salons, and workshops, which had the backing of a safe tenure and better accessibility at the ground floor (Nath, 2020).

Livelihood Preservation: In-situ upgrading did not significantly change the closeness to employment. The households kept employed in the local industrial estates, middle-class households (domestic work), construction projects, and home-based businesses, which did not disrupt the household income (Nath, 2020; Munot, 2023).

Resident Satisfaction: In-situ upgrading did not significantly change the closeness to employment. The households kept employed in the local industrial estates, middle-class households (domestic work), construction projects, and home-based businesses, which did not disrupt the household income (Nath, 2020; Munot, 2023).

Critical Limitations:

- *Infrastructure lapses:* The lack of drainage, sporadic water supply, and community facilities were eroding housing gains; failures to coordinate inter-departments demonstrated the weak institutional nature (Munot, 2023; Nath, 2020).
- *Quality control problems:* Units erected by a contractor had flaws (cracked walls, leaky roofs, poor finishing), which residents had to invest in to fix them, on top of the argument of built-up housing (Munot, 2023).

- *Poor replicability:* Yerwada model was not replicated in other BSUP cities or scaled in PMAY, which indicates policy inertia towards high-rise PPP models, despite its success (SPARC, 2012; Mitra, S. (2022)).
- *Lockout of renters:* The landowners were only provided with housing, and the tenant households (around 15-20 percent) were excluded, which caused intra-community inequalities (Nath, 2020).
- *Absence of support after constructions:* There were no technical advisory to incremental additions and this resulted in the haphazard expansions: structural hazards (overloaded foundations, insufficient beam-column connections), safety hazards (exposed reinforcement, poorly oriented staircases) and aesthetic inconsistency (Munot, 2023).

5.2 Baan Mankong Programme, Thailand

5.2.1 Context and Origins

Baan Mankong ("Secure Housing") is Thailand's national community-driven slum upgrading programme, launched in 2003 by the Community Organizations Development Institute (CODI), a state-backed public organisation under the Ministry of Social Development and Human Security (Boonyabancha, 2005; Archer, 2012). The programme emerged from three decades of experimentation with community-led housing and savings networks by grassroots organisations, notably the Urban Community Development Office (UCDO, CODI's predecessor) and community savings groups networked nationally through the Community Organizations Development Institute (Boonyabancha & Mitlin, 2012). In the early 2000s, Thailand had about 2 million households (8 million people, 13 percent of national population) residing in more than 5500 informal settlements, mostly in Bangkok and other secondary cities in the country (Chiang Mai, Khon Kaen, and Hat Yai) (CODI, 2019). Thai slums were characterised by moderate incomes, strong tenure insecurity, and environmental insecurity, compared to Indian slums, which were characterised by extreme poverty, ruthless land speculation, and lack of infrastructure (Boonyabancha, 2005; Archer, 2012). The Baan Mankong programme was specifically opposed to traditional slum clearance or redevelopment by contractors but rather placed communities in the centre of their own upgrading by collective design, savings-based finance and negotiated tenure solutions (Boonyabancha, 2005; (Mitlin & Walnycki, 2019).

5.2.2 Policy and Institutional Framework
Governance and Institutional Design:
The national, city and community institutions collaborate in a multi-level partnership, which is the way Baan Mankong functions (Boonyabancha & Mitlin, 2012; CODI, 2019):

CODI (National Level):
The infrastructure subsidies of 20,000-45,000 Baht per household (around 600-1300 dollars) are given to the program to cover land preparation, roads, drainage systems, water supply, sewerage, electricity, and community facilities (Boonyabancha, 2005). Moreover, it provides housing loans, up to 300,000 Baht in any household (approximately $8,500) with an interest rate of 4% and a 15–20-year term, which are provided through community savings cooperatives (Boonyabancha & Mitlin, 2012). The program also focuses on a citywide upgrading strategy, which deals with all informal settlements in a city as a whole as opposed to the projects theory. This holistic approach enhances the inclusive city-form and avoids gentrification as a result of displacement (Archer, 2012; (Mitlin & Walnycki, 2019). The technical assistance is also offered via the form of architects, engineers, and social organizers who are seconded to communities during both the planning and construction processes (CODI, 2019).

Figure 15. Urban Baan Mankong Citywide Mechanism
(Source: https://en.codi.or.th/baan-mankong-urban/))
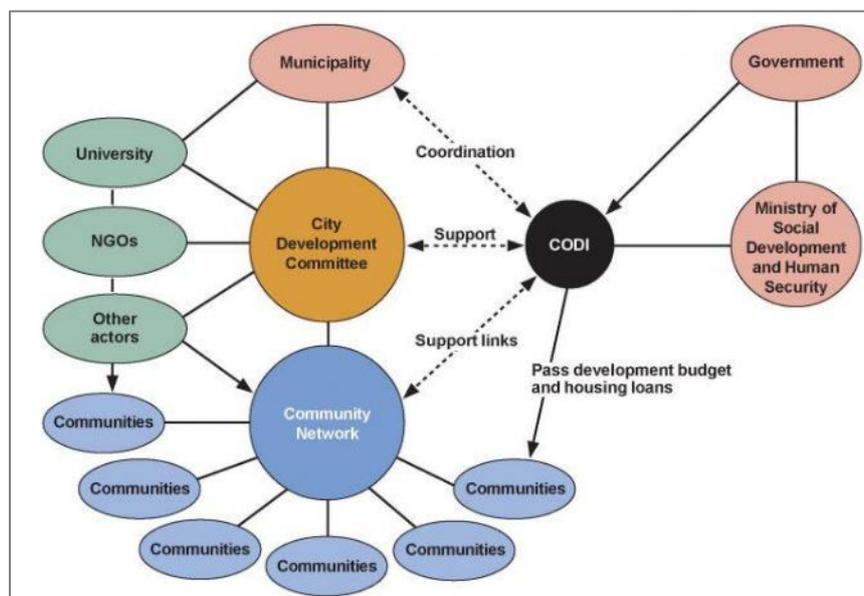
Local Governments (City/Municipal Level):

The program also provides negotiated land tenure solutions to the secure and equitable access to land by low-income communities. These are long term renewable tenures up to 30 years on the public land, assisted land purchase on the private land under the term of the municipal guarantee, and land sharing scheme where the land owners allocate part of their property to community housing in lieu of the development rights (Boonyabancha, 2005; Archer, 2012). The initiative also co-finances the infrastructure and land acquisition subsidy and has helped to provide regulatory assistance, including expedited building permits and liberalized density control in special slum upgrading areas ((Mitlin & Walnycki, 2019).

Community Savings Networks:

The organizational backbone of the program consists of pre-existing community savings groups which are usually 20-50 households in number. These organizations take small deposit amount daily or weekly amongst members and establish a common capital base with which members can loan out to each other in case of emergency or to fix repairs or small business ventures before participating in the Baan Mankong program (Boonyabancha & Mitlin, 2012). With time, the local savings groups merge at the level of cities and countries, promoting peer education, empowering them to collectively buy land and increase their bargaining power against the government ((Mitlin & Walnycki, 2019). These savings groups during upgrading process turns into a housing cooperative that would administer CODI loans, control the quality of construction and administer post-construction community funds (Boonyabancha, 2005).

Tenure Solutions—Multiple Pathways:

Unlike traditional land titling that is quite rigid, Baan Mankong has at its disposal various tenure mechanisms which are not only flexible but also very much adaptable to the condition of a particular location (Boonyabancha, 2005; Archer, 2012):

- Collective possession of land: Communities are collectively owning (as cooperatives through CODI loans and municipal guarantees) land, with title collectively owned by communities but individual households may not sell land separately, which prevents market-based displacement (Boonyabancha & Mitlin, 2012).
- Long-term lease: On state or institutional land (railways, military, port authority) the communities enter 30-year renewable leases at nominal rent, which gives them de facto security (Archer, 2012).

- Land-sharing: On disputed privately owned land, the communities make a deal where the land owners set aside a portion (30-40%) of the land to be used by the communities to provide housing, instead of facing hardship with the eviction litigation (Boonyabancha, 2005).

5.2.3 Physical and Social Strategies

Citywide Upgrading Approach:

The unique feature of Baan Mankong is the so-called approach in the city: the simultaneous engagement of all informal settlements in a city in participative city-level planning workshops during which community representatives, local government officials and technical professionals jointly map settlements, prioritise the intervention and negotiate land and infrastructure solutions (Archer, 2012; (Mitlin & Walnycki, 2019). This avoids the widespread issue of piecemeal upgrading that forces informal dwellers to other slums, and takes advantage of the municipal investment in every settlement, not separate initiatives (Boonyabancha & Mitlin, 2012).

Community-Driven Design and Construction:

Baan Mankong revolves on community control of designing and building unlike the architecture-based approach in Yerwada or the infrastructure-only approach in Ahmedabad (Boonyabancha, 2005; CODI, 2019):

Participatory surveys and mapping: The communities carry out household surveys, plot size measurement, infrastructure shortages map, and vulnerable households (elderly, disabled, female headed) are identified, which are then used to create detailed settlement profiles guiding upgrading plans ((Mitlin & Walnycki, 2019).

Design workshops: Local residents with the help of CODI architects prepare layout plans using the scale models, drawings, and field tours and determine typologies of housing, infrastructure pathing, common amenities, and staging (Boonyabancha & Mitlin, 2012). The inclusion of women is actively promoted by organizing separate female workshops and child care services during conferences ((Mitlin & Walnycki, 2019).

Collective construction: Villages engage contractors to do work on major infrastructure (drainage, roads) though they usually build houses themselves where the skilled workforce, together with outside labour, is overseen by an elected construction committee and CODI engineers (Boonyabancha, 2005; CODI, 2019).
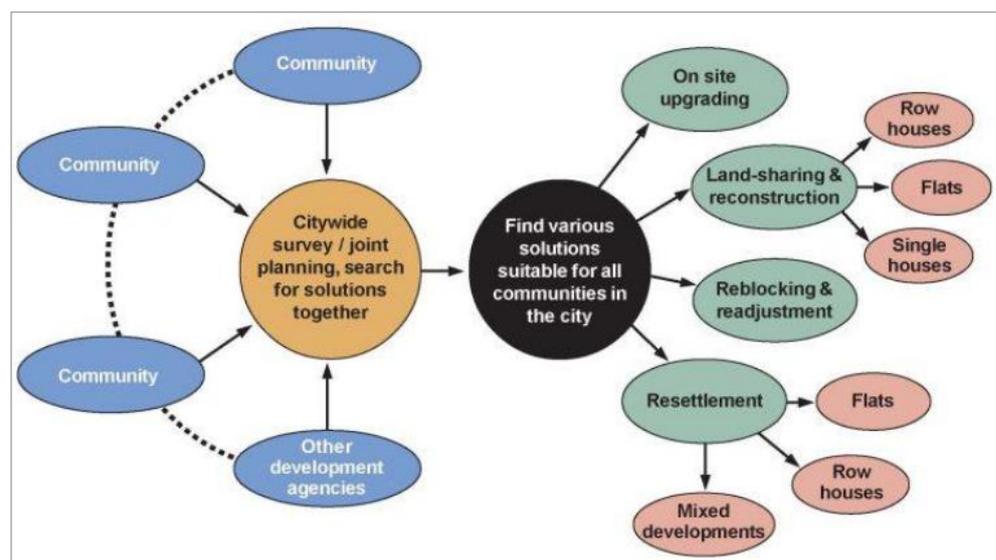
Figure 16. Baan Mankong Process and City Linkages *(Source: https://en.codi.or.th/baan-mankong-urban/))*

Infrastructure and Housing Integration:

Baan Mankong provides integrated infrastructure-plus-housing packages rather than separating infrastructure and housing (Boonyabancha, 2005):

- *Infrastructure subsidy:* Includes land preparation (fill in flood prone areas), underground drainage and sewerage, paved internal road (4-6 meters wide vehicle access), piped water supply inclusive of household connections, electrical grid extension, street lighting, solid waste collection points, and common facilities (community halls, playgrounds, childcare centres) (CODI, 2019).

- *Housing finance:* Housing- Loans are provided to households to construct/refurbish permanent housing (usually 4060 m 2, two-storey row houses or small detached houses), however the design is not standardised but instead, it depends on the preferences of the community (Boonyabancha & Mitlin, 2012).

Flexible Implementation Models:

The implementation models that Baan Mankong supports different conditions of sites include three models (Boonyabancha, 2005; Archer, 2012):

- *In-situ upgrading (63% of projects):* In-situ upgrading changes the situation where the communities have to move to a different place. The communities remain in the same place while improving the infrastructure, housing incrementally, and getting tenure either through leases or common ownership.

- *Reconstruction on-site (25%):* When a reorganisation of the layout for the site has been identified as necessary, e.g. flood mitigation, widening of roads, creating community spaces etc., the communities are moved to a nearby location just for the duration of the period in which the land is being cleared, the infrastructure is being installed and the new houses are being built. After that, the people are returned to their old neighbourhood which has continuity (Boonyabancha & Mitlin, 2012).

Figure 17. Baan Mankong - Participatory design workshop with scale models

(Source: https://en.codi.or.th/canal-housing-development/)

- *Land-sharing or relocation (12%):* Where the location is not conducive (flood prone sites or industrial hazard areas), the communities are negotiated to share their land (leaving part of the site) or relocate to adjacent land (prioritising the area so the community can access employment), and community consent is compulsory (Archer, 2012).

5.2.4 Outcomes and Critical Assessment

Scale and Coverage: Another aspect is that during the period between 2003 and 2020, the Baan Mankong program expanded to a level never before seen in Thais with regard to scale implementation (CODI, 2019; (Mitlin & Walnycki, 2019). It has directly assisted more than 110300 households, approximately 450000 individuals, by improving programs in 422 cities around the country. One thousand seven hundred and thirty-one communities were involved in the program and they included a large diversity of settlement sizes including small groups of clumps of approximately 50 households to large urban slums with over 1000 households. More so, some 2,500 community savings groups were either reinforced or new ones were created that accumulated over 2 billion Baht (approximately 60 million dollars) as revolving loan funds to further community development (CODI, 2019).

Tenure Security Outcomes: In the participating communities, land tenure became secure in nearly three-quarters (78%), which is achieved with a variety of mechanisms, such as cooperative ownership (45%), long-term lease (28%), and land-sharing (5%), making them very less vulnerable to eviction (CODI, 2019; (Mitlin & Walnycki, 2019). The rest 22% still lived on land with informal tenure agreements- usually due to negotiation processes that were not completely finished or due to communities preferring incremental upgrading before formal tenure regularization, but they still enjoyed a significant increase in access to improved infrastructure and housing (CODI, 2019).

Infrastructure and Housing Quality: 87% of Baan Mankong projects had comprehensive infrastructure packages including drainage, water supply, sewerage, roads, electricity, street lighting, and solid waste management services (CODI, 2019). The housing quality also improved significantly as 92% of the households built permanent dwellings using brick or concrete to replace the temporary shanty; the average residential unit measured between 45 and 60 m 2, and this constituted a significant increment in the living space than the situation when the upgrading was done ((Mitlin & Walnycki, 2019). A 6080 percent reduction of the occurrence of floods in flood prone regions, especially along the edges of the canals, through specific mitigation measures, including enhanced drainage, land-filling to elevate the ground level to 12 meters and dredging of the canals, (CODI, 2019).

Economic and Social Outcomes: The scheme was effective in saving lives by keeping the communities close to their working sites and services; consequently, 88 percent of households indicated no interruption to the source of income ((Mitlin & Walnycki, 2019). Moreover, an increased availability of water and sanitation helped decrease the time to spend on daily activities, including the water collection process, and the number of ill people absent, which resulted in increased productivity and an average 15-25% rise in household income after upgrading (CODI, 2019). Community social capital also improved, when savings groups and housing cooperatives became long lasting community-based organizations-68 percent of which were still involved in collectivity, after five years of completion in savings, childcare, elderly and micro-enterprise development ((Mitlin & Walnycki, 2019). Moreover, the program significantly contributed to the empowerment of women: 45 percent of leadership positions in savings groups and design committees were occupied by women, and 45 percent of leadership in housing cooperatives were occupied by women, which demonstrate the feeling of more confidence and active civic participation ((Mitlin & Walnycki, 2019).

Replicability and Influence: The way the Baan Mankong program developed out of first pilot programmes (20032005) and now is nationwide (2020) indicates the success of the institutional learning as well as the ongoing commitment to the policy despite changes in political regimes (Archer, 2012). Its success also made it have a strong international impact where similar community-based upgrading programs started being developed in other nations. As an example, Cambodia has implemented the Railway Community Development Programme, Philippines widened its Community Mortgage Programme and Vietnam has introduced participative upgrading pilots. In addition, the principles of Baan Mankong shaped the global principles of participatory slum upgrading by UN-Habitat making it a model of inclusive and locally controlled urban development (Boonyabancha & Mitlin, 2012; (Mitlin & Walnycki, 2019).

(a)   (b)

Figure 18. Baan Mankong – (a) Before and (b) After
(Source: https://en.codi.or.th/canal-housing-development/)

Critical Limitations:

- *Urban bias:* 85 percent of the projects were in urban areas; rural settlements were underserved because of the inadequate presence of savings net and the inability of the local government to comprehensively serve rural areas (CODI, 2019).
- *Variability in quality:* Sometimes, the work of community-led construction was uneven in quality; in case of the lack of technical control, structural flaws appeared (poor foundations, ineffective waterproofing), and remedial investments were made ((Mitlin & Walnycki, 2019).
- *Persistence of tenure insecurity:* 22% did not have secure tenure and were vulnerable; long-term lease renewal which can be changed and renegotiated with the landowner (Archer, 2012).
- *Lack of subsidy in expensive cities:* In the central regions of Bangkok, the infrastructure subsidy (20,000-45,000 Baht) was set at only 40-60 percent of the real costs, meaning that communities had to mobilise their own funds or settle with inferior infrastructure (CODI, 2019).
- *Elite capture risks:* Local elites (landlords who rent to slum households) sometimes took the upper hand in the process of making decisions in weaker savings groups; CODI social organisers tried to prevent this by making processes transparent, but it remained a challenge (Mitlin & Walnycki, 2019).
- *Trade-offs in the relocation model:* The 12 percent of the relocated had to commute longer (30-60 minutes against the past 10-15 minutes), which added to the transport expenses and time poverty even with better housing (Boonyabancha & Mitlin, 2012).

5.3 Ahmedabad Slum Networking Programme (Parivartan), Gujarat

5.3.1 Context

Established by the Ahmedabad Municipal Corporation (AMC) in collaboration with the civil society organisations, the private sector and slum communities (SEWA, 2002; World Bank, 2007), The Ahmedabad Slum Networking Programme (SNP), locally referred to as "Parivartan" (transformation), was an infrastructure-based slum upgrading project, a first of its kind in India, founded in 1995. When the programme was launched, 41 per cent of the 3.5 million people in Ahmedabad were in 1,029 slums and chalis (semi-slums), and only 23 and 26 per cent had a connection to water and household toilets respectively, compared with 87 and 73 per cent in non-slums (SEWA, 2002). Informal economy employed 77 per cent of the workforce in Ahmedabad and generated 46 per cent of the income in the city indicating the economic importance of the informal settlements despite the lack of infrastructures (SEWA, 2002). Women workers that is, vegetable vendors, domestic workers, home-based producers, were especially affected by the water and sanitation shortage, they had to spend 2-4 hours a day on the provision of water, which they could have used instead to earn income, childcare or education (SEWA, 2002; Bhatt, 2006).

5.3.2 Policy and Institutional Framework

The rule that Parivartan applied was based on a multi-stakeholder alliance with five actors (SEWA, 2002; World Bank, 2007):

Ahmedabad Municipal Corporation (AMC): Built a special SNP Cell to manage the implementation, was paying 100 per cent of the cost of connecting slums to citywide infrastructure (₹3,000/household), and a third of the cost of on-site infrastructure (₹2,000/household). According to the Bombay Provinces Municipal Corporation Act, a change was made so that AMC could get 10 per cent of the yearly revenues so that the slums can be improved and to sustain themselves (SEWA, 2002; World Bank, 2007).

NGOs (MHT/SEWA): Gujarat Mahila Housing SEWA Trust was the main implementation partner, which took care of community mobilisation, CBO formation, capacity building to monitor quality as well as facilitating savings and credit connections with SEWA Bank (SEWA, 2002).

SEWA Bank: Residents Loans to the residents to cover the household contribution with repayment flexed to non-regular informal-sector incomes (SEWA, 2002; Bhatt, 2006).

Community-Based Organisations (CBOs): Residents established legally registered neighbourhood associations that fulfilled 100 per cent consensus of households, made contributions, supervising the quality of construction (payments withheld in cases of defects), and the post-construction O&M (SEWA, 2002; World Bank, 2007).

Private Sector: The householders (1/3 on-site cost) as corporate social responsibility (the same could be said for this element), but the contribution was sporadic (SEWA, 2002).

Tenure Security: All upgraded slums were guaranteed no-eviction by AMC with a 10-year period, which guaranteed de facto tenure security allowing the housing investment without the fear of demolition (SEWA, 2002; World Bank, 2007).

5.3.3 Physical and Social Strategies

Infrastructure Package: Parivartan concentrated wholly on infrastructure and no housing building since it was shown that 99 per cent of the residents would upgrade housing after the services had been provided (World Bank, 2006, as cited in World Bank, 2007). The package included individual household water supply, underground sewerage and drainage, individual household toilets, paving of internal lanes, storm water drainage, street lighting, and solid waste management (SEWA, 2002; World Bank, 2006, as cited in World Bank, 2007). This infrastructure-based model cost ₹9,000–12,000 per

household was easier to implement (12-18 months versus 3-5 years) and respected the agency of residents (World Bank, 2006, as cited in World Bank, 2007; SEWA, 2002).

Participatory Mechanisms: Community participation operated at multiple stages. During pre-implementation, MHT conducted door-to-door visits to build 100 per cent consensus. The communities were consulted during the planning process on the positioning of the tap, the design and positioning of toilets and lanes. In the implementation, CBOs checked quality by using trained volunteer workers who spotted poor quality materials and poor construction work and withholding community input in case of defects (SEWA, 2002; World Bank, 2007).

5.3.4 Outcomes and Critiques
Scale: By 2009, it had been extended to 60+ slums that provided benefits to 13, 000+ households (World Bank, 2007, 2009; Urban Agenda Platform, 2020).

Impact: In a 2000-2001 survey of 297 households, it was found that, after upgrading interventions, living conditions and wellbeing had improved significantly (SEWA, 2002). The time spent by women each day collecting water had been reduced by 60 to 30 minutes and this enabled the women to do more work as an average workday increased by 7 to 9 hours with the result that income per capita increased by 22%- ₹318 to ₹388 monthly. School enrolment rates of children age 6-10 years increased dramatically by 28 to 67 percent, which showed improvement in access to education. The health outcomes also changed significantly with the incidence of waterborne diseases reducing by 60 and household health spending reducing by 56. In 5-7 years 99% of the families have improved their residential status and property markets have significantly appreciated.

Replicability: Parivartan has impacted the national policy (BSUP, RAY), has been replicated in Vadodara, and has been selected as a best practice by the UN-Habitat/World Bank (World Bank, 2007; Urban Agenda Platform, 2020).

Limitations: Self-built quality was different to no housing design support. Hard to execute on the non-AMC land. Worst 20% had been able to afford only slight improvements. Reduced livelihood integration other than saving of time (SEWA, 2002; World Bank, 2006, as cited in World Bank, 2007; World Bank, 2007).

5.4 Ongoing Smart City Redevelopment of Rajaji Nagar (Chengalchoola Colony)

5.4.1 Context
Rajaji Nagar (also referred to as Chengalchoola) is an old low-income colony that lies just behind the Secretariat at Thiruvananthapuram central business district. The colony is covering an area of approximately 12-12.6 acres and has approximately 1,100 dwelling units and about 2,000 families, making it one of the most populated and political sensitive slum regions in the capital of Kerala (New Indian Express, 2021; New Indian Express, 2023; SCTL, 2022). Although central, the settlement has been facing decades of infrastructural neglect. One of the complaints reported by residents is a persistent flooding, sewage overflow, leakage of underground drainage pipes, and a extremely poor housing stock (New Indian Express, 2022). The colony is situated on the extremely polluted Amayizhanchan canal, and during the downpour, the storms combine with the sewage and fill in the lanes and houses forcing many families to temporarily relocate to those of their relatives who are further away (New Indian Express, 2022; New Indian Express, 2023). It is against this backdrop that the State and the Thiruvananthapuram Corporation have established Rajaji Nagar as a pilot in-situ redevelopment project in a program called SCTL (SCTL). A detailed housing and infrastructure plan was declared under the pan-city and Area-Based Development (ABD) elements of the Smart City Mission with estimation of ₹61.42 crore (New Indian Express, 2021; SCTL, 2022,). The project was put in the context of long-term needs on the part of residents to access safe housing and fundamental

facilities as well as an opportunity to transform a centrally located informal settlement into a more formal, serviced neighbourhood.

5.4.2 Policy and Institutional Framework

Institutionally, the re-development of the Rajaji Nagar is at the cross-point between:

- *National Smart Cities Mission:* offering the primary capital envelope and the project logic (area-based redevelopment with modern urban infrastructure) (SCTL, 2022; PropNewstime, 2025).
- *Thiruvananthapuram Municipal Corporation:* owner/manager of most of the land and charged with making local facility service delivery; the Corporation is also charged with long-term financial and operational liability of the new assets, a situation that has questioned fiscal sustainability (New Indian Express, 2021; PropNewstime, 2025).
- *Smart City Thiruvananthapuram Limited (SCTL):* special purpose vehicle (SPV) which plans, tenders and delivers the project, with the beneficiaries, and contractor selection and coordination with the line departments (SCTL, 2022; New Indian Express, 2021).

The plan is formally outlined as the development of the slum in situ as housing complexes with all the facilities and recreational centers, with residents being able to be resettled in the same area of the Rajaji Nagar and not moved to remote outskirts (SCTL, 2022). But the working model is nearer to an apartment redevelopment by the contractor than it is to incremental in-situ upgrading. SCTL master plan is a plan that will be implemented in phases that will ultimately cover all the households in the colony (SCTL, 2022; New Indian Express, 2021). Phase 1 was to be occupied on approximately 2.8-2.85 acres of land in the settlement with other phases subject to the availability of land, consent of beneficiaries and availability of funding. The scheme is indirectly connected with the state-level housing initiatives (e.g. LIFE Mission), but the language of planning, timeline, and financial framework are predominantly the Smart City Mission ones.

5.4.3 Physical and Social Strategies

Physical redevelopment strategy: The essence of the Phase 1 physical strategy may be summed up in the following:

- *Land parcel (Phase 1):* 2.81-2.85 acres of land in Rajaji Nagar that has been identified to be redeveloped in the first phase (SCTL, 2022; New Indian Express, 2021).
- *Housing blocks and units:*
  The formal description of the Smart City of the ABD project defines that the dwelling units are 248 divided into eight G+3 residential blocks, as well as 8 non-residential units of livelihood centres and electrical rooms (SCTL, 2022). Parallel reporting of a first sub-phase records the building of a four-storey (G+3) block of 32 flats, each 2BHK of an approximate 650 sq ft, and, on a first come first serve basis, the families that had sold their original houses and land to the project. The foundation of the building is constructed in such a way that it can support two more floors (up to G+5/G+6) in subsequent stages (The Hindu, 2025). The end vision of the Smart City is to form a multi block settlement with houses, which in several stages would fit about 250 families in new apartments, in the redeveloped area (The Hindu, 2025; PropNewstime, 2025).

- *Facilities and infrastructures in the complex:*
  The apartments contain 2 bedrooms, a living area, a kitchen, and are connected with a lift, sewage treatment facility (STP), parking space, pipes cooking gas, and a community room (The Hindu, 2025). The site-level infrastructure will have access roads, parking, street lighting, adequate stormwater network and standalone sewage connections (SCTL, 2022; New Indian Express, 2021). Other ideas that the concept of the project brings out include green open spaces, a

community hall, a bio-bin and dry-waste segregation hub, solar panels, a unit of eight livelihood centres, and more of a wider upgrade package (SCTL, 2022).

Spatially, the Smart City plan is inclined to densification with the help of multi-storey apartment buildings on pieced plots, which will be subsequently utilized by reorganizing the internal environment of the colony using the free land and enhanced infrastructure.

Staging And Temporary Displacement

In clearing land to prepare the first phase of 2.8 acres, SCTL had initially planned to relocate on a temporary basis about 189-198 families, who lived on the parcels of land (New Indian Express, 2021). The agency provided monthly rent Aid of approximately ₹5,000 per family, and named various locations where temporary rehabilitation could be done, both in rental units and provisional buildings (New Indian Express, 2021). But majority of the residents opposed relocating, with their demands being temporary but on-site rehabilitation at Rajaji Nagar or near the site, out of fear of not receiving allotments of the final site and inability to afford rentals in the city (New Indian Express, 2021; New Indian Express, 2023). As a result:

- The initial agreement to move was by less than 40 family only.
- The initial stage was very much postponed and SCTL officially informed the state chief secretary that due to the limited timeline of the Smart City project and the risk of cost increase, it was planning to put the project on hold.
- Later accounts suggest that, following this stalemate, the scheme was reduced: eventually an estimated 18-34 families were transferred in stages, to allow some initial construction to be carried out, of one block at least.

In 2025, the Prop Newstime report reports that a contract of ₹9 crore was given to a private company to do works on Phase 1 that includes 248 units, stormwater drainage system, access roads, parking and community spaces, and that 18 families have already been moved to embrace works. The Phase 1 will be completed in a period of nine months depending on the construction on time and no future resistance.

Social and livelihood aspects:

Although the project entails the inclusion of livelihoods centres units and community facilities, the main focus is made on physical rehousing and basic service delivery (SCTL, 2022). The home-based businesses, small-scale trading, informal services and social life along small streets are not the main organising principle of the new layout. On the contrary, livelihood and community activities are concentrated in large parts in discrete, formalised spaces (livelihood centres, community hall, recreational areas) attached to the apartment complex (SCTL, 2022; New Indian Express, 2021). Since a good portion of the residents rely on working out of their homes, closeness of the city centre, and the elastic utilisation of the ground-floor area, such change of mixed-use incremental housing to standardised apartments creates possible conflicts. Nonetheless, systematic livelihood planning (skills, credit, market linkages) is not laid noticeable in the description of the project in the wider audience.

5.4.4 Emerging Outcomes and Critiques

The redevelopment of the Rajaji Nagar Smart City has also created both enthusiasm and a lot of competition since its announcement.

Delays and institutional uncertainty of implementation:

The initial ₹61.42 crore scheme, which was being trumpeted, did not even get off the ground in nearly a year because there was interest among bidders and no widespread beneficiary approval could be obtained. SCTL officially said it was ready to cancel the project due to the reason that the Smart City

funds will be redirected to the practical projects which have less barriers (New Indian Express, 2021; PropNewstime, 2025). All Smart City projects in Thiruvananthapuram with Rajaji Nagar included have had their deadline extended several times, and the most recent extension has pushed project completion dates as far as December and reported that approximately 95 percent of the funds allocated to various projects have already been expended. This has put SCTL on toes to demonstrate tangible improvement at Rajaji Nagar (PropNewstime, 2025).

Resident distrust, displacement fears and lack of clarity:

Lack of transparency in communication regarding eligibility, phasing and tenure has been a constant issue among the residents whose fears are that any temporary relocation will guide them into a permanent lockout process (New Indian Express, 2021; 2023). In local press conferences, locals identify themselves as unwanted people, citing forty years of neglect and collapsing buildings, and lack of any long-lasting political involvement other than election years. Demonstrations have pointed out the fact that [?]5,000 rent assistance does not allow finding a place to live in the immediate area, practically forcing the family to remote, less networked areas when they are willing to take the offer (New Indian Express, 2021). One of the major criticisms is the fact that, even though the term is in-situ development, the very work actually does not deprive households of their property of the need to relocate to temporary dwellings, further destabilizing already insecure households (New Indian Express, 2023).

Biases of partiality and exclusion:

And even in case Phase 1 passes through 248 units, it would directly serve only a small part of the approximate 2,000 families that are already living in the colony(New Indian Express, 2021; PropNewstime, 2025). Completely unofficial accounts exist of the redevelopment of Rajaji Nagar as a wholesome conversion of the area into a modern residential and commercial centre, but there is little open understanding about how and when the rest of the households are to be accommodated, on what terms of financing and tenure. This brings up issues of the establishment of a two-tier settlement a formalised aptitute enclave to serve a subset of beneficiaries, and a residual, under-serviced fabric to serve the rest upon future stages.

Infrastructure focus vs. systemic hydrological risk:

On the good side, the project does include storm water drainage systems, sewerage connection and garbage disposal systems within the new complex (SCTL, 2022). Nevertheless, the deeper issues of pollution of the canals, backflow and structurally leaky main drains persist in the greater colony and people still report of sewage-filled floodwaters when it pours heavily (New Indian Express, 2022; 2023). The enclave scale-type engineering solution, as opposed to a basin-wide blue-green infrastructure policy, which would take a systematic approach to the Amayizhanchan canal and catchment, has been indicated in the current description.

Financial sustainability and risk for the Corporation:

City officials and media commentaries have expressed concerns that vast capital expenses of the Rajaji Nagar plan, coupled with revenue constraints could leave the Corporation with a financial liability in the long run particularly in terms of servicing and life cycle expenses of multi-storey complexes (New Indian Express, 2021; PropNewstime, 2025). These financial strains combined with delays in implementation and opposition partly accounted earlier tendencies of SCTL to divert funds to less controversial projects. This case therefore offers an essential counterpoint to more participatory, incremental models such as Yerwada, Baan Mankong and Ahmedabad SNP, and it also allows alternative design and policy frameworks for Rajaji Nagar to be evaluated by a direct point of reference.

5.5 Key Observations: What Do These Case Studies Collectively Demonstrate?

The four case studies, Yerwada in-situ upgradation (Pune), Baan Mankong (Thailand), Ahmedabad Slum Networking Programme (SNP, Parivartan) and the current redevelopment of Rajaji Nagar, Smart City in Thiruvananthapuram, all demonstrate two opposite families of informal settlement improvement strategy:

- ❖ Family A - Participatory, incremental in-situ upgrading (Yerwada, Baan Mankong, SNP)
- ❖ Family B - Contractor-based, apartment-based, in-situ redevelopment (an example of the current Indian mainstream in Smart Cities) (Rajaji Nagar Smart City Smart City).

Observation 1: In-situ Upgrading Preserves Social and Economic Resources; Redevelopment of Apartments Tends to Destroy them
The fact that keeping households in or close to their origins as illustrated in the examples of Yerwada, Baan Mankong, and SNP produce better results by ensuring that the access to jobs, schools, and social networks is maintained, thus making them more satisfied. In Yerwada, there are various residents who operate in 2-3km radius whereas in Ahmedabad, availability of better water and sanitation have improved the income of women and school attendance among children. On the other hand, the Rajaji Nagar Smart City project though termed as in-situ entails temporary migrations of numerous households to enable new developments. This has elicited opposition among the residents who fear being marginalized and losing a source of livelihood, which implies that re-use of land is not enough but it has to be done in a way that displacement has been made functional.

Observation 2: Authentic Involvement Demands Sharing of Power; Tokenism Consultation brings forth War and Wasting of Time.
In Yerwada and Baan Mankong, the communities were engaged at different stages of housing development to enhance adaptive housing models and strong collective organizations by working through systems such as savings groups. On the other hand, Rajaji Nagar Smart City followed the top-down planning strategy, which limited the active participation of residents to the provision of information only. Such insincere involvement in participation resulted in suspicion and procrastination, which served to support the need to incorporate community organizations in the decision-making process and not just informing the residents.

Observation 3: Incremental and Flexible Housing Is Consistent with Household Economies; Fixed Apartments inhibit Adaptation.
The key housing model of Yerwada and the typologies of row-houses in Baan Mankong is that it allows gradual increases in rooms and floors, to suit the requirements of the joint family and variable incomes, and to accommodate home-based businesses. Studies indicate that after having the basic infrastructure, the low-income families will invest in self-enhancement of their residential houses. However, the Rajaji Nagar Smart City model provides a rather rigid 2BHK flats with limited layout, which is not able to be expanded or changed in the future. Although these flats will improve living standards of some families, it might limit the potential to grow in the long run and will not be suitable to the dynamics of joint family living, irregular or fluctuating income and mixed residential-commercial purpose. The significance of flexibility and incremental capacity in low-income housing solutions can be seen through this comparison.

Observation 4: Infrastructure Integration is Fundamental; Scale and Sequencing Are Important.
The three cases demonstrate that the combination of infrastructure (water, sanitation, etc.) and housing improvement should be a part of one process, but various orders can be justified. The SNP focuses on improving infrastructure, which improves health and provides self-directed housing

investment. Conversely, Yerwada and Baan Mankong combine core housing with progressive infrastructure developments but experience problems in case of inferior infrastructure. The Rajaji Nagar Smart City project has essential infrastructures such as sewage and waste management but is largely limited to the apartment enclave and fails to focus on issues of wider settlements in flood-prone zones such as contaminated water and absence complete hydrological approach.

Observation 5: Multiple Tenure Pathways May Be Effective, but they still have to be transparent, safe and non-marketized.

To realize secure tenure, such methods as long-term leasing, cooperative tenure, and no-eviction guarantees can be introduced that offer predictable benefits against eviction and motivate households to invest in the land as opposed to depending on single freehold titles. The issue in Rajaji Nagar Smart City is that tenure arrangement of new flats is not clear, and this causes anxiety to the residents on ownership, resale, inheritance, and consequences of temporary relocation. This degree of lack of transparency and pre-determined models of tenure demolishes the trust and stresses the necessity to focus more on tenure when redeveloping.

Observation 6: Livelihood Preservation Requires Express Spatial and Programmatic Integration.

Effective examples indicate that the introduction of livelihood concerns in the spatial design improves economic opportunities. As an example, Yerwada promotes commercial ground-floor use, which allows to rent the space, whereas in Baan Mankong, there are shared courtyards and workshops where people can do something together. SNP boosts revenues by providing better services in the form of a non-program. The Smart City project of Rajaji Nagar, on the contrary, provides livelihood centers as part of a mono-functional residential design, where livelihood planning is not systematic and income generation activities are displaced. It means that the mere inclusion of livelihood spaces is not yet a well-designed live-work settlement particularly in the central urban areas where proximity and informality are advantageous.

Observation 7: Revolutionary Upgrading needs institutional Reform and a lasting commitment rather than good pilot Projects.

The comprehensive coverage and large-scale slum improvement is possible through the help of Baan Mankong, enhanced by national institution CODI and adaptable upgrading policies in a large number of cities. By contrast, the Rajaji Nagar Smart City project is a single intervention that faces problems of consistency given the change of politics and financial problems, a weakness of one -off projects in systemic slum improvement. Constant change requires pre-established and permanent long-term upgrading programs as opposed to short term funding.

Observation 8: Hydrologically vulnerable Settlement Flood resilience should be at the heart of such settlements.

Only one case out of four adequately dealt with the deprivation of the vulnerable canal, edge communities in flood hazard areas by means of dredging, using land, fill for raising the platforms of the houses, and providing better drainage to reduce the flood water. On the other hand, Yerwada and SNP are suffering from both stormwater and sewage mismanagement and the floods in Rajaji Nagar have been turned into a nightmare by the sewage problem. The Smart City project is blamed for designing a stormwater network only within its boundary while neglecting a holistic canal, basin approach which takes into account the essential hydrological elements. Finally, it is pointed out that the key to the design of flood, prone informal settlements is to integrate flood resilience and blue, green infrastructure.

PART B: SITE STUDY: RAJAJI NAGAR COLONY, THIRUVANANTHAPURAM

Regional level Analysis

Site Specific Scale Analysis

Comparative Study of the Site with Case Studies

THIRUVANANTHAPURAM

CHAPTER 1
REGIONAL SCALE ANALYSIS

1.1 Why Thiruvananthapuram??

1.1.1 Geographic Environment and Demographic Description

The city of Thiruvananthapuram, capital of Kerala and the southern most of all metropolitan cities in India is situated at 8°17'N to 8°51'N latitude and 76°44'E to 77°20'E longitude respectively. It is limited by the Arabian Sea in the west and the Western Ghats in the east and it is approximately 214.86 km2 in area, making it one of the most space-constrained metropolitan areas in the country (Government of Kerala, Department of Urban Development, 2010; Thiruvananthapuram Municipal Corporation, 2013). The terrain of Thiruvana   nthapuram is that of low-lying coastal plains with average sea levels of 4.9 meters, lateritic hills. The result of this low elevation and high monsoon rains is often drainage and flood problems especially in depressed terrains that have traditionally built informal settlements (Master Plan, 2012; COSTFORD, 2005).
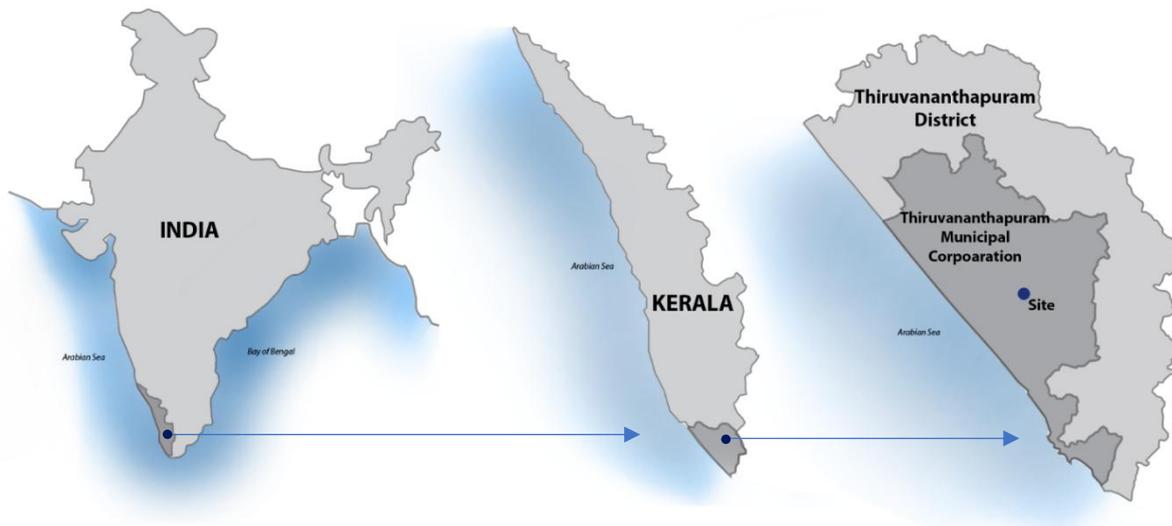
Figure 19. Spatial location of Thiruvananthapuram Municipal Corporation
(Source: Illustrated by Author)

According to the 2011 Census, 957,730 people form the municipal population, with almost 1.68 million living in the greater urban agglomeration. The population of the district was 3.3 million, and the population density was 1,509 persons/km2, which is much higher than the population density in Kerala (150 860 persons/km2) (Directorate of Census Operations, Kerala, 2014; World Population Review, 2024).
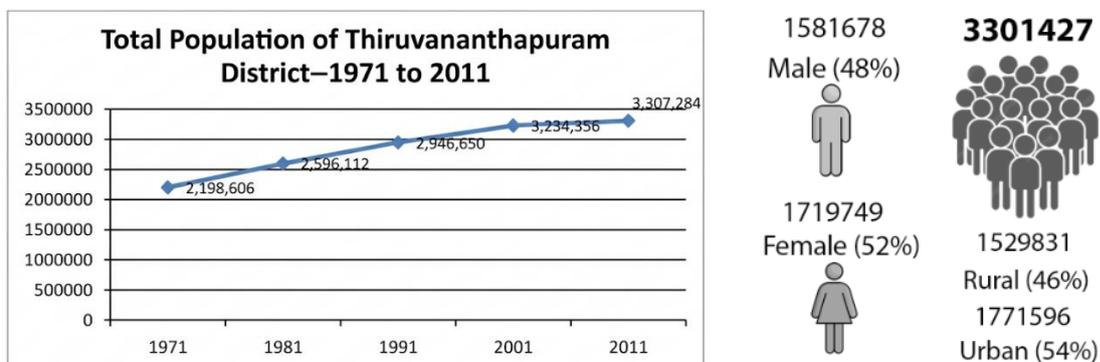
Figure 20. Total Population of Thiruvananthapuram District - 1971 to 2011
(Source: Reproduced from Thiruvananthapuram master plan (Draft), 2012)
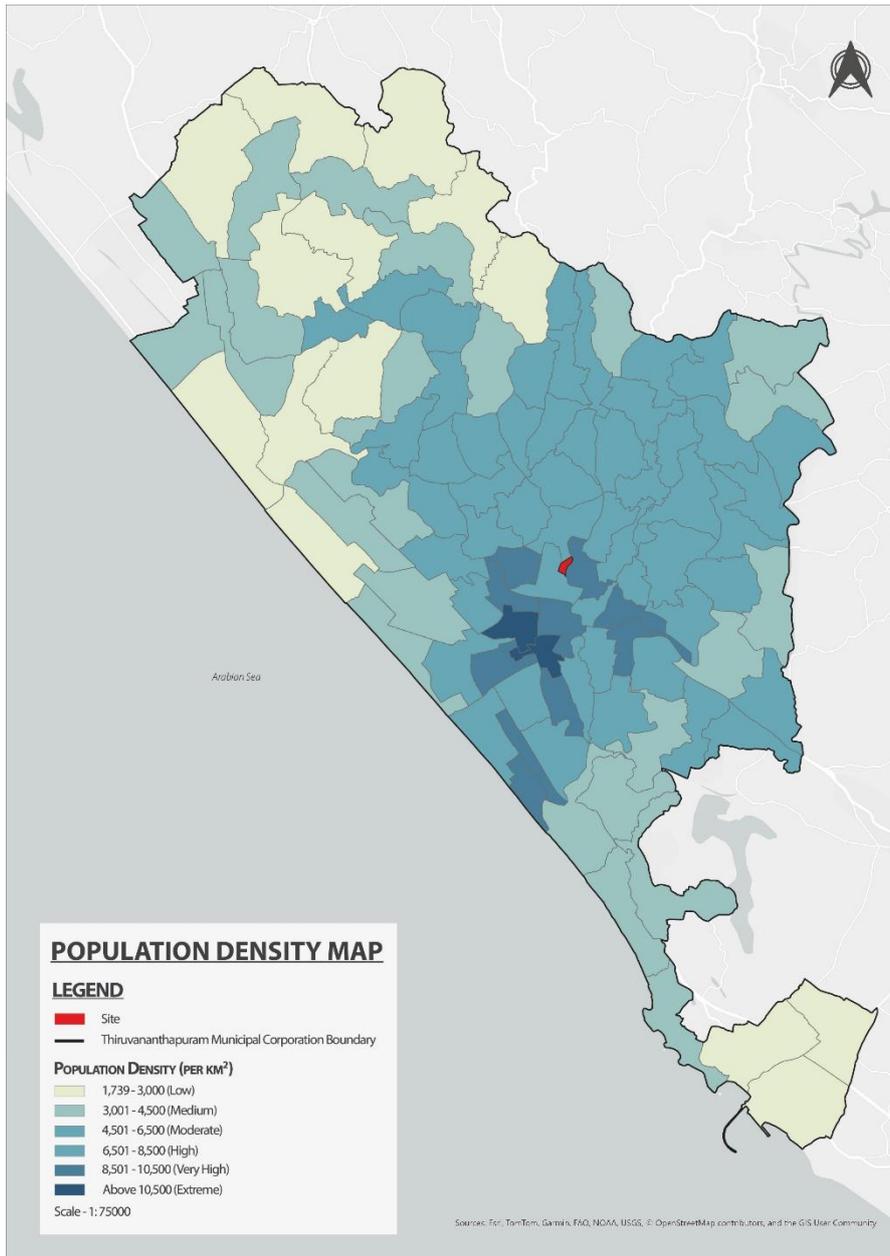
Thiruvananthapuram has good human development measures despite the high population density. The district literacy is 93% and that of the city is 95% that are above the state and national averages. A sex ratio of 1,054 female per 1,000 males is an indicator of high education level of females and late formation of families. Nevertheless, low formal employment (especially among women) is signified by the 33% Workforce Participation Ratio (Directorate of Census Operations, Kerala, 2014; United Nations Development Programme, 2015; Government of Kerala, 2016).

Figure 21. Population Density Map showing population distribution across Thiruvananthapuram Municipal Corporation.
(Source: Illustrated by Author, TVM Ward Map Viewer, K-SMART; Kerala Wards Dataset, GitHub; TVM Corp Delimitation Notification PDF, K-SMART; Household Profile: Thiruvananthapuram 2022, Open Government Data Platform India; Esri; TomTom; Garmin; FAO; NOAA; USGS; © OpenStreetMap contributors; the GIS User Community)

1.1.2 The Context of Informal Settlements:

The informal settlement of Thiruvananthapuram contrasts with the megacities such as Mumbai, Delhi, and Kolkata by creating small, tightly-packed clusters that are integrated into formal neighbourhoods but not massive peripheral clusters (Williams et al., 2019). The reported increase of 37 identified slums in 1995 to 355 clusters identified under JNNURM-BSUP (2005-2015) indicates better reporting on those settlements that existed before, and the growth of these settlements is unlikely to be due to a sudden increase, but rather related to their location in interstitial areas, flood-prone zones, and areas near infrastructures (Williams et al., 2019). Thiruvananthapuram is the first municipality in Kerala to adopt slum upgrading as a way to support women living in slums by partnering with Kudumbashree, a state-wide, women-centered, and poverty alleviation initiative (Williams et al., 2019). Some projects funded by BSUP received national acclaim due to incorporating community infrastructure micro-enterprise workspaces, child study areas, and anganwadis, which showed dedication to livelihood and other social needs other than housing (Williams et al., 2019). It is also one of six Indian pilot sites in the Rajiv Awas Yojana (RAY) scheme, which was suspended in 2015, highlighting its role in informal settlement intervention policy (Williams et al., 2019).
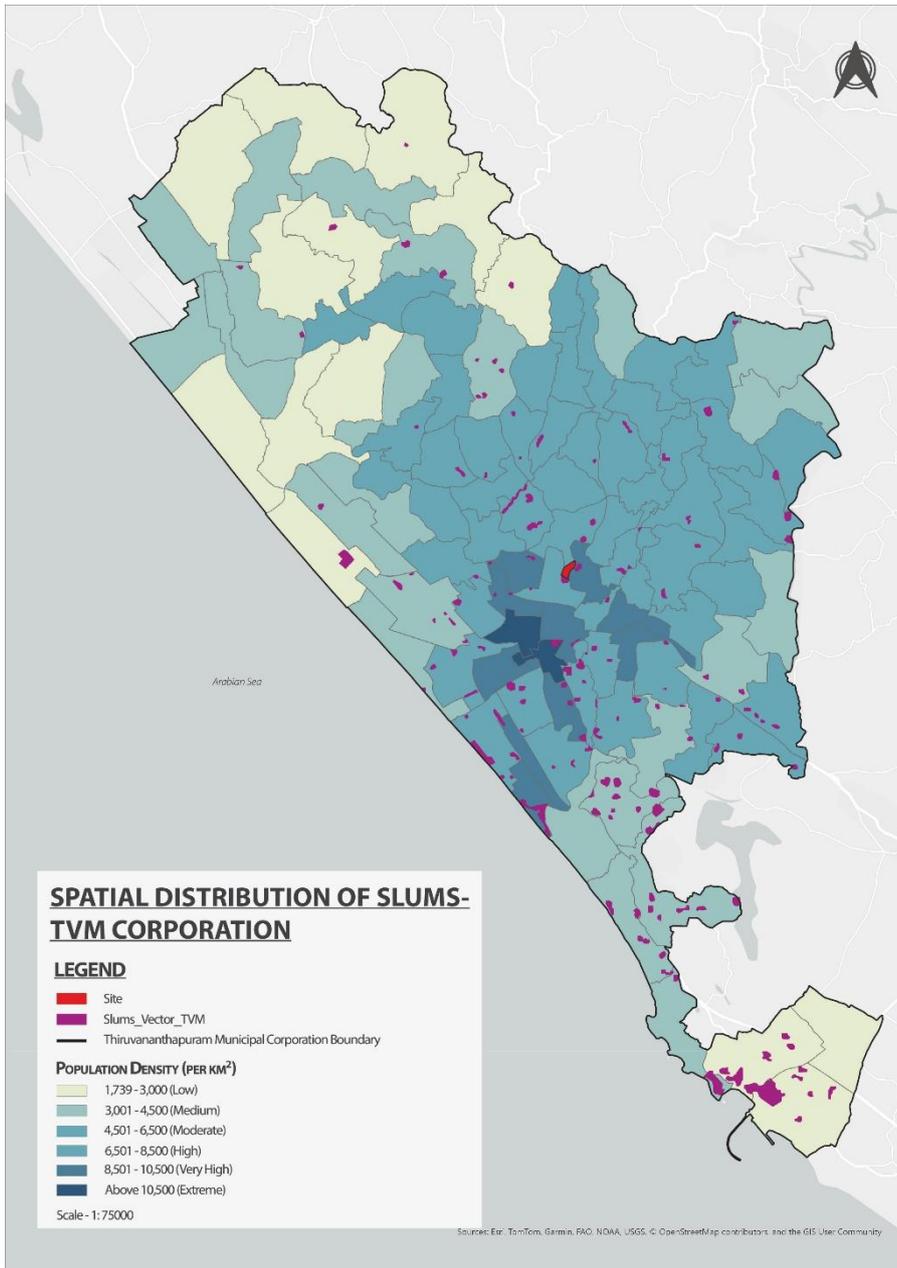
Figure 22. Spatial Distribution of Slums across Thiruvananthapuram Corporation

(Source: Illustrated by Author using Govt of Kerala, Department of Town and Country Planning, 2016, TVM Ward Map Viewer, K-SMART; Kerala Wards Dataset, GitHub; TVM Corp Delimitation Notification PDF, K-SMART; Household Profile: Thiruvananthapuram 2022, Open Government Data Platform India; Esri; TomTom; Garmin; FAO; NOAA; USGS; © OpenStreetMap contributors; the GIS User Community)

Nonetheless, there exist big gaps in implementing planning intentions and ground realities (Williams et al., 2019). Difficulties can be observed in the form of weak coordination between agencies, unwillingness of the residents to relocate because of insufficient compensation issues, lack of involvement with the private sector, and the absence of focus on the disruption of livelihood during the relocation process (Williams et al., 2019; New Indian Express, 2021b). The current approach to the city is currently framed as the Smart City Mission (launched in 2015), which focuses on in-situ redevelopment, maintaining the housing condition, improving infrastructure, and the ability of residents to access employment and livelihood opportunities available in the central part of the city (LSGD Kerala, n.d.).

1.2 About Thiruvananthapuram Corporation

Thiruvananthapuram, in abbreviated form Trivandrum under the British rule, is the southern-most district in Kerala as well as the capital of the state. The city is known as the Gods own land, and is perceived as the jewel in the emerald necklace of the Indian subcontinent. It is called by the name Thiru-Anantha-Puram, which translates to the city of Lord Anantha, the deity is the serpent around which Lord Vishnu is seated. Thiruvananthapuram is one of the oldest Indian cities that were mentioned in ancient Greek and Roman texts as far back as 1000 BC. It is a rich center of cultural

heritage with a lot of natural and human resources and has been the center of administration and service since the pre-colonial times, but still up to date under the British rule. The city covers a stretch of low coastal belt to the rolling midland area geographically, with the green forests of Western Ghats bordering it and the expansive Lakshadweep Sea at the end. Thiruvananthapuram being the educational, commercial, and medical capital of Kerala, is still developing at a very high rate. This city corporation area is approximately 214.86 sq km and the population density of this area is approximately 4,454 people/ sq km, which is well above the state and national population density figures.

1.2.1 Historical Evolution and Political Importance

Thiruvananthapuram got its name because of its history as the capital of Travancore Kingdom. It is referred to by the name of its Sri Padmanabhaswamy Temple which is the historical center of the spatial and cultural development of the city i.e. the City of Lord Anantha. Then in 1795, it was formally declared the capital by the Travancore rulers and it changed making it a political and administrative center (Government of Kerala, 2016; Master Plan, 2012). During 19 th and early 20 th century, Swathi Thirunal and similar reformers such as Chithira Thirunal sought education, art, and social reform by establishing institutions such as the University of Travancore and pillars of human development accomplishments in Kerala-the public health systems. Local quarrying activities were also launched by the construction around the temple and the Secretariat complex during the colonial time which later gave rise to the settlements such as Chengalchoola (Panikkar, 2000; Government of Kerala, 2016; Times of India, 2019; Master Plan, 2012).

After India gained independence, Travancore, Cochin state merged with the newly formed state of Kerala in 1956 and Thiruvananthapuram was made the capital of the state. The city was able to firmly establish its position as the political centre of the state largely due to the fact that the next big administrative structures, such as the Legislative Assembly, State Secretariat and Raj Bhavan, were located there (Government of India, 1956; Thiruvananthapuram Municipal Corporation, 2013). The issues of urban development are revealed in the planning development in the city. The 1971 Development Plan included only the center area and it also took only a period of twenty years. In 1993 there was a second plan which was not passed due to coordination issues. The accelerating urbanisation process resulted in a new shift and Government Order GO(Rt) No.3982/2008/LSGD began to prepare new Master Plans of 32 cities with Thiruvananthapuram the first one. This led to the first in four decades citywide plan the Master Plan 2012 (Master Plan, 2012; Thiruvananthapuram Development Authority, 1993; Government of Kerala, 2008).
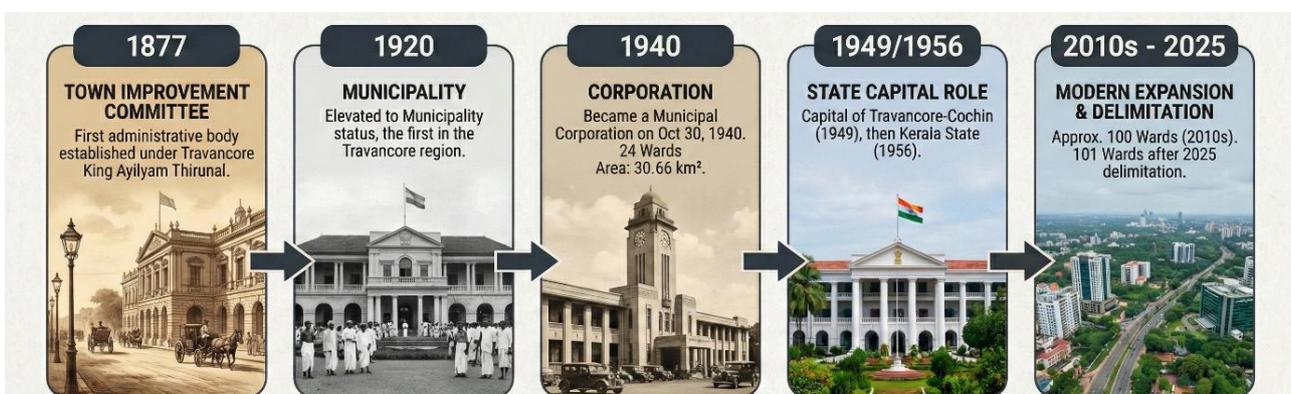
Figure 23. Administrative Evolution of Thiruvananthapuram 1877 -2025
(Source: *Generated by Gemini, Google, 2025*)

1.2.2 Administrative Structure and Governance Framework

The development of the urban governance system of Thiruvananthapuram can be traced back to the time of the conversion of the city into a metropolitan corporation, which also involved the transformation of the city into a capital of a prince. In 1877 under Dewan Peshkar Iraviperur Pillai, the first formal civic institution, the Town Improvement Committee was formed in the city in order to complete urban projects like the Connemara Market at Palayam (Thiruvananthapuram Municipal Corporation, n.d.). Statutory urban governance in Thiruvananthapuram Municipality started in 1920; it was the first municipality in the Travancore region to be formed (Thiruvananthapuram Municipal Corporation, 2013). One of the turning points occurred on 30 October 1940 when the town was promoted to a Municipal Corporation under the rule of Sree Chithira Thirunal Balarama Varma and in the area of 30.66 km2 (Thiruvananthapuram Municipal Corporation, n.d.; Wikipedia, 2006). After the establishment of Kerala in 1956, the Corporation has tremendously increased its size to suit the increased functions of the capital city with a total of around 100 wards by the 2010s (Thiruvananthapuram Municipal Corporation, 2013). The last delimiting of 2025 reorganized the Corporation to 101 wards and was a response to the constant struggle to meet the demographic demands with good governance in the localities (Onmanorama, 2025; Times of India, 2005). This was an administrative transformation of a 19 th -century improvement committee into the second-largest democratically elected body in Kerala that has significantly influenced the ability of the city to overcome urban development challenges such as informal settlement redevelopment.
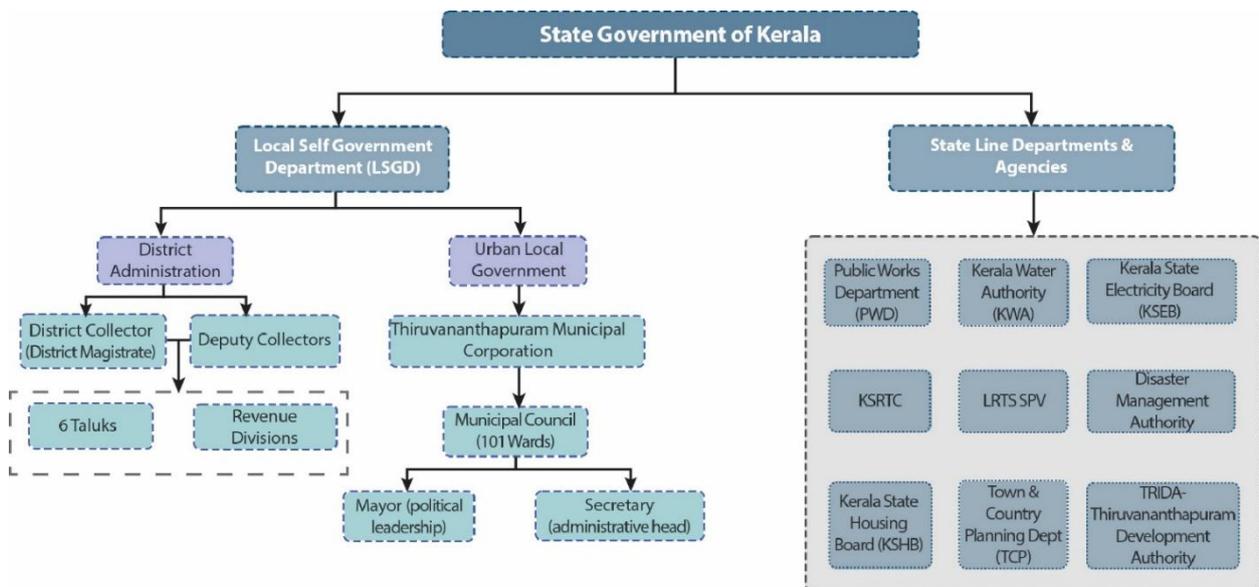
Figure 24. Institutional framework of urban governance in Thiruvananthapuram
(Source: Author's illustration based on Government of Kerala, n.d.; Thiruvananthapuram District Administration, 2022; Thiruvananthapuram Municipal Corporation

The administrative system of Thiruvananthapuram is a complex system of State administration at the district level and municipal government with the assistance of special service departments. This is a framework that was put in place under the Kerala Municipalities Act, 1994, to facilitate coordination of various levels of government in the management of city. The district level is where the District Collector is in charge of administration, law and order, and revenue issues with the assistance of Deputy Collectors. The administrative convenience divides the district into two revenue divisions and six taluks, which are again divided into villages and panchayats in the rural regions. In the case of urban governance, there is Thiruvananthapuram Municipal Corporation (TMC), which is the major local authority. It was originally a municipality created in 1920 and then a Corporation established in 1940 and now it serves an area of 214.86 square kilometers with 100 wards. The Mayor is elected by the 100-member Council and offers political guidance on planning and services and the Secretary makes

decisions and oversees daily operations. In addition to Corporation, a number of State departments provide important services: the Public Works Department takes care of infrastructure, Kerala Water Authority takes care of water and sewerage, Kerala State Electricity Board provides power and Kerala State Road Transport Corporation provides bus services to people. The new Light Rail Transit system (LRTS) agency manages the newly introduced metro-lite network in the city that is going to change the mobility trends. The key to effective service delivery in informal settlements is a coordinated effort on the part of these agencies the TMC prioritizing the local need but State departments applying sector specific programs in the context of housing, water, sanitation, transport and disaster management

1.3 Thiruvananthapuram: Regional and Urban Situation

1.3.1 The Geography of Urban Density and Informal Settlements

In spite of the significant human development successes in Thiruvananthapuram there are acute urban challenges associated with the city, which are due to the fact that the city is characterized by escalated rates of population growth and extremely limited geography. The Master Plan 2012 marks the key density differences that exist in the city: the population density in the corporation as a whole is about 4,500 persons per square kilometer, the density in the central part of the city and the southern wards is extremely high, amounting to over 10,500 persons per square kilometer- this is 2.3 times higher than the average population density in the corporation and 7 times higher than the average population density in the District (Master Plan, 2012; Directorate of Census Operations, Kerala, 2014.) This overpopulation of over 10,500 people/km2 in inner wards has what urban planners call inner-city urban stress, which is the physical congestion, strain on infrastructures and greater exposure to environmental hazards (Thiruvananthapuram Municipal Corporation, 2013).

Spatial analysis of the Master Plan,2012 reveals the existence of informal settlements that are spread in three geographically separate clusters in this high-density core:
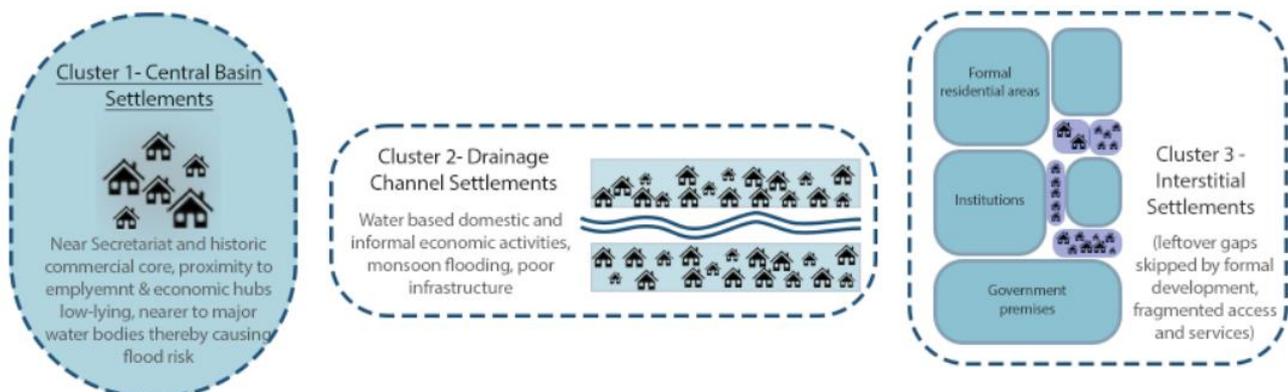
Figure 25. Conceptual illustration of spatial clustering of informal settlements
(Source: *Illustrated by Author, Adapted from Thiruvananthapuram master plan (Draft),2012)*

Cluster 1: Central Basin Settlement - The central basin maintenance is the major cluster located around the State Secretariat and former commercial areas where historical administrative growth provided both job places and physical weaknesses (Master Plan, 2012). The settlements within this cluster enjoy the advantage of being close to employment centres, although the risk of flooding is enormous since most of them are located at low levels and are near the past water bodies(Master Plan, 2040; Master Plan, 2012).

Cluster 2: Drainage Channel Settlement- The second cluster is formed along the system of drainage channels, canals and artificial waterways that flow across the city east-west (Master Plan, 2012). These waterways corridors which were tributaries of Karamana and Killi rivers and many of the secondary drains determined the settlement patterns in the past as water was needed to support domestic and

informal economic endeavors. Nevertheless, communities living in these places are prone to systematic floods during monsoons and lack of infrastructure (Master Plan 2040; Master Plan, 2012).

<u>Cluster 3: Interstitial Settlement</u>: The third cluster is the one that is filler of the interstices and gaps between the formal residential areas, institutional land-use areas and government premises. These marginalized areas signify land that the official process of development skipped or failed to absorb creating space to be occupied by informal settlement of a kind, yet leading to spatial fragmentation and inaccessibility of services (Master Plan 2040; Master Plan, 2012).

Under this categorisation, The Rajaji Nagar colony, falls under the cluster 2 typology – the drainage channel settlement as it is a low-lying settlement beside the Amayizhanchan canal (depicted in the later stage of the chapter) with serious flooding and drainage problems.

1.4 Land Use and Accessibility Analysis

1.4.1 Land Use Context

Thiruvananthapuram is a polycentric city with several density nodes scattered throughout the municipal corporation area with the highest densities recorded in the central and southern wards as they appear in the Master Plan of 2012 (Thiruvananthapuram Municipal Corporation, 2013). One element that takes a unique place in this polycentric structure is the Chengalchoola/Rajaji Nagar which is not peripheral but literally central in the formal spatial arrangement of the city and is located within what urban planners call the inner-city fabric.
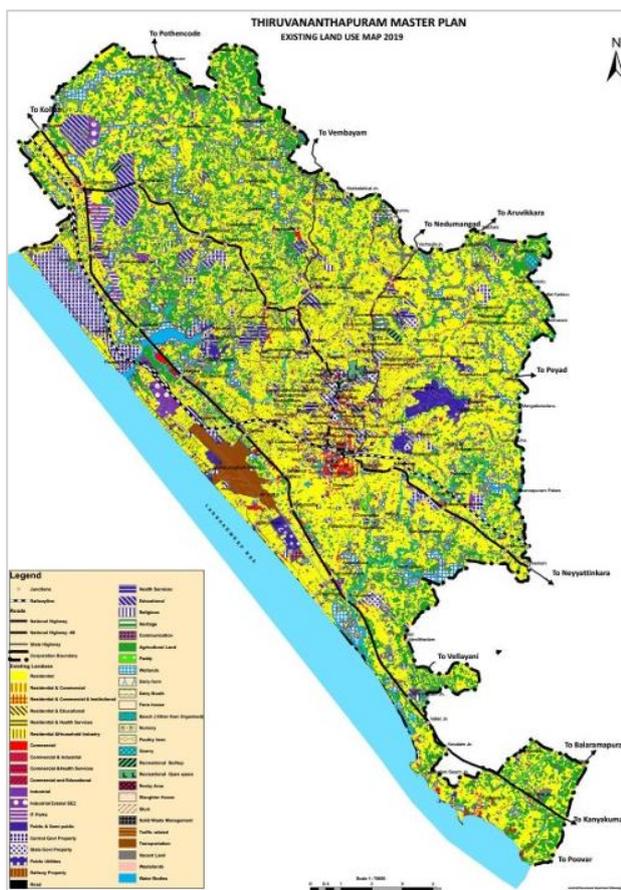
In the current map in land use (Master Plan, 2040) around the Thycaud area, where the Rajaji Nagar is situated, we see a high concentration of the mix of uses typical of a historic urban center. The land use analysis of the Master Plan defines the neighborhood structure, which consists of 55-60% residential, 15-20% commercial/mixed-use, 12-15% institutional (government offices, schools, hospitals), and 5-8% parks/open space (Master Plan, 2012, Chapter 7). This is a mixed-use setting that gives residents a variety of livelihood opportunities: formal government jobs in the state offices located nearby, work on commercial premises, informal selling and service jobs, urban development-related construction work (Master Plan, 2040).

Figure 26. Existing Land Use Map of Thiruvananthapuram
(Source: Reprinted from Thiruvananthapuram Master Plan 2040)

The Master Plan specifically mentions that the Thycaud neighborhood which was originally built as an administrative quarter of the city during the colonial period and later residential complexes of the government turned into a mixed-income residential development with the city growth (Master Plan, 2040;Master Plan, 2012). This state of juxtaposition between formal government institutions, middle-class residential buildings and informal low-income settlements within the same physical space what this paper has characterized as the formal-informal interstitial condition is a distinguishing feature of

Thycaud and indeed a central aspect in the social-spatial location of Rajaji Nagar (Government of Kerala, Department of Urban Development, 2010).

1.4.2 Character of Thycaud Neighbourhood

Chengalchoola is located in Thycaud locality that is a historically unique urban area in Thiruvananthapuram (Government of Kerala, Department of Urban Development, 2010). Thycaud grew up in the colonial era when it was a residential area of government administrators and staff, and government quarters, government offices, and civil amenities were planned (Master Plan, 2012). This institutional nature is still present in the neighborhood, as the spatial outline is still framed in terms of the State Secretariat (it occupies about 45 hectares), the government offices, schools, and health facilities (Thiruvananthapuram Municipal Corporation, 2013). The spatial interpenetration of formal and informal land uses in a historically planned administrative area is what is special about Thycaud in modern Thiruvananthapuram. Poor settlements such as Chengalchoola can be found in the spatial interstices of this formal structure, on residual lands, on drain edges, on gaps between the planned institutional blocks, to form a specific mosaic of formal and informal space (Government of Kerala, Department of Urban Development, 2010). This parallel existence is part of historical trends recorded in literature on planning: with increasing cities and the entrenchment of institutional complexes, informal settlements are located along residual, low-value spaces adjacent to formal land use, since the former offer access to job opportunities without directly competing with formal land use (Bhan, 2013; Weinstein, 2014). As a result, the neighborhood displays drastic differences in the quality of the built environment, quality of infrastructure provided and livelihood security. Institutional zones are planned with drainage systems, pavements, electricity system, and formal jobs; informal areas have informal drainage systems, lanes, informal electrical and informal livelihood. Nonetheless, the residents of both zones are very interdependent: people working in the informal service sector (domestic workers, construction workers, transport workers, etc) and serving the institutional areas rely on the closeness to the areas of work, and formal residents rely on informal labor to maintain, build and service their structures (Master Plan, 2012; COSTFORD, 2005).

1.4.3 Access of Roads and Public Transport

Urban mobility connectivity analysis shows that even though Rajaji Nagar has issues of internal accessibility, it has extraordinary macro-scale accessibility to the regional transportation systems (Thiruvananthapuram Municipal Corporation, 2013). The urban area is situated close to major arterial roads, one of which is the Secretariat Road (which connects the urban center to the periphery), and it is also within a short walking distance (0.8, 1.2 km) of the Thiruvananthapuram Central Railway Station, this being the main hub of the railroad in Kerala as well as in the southern part of India (Thiruvananthapuram Municipal Corporation, 2013; Indian Railways, 2023). Thiruvananthapuram has regional road connections to Kochi, Bangalore, and Chennai located 2-3 kilometers by national highway 66 (formerly NH 47) connecting the southern coastal cities of India (Master Plan, 2012). The area is served by the bus network of Kerala State Road Transport Corporation (KSRTC) that has a range of regular routes connecting Rajaji Nagar with all significant employment and service centres in the city with a high frequency at peak hours (Thiruvananthapuram Municipal Corporation, 2013). The availability of auto-rickshaw at the boundary of the settlement offers a medium transit between people and secondary employment centers and service destinations across the city comparatively easily and at a relatively low cost in terms of travel time. This macro-level accessibility is one of the main reasons why the residents of Rajaji Nagar, despite the extreme lack of housing and infrastructure, have been living in this place over a number of decades and through numerous redevelopment projects. Jobs available within a distance of 1-2 km (government offices, retail outlets, hospitals, schools, transport centers) offer life sustenance opportunities which are not present in the fringe urban centers (COSTFORD, 2005; Bhan, 2013).

Nevertheless, this macro scale accessibility is in stark contrast to the internal accessibility in the settlement which is recorded below. The settlement has a great access to external working and service but has extreme internal circulation capacity that compromises the daily access of residents to fundamental facilities and emergency services (COSTFORD, 2005; Master Plan, 2012).
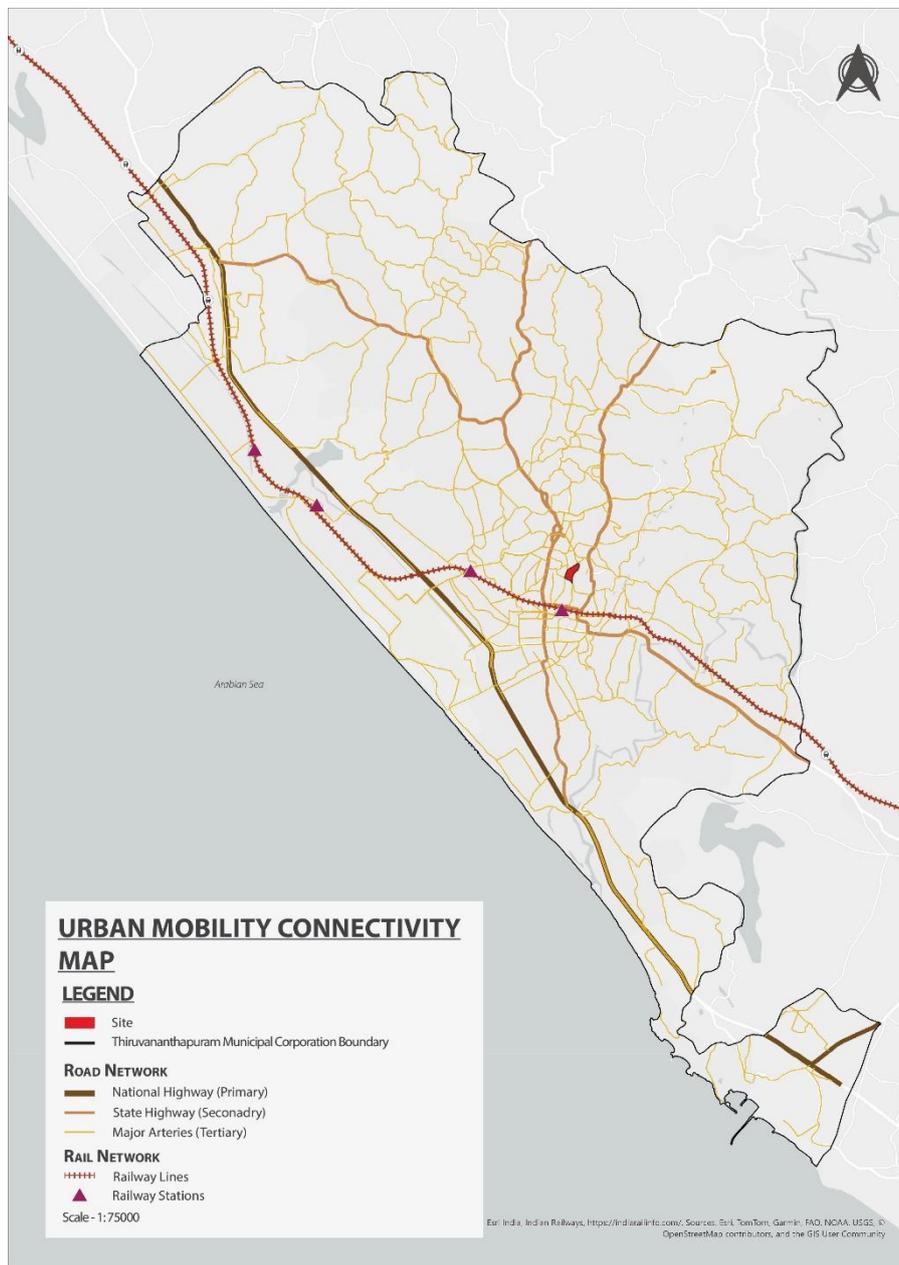
Figure 27. Urban Mobility and Connectivity Map

(Source: Illustrated by Author using ArcGis, Esri India, Indian Railways, https://indiarailinfo.com/ , Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community.)

1.4.4 Future Accessibility Opportunities - LRTS and Multi-Modal Mobility

The city of Thiruvananthapuram is suffering severe transport issues in which there are a number of vehicles increasing to more than 750,000 and an increase in the GDP is 8,000 in 1981 (Master Plan, 2012). Multi-modes solutions proposed by the Master Plan include the development of bus rapid transit, Light Rail Transit System (LRTS), and the development of monorails (Master Plan, 2012). The proposed LRTS route will cross an area in Thycaud in the immediate vicinity of Rajaji Nagar as shown in the Master Plan 2040 transportation map (Figure X), which is part of an integrated multi-modal

transport network comprising of proposed ring roads, upgraded rail corridors, and areas of transit-oriented development. The LRTS alignment along the former route of the NH-47 which passes through the midst of Rajaji Nagar can have the potential of being tied into the metro were it to be implemented, especially through interchange nodes like Thampanoor and Palayam which are at a range of 2-3 kilometers of the settlement (Master Plan, 2012; Smart City Thiruvananthapuram Limited, 2020).

The LRTS is going to seek to alleviate the congestion in core cities by providing high capacity transit schemes which can greatly redefine access to low-income settlements like the Rajaji Nagar. But this infrastructure is still in place, and it requires redevelopment strategies that can make sure that there is connectivity in the short-term but at the same time avoids future transit integration (Smart City Thiruvananthapuram Limited, 2020). The Master Plan 2040 refers to a 250-meter Transit-Oriented Development (TOD)-based area on both sides of major transport corridors making Rajaji Nagar a strategic zone of accessibility enhancement in the future and mixed-use redevelopment opportunities.
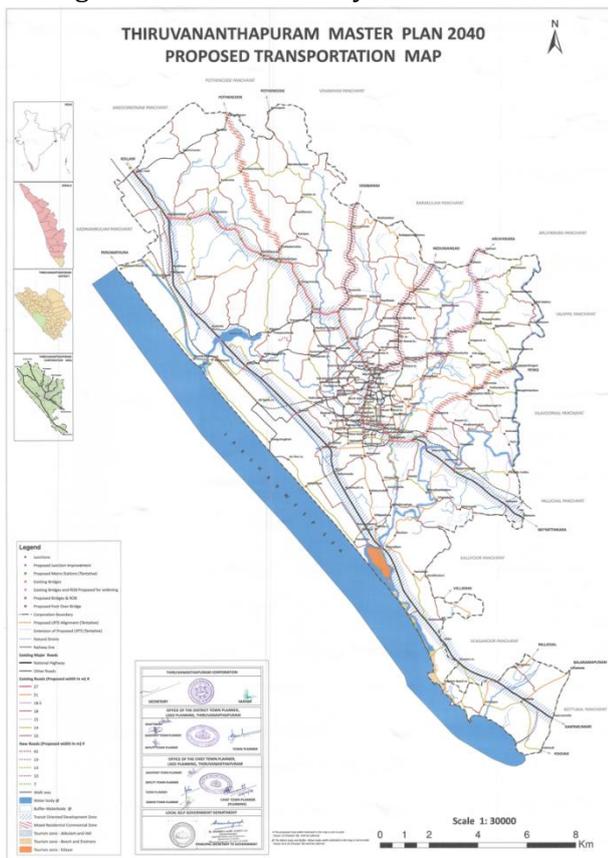
Figure 28. Proposed Transportation Plan
(Source: Thiruvananthapuram Master Plan 2040
http://tmc.lsgkerala.gov.in/en/master-plan/1282

1.5 Environmental and Hydrological Environment

1.5.1 Climate and Topography

Thiruvananthapuram enjoys a tropical monsoon climate with the temperature range kept pretty low, mean maximum temperatures are not quite different, and they are 31-32 °C with the mean minimum temperatures 23-24 °C which constitute an 8-9 °C annual range (India Meteorological Department, 2020). It is very seasonal: an estimated 75 percent of the rain is received in the southwest monsoon (June, September) and 20% in the northeast monsoon (October, December) (India Meteorological Department, 2020). The total rainfall is 1,835 millimeters, and these two seasons alone have the total rainfall of 1,567 millimeters (India Meteorological Department, 2020). The onset of monsoons in early June produces a daily down pour of more than 100-150 millimeters of rain leading to rapid surface discharge, which overflows poorly designed drainage systems (COSTFORD, 2005). The topography of the city is undulating which is composed of low-lying lateritic hills with an average height of approximately 4.9 metres above mean sea level as indicated in the topography map (Master Plan,

Figure 29. Topographic Map of Thiruvananthapuram Corporation
(Source: Reprinted from Thiruvananthapuram Master Plan 2040)
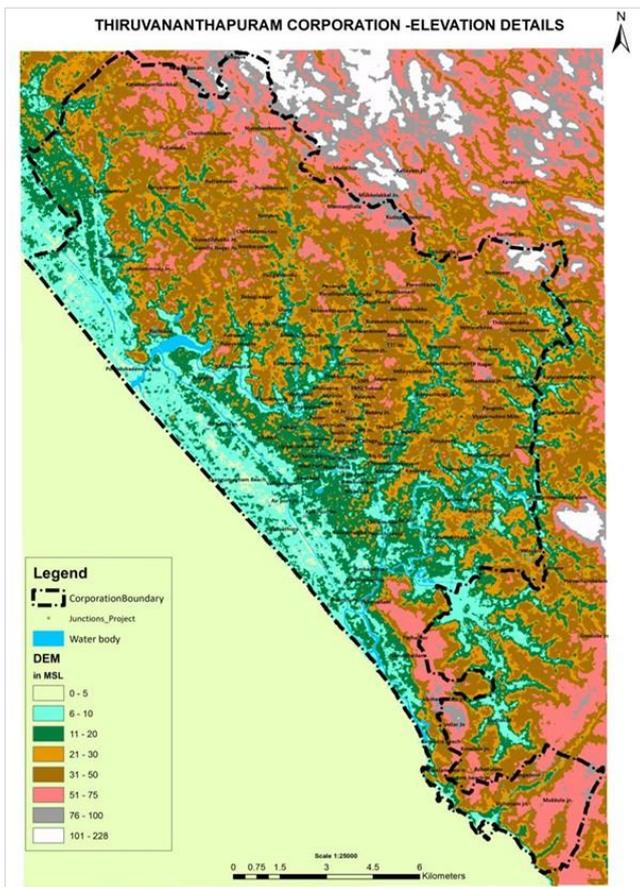
2040;Master Plan, 2012). In this topography, there are depressions which serve as natural pockets of floods, and Chengalchoola/Rajaji Nagar is located in an old quarry excavation zone which in itself is vulnerable to floods (Master Plan, 2012; Times of India, 2019; COSTFORD, 2005).

1.5.2 Hydrographic Network

The hydrographic network of Thiruvananthapuram consists of hierarchical primary, secondary and artificial canals that are able to guide the surface water to backwaters (Master Plan, 2012). Nevertheless, the Master Plan acknowledges poor maintenance and encroachment as institutional causes of vulnerability to floods (Master Plan, 2012).

Primary System: The Karamana River (western axis) and the Killi River (eastern axis) constitute the primary drainage system and they drain into the Akkulam and Vellayani Lake systems respectively (Master Plan, 2012).

Secondary System: Secondary channels such as Pattom Thodu, Ulloor Thodu and Amayizhanjan Thodu supply primary rivers but are increasingly encroached on by informal settlements and infrastructure to decrease effective flow capacity (Master Plan, 2040;Master Plan, 2012).

Tertiary System: Informal locations such as Rajaji Nagar have no tertiary drainage systems, which is also a reason why water logging is a prominent issue.

Rajaji Nagar is a depression of a secondary drainage channel next to Karamana system, which was a hunting ground once used as a source of water (Times of India, 2019). The continual encroachment of informal settlements through the channel cross-section and the buildup of sediment and unstable maintenance diminishes hydrological capacity, building up the risk of backflow and overflowing progressively during monsoons (COSTFORD, 2005).
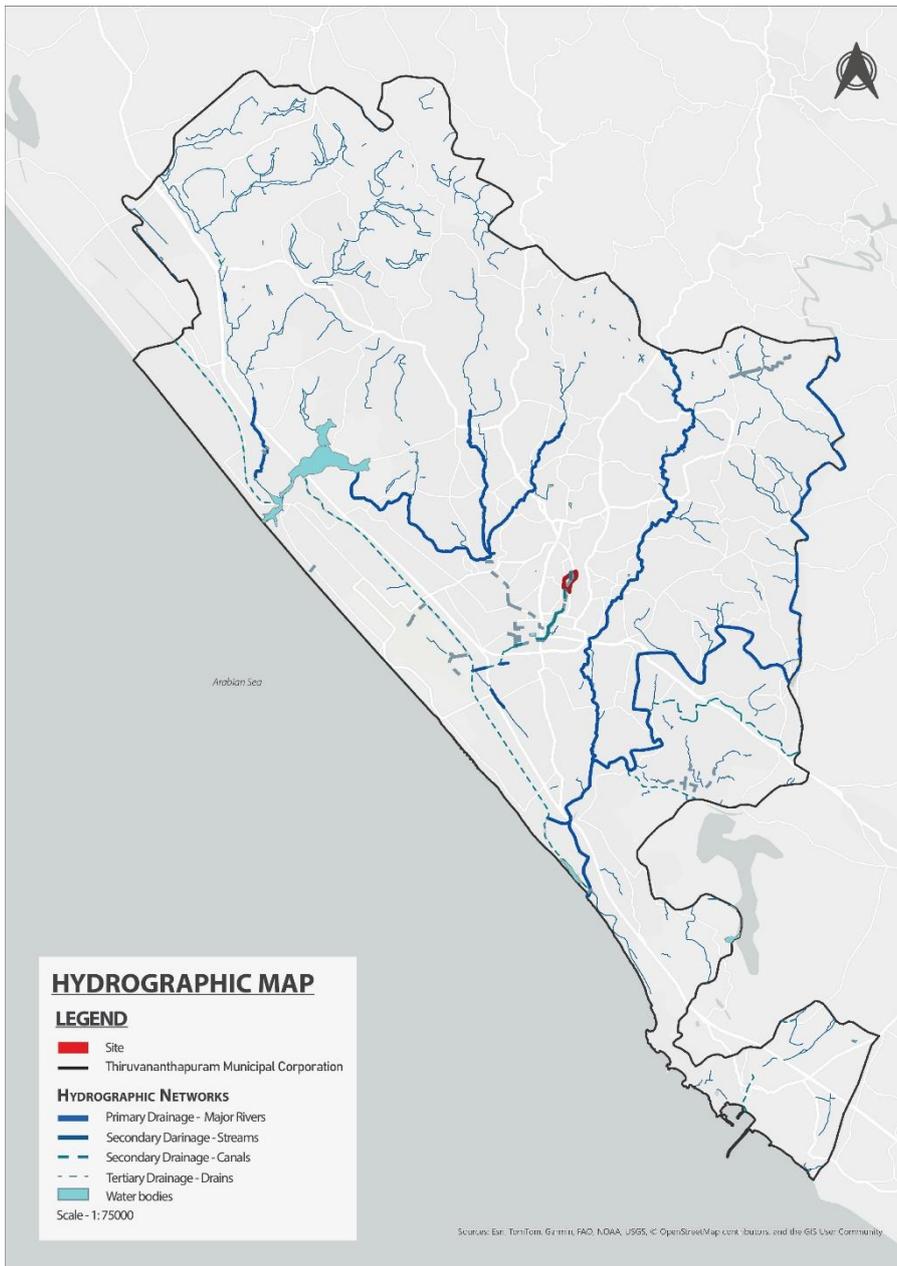
Figure 30. Hydrographic Map
*(Source: Illustrated by Author using ArcGis, OSM Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community)*

1.5.3 Flood Risk and Storm-Water Inundation

Analysis of satellite images and in-field surveys prove that Rajaji Nagar is located on an extensive flood-prone land, with low soil levels (4.9 meters above the sea level), close to an encroached drainage system and lack of internal storm-water management infrastructure, which form numerous inundation routes during heavy rainfalls (COSTFORD, 2005). The engineering surveys recorded frequent waterlogging during the monsoons and the level of the water ranged between 30 and 60 centimeters and lasted between 6 and 24 hours after the rainfall; extreme incidences have resulted in overflow of neighboring channels filled with solid waste and poor living conditions (COSTFORD, 2005). The Kerala floods of 2019 inundated the Rajaji Nagar with water levels more than one meter in certain lanes and long durations of floods (Times of India, 2019). Lack of engineered drainage causes stagnant surface waters in lanes and courtyards, which ruin building foundations, breed disease-carrying vectors and limit the movement and livelihood of residents during the monsoons (COSTFORD, 2005; New Indian Express, 2024). This weakness has direct impacts on the housing sustainability, the health of residents (transmitted by water and vectors, respiratory diseases and complications, loss of productivity, loss of

FLOOD HAZARD MAP

LEGEND

Site
Thiruvananthapuram Municipal Corporation Boundary

HYDROGRAPHIC NETWORKS
Primary Drainage - Major Rivers
Secondary Darinage - Streams
Secondary Drainage - Canals
Tertiary Drainage - Drains
Water bodies

FLOOD PRONENESS
Intensity of Flood Hazard
1 2 3 4 5
Scale - 1 : 75000

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Arabian Sea

education) and socio-economic sustainability (disruption in employment, loss of education) (COSTFORD, 2005; World Health Organization, 2014). The Master Plan 2012 recognizes the inadequate drainage infrastructure and undertakes to have extensive intervention over primary, and secondary drainage systems- which is a direct confirmation of how integrated hydrological management has to be in the redevelopment plan of Rajaji Nagar (Master Plan, 2040;Master Plan, 2012).

Figure 31. Flood Hazard Map

(Source: Illustrated by Author using ArcGis, OSM Esri, TomTom, Garmin, FAO, NOAA, USGS, © Open Street Map contributors, and the GIS User Community, USGS Earth Explorer)

1.6 Synthesis:

The local analysis of Thiruvananthapuram evidences that it is a capital city with extreme spatial pressure where large population densities, paucity of land, and past trends of the institutional development have created a unique formal-informal interstitial situation. Informal settlements do not exist as peripheral areas but rather as small, densely clustered, units of inhabited lands which arise as residual areas along canals, drainage systems, and institutional fringes, particularly in the mixed-use centre. Meanwhile, the polycentric form of the city, good human development indicators and the presence of an administrative and service center create good employment and access to services that creates employment and holds low-income households in the central areas. This regional context is a two-sided one in the case of Rajaji Nagar. The location in Thycaud and the Amayizhanjan canal is an exceptional accessibility at the macro-level, both in terms of the closeness to the Secretariat, Thiruvananthapuram Central railway station, major roads, and the future LRTS corridors; and acute environmental and infrastructural vulnerability. This is combined with repeated floods, bad tertiary drainage, encroachment on secondary channels together with poor inter-agency coordination and disconnecting planning intentions and implementation, particularly in former slum upgrading and

housing projects. Accordingly, the regional level already represents Rajaji Nagar not merely as a problem settlement but as a strategic low-income enclave of the core of the city administrative, mobility, and hydrological systems.

In the next chapter, this regional knowledge is transferred to a more site-focused knowledge of the Rajaji Nagar colony, applying the insights on the bigger patterns that have been identified here as a prism. It explores the realisation of urban stress in the inner-city, hydrological danger and governmental fragmentation in the physical morphology, internal circulation, housing structures and daily livelihoods in the settlement. The site analysis transforms opportunities in the region (access to transit and mixed-use environment) into specific spatial and design issues and constraints in the region (flood risk and institutional void) by scaling up the opportunities and constraints on the scale of lanes, clusters, and public spaces. This forms the basis to develop a comprehensive redevelopment scheme which is based on the lived reality of Rajaji Nagar and at the same time is in coordination with the city-wide plans and infrastructure developments.

CHAPTER 2
SITE SPECIFIC SCALE ANALYSIS

2.1 Why Rajaji Nagar??

Figure 32. Spatial location of Rajaji Nagar Colony
(Source: Illustrated by Author)

Occupying an area of 12.6 acres of land in Thampanoor Ward in the centre of Thiruvananthapuram, Rajaji Nagar is classified as a notified slum with a population of about 967 dwelling units and 1,500 2,000 families (LSGD Kerala, n.d.; New Indian Express, 2023a). The residents are mainly engaged in jobs of informal sector - daily wage workers, auto-rickshaw drivers, domestic workers, the livelihood is based on the closeness to the central city (New Indian Express, 2023a). It has been chosen as the site of in-situ redevelopment within the context of the Smart City Mission with the planned enhancements of housing, drainage, roads, and community amenities, even though actual execution has been delayed and opposed by residents (Smart City Thiruvananthapuram, 2022; New Indian Express, 2021b; PropNewsTime, 2025).

Rajaji Nagar as Model to Slum Clusters of Trivandrum:
Although it is unusually large, the issues of Rajaji Nagar, including overcrowding, lack of infrastructure, lack of tenure security, and lack of livelihood security, are typical of the 355 slum clusters in Trivandrum (Williams et al., 2019). When the in-situ redevelopment shows the successful incorporation of the enhanced housing, infrastructure, and step-by-step implementation to maintain the livelihoods access, governance procedures and policy dynamics (not strict physical design) can be replicated to other settlements with the similar conditions (Williams et al., 2019). This thesis assumes that Rajaji Nagar is the main case study and the suggested design and policy frameworks are to be transportable to other informal settlements of the same sort within the city.

2.2 Rajaji Nagar Colony: Historical Genesis and Spatial Evolution

2.2.1 Origin as a Quarry Settlement of Labour
Rajaji Nagar, also known as Chengalchoola can be traced back to the days when the Secretariat and other colonial-era buildings in central Thiruvananthapuram were built. This area was used to quarry laterite stone, and casual workers involved in the quarries and construction started to build informal shelters where they worked (Times of India, 2019). With time, this labour camp grew into a permanent township, which grew on both sides of the drainage channel. The very name of the colony -

Chengalchoola - means "red stone," which reflects this history of quarrying. People slowly established close social and economic relationships with the city around them, living in an extremely fragile physical and tenure situation.

2.2.2 Formalisation by Way of KSHB Housing (1970s)

The Kerala State Housing Board carried out a slum redevelopment project in the 1970s at Chengalchoola as part of the larger exercise of bettering housing conditions in inner city slums (Kerala State Housing Board, 2001). This has turned the former informal encampment into a formal housing estate with approximately 700 families resettled in new low-income housing units in the same area. The KSHB scheme was mainly row-type housing blocks of two storeys constructed using conventional brick masonry and reinforced concrete slabs. The units were less than 25 m² in floor area to accommodate small families (COSTFORD, 2005). However, quick population increase and small unit sizes resulted in congestion and gradual additions and informal infill in the subsequent decades (COSTFORD, 2005).

2.2.3 COSTFORD and Laurie Baker Intervention (2005)

Considering the problem of housing shortage and the demand for affordable housing solutions, the Thiruvananthapuram Municipal Corporation under Jawaharlal Nehru National Urban Renewal Mission (JNNURM) subcontracted COSTFORD and architect Laurie Baker to Develop additional living spaces in 2005 (Ministry of Urban Development and Poverty Alleviation, 2006). Nine-storey residential buildings were built using Baker's cost-effective and climate-accommodating techniques and added 90 dwelling units to the colony (COSTFORD, 2005). These vertical stacking blocks utilized rat-trap bond brickwork, filler slabs and other innovations that saved material, thus allowing high-cost savings without compromising structural and thermal comfort levels (Tiwari, 2015). The layout included five dwellings on the ground floor, three on the first floor with open terraces and two on upper floors, with a total of approximately 90 families (COSTFORD, 2005). There was a big turn towards a more environmentally conscious construction and higher vertical density in this phase too. The problem of inadequate infrastructure for drainage, sewage and social amenities still remained however.

2.2.4 Spatial Growth Timeline

A timeline of historical growth would show how the area that once held the quarry settlement has developed to the current KSHB housing estate, the COSTFORD blocks and the current Smart City redevelopment. These maps would assist in visualising the encroachment of the built-up area, encroachment of open space and canal edge, and increasing densities. This type of visualization is critical to learn how urban growth trends and limitations on redevelopment in the site.
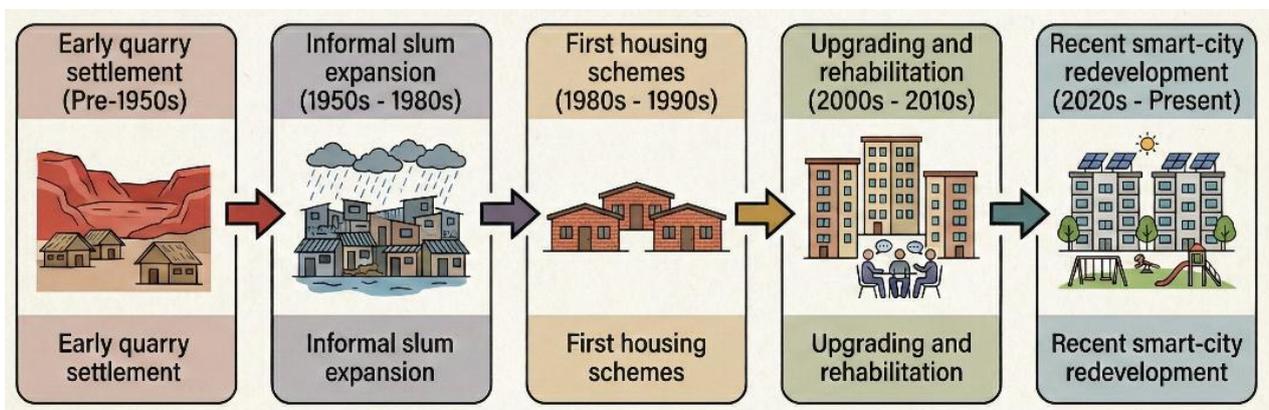
Figure 33. Timeline of Settlement Development in Chengalchoola Colony
(Source: Generated by Gemini, Google, 2025)

2.3 Physical and Environmental Analysis

2.3.1 Topography

Rajaji Nagar Colony is situated on a natural depression that was exploited for laterite quarrying in the past (Times of India, 2019). The distinct valley which extends 280 meters in the horizontal direction is marked by the elevation of 25 meters at the edge and 13 meters at the center (Niranjana et al., 2021). The depression resembles a basin in which runoffs from the surrounding elevations are naturally drained and collected. The surface water flow in the settlement is influenced by the presence of three different slope zones. The first zone (0, 40 meters) has a steep slope of a 4, meter drop that increases the speed of the surface water entering the site (Niranjana et al., 2021). The middle section (40, 120 meters) is where the slope becomes more gradual and there water slows down and pools at the 13, meter depression (Niranjana et al., 2021). The third zone (120, 280 meters) is rising towards the southeast and therefore water coming down the slope is trapped in the main depression of the area during rainfalls (Niranjana et al., 2021; Master Plan, 2012). This exposure is further accentuated by the fact that the settlement is located in the low coastal terrain of Thiruvananthapuram, which is only 4.9 meters above the average sea level (Master Plan, 2012).Based on all these features of the land, Rajaji Nagar Colony can be considered as an area which has less hydrological advantage and hence is more susceptible to water logging and stagnation, something that would be very critical while planning the redevelopment of the area.

2.3.2 Climate and Environmental Conditions

Heat Island Effect and Microclimate

The microclimate stress factors in Rajaji Nagar are high density of buildings, large proportion of impervious areas, and very low vegetation. The urban heat island effect of the settlement increases the local temperature by 3-5 °C compared to the surrounding places (Urban Heat Island Studies, 2022). The small streets limit airflow and trap heat and humidity, especially during pre-monsoon months (March-May) when wet-bulb temperatures are very dangerous, especially to the elderly population and children (World Health Organization, 2014).

Air Quality and Noise Pollution

In the absence of tree buffers, the residents are exposed to high levels of vehicular emissions and dusts due to the usage of unpaved lanes. The close proximity of the settlement to the railway stations and major roads makes noise pollution a chronic problem (70-75 dB) which is higher than the recommendable level of 55 dB in residential settlements (World Health Organization, 2018). The tree belts can decrease the noise in the traffic by 5-10 dB, yet this cannot be offered in the settlement core (Urban Vegetation and Noise Reduction, 2020).

Environmental Inequality:

Low density of trees indicates land use that was survival oriented with residential floor area being given preference over environmental amenity. This inequity of green infrastructure is disproportionately affecting low-income communities, and the health effects of this tendency have been accumulated, such as heat stress, respiratory disease, or the lack of safe places where children can play (Green Infrastructure Inequalities in Informal Settlement, n.d.; World Health Organization, 2014).

2.3.3 Drainage and Flooding

The drainage system is the most essential infrastructural flaw in the Rajaji Nagar Colony because the topography is susceptible and lacks drainage systems and the encroachment on the canals interact to produce frequent floods during the monsoon periods. The tropical monsoon climatic conditions of the city receive around 1,835 millimeters of rainfall, 75% of which occurs during the southwestern monsoon (June-September) and create heavy downpours of more than 100-150 millimeters per day

that overload improperly designed drainage systems (India Meteorological Department, 2020; COSTFORD, 2005).
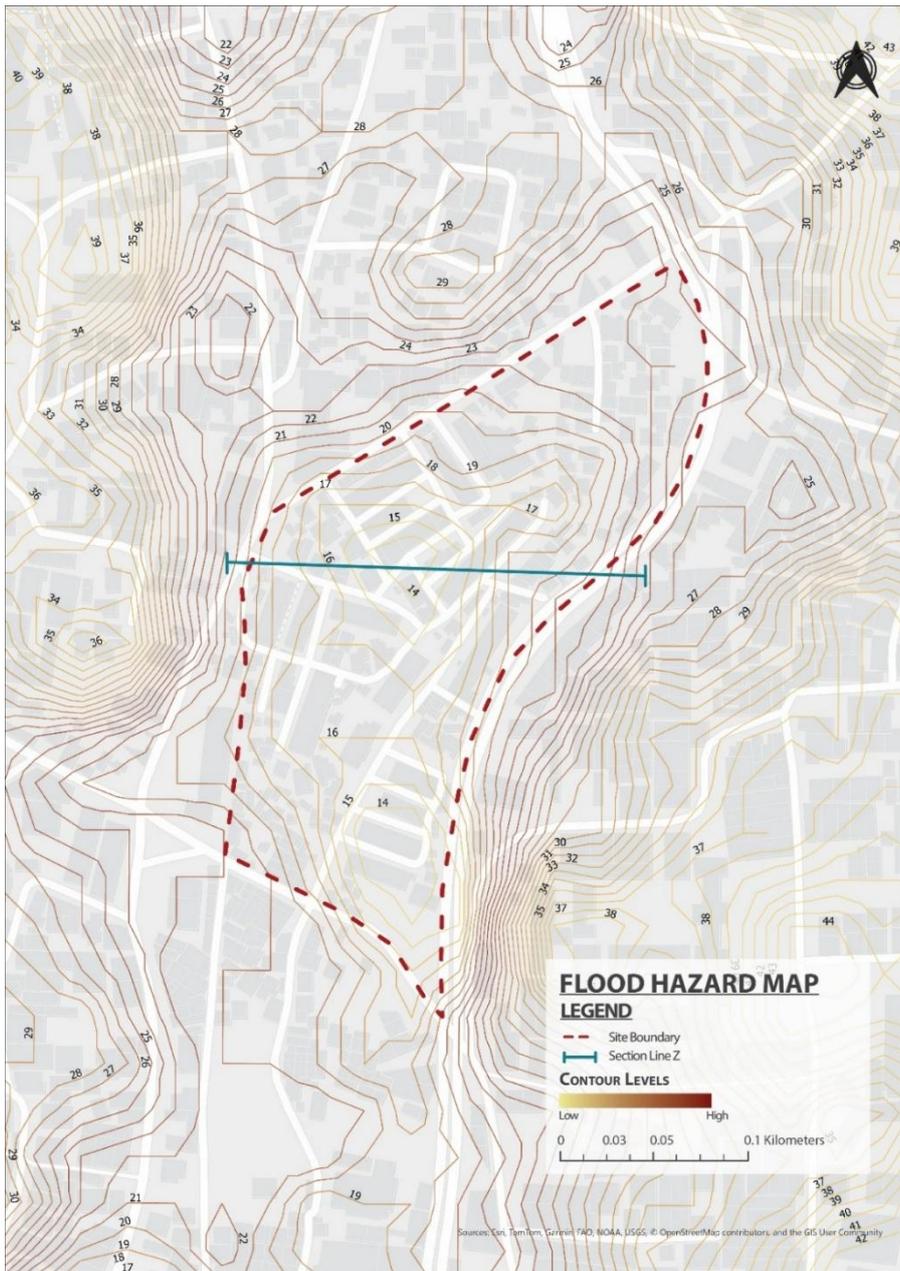
Figure 34. Contour Level Map with its Profile Graph

(Source: Illustrated by Author using ArcGis, OSM Esri, TomTom, Garmin, FAO, NOAA, USGS, © Open Street Map contributors, and the GIS User Community, USGS Earth Explorer
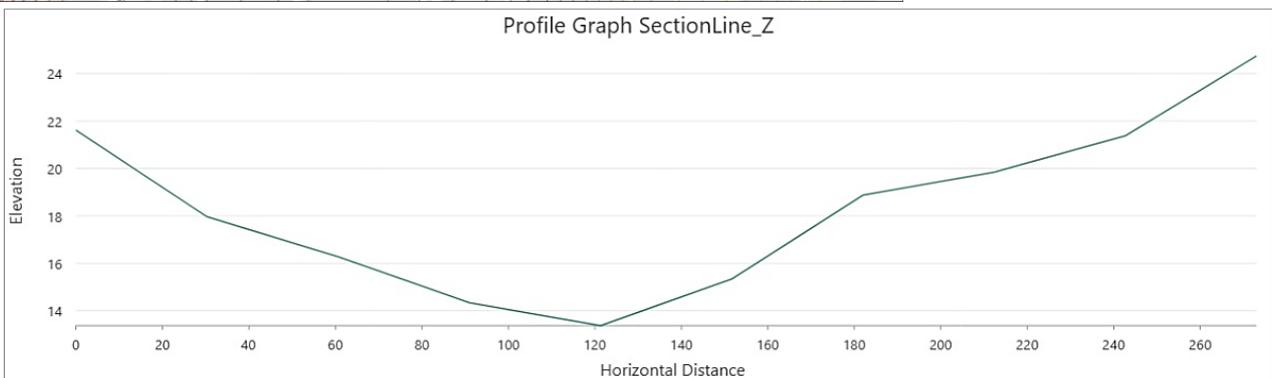
Storm-water drainage is perhaps the most important infrastructural deficiency in the colony. The central parts of Thiruvananthapuram are served by surface run-offs, which drainage channels to adjacent Amayizhanchan Canal, which is a secondary drainage channel in the Karamana River system,

and has been grossly impaired by encroachment by the informal settlements, narrowing of cross-sections and accumulation of debris (COSTFORD, 2005; Master Plan, 2012). According to engineering survey, the hydrological capacity of the canal has been reduced by constant encroachment and poor maintenance, which accumulates back flow danger and gradual overflow of water during monsoon weather (COSTFORD, 2005).
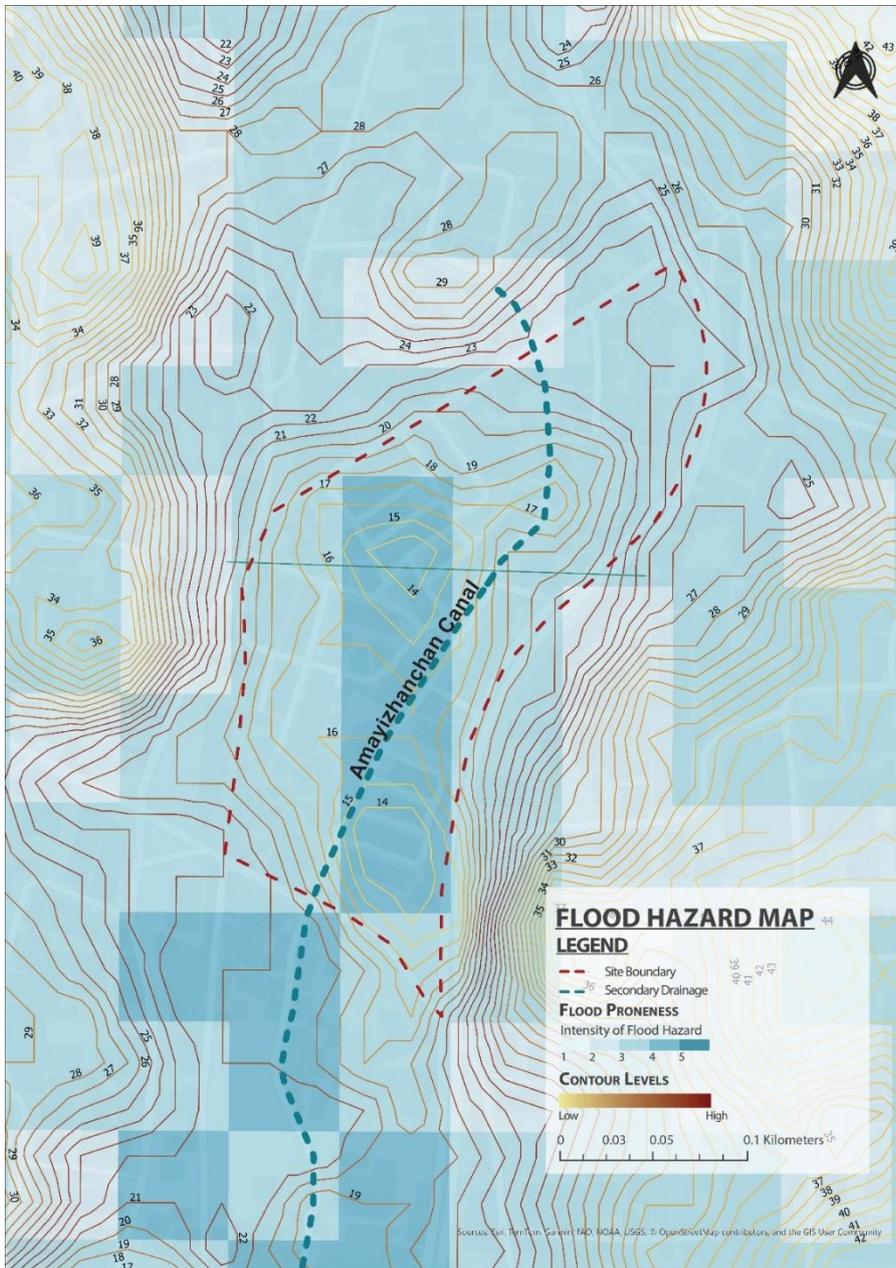
Figure 35. Flood Hazard Map
(Source: Illustrated by Author using ArcGis, OSM Esri, TomTom, Garmin, FAO, NOAA, USGS, © Open Street Map contributors, and the GIS User Community, USGS Earth Explorer)

In the settlement, there are no internal storm-water drains and this implies that the runoff caused by rainfall lingers in lanes and courtyards. According to the engineering surveys, waterlogging was a common experience during monsoon seasons and the depths of water were 30 to 60 centimeters and lasted 6-24 hours post-monsoon; extreme events, like the 2019 Kerala floods, flooded parts of Rajaji Nagar to a depth of over a meter in some of the lanes (COSTFORD, 2005; Times of India, 2019). As it can be seen based on the flood hazard map (Figure 35), the site is occupied by a high-flood-prone area, which in turn proves the necessity to incorporate efficient drainage and flood-reduction measures into any redevelopment strategy (Master Plan, 2012). The Master Plan 2012 recognizes the poor drainage infrastructure and promises to undertake a widespread intervention along the primary and secondary

drainage systems- this is a direct affirmation that integrated hydrological management should be at the centre of the redevelopment plan of Rajaji Nagar (Master Plan, 2012).

Figure 36. Waterlogging and ater accumulation in settlement lanes during monsoon period
(Source: https://www.deccanchronicle.com/nation/in-other-news/180416/slums-suffer-as-kudumbashree-drags.html)

2.4 Spatial Morphology, Land Ownership, and Tenure

2.4.1 Building Footprint and Street Network Pattern

The street and building pattern map shows that the footprints of buildings inside the site are very dense and irregular. Narrow slabs representing KSHB and COSTFORD blocks are long and more or less parallel to each other, divided by small lanes and courtyards. Smaller and more informal forms fill the interstices, particularly at the canal edge and in the gaps between formal blocks, which indicate incremental extensions and informal infill constructions.

STREET & BUILDING FOOTPRINT MAP

- – · – Site Boundary
- Building Footprint

STREET PATTERN
- Secondary Roads
- Tertiary Roads
- Interior Street Roads
- Pedestrian Paths

Scale - 1: 2000
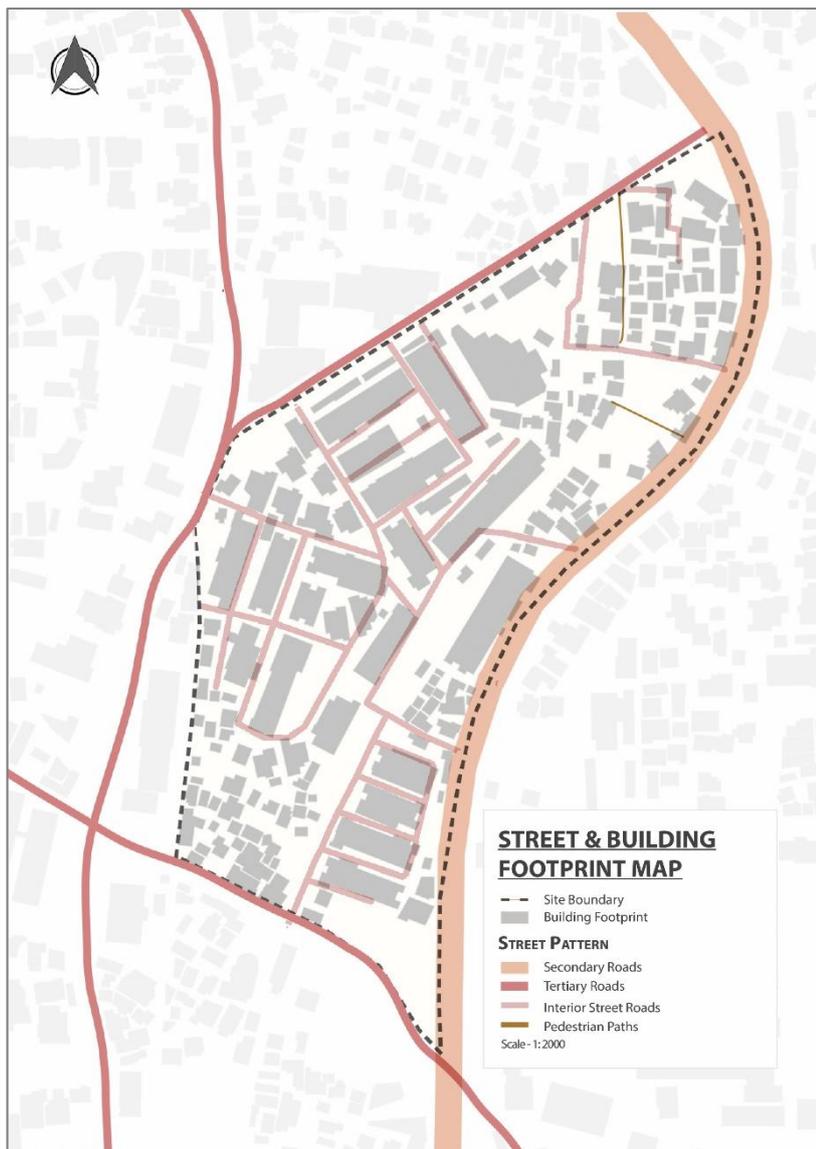
Figure 38. Street and Building Footprint Map
(Source: : Illustrated by Author using ArcGis, Esri India, https://indiarailinfo.com/ , Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community.)

The street network internally is disjointed but fine-grained. Most lanes end in dead-ends or narrow down to sizes not large enough for vehicles, restricting emergency service coverage and making waste collection and infrastructure upgrade more difficult (COSTFORD, 2005). This morphology will result in a very permeable, yet overcrowded major urban design, and has a deficit in visibility, low ventilation rates and minimal open spaces.

2.4.1 Public Versus Private Land Parcels

Land tenure is the process of people having rights over occupying and using land in an informal squatter form to fully registered land ownership (Payne and Durand-Lasserve, 2012). The residents are probably placed somewhere in the middle of this tenure continuum: they might not hold formal titles, yet they tend to have a long-term practice, rudimentary service relationships, and political awareness, which, as a result, form a certain level of de facto security (Williams et al., 2019). Enhancing this security, which is often achieved by the use of long-term leases, stipulated by the Kerala Slum Areas (Improvement and Clearance) Act, 1981, is a major prerequisite to inclusive in-situ redevelopment, since households make more investment in their homes when they are less likely to be evicted (Government of Kerala, 1981; UN-Habitat, 2003).
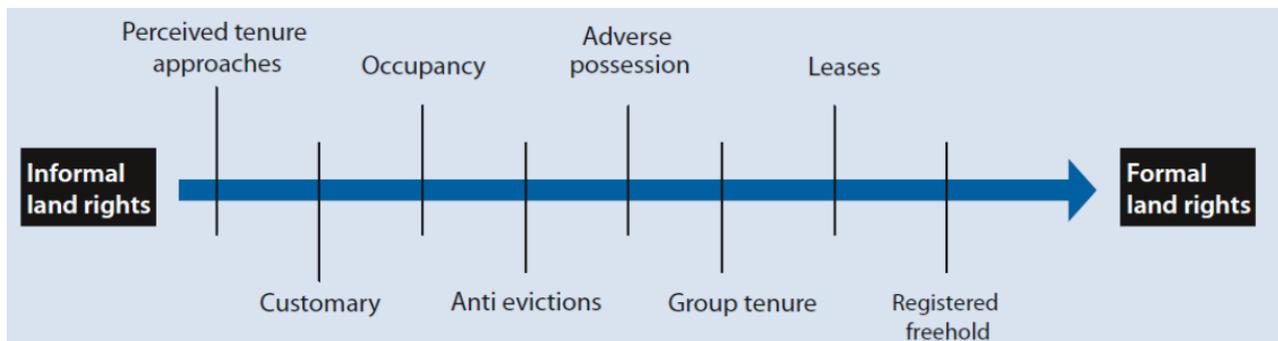
Figure 37. Tenure Security progression
(Source: Payne G, 2012)

When an individual leaves their job and opens new opportunities, they are able to anticipate a potential improvement in their lifestyle. Figure (Tenure Security Progression) explained. The figure shows that informal land rights are slowly shifting to formal rights along a spectrum- of perceived/customary use and simple occupancy, through protection against eviction and group tenure, to leases and finally registered freehold (Payne, 2012). In the case of Chengalchoola, it is not always about moving residents directly to the freehold, but to step them gradually up to the safer positions in this spectrum (such as moving informal occupation to documented leases), so that they would redevelop without eviction (Payne and Durand-Lasserve, 2012).

The land ownership map indicates that a major portion of the research area lies under the control of the public or para-statal property which is mainly under the control of the Kerala State Housing Board and the municipal corporation. The central and western sections of the site are covered by government-owned parcels where KSHB and COSTFORD housing blocks are found. Smaller spaces are clustered around the north and eastern sides which are denser with small parcels and asymmetrical building footprints suggesting more incremental and self-built development. This trend has two implications. First, when government has control over big contiguous tracts of land, an opportunity arises for coordinated in-situ redevelopment with comparatively fewer complex land-assembly challenges. Second, the availability of private parcels on the edges implies that the process of reconfiguring a street network or an open space should be negotiated very sensitively, keeping in mind that the rights of residents cannot be infringed.
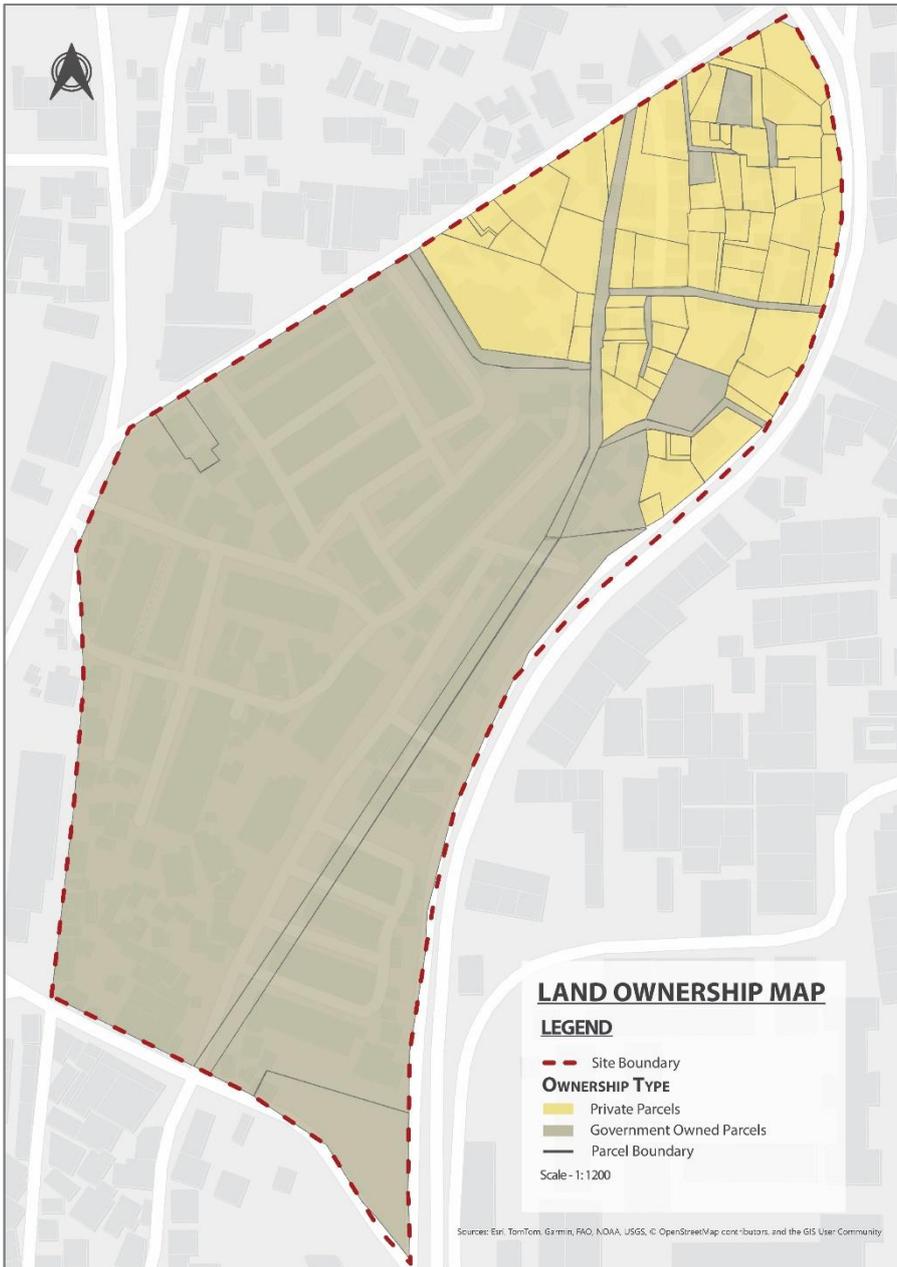
Figure 39. Land
Ownership Map

*(Source: Illustrated by Author using
ArcGis, Bhunaksha, Kerala AMRUT
Indian open maps, Esri, TomTom,
Garmin, FAO, NOAA, USGS, ©
OpenStreetMap contributors, and
the GIS User Community))*

2.4.3 Implications for In-Situ Redevelopment

The presence of dominant public ownership and lack of internal circulation implies that in-situ redevelopment can be conducted but should be gradual. Re-blocking would involve re-organizing selected rows of structures to create continuous circulation spines and pooled open spaces but maintain the overall residential density. At the same time, the enhancement process should not disrupt the current social networks, and little displacement should take place, in particular, on privately-owned pockets and canal-edge situations which are vulnerable.

2.5 Built Form

2.5.1 Building Use Pattern

The site building-use map reveals that the site is highly residential in nature, with the large majority of buildings serving residential use. There are small groups of business and mixed-use constructions situated on major access roads and important intersections, with ground floors usually occupied by shops, small trade or workshops, and upper floors by residential purposes. Public and social uses like Anganwadi centres, clubs and small community halls are sparse and few in number, which also

represents the low institutional presence in the colony (COSTFORD, 2005). This trend highlights the importance of redevelopment to blend formal areas for community activities, education support and health provision rather than depending on residential blocks only.
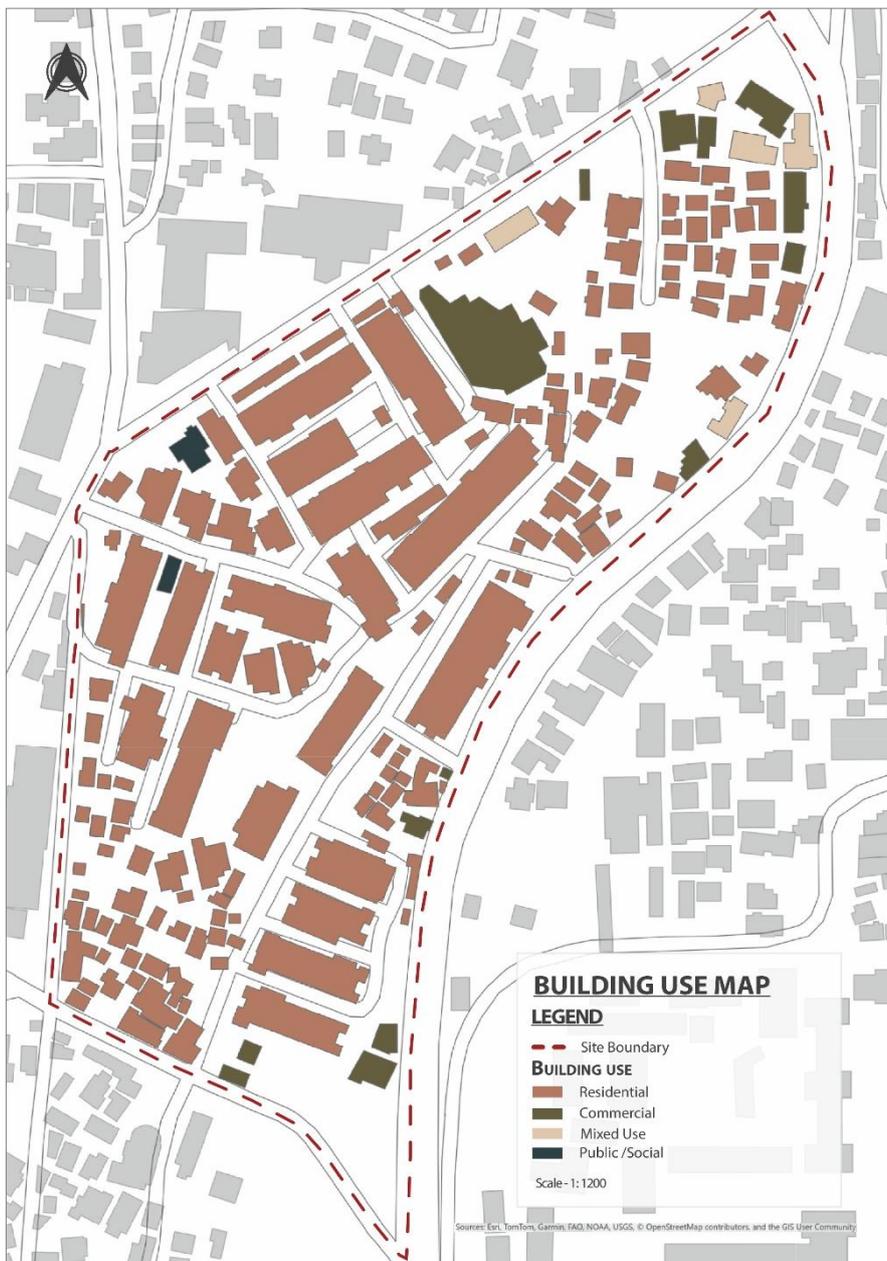
Figure 40. Building Use Map

(Source: Illustrated by Author using ArcGis, Kerala AMRUT, OSM, Indian open maps, Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community))

2.5.2 Building Construction Types: Pucca, Semi-Pucca and Kutcha

The structure type map identifies the presence of pucca[1] (permanent), semi-pucca[2] and kutcha(katcha)[3] (temporary/unstable) buildings in the site. The blocks which are larger with multi-storey construction will be classified as pucca since the buildings are constructed with brick masonry and reinforced concrete under schemes of KSHB and COSTFORD. At the canal edge, there is a concentration of semi-pucca and kutcha buildings, which are not used and pockets left by unused residences and the rear of formal blocks, which may be expansions, sheds or earlier housing stock which is yet to be replaced. Having kutcha units in flood and environmentally-sensitive areas means

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[1] *Pucca – Structures with both roof and walls made of pucca materials such as cement, concrete, oven-burnt bricks and other such building reinforcement materials. (Ministry of Housing and Urban Poverty Alleviation, 2013)*

[2] *Semi-pucca – Structures with either roof or walls, but not both, made of pucca materials. (Ministry of Housing and Urban Poverty Alleviation, 2013)*

[3] *Kutcha (katcha) – Structures with both roof and walls made of kutcha (non-pucca) materials, such as mud, thatch, bamboo, tents, etc. (Ministry of Housing and Urban Poverty Alleviation, 2013)*

high risk to the poorest people in society who can least afford to invest in long-term construction. This transfer (or reinforcement) of such units ought to feature predominantly in any inclusive strategy of redevelopment, particularly with reference to intended drainage improvements.
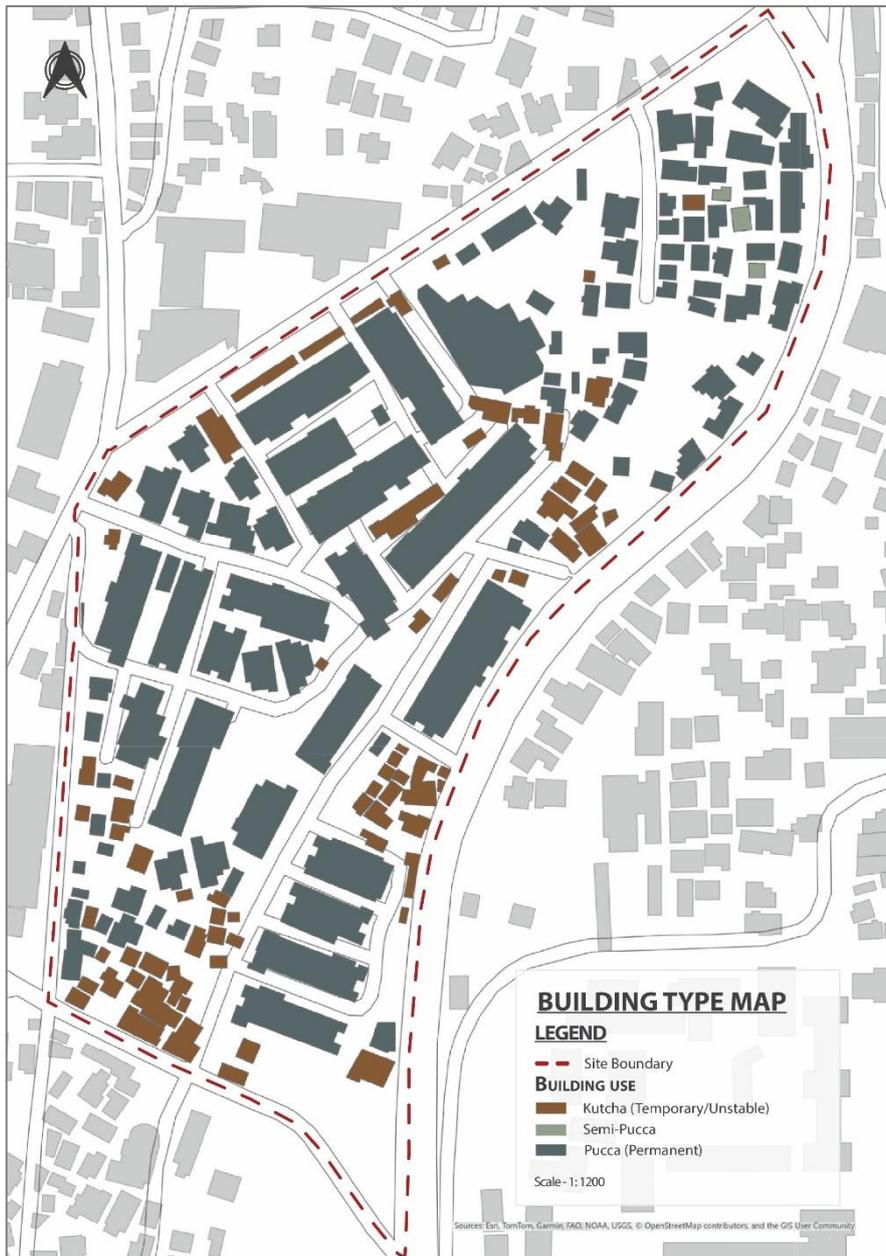
Figure 41. Building Type Map
(Source: Illustrated by Author using ArcGis, Kerala AMRUT, OSM, Indian open maps, Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community))

2.5.2.1 Construction Technologies: Building Materials, and Housing Typologies

As explained earlier, the colony is characterised by mainly three typologies of structures:
The Kutcha Structures

The kutcha buildings in the colony are the most fragile type of housing made of lightweight and perishable materials, corrugated sheet metal, plastic tents and timber frames. They do not have adequate foundations and walls, but rather solely depend on complete temporary roofing systems which are very prone to damage due to weather condition. They are built in informal ways and are not constructed in accordance to the set standards of construction and building codes, and are usually constructed by the locals using locally available, cheap materials. Kutcha buildings are mostly single-storey and are limited in their footprint, to benefit poor families, thus, representing a vulnerable

population in acute housing insecurity. Their temporality requires continuous repairs and maintenance, but the makeup of the material guarantees a short life of these houses.

Figure 42. Kutcha Structures inside and around the colony
(Source: https://www.lauriebaker.net/photos-videos/pictures-of-buildings/)

Physical Conditions and Structural Vulnerabilities- Severe Vulnerability

Kutcha buildings form a very dangerous form of housing in the colony, made of plastic sheets, corrugated metal, timber frames and tarpaulin, materials that are weak and non lasting by nature. Their very quick decaying through exposure to monsoons and oxidation causes severe damage like rust and torn covering as well as an unstable foundation. Problems with dampness and also lack of natural lighting are also worsened by the poor interior conditions. These units are not thermally efficient thus increasing their vulnerability to severe weather conditions. The presence of such dwellings together promotes fire risks whereas poor drainage and sanitation are of high health risks. In addition, regular maintenance is often not provided, so it is easy to see structural problems in the form of roofs falling, and poor safety.

Semi- Pucca Structures:

The semi-pucca construction are across the settlement hierarchy that consists of building with a combination of brick and stone masonry walls and corrugated metal or asbestos roofing. They are more durable than kutcha units but not as permanent as pucca structures and include simple foundations and load bearing walls. These buildings tend to be residential and commercial, following small-scale businesses along settlement routes. They are reflective of the transitional economic position of residents offering greater durability without losing economic accessibility and therefore, play a role in the economic life of the informal settlement.

Figure 43. Semi-pucca structures around the colony which are used mostly used commercial purposes.
(Source: Author's Illustration using Google Earth)

Physical Conditions and Structural Vulnerabilities- Moderate to Significant Deterioration

The semi-pucca structures are structurally better than the kutcha ones, but they experience a significant physical decay. The walls are made of brick or stone and the roofs are made of metal or asbestos, thus revealing signs of deterioration such as cracks, spalling, rust, peeling paint, and dampness; which are indications of water permeation. Brick mortar harm is structural integrity and metal roofs are rusted and water tight. Lack of adequate ventilation, waterproofing and darkness of interior spaces are also a cause of high humidity levels. There are many asbestos-roofed units that bring other health hazards. Business semi-pucca buildings also indicate erosion, lean-to extensions and lack of drainage that lead up to waterlogging and lack of foundation.

Pucca Structures:

The pucca buildings represent the most stable and long-term type of housing in the colony; these buildings are made of solid material (concrete, cement, brick, and stone). The structures also perforated with concrete are usually reinforced, plastered walls, concrete or tiled roofs. Contrary to the kutcha and semi-pucca typologies, the pucca buildings are superior in terms of structural stability and resistance to weather, and multi-story patterns are evident in some of the settlement areas. The buildings are mainly residential with families having invested more in the building with time. Pucca constructions are an indication of a certain level of economic stability and residential commitment by specific households in the informal settlement. According to COSTFORD documentation, there exist two major typologies of low-income housing in the colony (COSTFORD, 2005):

Type 1: Row Housing (Early KSHB Buildings)
Plastered row houses made with traditional materials and ordered in linear blocks of two storeys with capacity for approximately 750 families (COSTFORD, 2005). These units have floor areas less than 25 m² and were designed to accommodate nuclear families, although they currently tend to house extended families of five to ten people, causing severe overcrowding (COSTFORD, 2005). Cement brick walls of 15 cm thickness, plastered inside and outside, plastered PCC floor and flat RCC slab of 13 cm thickness on roof and slabs (COSTFORD, 2005). Traditional reinforced concrete structures are lintels and beams, which assemble structurally sound but fairly material-consuming units.

Figure 44. Row Housing typology- KSHB Buildings
(*Source: Sherin & Rani, 2023, Kuriakose, 2014; New Indian Express, 2021*)

Type 2: Vertical Stacking (Laurie Baker)

Unplastered vertical stacking blocks utilizing economical construction technologies developed by Laurie Baker (COSTFORD, 2005). They are arranged in vertically-stacked units, with five dwellings on the ground floor, three on the first floor with open terraces and two on upper floors (Centre of Science and Technology, Rural Development, 2005). The design enables increased density and reduced growth in the footprint to give way to circulation and small courtyards. Being physically smaller as it is depicted in photographs, these buildings provide better natural ventilation and thermal comfort when compared to conventional concrete boxes (Tiwari, 2015). Typically, Type 1 blocks are a prototype of an early mass housing with an effort where quantity in place of quality dominated and Type 2 blocks are

a more sophisticated effort of affordability, climatic compatibility and liveability (Tiwari, 2015). Nonetheless, both typologies have poor surrounding infrastructure, insufficient open space and strain from incremental occupant changes. Brickwork constructed using rat-trap bonding with hollow cavity between bricks forming a 9-inch wall with insulating air gap that reduces brick usage and increases thermal performance (COSTFORD, 2005). Filler slabs substitute some reinforced concrete areas with lightweight ones like tiles, consuming less cement and steel (Tiwari, 2015). Pitched or sloping roofs cut off heavy rainfall and keep walls dry which is a significant consideration based on the nature of excavation site which is prone to floods (COSTFORD, 2005). With the help of these technologies, it is evident that cost-effectiveness can be maintained without loss of climatic suitability, and this will be an

example worth of housing construction in the colony.

Figure 45. Row Housing typology- Laurie Baker buildings

Source: https://www.slideshare.net/slideshow/chegalchoola-slum-development-project-critical-appraisal/77522514;'

Physical Conditions and Structural Vulnerabilities -Progressive Degradation

The colony is facing severe physical degradation on most of its pucca buildings even though the buildings were built using concrete and bricks. Fissures found in columns and beams are evidence of possible structural fatigue, and corroded reinforcement exposes the dulled and peeling concrete to the corrosion process. Plaster finishes exhibit profuse cracking and biological colonisation due to inadequate drainage during rainy seasons, and together with moisture problems as exhibited by the corrosion of paint. These are especially susceptible to seismic risks as there is lack of lateral bracing in these multi-storey buildings and the safety conditions are outdated. Waterproofing failures, inconsistency in maintenance, and additional prevention of the deterioration process are also motivated by irregular maintenance, and the exposed electrical systems are characterized by electrocution risks due to moisture exposure.

2.6 Green Space Deficit and Vegetation

The tree density map shows a sharp inequality with space the central built-up areas (KSHB and COSTFORD blocks) having critically low tree cover with the periphery having medium and high levels of density. Most importantly, the settlement does not have formal green areas like playgrounds or parks. The sole vegetation available is scattered and unplanned trees along the edges of lanes that offer little ecosystem services (Green Infrastructure Inequalities in Informal Settlement, n.d.). Tree covers provides essential services: thick vegetation has the potential to lower temperatures 2-5°C, and capture airborne pollutants (PM2.5, PM10, nitrogen oxides). From the tree density map it can be analysed that the trees have a fragmented distributed due to which its benefits are not equally available to all the residents of the locality. While some enjoy its benefits, the others are deprived of it. The broken distribution of trees, as well as the recent transfer of the power to cut trees by Thiruvananthapuram at the end of 2024, undermined the mechanisms of vegetation protection (Times of India, 2025).
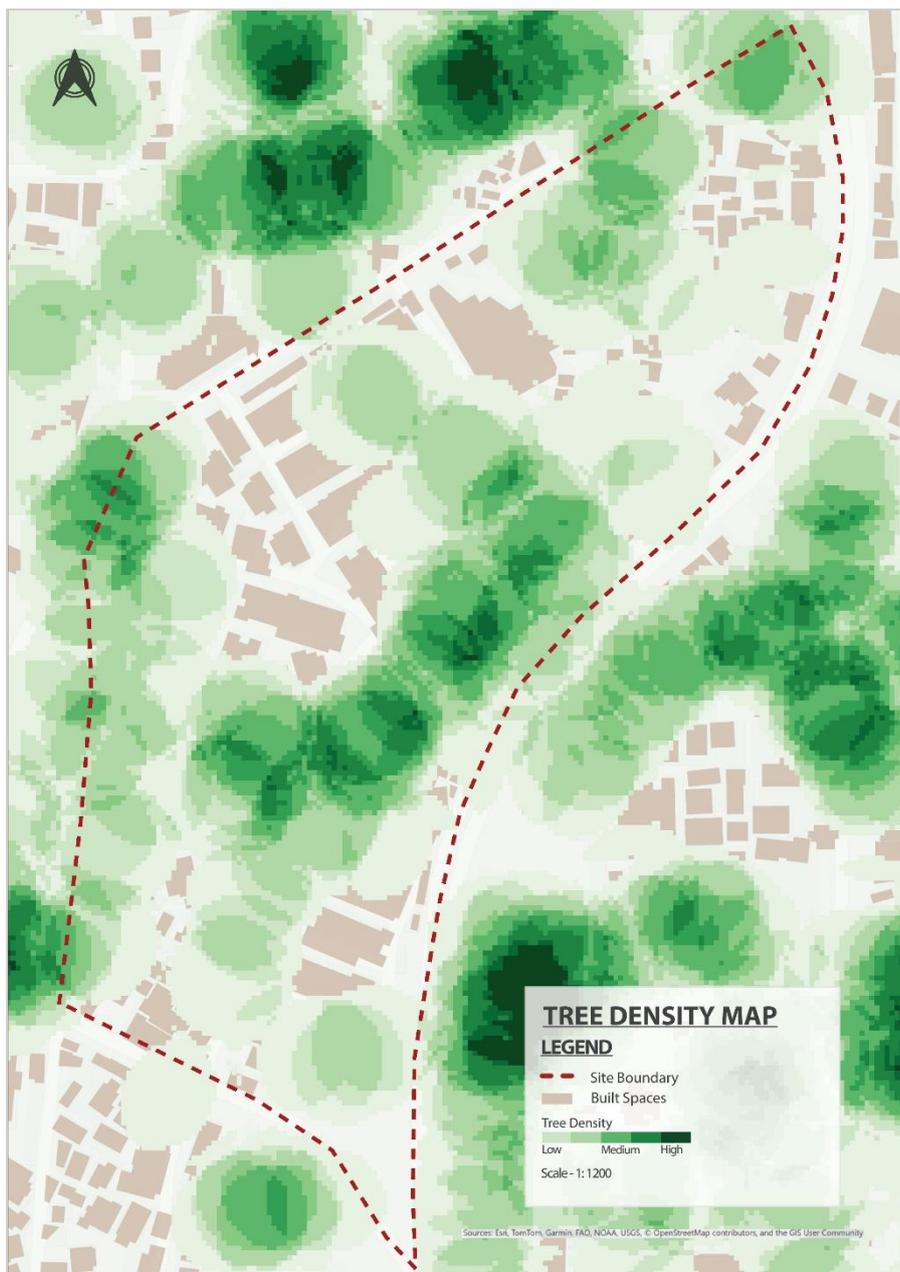
Figure 46. Tree Density

(Source: Illustrated by Author using Google Earth, Bhunaksha, Kerala AMRUT Indian open maps, ArcGis, OSM Esri, TomTom, Garmin, FAO, NOAA, USGS, © Open Street Map contributors, and the GIS User Community,

2.7 Social, Economic and Behavioural Dimensions of Everyday Life in the Settlement

2.7.1 Population, Household Size and Density

On-site information reveals that the developed land area of the colony is about 23,000 m^2, home to over 900 families in previous census and over 1,000 households in recent ones (COSTFORD, 2005). This implies approximately 5,000 people with residential densities far surpassing normal low-income housing densities (COSTFORD, 2005). The size of the household units is not big (25-35 m2 on average and smaller) and polymorphous families with multiple generations live in single-unit houses frequently. According to socio-economic surveys by COSTFORD, there are households with five to ten members in certain units, and frequently more than one household shares the same structure (COSTFORD, 2005). Short term consequences of this kind of overcrowding are effects on privacy, health, educational performance and ability to live with dignity.
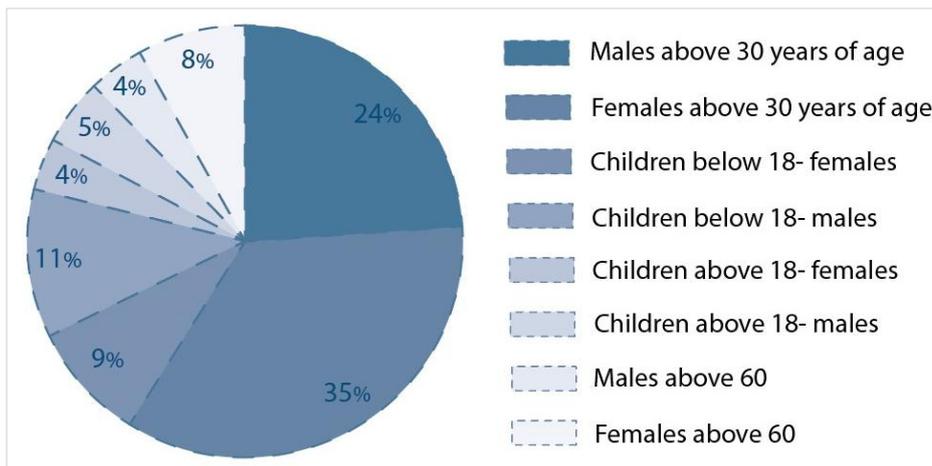
Figure 47. Population distribution Chart
(Source: Adapted and Re-illustarted by Author from Meera.2015)

2.7.2 Income Sources and Occupational Structure
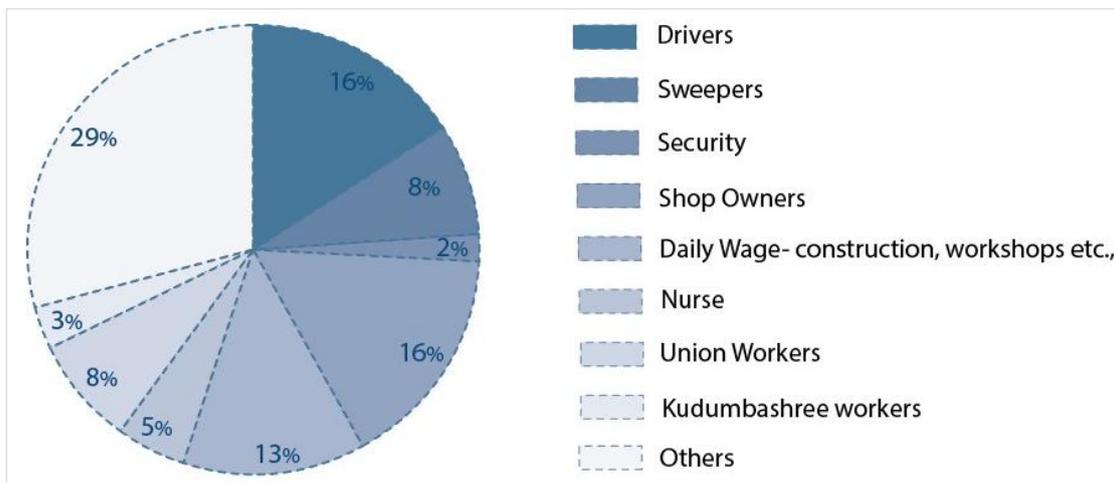
Figure 48. Employment type Distribution Chart
(Source: Adapted and Re-illustarted by Author from Meera. 2015)

Approximately 90 per cent of working-age men in the colony are employed, mostly in low-paying and informal jobs (COSTFORD, 2005). These include government or quasi-government contractual employment, construction labour, loading and unloading services in markets, taxi and auto-rickshaw driving, vending and minor-scale trade (COSTFORD, 2005). Women play major roles in household incomes by working as domestic helpers, sweepers and service industry workers as well as unpaid home-based work (COSTFORD, 2005). The level of income is low; it is also vulnerable to changes, and this puts the household under economic shocks, change of sickness or seasonal employment. This is confirmed by the existence of an informal market in the colony operated by older women selling goods daily, confirming residents' entrepreneurial spirit as well as the precarity and unregulated nature of most local jobs (COSTFORD, 2005).

2.7.3 Education, Gender and Marginalisation in Society

The degree of education among the locals is different with the young generations enjoying the high literacy levels of Kerala, however, the past generations lacked access to education (Kudumbashree, 2024 and COSTFORD, 2005). Examples such as the autobiographical book "My Life in Chengalchoola" document experiences of school dropout, social stigma and difficulties of growing up in a stigmatised settlement (Times of India, 2012). Of special importance are gendered experiences. According to COSTFORD documentation, there are no general facilities provided to girls and women such as safe recreational areas and special community centres (COSTFORD, 2005). It is also worsened by lack of

infrastructure that is sensitive to gender which makes such a load on domestic labour even more, as well as exclusion of women in social and economic participation. The media labels used for the colony (as "notorious") and residents (as "unwanted people") have traditionally supported societal marginalisation (New Indian Express, 2023; Times of India, 2019). These stories determine the attitude of residents to their role in the city and their involvement in redevelopment processes.

2.7.4 Socio-Behavioural and Environmental Psychology Dimension: Understanding How Residents Adapt and Interact

2.7.4.1 Zoning and Intra-Settlement Interactions
Based on environmental psychology analysis and behavioural mapping of the settlement, the colony can be classified into five distinct zones (Meera, 2015) with different interaction patterns:

Zone 1: Conservative Core (KSHB 1980s Housing)
Residents interact primarily within their own zone. Health center is the only facility beyond the zone used regularly. As early inhabitants (since 1980s), residents possess strong social cohesion. Interaction with other areas occurs only for purposeful activities like purchasing commodities or accessing market/health centres.
Characteristics: Strong internal social cohesion; external contact resistance; change resistance; decades-old strong family ties.

Zone 2: Recently Developed (COSTFORD Housing)
Residents show both inter and intra-zone interactions due to relationships and associations. Since recently built, people maintain social connections with areas they previously inhabited, especially Zones 1 & 3.
Characteristics: Transitional zone- internal relationship; external relationship; mixed patterns of interaction; bridging functions to the other zones.

Zone 3: Institutionally-Centered Area
Restricted inter-zone communication; people are visiting other zones to visit health centre and market. Religious facilities (temple, church, community hall) in zone.Since most facilities exist within area, residents have less incentive for external interaction. **Characteristics:** Independent in services; not highly dependent externally; facility-focused contacts; local institutions are proud in the community.

Zone 4: Segregated by Drainage Canal
Only interacts between zones because of physical barrier of main drain separating between the other zones. Good social cohesion as a result of family ties and acquaintances. Little interest in the relations between zones because of the negative attitude to other regions (alcoholism, drug use, conflicts).
Characteristics: Physically withdrawn; high cohesiveness, group; negative perceptions toward out-group; drains physical and social barriers.

Zone 5: Informal Shacks and Most Vulnerable
Houses the shacks with barrier-free environment for self-building. The people are social and talkative regarding daily issues. Majority of the victims of infrastructure shortages and floods. Unhygienic conditions cause many to have health problems (TB, allergies, heart problems). Have family ties across all zones. Includes aged residents reluctant to move to new formal housing.
Characteristics: High vulnerability; multi-zone contacts; adaptive resilience; aversion to formal housing; intergenerational contact; the greatest exposure to the environment.
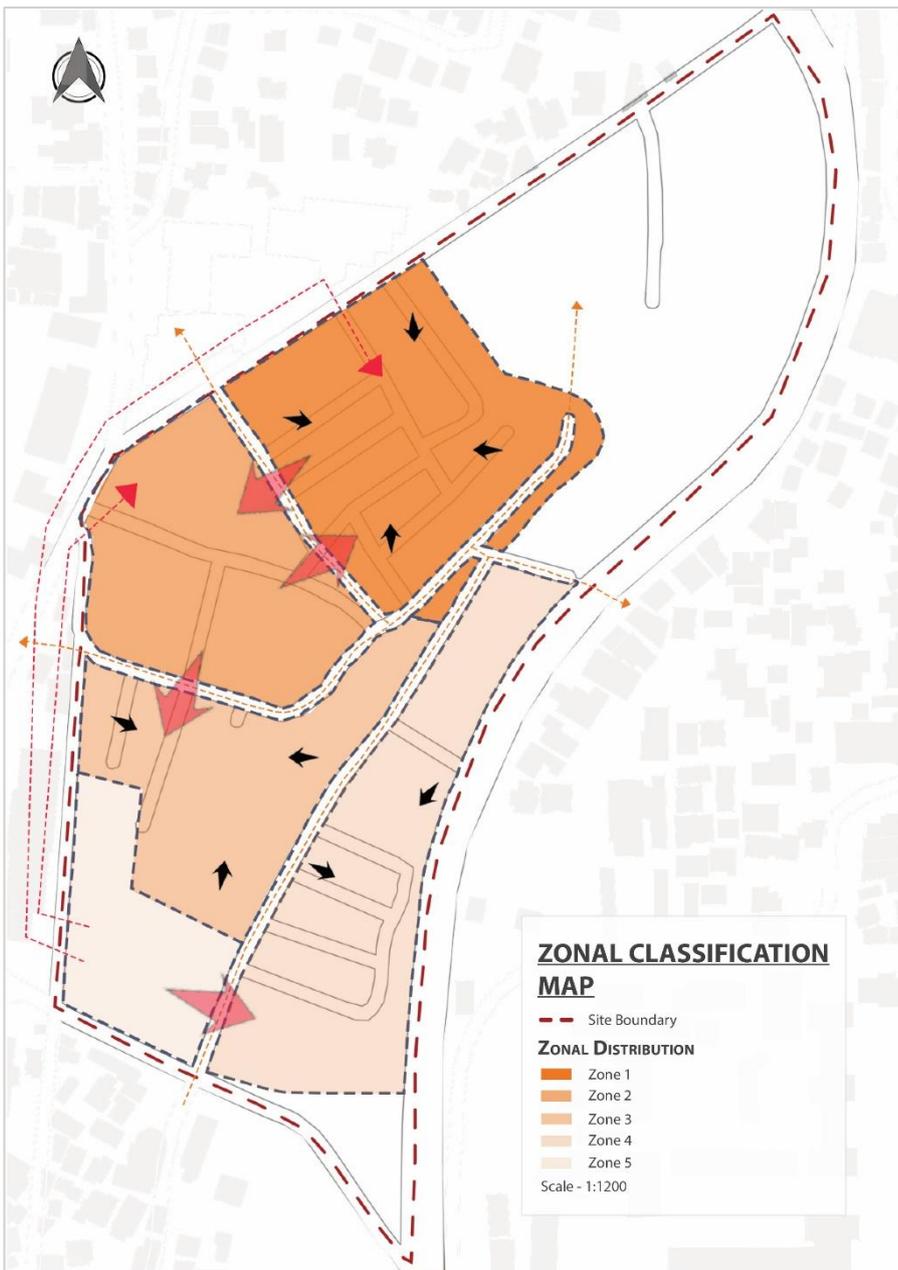
Figure 49. Zonal
Classification of the colony
*amd its inter and intra zonal
behavioral patterns*

*(Source: Adapted and Re-illustarted by
Author from Meera, 2015)*

2.7.4.2 Activity Spaces and Temporal Usage

Inhabitants reimagine the use of available space, creating convertible space:

- *Rear market area:* Operates as a loading/unloading/commerce in the morning; is converted into children play area in the evening, with a court and seating.
- *Tea stalls:* Active in morning; become women's interactive spaces in evening
- *Interaction areas:* This is on area around functional spaces (verandahs, public taps, central drainage) particularly used by women and the aged.
- *Playing areas of children:* Boys use access roads and playschool grounds; girls use stairs, balconies and verandahs.

2.7.4.3 Adaptation Strategies: Utilizing Shared Spaces

Residents demonstrate adaptive innovation:

- Terraces that have been turned into residential or rental houses (income generation).
- Shared courtyards separated by compound walls turned into work areas/storage (next to kitchens). Self-established shops, workshops in open spaces (self-sustainable economy)
- Pets that had been kept at home stored under stairs or landings.

- There are open space areas between rows of housing that serve as parking, junk storage, shops, play areas, green shade.

This is indicative of the utility space requirement of residents and the introverted character of the community-iniating to seal themselves off against the exposure of adjacent units and making the most out of the limited space.

2.8 Infrastructure, Services and Accessibility

Rajaji Nagar (Chengalchoola Colony) is very poor in basic urban infrastructural features despite geographic location centrality. The supply of water is still to some extent communal with community taps and domestic water supplies are few and sporadic. The sanitation system is heterogeneous: even though the units of KSHB and COSTFORD block can have in-house toilets, a relatively large percentage of semi- pucca and kutcha houses use common or makeshift sanitation, or no secure and private sanitation at all. The management of solid waste is significantly poor and this is characterized by inconsistent collection days, lack of established disposal sites, and common informal dumping of solid waste in the areas around the homes and along the canal route. These inadequate infrastructures create unhealthy environments and increase the health hazards experienced by the locals every day. The availability of social services in the colony is also limited. There are very few formal facilities like anganwadi centres, informal community halls and religion facilities, and their spatial allocation in the settlement is disproportionate. External schools, health centres, and markets are important components of residents as they play a significant role in their lives, but they are not always available to vulnerable populations, such as children, the elderly, and people with disabilities, which are not always geographically proximate. Thus, numerous social and economic practices are subjected to being in improvised locations, including thresholds, staircases, and close courtyards.

At the same time, the colony has good external connectivity on the municipal level. It is also within walking distance of the State Secretariat, Thiruvananthapuram Central railway station, and the main KSRTC bus terminal and it has a full flot service of the auto-rickshaws and other intermediate forms of public transport. This is external accessibility which supports livelihood strategies of inhabitants. Nevertheless, there is a severe lack of internal circulation: the system of streets includes tight passages, numerous dead ends and consecutive lines of houses with subsequent infill, forming areas too narrow to allow emergency or service cars in, and also made narrow by accidental extensions and parked two-wheelers. There is poor quality of pavement, lack of universal-access facilities, and low lighting which reduces safety and comfort especially to women, children and the elderly. In such a way, the fact of high regional connectivity does not eliminate the internal infrastructural shortage and the low level of service delivery limits residents with the capability of converting locational benefits in safe and respectable urban life.

CHAPTER 3
CHALLENGES OF THE SITE AND ITS COMPARATIVE STUDY WITH CASE STUDIES

3.1 Synthesis of Site Challenges

On a Regional and Site-Specific Level, the site analysis enables the greater insight into the regional perspective owing to the fact that it records specific vulnerability mechanisms. Rajaji Nagar is located in a topographic basin (25m sides to 13m middle) with waterlogging of 3060 cm during normal monsoons and above 1 meter during extreme monsoons which is augmented by encroachment which kills the water permeability and lack of internal tertiary drainage. The highest population density is at the canal edges and crawling low premises of utmost flood prone areas, all around 40% pucca, 35% semi-pucca and 25% kutcha constructions, of which the most vulnerable groups, specifically renters with uncertain tenure, are packed. However, this physical weakness goes hand in hand with a paradox of livelihood accessibility. The residents are highly sensitive to displacement because of high household budgets based on sporadic sources of income ranging between ₹8,000-12,000 per month and the majority of the working age population is involved in informal activities, which rely on the closeness to the Secretariat, commercial districts, and transport facilities within 12 km or below. Any redevelopment that cuts off central location or fails to provide an integrated livelihood infrastructure will cause economic displacement even though it is built in situ. There is a clear social stratification of the settlement, that is, KSHB core (3540% tenure security), COSTFORD blocks (transitional cohort), and informal canal-edge settlements (2025%, very vulnerable renters). Women are disproportionately vulnerable, lacking access to safe space and to decision-making, home-based businesses without spatial accommodation, and health impacts of floods, but engage in adaptive agency through Kudumbashree NHGs and informal networks, which can be mobilized in participatory processes. The present Smart City project, in spite of in-situ designation, suggests hard-stop demolition-reconstruction that is incompatible with incremental livelihood patterns and not coordinated to have hydro-logical plan with city-wide drainage interventions. There aren't any gender, specific measures. Redevelopment tightly integrates the responses to: (1) gradual housing typology with tenure security; (2) combined livelihood infrastructure; (3) hydrological resilience through land, filling, high circulation, and coordinated canal upgrading; (4) participatory design and female leadership; and (5) inter, agency governance coordination. It is not just about changing the infrastructure or design. Rather, a restructuring of physical, social, and institutional conditions that can bring about sustainability, livelihood security, and an inclusive decision, making process is needed.

3.2 Fit of Case-Study Principles to Rajaji Nagar

The three core case studies reviewed in Part A—Yerwada (Pune), Baan Mankong (Thailand) and Ahmedabad's Slum Networking Programme—offer a set of transferable principles that align strongly with the conditions observed in Rajaji Nagar. Yerwada demonstrates the feasibility of incremental, in-situ upgrading with over-structured core housing units that households can extend vertically over time, supported by secure long-term leases and deep community participation (Munot, 2023). This approach is particularly relevant to Rajaji Nagar's combination of limited land, high densities and joint family structures. Baan Mankong provides a contrasting yet complementary model centred on community cooperatives, flexible tenure arrangements (including land-sharing) and intensive flood-resilience infrastructure such as canal dredging, land-fill and raised platforms (Boonyabancha, 2005; CODI, 2019). Given Rajaji Nagar's canal-edge encroachments and recurring waterlogging, these strategies point towards an integrated hydrological upgrading rather than a purely architectural solution. Ahmedabad's SNP illustrates the power of infrastructure-first upgrading, where the provision

of universal, high-quality water, sanitation, drainage and road networks at relatively low per-household cost triggered widespread self-investment in housing within 5–7 years (World Bank, 2007You can see a similar pattern in Rajaji Nagar's near but poorly serviced fabric: the slum where many people want and partly have the means to improve their homes if only they were guaranteed tenure and had access to basic amenities. To conclude, these examples show that Rajaji Nagar is in need of a redevelopment model that accommodates: (1) local redevelopment with minimal displacement; (2) gradual and adaptable housing; (3) main infrastructure sequencing along with flood, resilience; (4) safe and adaptable tenure; (5) vigorous, community engagement supported by the institution. This composite model provides the benchmark against which the current Smart City scheme must be critically assessed.

3.3 Critical Assessment of the Rajaji Nagar Smart City Scheme

When evaluated against the diagnostic of Rajaji Nagar and the principles distilled from comparative case studies, the ongoing Smart City redevelopment reveals significant misalignments.

First, on displacement and phasing, the scheme is formally labelled as in-situ but in practice depends on the demolition of existing clusters and the temporary relocation of households during block construction. Unlike Yerwada's micro-phased approach—where small clusters were upgraded while residents remained nearby—the Smart City model lacks a fine-grained phasing plan that would allow reconstruction around existing social networks and livelihood routes (Munot, 2023). This generates anxiety among residents about both short-term disruption and long-term return.

Second, on housing typology and flexibility, the adoption of uniform G+3, 2BHK apartment blocks reflects a "finished unit" mentality closer to PMAY-ISSR projects than to incremental upgrading models (Government of India, 2017). For Rajaji Nagar's joint families and home-based workers, these units offer limited scope to add rooms, create independent entrances for married children, or integrate micro-enterprises on the ground floor. In contrast, Yerwada's over-structured frames and Baan Mankong's diverse typologies explicitly anticipate household expansion and mixed-use configurations (Boonyabancha & Mitlin, 2012; Munot, 2023).

Third, on flood resilience and infrastructure integration, the Rajaji Nagar Smart City scheme emphasises conventional internal networks—underground drainage, paved roads, street lights—without a clearly articulated strategy for area-wide hydrological restructuring. Baan Mankong's experience demonstrates that substantial reductions in flood frequency require coordinated canal dredging, widening, land-fill of low-lying plots and raised circulation systems (CODI, 2019). For a settlement like Rajaji Nagar, located in a flood-prone basin, the absence of such measures risks perpetuating environmental vulnerability even in newly built blocks.

Fourth, on tenure and governance, the scheme appears to rely on standard state-issued allotment or ownership documents linked to individual flats, managed through a project-based SPV (SCTL) and municipal agencies. This approach does not exploit the potential of cooperative or group-based tenure models that have proven effective in preventing market-led displacement in Baan Mankong (Boonyabancha, 2005). Nor does it provide explicit, time-bound no-eviction guarantees comparable to Ahmedabad SNP's ten-year security framework (World Bank, 2007).

Lastly, concerning participation and power-sharing, the current trend of resident participation in Rajaji Nagar has been based on enumeration, redress grievances and political mediation on beneficiary lists. Though important, these types of participation are not as robust as the co production processes in Yerwada and Baan Mankong where the community worked together to design layouts, to select housing typologies and to monitor the quality of construction and post occupancy systems (Mitlin & Walnycki,

2019; SPARC, 2012). The demonstrations and arguments that surrounded the Smart City project are indications of lack of trust that should be taken into consideration by any other framework.

In summary, the Rajaji Nagar Smart City scheme improves upon traditional off-site relocation by maintaining residents within the central area and promising upgraded infrastructure. Yet, it remains structurally constrained by a unit-delivery, apartment-based logic that underutilises the incremental capacities, social institutions and spatial potential of the settlement. The integrated design and policy framework proposed in the next part of this thesis seeks to construct a more context-appropriate alternative, explicitly responding to these limitations.

3.4 Connecting Site Analysis to Design Interventions

Challenge 1: Overcrowding and Inadequate Unit Sizes
Site Reality: 1,000 + households per 23,000 m 2; KSHB units less than 25 m 2; extended families (5-10 persons) in unit units; excessive overcrowding impacts privacy, health, education.
Case Study Solution (Yerwada, Pune): Incremental housing (core housing of 270 sq.ft/25 m2) on over-structured frames allowed 82 percent to put up vertical extensions within 8 years and host joint families providing rental income.
Application to Rajaji Nagar: Build incremental core housing (300-350 sq.ft ground floor) on over-structured RCC frames (constructed to expand to G +1-G +2) in lieu of finished apartments. This fits the household size of various sizes, fits irregular incomes and allows rental income generation.

Challenge 2: Livelihood Dependence on Central Location
Site Reality: 90 percent are in informal employment (construction, vending, domestic work, auto-rickshaw driving); location in the center of the site is important in accessing employment.
Case Study Solution (Yerwada, Baan Mankong, Ahmedabad): In-situ upgrading saved livelihoods (Yerwada: 100% retained employment; Baan Mankong: 88% not disrupted; Ahmedabad: time savings-income +22%).
Application to Rajaji Nagar: Not to be moved peripherally (to be kept in-situ). Design should incorporate livelihoods: ground floor shops / workshops in mixed use blocks; special street vending space; community workshop centre; childcare centres that allow women to work.

Challenge 3: Mixed Land Ownership and Tenure Insecurity
Site Reality: A combination of KSHB, municipal and small private holdings, tenants do not have legal ownership, past interventions have entailed housing without title deeds; informal tenure boundaries discourage investment.
Case Study Solution (Yerwada, Baan Mankong): Secure tenure requirement to investment (Yerwada: 99-year lease-82% expanded; Baan Mankong: 78% secure tenure by cooperative ownership). Various tenure types suit different ownerships.
Application to Rajaji Nagar: Long-term leasing (99 years) or cooperative ownership should be applied to KSHB/municipal land. On non-state land, privatize tenure or land-sharing. Titles (women names) are gender sensitive and are more equitable. Pre-redevelopment BEFORE construction is made with tenure issues.

Challenge 4: Flood Vulnerability and Inadequate Drainage
Site Reality: Site in low-lying monsoon basin; heavy monsoon floods by water overflow in the drainage canal; underdrainage is non-existent; high risk of floods is identified.
Case Study Solution (Baan Mankong, Thailand): Canal-edge communities improved by landfill (ground 1-2 m raise), canal dredging/widening, underground drainage, and platform plinths of houses-- reduced flood frequency up 60-80 percent.

Application to Rajaji Nagar: Focus on flood control (enhancement of canals, dredging of drains, creation of land-fills on low grounds) and climate-sensitive housing construction (high plinths, sloping roofs, etc.).

Challenge 5: Gender-Based Social Marginalisation

Site Reality: Media stigmatises colony; social stigma on residents; there is no safe recreational place where the girls/women can recreate; the facilities are not gender sensitive thus increasing the burden of household chores; women have very little social/economic participation.

Case Study Solution (Yerwada, Baan Mankong): Dignity and confidence are established through participatory processes. Participation of the populace and self esteem were brought up by women leadership in cooperatives (Baan Mankong: 45% leadership positions).

Application to Rajaji Nagar: Real involvement using community-based enumeration and design voting; sex sensitive design workshops (childcare offered); direct orientation of needs of women (safe community areas, childcare, well lit lanes, courtyards); leadership by women in community groups (Kudumbashree NHGs); break the slum as eyesore discourse using good architecture and urban design.

PART C: INTEGRATED DESIGN AND POLICY FRAMEWORK AND CONCLUSION

Integrated Design and Policy Framework For Redevelopment Of Rajaji Nagar (Chengalchoola Colony)

Discussion & Critical Debate

Conclusion

CHAPTER 1
INTEGRATED DESIGN AND POLICY FRAMEWORK FOR REDEVELOPMENT OF RAJAJI NAGAR (CHENGALCHOOLA COLONY)

The above chapters have determined that Rajaji Nagar (Chengalchoola Colony) is the overcrowded informal settlement with spatial overlapping, environmental, infrastructural, and socio-economic predicaments. Overpopulation in residential areas, frequent flooding, inappropriate drainage, insufficient community spaces and open spaces, improper solid waste disposal, disjointed accessibility and continued tenure insecurity all deteriorate the quality of life of the inhabitants. Meanwhile, the settlement has an excellent social network, conventional livelihood patterns and a central urban center, which makes it feasible and upgradable in place. The chapter forms a framework of the urban design that addresses these circumstances with in-situ, incremental and policy-consistent approaches as opposed to traditional relocation or tabula rasa masterplanning. It concentrates on settlement level plans that may re-organize space, housing and infrastructure and land distributions to enhance the living conditions and keep the residents, community identity and livelihood within the proximity of the residents. The framework translates the findings of the site analysis, the lessons drawn from national and international case studies, and the review of relevant urban policies and programmes into a set of **integrated design strategies** for Rajaji Nagar. These strategies are organised into five interrelated clusters:

1. In-situ redevelopment approach
2. Housing upgradation
3. Infrastructure development (drainage, mobility, services)
4. Land tenure and institutional support
5. Public and community spaces

Each cluster is clearly associated with corresponding urban policies: JNNURM-BSUP, RAY, PMAY-ISSR, LIFE Mission, KSHB schemes, Smart City and AMRUT, which shows how design can be brought to life in the current policy and institutional frameworks.

1.1 Aim and Approach of the Design Framework

The general objective of the design framework is:
"To enhance the livelihoods in Rajaji Nagar by redevelopment policies aimed at upgrading housing, infrastructure and community facilities, and aligning with the current city policies and reducing the level of displacement of the inhabitants."

The framework is operationalised under three steps and they are interconnected to achieve this objective:

Translation problems-issue: Problem clusters are formed by grouping key problem issues that are identified in site analysis (flood-prone pockets, overcrowding, locations of kuccha and semi-pucca housing, lack of organised open space, internal circulation bottlenecks, unsafe or underutilised spaces, tenure ambiguity), which are identified in site analysis.

Policy/precedent congruence: In respect of each problem cluster, national and state policy (PMAY-ISSR, LIFE Mission, BSUP/JNNURM heritage, KSHB schemes, AMRUT, Smart City guidelines) and case study (Yerwada, Ahmedabad SNP, Baan Malkong) are considered in order to find measures that have been successful in other locations and funding vehicles which can be practical in the context of implementation.

Strategy development and spatialisation: Each cluster has a set of specific design strategies, specifically stating which policy instruments will be able to finance or steer implementation. The strategies are stated at the settlement level, but they are adaptable in order to align with the community negotiations and technical studies.

1.2 Guiding Principles for Inclusive In-Situ Redevelopment

The design framework based on the literature, policies and case studies and the observed dynamics in Rajaji Nagar is designed on the following principles:

1. In-situ development as opposed to displacement: Redevelopment must take place mostly within the settlement area itself or the immediate surroundings and not on the edges, which breaks the livelihoods, schooling and social connections. This principle is consistent with the in-situ focus of RAY and PMAY-ISSR and is also supported by the in-situ findings of Yerwada and Baan Mankong who indicated that peripheral relocation decreases the satisfaction and livelihood security.

2. Gradual and low-cost change: Policies must enable residents and agencies to improve housing and infrastructure through incremental, manageable, and stages instead of a one-time and large-scale project, according to the irregular income and mitigating project risk. The infrastructure-first methodology employed by the Ahmedabad Slum Networking Programme demonstrated that as soon as the services are enhanced the households themselves invest in housing improvements in the long run.

3. Infrastructure and environmental safety as a background: Renovation of drainage, sanitation, water supply, solid waste management and flood protection is viewed as the background of redevelopment. Spatial reconfiguration and housing improvement follow to strengthen the environmental resilience instead of increasing risk as per the BSUP norms and the resilience focus of LIFE Mission.

4. Community network preservation and reinforcement: The available neighbourhood networks, support networks and cultural practices are known to be very important social infrastructure. Redevelopment aims to maintain neighbour groupings, uphold collective spaces and not to disperse residents throughout separate places.

5. Work, life blend and economic stability: Most families are dependent on home, based and informal businesses for their survival. In ground-floor live-work opportunities, market and transport accessibility, and ground-floor small commercial or productive spaces, spatial strategies follow the strategies that have been successful in Yerwada and in Ahmedabad.

6. Child-friendly and inclusive, as well as gender-sensitive public realm: the inadequacy of the infrastructure and unsafe spaces usually affect women, children, elderly and people with disabilities most. The framework focuses on open, bright avenues; secure meeting stations; and available communal amenities and aligns with the BSUP and PMAY-ISSR directions regarding inclusivity.

7. Policy convergence and tenure security: Design strategies are designed in a manner that are compatible with the current housing and urban development schemes, which provide space to be regularly formalised and secure tenure. Unless there is some type of secure rights, investments in upgrading will be feeble.

1.3 Integrated Design Strategies for In-Situ Redevelopment of Rajaji Nagar

1.3.1 Strategy Cluster I: In-Situ Development
1.3.1.1 Rationale

The experience of this country and other countries proves that when low-income settlements are shifted to the housing colonies of the periphery, a loss of livelihood, increased transport expenses and breaking of social communities, often occur despite an addition of a technically better dwelling unit. The previous reports of BSUP schemes carried out in Thiruvananthapuram indicate high vacancy and informal migration of movement of the peripheral locations to inner-city areas. On the other hand, the residents who will be In-situ redevelopment are living in or very close to their current neighbourhood. They have a higher chance of maintaining their job and social network and making long, term housing investments (Boonyabancha & Mitlin, 2012; Munot, 2023). Since the location of Rajaji Nagar is central with a well-established community relationship, it embraces in-situ development as its main strategy. The rest of the clusters are aimed at supporting this decision.

1.3.1.2 Key Principles for In-Situ Development
In-situ development is operationalised through three practical principles.

Firstly, retaining the settlement footprint as much as possible. The redevelopment will be done within the current limit or close to the periphery of Rajaji Nagar. In case of temporary relocation during construction, that temporary removal should be within walking distance although preferably not more than 50-100 metres to ensure that livelihoods and schooling are not disrupted.

Secondly, utilise the available resources. Already existing KSHB and COSTFORD buildings, municipal infrastructure and community organisations (particularly, Kudumbashree neighbourhood groups) are seen as starting points, not as barriers. The proposal is directed towards repair, modification and selective extension rather than general demolition and rebuilding.

Thirdly, incremental sequence interventions. Instead of trying to do an overhaul change, things are graduated. The first attempts are directed at the most severe risks, i.e. canal-edge floods and structurally vulnerable kuccha houses, and more gradual integration of housing, services and public areas. This incremental approach aligns with the financial and institutional capacity of local authorities and the community.
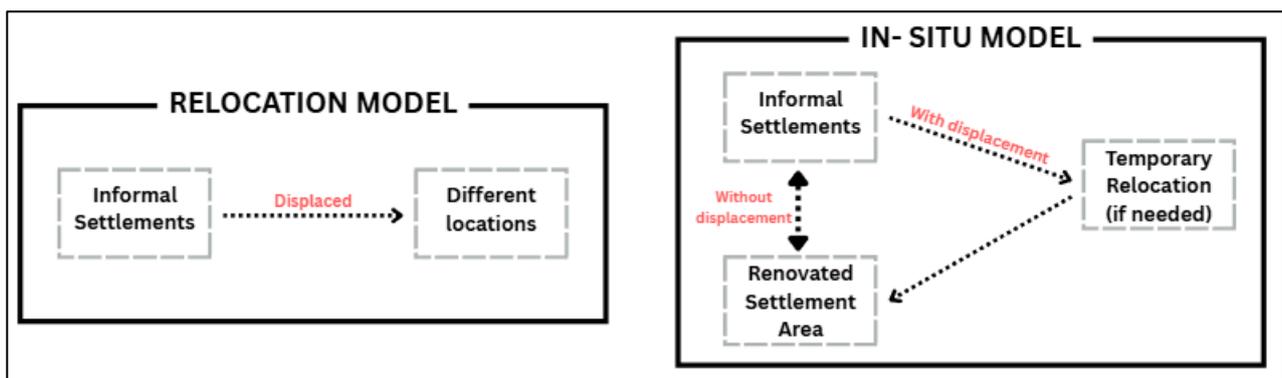
Figure 50. Concept of Redevelopment Models
(Source: Illustrated by Author)

Figure 51. Potential for In-Situ Upgrading and Kuccha House Replacement

(Source: Google Earth imagery modified by Author)

Figure 52 provides a clear image of the regeneration capacity of the settlement through In-situ regeneration by indicated the total of the formal blocks that can either be vertically expanded or horizontally expanded. The emphasis on the highlighted buildings represents those houses that can receive an additional floor or wing and, therefore, accommodate the existing residential needs without having to relocate most residents to a different place. Through this form of densification, the houses that are already predominantly located in the specially established kuccha structure space can be phased out and replaced by safer and more sustainable units that make up the improved built environment.

1.3.2 Strategy Cluster II: Housing Upgradation and Density Management

1.3.2.1 Problem Definition

Rajaji Nagar has very high built densities and a combination of house types. The blocks of KSHB and COSTFORD constructed by the government co-exist with semi Pucca and kuccha houses constructed in the remaining spaces and alongside the canal. The number of people sharing 25-35 m 2 is considerable and 5-10 people live in many units and this causes poor ventilation, lack of privacy and high exposure to flooding and fire. However, structural observation indicates that there is under-utilized capacity since some KSHB blocks might be extended vertically in a modest way.

1.3.2.2 Strategic Objective

The goal will entail the reorganisation and modernisation of the in situ housing stock through upgrading existing buildings, eliminating the most vulnerable units of kuccha and permitting incremental expansion, but not causing massive displacement or speculative redevelopment.

1.3.2.3 Proposed Strategies

a) *Renovation and selective vertical extension of KSHB/COSTFORD blocks:* An expert structural test is necessary to determine the number of existing blocks that can safely accommodate an extra floor. The initial priority is full repair cracks, waterproofing, stair and corridor security, minimum services. In those cases where possible an additional storey of small apartments is inserted. These new units are to be targeted at those families already residing in the most vulnerable kuccha houses, especially along the canal and drainage lines.

b) *Phased relocation and removal of high-risk kuccha clusters:* At risk clusters are mapped and risk ranked. During the first stage, the canal edge and structurally insecure units will be removed to newly refurbished or enlarged KSHB blocks. Their old machinations are then absolved. These small parcels are drainage corridors, small open spaces or service pockets depending on the location. The next stages focus on the remaining kuccha in the internal spaces.

c) *Incremental housing and live–work flexibility:* New or redesigned units are developed with simple and regular plans and supporting structures that may be extended to the household led extensions in future. Small shops, workshops or service activities can be located on the ground floor units without significant structural modification to appreciate the significance of home based livelihoods. This is a manifestation of incremental housing in Yerwada where occupants continued increasing and accommodating their units as finances allowed them to keep up. allowed (Munot, 2023).

d) *Micro re-blocking where essential:* In areas with very narrow corridors or in awkward locations of buildings that make them inaccessible in case of emergency, some slight modifications to footprints might be necessary. Any re blocking would be agreed with any affected residents and would highly attempt to maintain the same relationship with the neighbours and minimise the distance of the relocation.

These plans make the housing plan realistic: they are aimed at making the current situation better and slightly more challenging instead of redeveloping high rises.

Figure 52. Potential for KSHB Buildings for Vertical Upgrading
(Source: Google Earth imagery modified by Author)

1.3.3 Strategy Cluster III: Infrastructure Development (Drainage and Accessibility)

1.3.3.1 Problem Definition

The major issues of the analysis proved to be flooding, water logging and poor access. The low lying land of parts of Rajaji Nagar is bordering a silted canal. Minor drains are plugged up or missing and large bi-terminal surfaces do not permit natural percolation. The internal circulation is limited by twisting, parallel lanes and dead-streets, too small to accommodate emergency trucks and hard to collect the garbage. The conditions impact negatively on health, livelihood and mobility opportunities.

1.3.3.2 Strategic Objective

This is aimed at developing a strong yet simple infrastructure that mitigates the risk of floods, facilitates secure pedestrian passage, facilitates access to basic services and links Rajaji Nagar to the rest of the city better.

1.3.3.3 Drainage and Flood-Resilience Strategies

This proposal is deliberately simple. The canal is cleared, scanned and, wherever physically feasible, a little broadened to resume the flow. A small no build downturn is characterized along the two banks. Homes constructed at the very edge of the canal are moved out, in stages, into adjacent upgraded units, giving up the space to uninterrupted drainage and uncomplicated popular activity. A simple structure of drains is presented within the settlement. There are one or two main drains that pass parallel to the canal and along the main inner streets, which convey water to the canal or to municipal outfalls that are already in existence. Primary lines have secondary drains that receive the runoff of interior clusters. Water is directed away at home in the narrowest of passages by shallow surface channels or covered drains. The grades are verified by the municipal level officials at the border to avoid backflow or water logging. Internal lanes that are chosen are tarmac with interlocking or permeable blocks to allow a little penetration enabling reduction in surface runoff. Homes are also

linked by slightly elevated pedestrian paths that offer dry paths in the event of heavy rains to community facilities and bus stops.

1.3.3.4 Accessibility and Service Strategies

Accesibility and drainage are considered jointly thus the same structure supports the two. There are two or three main internal spines that are identified. Where possible, they are slightly expanded to permit emergency and service vehicles but maintain their use as pedestrian friendly streets. They also connect the primary entrances of Rajaji Nagar to social centers, pocket parks and the primary road. Out of these spines a system of secondary lanes (pedestrians and two wheelers) and more narrow pedestrian walks serves the centers. Even the lanes are kept car-free, although paved, made up with light and sharper boundaries. Minor service pockets are allocated at convenient locations on the main spines or close the main spines. These are host solid waste collection sites, which have simple enclosures, restricted two wheeler parking and utility facilities like transformers or water standposts. When concentration services are located in particular areas, it is easier to collect and less cluttering and dumping in the residential lanes. Even the simplest wayfinding features, name of the streets, direction signs to important facilities, and simple traffic control devices at the areas of conflict can enhance legibility and safety, particularly to women, children and elderly inhabitants. This along with the upgrading of housing, is the infrastructural base of the proposal.

1.3.4 Strategy Cluster IV: Land Tenure and Basic Governance
1.3.4.1 Problem Definition
The challenges that hinder continued improvement are lack of tenure security and scattered institutional responsibility. Numerous dwellers of KSHB blocks dwell in units, where documentation is not precise and up-to-date, and families of kuccha buildings do not receive any formal registration. Several agencies are present in Rajaji Nagar and showed lack of coordination amongst others; these are KSHB, Municipal Corporation, Kudumbashree and so on. Unless there is a bit of understanding in terms of rights and roles, the public investment as well as the household self-investment will remain weak. This lack of clarity also acts as a reason why most of the residents are not ready to relocate temporarily during the redevelopment phase.

1.3.4.2 Strategic Objective
The challenge that one has is to delineate tenure arrangements that are viable and governance schemes that are light and that can be used to promote redevelopment in situ and thus avoid setting up heavy new institutions.

1.3.4.3 Tenure Strategies
In households who already reside in the KSHB or COSTFORD units, a new long term lease agreement and renewed occupancy certificates can slowly carry out tenure regularisation. This may be made even in conjunction with renovation hence physical improvement is accompanied by legal security. In the case of households that have to be moved out of kuccha houses into new or extended houses, it is necessary to have transparent and participatory procedures of allocation. The resident groups should be discussed on the benefits list; the distribution can be based on both the vulnerability factors and simple lottery rules. Occupancy rights or lease agreements are written and made to each household explaining their status and terms of use and eliminate fears of eviction in the future. Where suitable, new housing clusters may be considered in small cooperative or association-based arrangements, with land or buildings being collectively owned as opposed to being individually sellable property. This has the potential of averting resale speculation and safeguarding long time claims of the

residents and is based on the experience of cooperative models in programmes like Baan Mankong (Boonyabancha & Mitlin, 2012).

1.3.4.4 Governance Arrangements
The proposal proposes the utilization and slight enhancement of existing structures as opposed to developing new project authorities. An example is to create a ward level Rajaji Nagar Redevelopment Committee that would be an amalgamation of the Municipal Corporation, KSHB, Kudumbashree and the ward councillor and elected resident representatives. This committee holds periodic meetings to assess the progress and organize funding proposal under PMAY ISSR and LIFE Mission and to tackle the bottlenecks. Participatory planning, works monitoring and control of some of the community facilities revolves around Neighbourhood Groups under Kudumbashree, and the existing residents associations. Establishment Filling in the existing institutions that are already trusted by the residents is more feasible than the total development of new bodies.

1.3.5 Strategy Cluster V: Public and Community Spaces

1.3.5.1 Problem Definition
Despite a lively everyday social life in Rajaji Nagar, it is presently being played out in congested lanes, thresholds and small corners that are not designed as urban spaces. In the locality, there are minimal spots where children can play and women can sit and relax or hold meetings. Most of the peripheral areas are full of parked cars or garbage, further supporting an impression of abandonment.

1.3.5.2 Strategic Objective
The goal is to make a simple and fine-grained network of public and community spaces that can be used to support social life and services without incurring heavy investment or large pieces of land.

1.3.5.3 Proposed Strategies
The tiny areas of land emancipated by the excavation of kuccha units and micro re blocking are turned into pocket parks and shared courtyards. There are open spaces with trees, benches and play equipment of simple nature; semi private spaces which are shared by neighbouring households. It is hoped that every cluster contains at least a small usable open space that can be accessed in a short walk. Primary internal spines have one or two community hubs. These are a multi storey with only a small area, Anganwadi, small health sub centre, women rooms connected with Kudumbashree self-help groups, study or training rooms as well as a multipurpose hall that can be used during meetings and cultural events. Community kitchen or micro enterprise activities can be allocated a small area, which will help support the livelihoods of the locals. Public ways and streets are handled as being a part of a safer, more accommodating public realm. Perceived safety is enhanced by lighting, clear sightlines and active ground floor uses around open areas. Accessibility to the elderly residents and individuals with disabilities is achieved by ensuring that paths and open spaces have slopes and even surfaces. The existing religious buildings and shrines are respected and incorporated within a network of the public spaces with small forecourts to hold meetings without ad hoc encroachments to block circulation.

|(a)|(b)|

Figure 54 (a) (b). Strategic Illustration for Public and Community Spaces
(Source: Pinterest)

1.4 Urban Policy alignment for each strategy cluster

The suggested design approaches have been strategically positioned and packaged in such a way that they operate within the infrastructures of the already-established Indian and Kerala specific urban policies and not in full scale new programmes. Simultaneously, they also point out areas where minor, local policy enhancement would empower implementation in Rajaji Nagar, and in other informal settlements of the same nature.

Strategy cluster	Key existing policies/programmes	Possible new/local policy tools to suggest
In-situ development	PMAY-ISSR (in-situ slum redevelopment), RAY principles, Kerala State Housing Policy, LIFE Mission	City/ ward -level in-Situ First guideline which mandates relocation when in-situ options have been depleted.
Housing upgradation	PMAY-ISSR (housing + common facilities), LIFE Mission housing improvement, KSHB housing schemes, BSUP heritage	Scaffolding building by-laws conditions (small unit, external stair, live-work ground floors) Incremental housing.
Infrastructure development	AMRUT / Jal Jeevan Mission (water & sewerage), LIFE Mission (resilience), Smart City & municipal storm-water/waste plans	Blue, green approach at the ward level (canal setbacks, permeable streets, micro, parks)
Land tenure & governance	KSHB lease policies, RAY's patta approach, Kerala housing/land assignment policies, PMAY-ISSR beneficiary guidelines	Land trust or cooperative model of one block piloting community land; simple ward by-law of participatory slum committees.
Public & community spaces	PMAY-ISSR common facilities, LIFE Mission social infrastructure, Smart City "inclusive public space" components, BSUP experience	Resident groups (adopt-a-park type agreements) Local public space maintenance MoUs with Kudumbashree/ residents.

Table 3. List of Policy Toolkit for Inclusive Redevelopment: Strategy Clusters, Existing Schemes, and Local Instruments
(Source: Tabulated by Author)

Strategy cluster I: In-situ development

The decision to use in situ redevelopment as the central strategy is well in line with the purpose of PMAY-ISSR that literally focuses on on site slum redevelopment as opposed to relocation and the Kerala State Housing Policy that specifically puts an emphasis on the upgrade of the existing settlements and not the relocation of residents to peripheral estates. Other previous programmes like RAY and BSUP also offer a normative foundation of the treatment of slum dwellers as legitimate citizens of the cities who deserve services at their current places. At Rajaji Nagar, these policies of higher level can be transformed into a simple principle on the ward level that in situ options must be explored before they can be relocated to influence the future project choices, and may help to counteract some ad hoc proposals of peripheral rehousing.

Strategy cluster II: Housing upgradation and density management

The housing policies, renovation and selective vertical expansion of the KSHB and COSTFORD blocks, gradual displacement of the at-risk kuccha groups, and gradual live-work units, align well with the financial and institutional agenda of the PMAY-ISSR and LIFE Mission. PMAY-ISSR may be used to help upgrade and partial new developments of existing public land, and KSHB will be the nodal agency, whereas LIFE Mission will be able to fund quality upgrades on the most vulnerable households. At regulation, the strategies indicate small changes in municipal building with laws, namely, the clear allowance of small area units, exterior staircase on incremental levels, and residential-commercial mix at ground levels in the rehabilitation zones. These would be used to legitimise incriminal incremental forms, livelihood oriented forms of housing that the proposal would encourage.

Strategy cluster III: Infrastructure development (drainage and accessibility)

The drainage and street hierarchy suggested to Rajaji Nagar is aligned with the infrastructure plans that are being pursued both AMRUT and state water supply and sewerage missions and the climate resilience and basic services provisions of LIFE Mission. In Thiruvananthapuram, Smart City already (and will continue to prioritize) storm water management, canal rejuvenation and non-motorised mobility; and Rajaji Nagar can be positioned as a pilot to that larger scale agenda at the neighbourhood level. In the local level, these interventions propose the development of a straightforward blue green infrastructure principal guideline of low-lying colonies, canal setbacks, which can be filled, the use of permeable materials on inner lanes. Incorporating these directions in the local practice would simplify the process of applying the drainage and access model in Rajaji Nagar to other areas.

Strategy cluster IV: Land tenure and basic governance

The tenure and governance cluster is not a replacement of the prevailing institutions but a development. The long term lease systems and occupancy certificates of KSHB offer an easy tool of regularisation of the residents of old and new units that are created. The transparency in the process of upgraded housing allocation can be achieved through benefits selection and consent processes offered by PMAYISSR where Kudumbashree neighbourhood groups provide an already existing platform of participatory planning and monitoring. The suggestion then is not that a new body is needed but that there is a light coordination committee at the ward level through which these actors can be brought together in terms of shared redevelopment agenda. Where experimentation is feasible, Rajaji Nagar might introduce a restricted collaborative or community association framework on a single housing cluster and it will be checked whether collective tenure types are more effective in avoiding speculative resale and ensuring long term affordability.

Strategy cluster V: Public and community spaces

The setting up of pocket parks, joint courtyards and tight spaces community centres is directly facilitated with the elements of PMAY-ISSR common facilities and with the provisions of a social infrastructure of LIFE Mission that may finance Anganwadis, health rooms or community halls in low income regions. The inclusivity and gender sensitivity of public spaces are also in line with the lighting, visibility and barrier free design, as per the guidelines of Smart City. The policies at the micro level have been directed at straightforward maintenance agreements, e.g. memoranda of understanding between the Municipality and Kudumbashree groups or residents associations on the daily maintenance of certain parks or courtyards. These ad hoc arrangements of adopting space would institutionalise community stewardship but not to the full extent of abrogating financial liability to the municipality.

1.5 Why This Proposal Is Appropriate for Rajaji Nagar??

Combined, the proposed strategy clusters provide a redevelopment way that is especially adapted to the situation in Rajaji Nagar. The settlement is located centrally embedded in the city completely within the labour markets and social networks, physically bounded by high densities, low lying land and already a complex built fabric. In such a scenario, the idea of large scale relocation or tabula rasa reconstruction would be disruptive, costly in addition to being practically hard to enact. The most practical method of ensuring improved living conditions without compromising on the same benefits which make Rajaji Nagar a viable place to stay is therefore an in situ, incremental framework.

The proposal begins with what is already there other than with an abstract ideal. It acknowledges the high stocked KSHB and COSTFORD housing and the internal lane network already used by the residents and even active neighbourhood groups and Kudumbashree units. The housing approach enhances safety and minimizes overcrowding by promoting the renovation and small vertical expansion of the existing houses and the progressive movement of only the most vulnerable kuccha housing to other areas leaving households near their current neighbours, workplaces, and schools. This strategy circumvents the social cost and institutional complexity of wholesale reconstruction or high- rise redevelopment that will hardly be practical on this site.

At the same time, the infrastructure cluster accomplishes the important environmental and mobility matters of the area with simple and strong solutions: rebuilding the canal, creating a clear drainage system and streets, as well as permeable surfaces and elevated pedestrian walkways where they are most needed. The model focuses on minor but well, positioned changes instead of suggesting expensive, high-tech solutions, which can be done in conjunction with the existing local government and state programmes.

The land tenure and control measures are specifically light, to ensure that there is sufficient security and coordination to make investment worthwhile. Normalisation of leases of current tenants, giving proper occupancy papers to resettled families and utilisation of the established institutional frameworks such as KSHB, Municipal Corporation, Kudumbashree, ward level committees eliminate uncertainty without bringing about large new bureaucracies. This is significant in an environment where administrative ability and financial assets are restricted and community trust is developed gradually.

Lastly, the network of pocket parks, shared courtyards and small community centres is a response to apparent lack of usable open space and social infrastructure, but in a manner that will be harmonious with the high density of the location. The proposal does not require big vacant spaces, but it stitching

comprises numerous small opportunities that will occur with the removal of kuccha and micro re blocking. This small-scale plan of the public space contributes to the social life, provides less hazardous areas to women and children, and offers points where other services like childcare and health outreach could be accessible at the convenient walking distance.

The proposal is, on the whole, a perfect fit for Rajaji Nagar not because it is great or changes everything at once, but because it reflects the community's geographical limitations, its institutional set, up and its social conditions.It identifies the highest priority hazards, leverages the existing strengths, operates within the current policy frameworks and makes a provision for gradual upgrading through public agencies and residents working together. Given the limited ambit of this dissertation, it provides a consistent and feasible change of direction which can be further polished and fleshed out in the subsequent technical and participatory planning stages.

CHAPTER 2
DISCUSSION AND CRITICAL DEBATE

2.1 Discussion: Bridging Policy Aspirations and Ground Realities in Informal Settlement Redevelopment

This thesis has explored the uneven topography of informal settlements renovation with references to Rajaji Nagar (Chengalchoola Colony), a high-density settlement in the centre of Thiruvananthapuram. The study shows a deep contradiction between the progressive policy discourse and systemic implementation delays- which is not only a trend that Rajaji Nagar redevelopment has stalled, but also the entire urban transformation agenda in India. The offered integrated design framework will address this lack of connection by basing its strategies on the evidence provided by successful case studies and spatial analysis of the area and proven principles of participatory and in-situ upgrading (Williams et al., 2019; Government of Kerala, 2017).

2.1.1 The Policy-Practice Chasm: Evidence from National Programs

As seen in the comparative policy analysis, there are high disjunctions between the goals of national housing schemes and its results. JNNURM-BSUP had the 64 percent completion rate, but 90 percent of apartments were refused by the beneficiaries (SPARC, 2012; Mitra, 2022). Rajiv Awas Yojana was not very much implemented, with settlements such as Rajaji Nagar having no envisaged institutions (Government of India, 2013; Williams et al., 2019). Only 22 percent unit construction nationally was reached by PMAY-ISSR, and such flagship sites as Dharavi have not improved (Mitra, 2022; Land Conflict Watch, 2023). By comparison, 365,531 housing units were recorded by the LIFE Mission of Kerala by 2023 based on decentralized execution, mobilization of communities via Kudumbashree, and integration with the existing welfare systems (Government of Kerala, 2017; LSGD Kerala, 2023). This shows that institutional capacity, political will and embeddedness of a community are more important than a national policy design. The philosophy of using existing structures instead of forming parallel bureaucracies by the LIFE Mission serves as a directly apposite structure to apply to Rajaji Nagar.

2.1.2 The Spatial and Social Logic of In-Situ Redevelopment

The economic sustainability of the inhabitants of Rajaji Nagar depends on its closeness to job centers (1- 2 kilometers), which enables home-based livelihoods, informal services, and labor is accessible (Master Plan, 2012; COSTFORD, 2005). In-situ upgrading is the solution to these vital economic links, yet most Indian cities use peripheral relocation, which results in the disruption of these relationships: a 20-year longitudinal study of slums in Chile found that in-situ upgrading raised housing quality in the long-term, attracted higher socioeconomic residents, reduced crime by 11 percent, and cost half of the cost of relocation per beneficiary (Econ Wisconsin, 2024; UC Berkeley Haas, 2025). Instead of wholesale-based demolition, the suggested structure of Rajaji Nagar is the selective vertical extension of structurally sound blocks, the gradual removal of the weakest items, and the micro-reblocking of bottlenecks. This strategy does not only continue the community, but it also ensures the safety and survival of the children and the economy through community networks and networks, and takes care of the safety and environmental risks. Such an approach is compatible with infrastructure-first interventions introduced in Yerwada (Pune) and in Slum Networking Programme of Ahmedabad where HRs were catalysed to initiate housing improvements (Munot, 2023; SEWA, 2002; World Bank, 2007).

2.1.3 Infrastructure as Foundation: Addressing Environmental Vulnerability

The site of Rajaji Nagar is the silted Amayizhanchan canal, and thus acutely susceptible to monsoon flooding, a susceptibility worsened by climate change and poor management of storm water. The infrastructure cluster of the proposed framework is based on the needs of draining restoration, desilting of canals, and a hierarchical network of primary and secondary drains as a form of environmental core around which all other improvements can be organized but not as technical solutions. This sequencing is based on the experience of the Ahmedabad Slum Networking Programme where visible infrastructural improvements generated trust in the residents and allowed them to invest in housing later (SEWA, 2002; World Bank, 2007). The framework focuses on permeable surfaces, canal edges setbacks, and raised pedestrian walkways, which is a direct response to site-specific flood mapping based on the canal edges that have been analyzed using GIS (Niranjana et al., 2021; COSTFORD, 2005). The proposal would reduce displacement to the greatest extent possible, since only canal-edge kuccha houses are at most at risk of floods, and that the families would be relocated to improved blocks within the settlement area, which would eradicate the greatest environmental risk. This focused methodology is opposed to the blanket relocation strategies, which were common in failed BSUP projects in Thiruvananthapuram, where intermediate rehousing resulted in the high vacancy rates due to informal migration of the families towards the inner city (Williams et al., 2019; SPARC, 2012).

2.1.4 Tenure Security as Catalyst for Investment

The analysis of the case study and the literature review work constantly shows that the tenure insecurity is the most essential impediment to the achievement of the continuous upgrading. The public agencies and households will not make long-term investments without safe occupancy rights (UN-Habitat, 2025; Payne and Durand-Lasserve, 2012). The tenure policies that are proposed include regularization of long-term leases of the current KSHB tenants, transparent allocation policies in the families relocated, and pilot schemes of cooperative ownership the rationales of which are directly based on the successful examples of Baan Mankong (Thailand) and LIFE Mission with its documented occupancy rights (Boonyabancha & Mitlin, 2012; Government of Kerala, 2017). Notably, the framework does not dictate full freehold ownership but it knows that tenure security in the form of incremental tenure security along a continuum of documented occupancy, to long-term lease, to ultimate land titles, can suffice to catalyze household investment (Payne, 2012). This practical strategy recognizes that land tenure in Kerala is a complicated situation and does not require the legal and political stalemate that usually follows calls to immediate property titling in informal settlements.

2.1.5 The Kudumbashree Advantage: Community Institutions as Implementation Vehicles
The institutional environment of Kerala, namely the Kudumbashree network of women neighborhood groups that covers the state, provides an implementation advantage that is not present in most of the Indian cities. Since the structures of established neighborhood groups already exist in Rajaji Nagar, the framework harnesses the structure to participate in planning, construction oversight, and management of community facilities instead of establishing new bureaucracies (Kudumbashree, 2024; Government of Kerala, 2011). This choice is supported by the results of various case studies that indicate that exogenously imposed project authorities usually cannot achieve the trust and local knowledge to have a long-standing collaboration with the community (REAL CORP, 2021; IIED, 2019; GPSC, 2021). Nevertheless, the framework also takes into consideration that the significant involvement of communities cannot be achieved only through tokenistic consultation (REAL CORP, 2021; Nature, 2025; IIED, 2019). The study of informal

settlement upgrading in South Africa showed that despite the clear expression of the principles of participation in policy, the failure in the implementation meant that people did not receive basic information on the plans and designs of the project, which caused mistrust and resistance (REAL CORP, 2021). The proposed governance arrangements to prevent this trend include periodic meetings on coordination at the ward level, open beneficiary selection procedures, which should be based on vulnerability factors, and participation of the community in maintenance agreement of the communal spaces. Such mechanisms are meant to institutionalize participation as a continuous process and not a consultation exercise that is periodically done.

2.1.6 Cultural and Social Dimensions: Beyond Physical Upgrading

The thesis shows that informal settlement redevelopment which is successful, should be sensitive to both socio-cultural continuity as well as physical enhancement. The multi-religious (five religious communities in 886 families) set up of Rajaji Nagar, the developed social networks, and the traditional livelihood patterns are all considered social infrastructure equally valuable as physical infrastructure (Smart City Thiruvananthapuram, 2022; Meera, 2015). The concentration of the framework on preserving neighbor groupings in the phased relocations, the use of pocket parks and community halls as social platforms, and the design of ground floor units to accommodate home based businesses are indicative of the knowledge that redevelopment should not interrupt the social and economic activities that give community resilience. This focus on cultural conservation helps this proposal to be distinct as compared to market-oriented redevelopment models, which focus on the maximization of real estate value in addition to social continuity. A study of Mumbai on redevelopment of chawls, found that the resettlements policies where the communal living patterns were not taken seriously created a high resistance of the resident despite being technically superior in terms of housing units (Gawde and Paliwal, 2023). The moral of the story about Rajaji Nagar is that the typology of housing, their spatial patterns, and phasing plans should be competent in terms of culture, i.e. not of the people themselves.

2.2 Critical Debate: Why This Framework Could Succeed Where Smart City and Past Interventions Have Failed

The proposed integrated framework is a plausible avenue of implementation when the past slum upgrading projects have been brought to a halt. This part analyzes why Smart City and the previous national initiatives have failed, what structural flaws they foster, and why the approach to governance offered by the thesis framework can overcome these failures.

2.2.1 Top-Down Planning no Community ownership: The Smart City Impasse

Phase I of the Smart City plan suggested 248 dwelling units that were to be transferred temporarily 189 families, and only 18 families agreed by 2021, which led to the cancellation of the project (Smart City Thiruvananthapuram, 2022; New Indian Express, 2021; PropNewsTime, 2025). This is similar to JNNURM-BSUP where 90 percent of the beneficence did not accept the apartments even when 64 percent of the apartments were completed due to designs lacking resident participation (SPARC, 2012; Mitra, 2022). The high-rise apartments of BSUP disregarded the livelihoods of people working at home and neighborhood networks resulting in high vacancy and informal back-migration (Williams et al., 2019; SPARC, 2012). The top-down SPV system of the Smart City proposes final designs to the residents instead of the residents participating in the decision-making process of the system on the assumption that physical quality will guarantee acceptance. The suggested framework reverses the given dynamic: the residents will be co-decision-makers, rather than end-stage

consultees. Ward-level committees that have elected resident representatives are as powerful as government officers in their decisions regarding the phases, design, and the selection of the beneficiaries. Successful experiences in Baan Mankong processes are manifested through participatory enumerations, mapping and design workshops, which are facilitated by reputable Kudumbashree Neighbourhood Groups using scale models and field visits (Kudumbashree, 2024; Boonyabancha & Mitlin, 2012). When the residents have the true power of the veto, they turn into would-be blockers rather than stakeholders and will be guaranteed a long-term support during the implementation.

2.2.2 Why Incremental Phasing Work Succeeds Mega-Projects Stall?

The project of Smart City was planned to be completed in 2020, but because of the delays in the procurements process, the contractor controversies and the change of priorities, the project completion was postponed until 2025 (New Indian Express, 2024; Times of India, 2024). Mega-project contracts do not allow the possibility of adapting to the middle of the implementation; unforeseen drainage or structural problems cannot lead to redesign because of the prohibitive costs under the law and money (Smart City Thiruvananthapuram, 2022). Fixed deadlines consider the political schedules more important than quality and community adoption, and projects of Smart City in the country have not achieved their funding because of the bottlenecks of implementation and slow procurement (Nature, 2025; Policy Circle, 2025). The suspension in 2021 of Rajaji Nagar proves that strict schedules do not work against the local resistance, and instead of adjusting to the situation, a permanent stalling is achieved (New Indian Express, 2021). The framework proposed inverts this, because tenure security is frontloaded as a condition of the tenure, rather than post-construction condition. Present occupants (KSHB and COSTFORD) are given renewed 30-99 year leases on renewal with new occupancy certificates prior to renovation; kuccha house families are given written occupancy rights or cooperative membership certificates prior to relocation, given out on transparent vulnerability basis. Pilots using cooperative ownership were able to obtain 78 percent tenure security via collective ownership or long-term leasing by Baan Mankong, which accesses [?]2 billion in community revolving savings despite not acquiring individual freehold titling (Boonyabancha & Mitlin, 2012; CODI, 2019). Through tenure security advancement, residents can be made co-investors, with vested interests, which will make them stop being potential resistors, and become stakeholders in the community upgrades.

2.2.3 Why Diverse Funding Streams Outlast Single Schemes?

The solitary source of funding generates existential vulnerability at Smart City. The mission was moved to 2025 without post-mission setups, and its time was originally planned to be 2020 (New Indian Express, 2024; Times of India, 2025). In case it takes longer than the deadline of the scheme, which in this case probably involves delays in the past, it is subject to further funding based on the political priorities (Smart City Thiruvananthapuram, 2022). This risk is demonstrated by precedent: JNNURM ended in 2012 has left projects incomplete; Rajiv Awas Yojana closed down in 2015 before it was implemented (Mitra, 2022; Williams et al., 2019). The given framework will reduce this issue by diverting funds into various schemes: infrastructure is funded by AMRUT and Smart City; housing upgradation is funded by PMAY-ISSR and LIFE Mission; community facilities are funded by PMAY-ISSR and LIFE Mission; tenure regularization is funded by KSHB policies; public spaces are funded by Smart City and BSUP. Such a diversification makes it possible to implement in phases: ground-floor commercial units generate [?]5,000-10,000 every month as a rental source and community maintenance funds, resident contributions ([?]100-500 monthly, income-based)

maintain the drains, parks, and facilities, and Kudumbashree Neighbourhood Groups run the funds through annual social audits and make it less dependent on the municipality (Kudumbashree, 2024). This practice is similar to the savings cooperatives of Baan Mankong that has banked [?]2 billion in revolving funds that maintain community upgrades years after government subsidies had ceased (CODI, 2019).

2.2.4 Why Decentralized Implementation Works Better Than SPV Control?

The Special Purpose Vehicle (SPV) of Smart City is, in fact, a side-arm of the Municipal Corporation, which, however, is not accountable to the community or their elected representatives but is accountable to the state and central governments (LSGD Kerala, n.d.; Smart City Thiruvananthapuram, 2022). Some studies demonstrate that these SPVs evade the local democratic scrutiny: they still retain the authority in the unelected, tech-savvy hands of the SPVs, excluding the municipal councils and the ward committees that are actually the people who should be making the calls (Nature, 2025; LinkedIn, 2023). The result? The projects are bulldozed over the top of the residents and construction certificates are handed out immediately, and the Town and Country Planning Act is ignored (Nature, 2025). Such top-down arrangement makes the deadlines of the contractors prior to the quality of life of people, the idea of success is the number of bricks that got laid or money that was spent but not the happiness of people or the impact of this on their livelihoods- just like the old JNNURM-BSUP mess (Mitra, 2022; SPARC, 2012). In 2021, the community did not comply when the owners of the Rajaji Nagar attempted to destroy a block and resettle residents (New Indian Express, 2021). The scheme in this case reverses that trend: the ward-level committee is the actual boss, and the Municipal Corporation serves as a control to both the elected council and the electorate. Approximately 40 per cent of the leadership in the committee should be manned by resident reps so that the community actually has a say on the phases, design changes, who is allowed to live where and how the common areas are divided. The SPV is not a power of its own, not a technical or financial assistance at all. In that manner the redevelopment fits well into the constitutional decentralization of Kerala (73 rd and 74 th Amendments) hence it is legally viable and politically responsible as opposed to those grand central plans which just never fill the local checklists (Government of Kerala, 2011; LSGD Kerala, 2023). It is based on the LIFE Mission model, according to which the local governments choose to carry the implementation and financing but remain responsive to the local circumstances, which the central schemes cannot (Government of Kerala, 2017). The politics of suddenly dropping a project is sooo expensive when the local officials and the community are making the calls.

2.2.5 Why Previous Schemes Failed: A Pattern of Structural Disconnects

JNNURM-BSUP (2005-2012) was performing well with 64% completion but 90% of the rents were denied by the target audience that is meant to be served by the initiative showing that merely constructing houses without further considerations of jobs, environment or getting the community into the loop kills the project (SPARC, 2012; Williams et al., 2019). In Thiruvananthapuram, the tall towers lacked employment opportunity and social services, as a result, individuals had to relocate or go back to informal settlements (Williams et al., 2019; SPARC, 2012). That was the final destination of the architects and builders they did not allow any voices of people residing there to affect the appearance of the completed rooms (SPARC, 2012). The concept of upgrading in place and tenure was increased by Rajiv Awas Yojana (2013-2015), which, in two years, halted before passing surveys and plans (Mitra, 2022; Government of India, 2013). Due to the next government turning the switch, the project lacked a foundation in local governance and was pulled out

(Government ⁻ One, 2013; Williams et al., 2019). PMAY -ISSR (2015 -present) boasts it is all about in-situ slum redo, but only constructed 22 per cent of the national units; a flagship in Dharavi is in the planning phase ten years on (Mitra, 2022; Land Conflict Watch, 2023). The PPP deals allow developers to cross-subsidise low-cost housing with FSI privileges or TDR, which contravenes the fear of eviction in the minds of people, and thus nothing goes on (Mitra, 2022; Land Conflict Watch, 2023). Smart City Rajaji Nagar resembles it greatly: it has a lagging schedule, was on hold in 2021 due to the people saying no, and has an unclear ownership and participation mix (Smart City Thiruvananthapuram, 2022; New Indian Express, 2021). The leading SPV/contractor spurt only imitated the recipe of the BSUP (New Indian Express, 2021). The larger point is that the central, contractor-based models allow rent-seeking in the procurement and land deals, and community-operated models compel the transparency and nail down the corruption (Bhan, 2013; Weinstein, 2014; Mitra, 2022). As an illustration, the tall redevelopment will accumulate land value through FSI bonuses and TDR that make developers and speculators feel cheated and the average people are left behind. Such embedded rewards continue the cycle of failure, despite the statistics that indicate slow, participatory, on-the-ground strategies prevail (Econ Wisconsin, 2024; UC Berkeley Haas, 2025).

2.2.6 Why This Framework Overcomes Political Economy Barriers

Although research supports the idea that the slow, community based upgrade is superior as in the case of Slum Networking Programme in Ahmedabad, Thailand in Baan, and Kerala in LIFE Mission it lacks a place in national policy since it will eliminate rent-seeking employment and demand transparency. The proposed plan breaks that ceiling through support and exerting pressure in three ways. To begin with, the push of the people is transformed into a political weapon rather than a roadblock. In 2021, a 2021 sit-down in Rajaji Nagar stopped a 61.42-crore takeover the evidence that communities can take on a call (New Indian Express, 2021). Anything vetoed in this system will be the main infrastructure and the design of the buildings and hence leadership cannot just flick a switch and forget it, they have to work out a serious compromise or turn off the plug-so the notion that a project can die in the middle no longer works. Fulfilled vows are expensive in the real politics today, as the decision is made by the people who belong to the group (REAL CORP, 2021; Williams et al., 2019). Second, actual on-ground work displays outcomes, which solidifies the trust of the population. During the first two years, the fix of the drainage, cleaning canals and widening emergency lanes provide people with the physical evidence that they have less of a problem with flooding and the improvement of their neighborhood (COSTFORD, 2005; Niranjana et al., 2021). This form of social evidence transforms doubters into fans and urges them to marshal put-in-to-power reps to continue with the subsequent stages (SEWA, 2002; World Bank, 2007). Now, what about the case where you put the project down mid-way, it is a pain in the neck politically as the society will shout at you but that is more difficult to track on the radar when it comes to a large central project. Third, there is already a presence of solid Kerala nitty-gritty, a plethora of the educated population, and a battery of community groups that are not going to allow the elite to be envious (Williams et al., 2019; Government of Kerala, 2011). The 4.5-million network of mostly women of savings groups and community work in Kudumbashree provides an automatic watchdog that can drain the corruption out, which top-down plans can hardly avoid. This design extends a political survival that central plots are powerless to match by building upon what is already present. Those states that do not have this bridge are not deprived of the opportunity of copying the ward-level governance and participatory mindset- only modify it and invest in organizing the community.

2.2.7 Synthesis: Why Implementation Happens This Time

The critical discussion reveals that the framework is a success where Smart City and its predecessors have failed because it takes into account the direct reasons for failure that are documented instead of repeating their structural weaknesses. The framework places community participation at the core, not as an afterthought, thus, residents co, design, co, decide, and co, manage upgrading, not being passive beneficiaries of predetermined plans. It sequences work realistically, with infrastructure, first improvements that establish trust before major housing construction; incremental stages that allow for adaptation as situations change; and phasing that fits the actual capacity of municipal agencies for delivery rather than using externally imposed timelines. It obtains tenure as the essential primary condition in advance, thus, removing the root of project failure and resistance. It spreads funding over several schemes, thus, ensuring its existence beyond the duration of any single program and creating self, sustaining maintenance mechanisms through community savings. It grants decision, making power to ward, level committees that have genuine resident representation, thus, providing electoral accountability and local responsiveness that SPV, led centralization cannot achieve.

What sets apart the new strategy is the fact that it considers the local community as rational actors whose resistance to the previous schemes was most probably based on their disappointment and not merely irrational behavior that could be broken through stricter enforcement. Firstly, the move from demonstrators to co, implementers with the project by local residents has been achieved through the framework addressing their main issues, ensuring livelihood by allowing biographical proximity with employment centers, securing the right of occupancy before displacement, living in a safe environment which is made possible by measures of flood prevention, and quite participation in decision, making. This political realism, which is supported by examples of effective implementation in the localities of South Asia and India, is the reason why the framework is a credible solution to repeated national initiatives that have been on the wrong track. Implementation of such a project will succeed this time around because the elements of success are integrated into the structures of governance, the logical and practical sequencing, the availability of funds, and the incentives given to the residents rather than depending on the unreliable political will and the bureaucratic efficiency which has been seen to be inconsistent.

CHAPTER: 3
CONCLUSION

This thesis has discussed the pressing issue of how informal communities such as Rajaji Nagar (Chengalchoola Colony) can be changed into safe, dignified, and sustainable communities without forcing out the low income population whose livelihoods rely on the centrality of the urban areas. This investigative process has cut across the various levels, beginning with global policy and scheme-level analysis and concluding with site-based GIS and household-level livelihood patterns; it has shown that the effective redevelopment is not a one-time intervention, but the convergence of spatial design, institutional capacity, convergence of policies, community agency and political commitment.

3.1 Synthesis of Key Findings

Policy Gaps and Institutional Lessons:

Positive comparison suggests that the principles of participatory, in-situ upgrading have not been largely applied at scale. The JNNURM-BSUP programme was documented at 64 per cent completion with covering a 90 per cent refusal by beneficiaries; RAY progressive concept was discarded before its implementation and the PMAY-ISSR only reported 22 per cent construction nationwide with no flagship achievements (SPARC, 2012; Mitra, 2022; Land Conflict Watch, 2023). The failures are not due to the design of the policy, but to implementation: the contractor-based models neglect the community, the high-rise typology clashes with the informal life, the poor integration of infrastructure, the poor coordination between agencies, and the lack of trust is undermined by short project cycles (SPARC, 2012; Mitra, 2022; UN-Habitat, 2025; IIETA, 2025). The Kerala LIFE Mission proposes another option: 365,531 units by 2023 completed in a decentralized effort, with Kudumbashree-based community mobilization, and through integrating with welfare systems (Government of Kerala, 2017; LSGD Kerala, 2023). In this case, the focus on using existing institutions, that the government should act as a facilitator and not as a controller, and promote incremental modernisation based on the financial capacity of households are supported.

Spatial and Environmental Imperatives:

Opportunities and vulnerabilities are discovered after GIS analysis of Rajaji Nagar. The proximity of livelihood (12-3 kilometres to employment centres) makes it impossible to relocate to peripheral areas as is the case with the central location (Master Plan, 2012; COSTFORD, 2005; Thiruvananthapuram Municipal Corporation, 2013). However, the canal-bank environment triggers occasional flooding; the built-up kuccha/semi-pucca environment and the canal-side buildings create fire, air-quality and structural risks (COSTFORD, 2005; Niranjana et al., 2021). The integrated design framework emphasises on drainage and flood resilience as preconditions to housing and community improvement. A 20-year longitudinal study in Chile demonstrates the beauty of in-situ upgrading: the quality of permanent housing goes up, socioeconomic attractiveness goes up, and negatively spillovers occur in neighbourhoods (11 percent crime reduction, more investment), and fiscal efficiency (some 1/3 the cost of relocation) is realised (Econ Wisconsin, 2024; UC Berkley Haas, 2025). This disputes the notion that informal settlements should be slated to be cleared to develop upon; upgrading offers more social, economic, and fiscal advantages than displacement.

Social-cultural aspects of Community Resilience:

Informal settlements do not constitute spaces in need of infrastructure but instead, strong social networks, support mechanisms, cultural practices, and adaptive livelihoods define them as socio-cultural systems (Williams et al., 2019; Meera, 2015). The multi-religious needs of Rajaji Nagar and

neighbourhood associations, as well as home-based enterprises, are the elements of social capital that the redevelopment should not destroy but instead help to develop (Smart City Thiruvananthapuram, 2022; COSTFORD, 2005; Meera, 2015). Mumbai chawls, Yerwada (Pune) and Baan Mankong (Thailand) case studies depict that housing typology, spatial organisation and phasing solutions that do not interfere with established social forms induce resident investment and satisfaction; redevelopment that detracts communities or introduces alien forms fosters resistance, vacancy and informal re-occupancy (Gawde et al., 2023; Munot, 2023; Boonyabancha et al., 2012). This is operationalised in the framework as neighbour groupings are maintained during relocation, ground-floor live-work units are developed, pocket parks are created as social spaces and religious buildings are incorporated into the networks of the public spaces.

Participation and Governance as Success Determinants:

The results of redevelopment are extensively dependent on the governance structures. Top-down models of states create resistance and ignore local knowledge; market-based models evicts the poor in the name of gentrification; effective models give the poor real decision-making powers on design, budgets and implementation (Boonyabancha″ Mitlin, 2012; REAL CORP, 2021; IIED, 2019; GPSC, 2021). The suggested ward-level Rajaji Nagar Redevelopment Committee institutionalises the co-governance by use of Kudumbashree neighbourhood groups and the Municipal Corporation as a nodal agency. Nonetheless, the format of the SPV of the Smart City entails the risks of destabilised participation through parallel decision making and through the timelines of contractors (LSGD n.d.; Nature, 2025). Sophisticable safeguards are put in place so that meaningful participation can be achieved: resident-independent documentation, gradual consenting processes, community-level accountability, and community-level capacity building (REAL CORP, 2021; IIED, 2019; GPSC, 2021).

3.2 Answering the Research Questions

Primary Research Question:

How can integrated design, infrastructure policy, and participatory governance frameworks work in harmony to make sure that the in, situ redevelopment of Rajaji Nagar (Chengalchoola) brings prompt improvements in housing, livelihood security, and community well, being without the implementation failure and resident resistance, which have always been the features of the past interventions?

The integrated framework proposed in Chapter 1 of Part C provides a comprehensive answer: by sequencing infrastructure improvements (drainage, canal restoration, internal circulation) as the visible foundation that builds resident trust; by leveraging existing KSHB and COSTFORD blocks for selective vertical extension rather than pursuing wholesale demolition; by phasing kuccha house relocation in small increments with transparent rehousing within the settlement footprint; by regularizing tenure through documented occupancy rights that trigger household investment; by embedding Kudumbashree groups in design, monitoring, and management roles with real decision-making authority; and by aligning all strategies with existing funding streams (PMAY-ISSR, LIFE Mission, AMRUT) to ensure fiscal feasibility. Most importantly, the framework evades failure of the past schemes by:

- Opposing the peripheral relocation that cuts access to the livelihood, which proved to be better in Chile by the data on in-situ upgrading (Econ Wisconsin, 2024; UC Berkeley Haas, 2025);
- Infrastructure-first, housing-second, in the pattern of the Ahmedabad Slum Networking Programme in which basic services were stimulated by household-based improvements (SEWA, 2002; World Bank, 2007);

- By making use of light instead of constructing parallel bureaucracies which will divide accountability;
- Pacing interventions to fit the local financial and institutional capacity, decreasing the risk of a project and making corrections along the way;
- Giving tenure security in stages (leases, occupancy certificates, would-be cooperatives) instead of requiring full ownership which would paralyze the legal system (Payne & Durand-Lasserve, 2012; Boonyabancha and Mitlin, 2012).

Secondary Research Questions:

What are the existing spatial, environmental, social, housing, infrastructural, and environmental risk challenges in Rajaji Nagar, and how do relevant Indian urban policies and programs (such as JNNURM, RAY, PMAY, LIFE Mission) currently address or fail to address these issues?

The analysis of the site reflected serious problems: overcrowding (5-10 people per 25-35m2 unit), a state of significant structural degradation of decades-old KSHB blocks, an exposure of the canal-edge kuccha houses to monsoon flooding, insufficient drainage systems that caused waterlogging, insufficient internal lanes leading to weak accessibility, weak tenure that adversely affects investment incentives, and the lack of organized open space or community amenities (COSTFORD, 2005; Niranjana et al., The Indian policies take these problems rhetorically-PMAY-ISSR pledges in-situ upgrading, RAY highlighted the importance of tenure security, LIFE Mission combines infrastructure with housing-but implementation loopholes persist: the contractor paradigm avoids communities, the high typologies of high-rise undermine livelihood motives, weak inter-agency coordination stails approvals, and short-term funding cycles undermine long-term engagement (Mitra, 2022; SPARC, 2012; UN-Habitat, 2025; IIETA, 2025).

Which integrated in-situ design and implementation strategies for infrastructure, housing upgradation, and community spaces—drawn from successful informal settlement redevelopment case studies in India—are most transferable to Rajaji Nagar, and how should they be adapted to its specific context while minimizing displacement and ensuring community participation?

Four strategies can be obtained as direct transfers:

Infrastructure-First Sequencing (Ahmedabad SNP): Drainage and water supply can be seen through improvement to build trust and create household-investment conditions (SEWA, 2002; World Bank, 2007). Adaptation: Phase 1 Canal restoration and hierarchical drain networks should be prioritized, and a housing upgrade should be done after environmental safety is ensured.

Nano-housings with Live-Work Flexibility (Yerwada, Pune): Ground-floor commercial space and core units with expansion are provided to accommodate home-based livelihoods (Munot, 2023; Desai, 2013). Adaptation: Design enhanced KSHB blocks with structural ability to accommodate house hold led vertical additions and adaptable ground floors.

Community-Led Planning and Tenure Flexibility (Baan Mankong, Thailand): Organised communities bargain designs, run building and obtain collective tenure of land (Boonyabancha & Mitlin, 2012; Mitlin and Walnycki, 2019). Adaptation: Empower Kudumbashree groups to guide participatory mapping, benefit allocation and pilot cooperative ownership models.

Decentralized Implementation (LIFE Mission, Kerala): The Part of the funding and decision-making is in the hands of Local Self-Governments, which allows them to respond to the local context (Government of Kerala, 2017; LSGD Kerala, 2023). Adaptation: Have Municipal Corporation as nodal

agency with ward-level committee authority, but no top-down control of Smart City SPV (LSGD Kerala, n.d.).

3.3 Contributions to Knowledge and Practice

Methodological Contribution:
The combination of GIS-based spatial analysis, comparative policy analysis, synthesis of international case studies, and development of evidence-based design frameworks prove that the replicable methodology is the diagnosis of informal settlements and the design of interventions. The particular connection between spatial vulnerabilities (flood-prone areas, kuccha houses sites) to specific methods of action (staged relocation, drainage hierarchies) and policy tools (AMRUT, PMAY-ISSR) is an example of how academic research can be implemented into the planning framework (Niranjana et al., 2021; COSTFORD, 2005).

Theoretical Contribution:
The thesis confirms and expands the theories of incremental urbanism, participatory planning and spatial justice by showing that informal settlements have internal logics, social capital and adaptive capabilities which are usually destroyed by conventional planning. The model built on the idea that the community structure (Kudumbashree) and fabric built (KSHB blocks) should be utilized instead of introducing new solutions to the area indicates the relational approach to planning, where residents are viewed as co-producers rather than consumers (Williams et al., 2019; REAL CORP, 2021; IIED, 2019).

Policy Contribution:
The thesis offers evidence of reforming the urban housing policy towards: by systematically recording the differences between national schemes (JNNURM, RAY, PMAY) and the realities on the ground. Not centralized, but decentralized control and flexible funding (LIFE Mission model) instead of the implementation based on contracts; Phasing was done by increments in accordance with institutional capacity and not the mega-project methodology; Tenure security as inducer of investment as opposed to end-state reward; Consideration of in-situ prioritization before relocating to the site when there are environmental constraints or land constraints that cannot be overcome (Econ Wisconsin, 2024; UC Berkeley Haas, 2025; Government of Kerala, 2017).

Practical Contribution:
The strategy clusters, which have clear connection to the already available policy instruments, namely in-situ development, housing upgradation, infrastructure development, land tenure and governance, public and community spaces give Thiruvananthapuram Smart City SPV, Municipal Corporation, KSHB, and Kudumbashree an implementation roadmap. The framework is structured in such a way that it is planned, cost-appropriate and politically possible without meeting the same destiny as masterplans that remain unimplemented.

3.4 Limitations and Future Research Directions

Methodological Limitations:
Lack of Primary Fieldwork: The use of secondary sources (COSTFORD technical surveys, journalistic coverages, academic behavioral mapping, governmental reports) offers highly informative data but does not present first hand resident accounts, ethnographic insight into the area, and participatory confirmation of suggested solutions (COSTFORD, 2005; Meera, 2015; Kumari, 2014). Future studies need to use household surveys, focus group discussions, participatory mapping workshops, and longitudinal ethnography to elicit lived experience and establish framework acceptability.

No Cost-Benefit Analysis: The framework lacks any financial modelling of costs (building construction, land purchase, compensation during temporary relocation) and benefits (health benefits, livelihood benefits, property value increase). The fiscal argument on in-situ upgrading and relocation would be bolstered by quantitative economic analysis (Econ Wisconsin, 2024; UC Berkeley Haas, 2025).

Minimal Climate Modeling: The vulnerability to floods is determined using strategies of drainage although the thesis does not touch the climate forecasts across different situations of emission levels or the long-term habitable conditions at the sites. Flood risk modeling of the future (2050 and 2100) under 2050 and 2100 climatic conditions would be used to determine whether settlement in this area is viable or planned resettlement is necessary (India Meteorological Department, 2020; Master Plan, 2012).

Conceptual Limitations:

The Community Cohesion Assumption: The framework presupposes that Kudumbashree groups and resident associations are the representatives of community interests, yet informal settlements do have internal hierarchies, power relations, caste and religious conflicts, and marginalized sub-groups of the population (tenants, recent migrants, stigmatized occupations) that could be excluded in the participatory processes (REAL CORP, 2021; IIED, 2019). The future studies need to investigate intra-community differentiation and strategies of inclusive participation.

 State Capacity Optimism: The proposal bases its planning on Municipal Corporation, KSHB, and state departments collaborating well with a ward-level committee, however, the inter-agency coordination attempt has failed over the past decades (UN-Habitat, 2025; IIETA, 2025). The framework can be overly naive about bureaucratic inertia, political interference and capacity constraints. Governance proposals would be strengthened by comparative research on the effective inter-agency coordination mechanisms on other informal settlement upgrading projects.

Risk of Gentrification: The framework emphasis on affordability and tenure security to prevent displacement only, in, situ upgrading that improves infrastructure and housing quality may lead to higher land values and rents, thus market, based displacement of the most vulnerable households (Econ Wisconsin, 2024; UC Berkeley Haas, 2025). The thesis lacks a direct reference to the gentrification risks.

Future Research Agenda:

According to Longitudinal Impact Assessment, the Rajaji Nagar framework must be implemented to facilitate continuous studies for 5, 10 years that would examine such aspects as the quality of housing, the effect on livelihood, the level of community satisfaction, the rate of displacement, and the price of housing. The intention of this assessment is to figure out whether situated upgrading is an effective method and if it can be applied to other settlements. Comparative City Studies point out that the integrated framework methodology should be transferred to the informal settlements of the cities of Kochi, Kozhikode, and Kollam in Kerala. The main focus would be on the directions of implementation, the institutional changes, and the identification of the success factors that are specific to the particular context. Climate Adaptation Integration encourages the use of neighborhood, level climate vulnerability indices and the incorporation of nature, based solutions, like bioswales, constructed wetlands, and urban forests, in the upgrading of informal settlements, thus, nurturing the planning for climate, responsive urban areas. Finally, Participatory Action Research recognizes the significance of residents as co, researchers by involving them in the design, monitoring, and evaluation of upgrading interventions to validate the strategies and to build their capacities for advocating their needs, according to various sources (REAL CORP, 2021; IIED, 2019; GPSC, 2021).

3.5 Final Reflections: Reimagining Informal Settlements as Sites of Urban Possibility

Rajaji Nagar, just as thousands of informal settlements in India and the Global South, exists in the suspended possibility between officially becoming a part of the formal city and becoming permanently marginalized. Its residents live with daily indignities of the structural breakdown, monsoon flooding, and tenure insecurity and at the same time, construct social networks, micro-enterprises, children to schools and Kudumbashree cooperatives. That is the paradox of deep deprivation and strong agency that determines the difficulty and prospects of the informal settlement redevelopment. The thesis statement is that this paradox should be solved not by demolishing and displacing (which kills the agency but provides the appearance of solving deprivation) but by providing in-situ upgrading, which acknowledges residents as legitimate urban citizens and gives them the right to safety, dignity, and involvement in making decisions on how to develop their neighborhoods (Williams et al., 2019; Econ Wisconsin, 2024; UC Berkeley Haas, 2025). The experience of Kerala LIFE Mission, Chile in-situ upgrading, Thailand Baan Mankong and the successful pockets of community-led redevelopment experience shows that such an approach is not idealistic but can be implemented when there is a political will, institutional capacity, community organization and long-term funding (Government of Kerala, 2017; Econ Wisconsin, 2024; UC Berkeley Haas, 2025; Boonyabancha and Mitlin, 2012). Nevertheless, the critical debate section is faced by the hard truth of the fact that such alignment is disputable and delicate. The Smart City Mission, the redevelopment vehicle of Thiruvananthapuram, has been found to embody numerous of the pathologies that characterize inclusive upgrading: a poor community engagement, top-down planning of the SPV, project delays, and superficial prioritization over fundamental improvement (Smart City Thiruvananthapuram, 2022; New Indian Express, 2021; LinkedIn, 2023; Nature, 2025; Policy Circle, 2025). The viability of the framework will be based on the possibility of local actors, including Kudumbashree groups, ward councillors, Municipal Corporation officials, and residents themselves to utilize Smart City resources and place-the-city-first, technocratic, and displacement dispositional orientations.

In the end, this thesis suggests that redevelopment of informal settlements is an issue of city justice: who is entitled to central land of high value, whose expertise will determine the future of their neighborhoods and whether cities are concerned with the continuity of livelihood or with maximization of real estate value. The integrated framework of Rajaji Nagar takes the position that the community has the right to stay in the city center because of decades of service delivery (domestic work, construction labor, informal commerce), that they have legitimacy in their community-based organizations just like government agencies, and that place upgrading has better social, economic, and fiscal returns compared to displacement. The question of whether this vision becomes a reality in Rajaji Nagar will not rely on the technical soundness of the planned strategies of the design which is based on tested precedents but rather the political determination of inclusive urbanism. The thesis ends by urging policymakers, planners and community leaders to stop viewing informal settlements as problems to be swept away and begin to see them as laboratories of urban possibility, in which with proper support, their own residents can become now the designers of their own destinies.

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LLMs (Perplexity AI) Prompts: 1. Paraphrase the paragraph while keeping the original meaning unchanged. 2. Check for grammatical and syntax errors, identify clarity issues, and provide suggestions for improvement.

LLMs (Gemini Nano Banana Pro) Prompts: 1. Generate an illustrative image for the study context. 2. Refine the image style and composition according to the author's instructions.