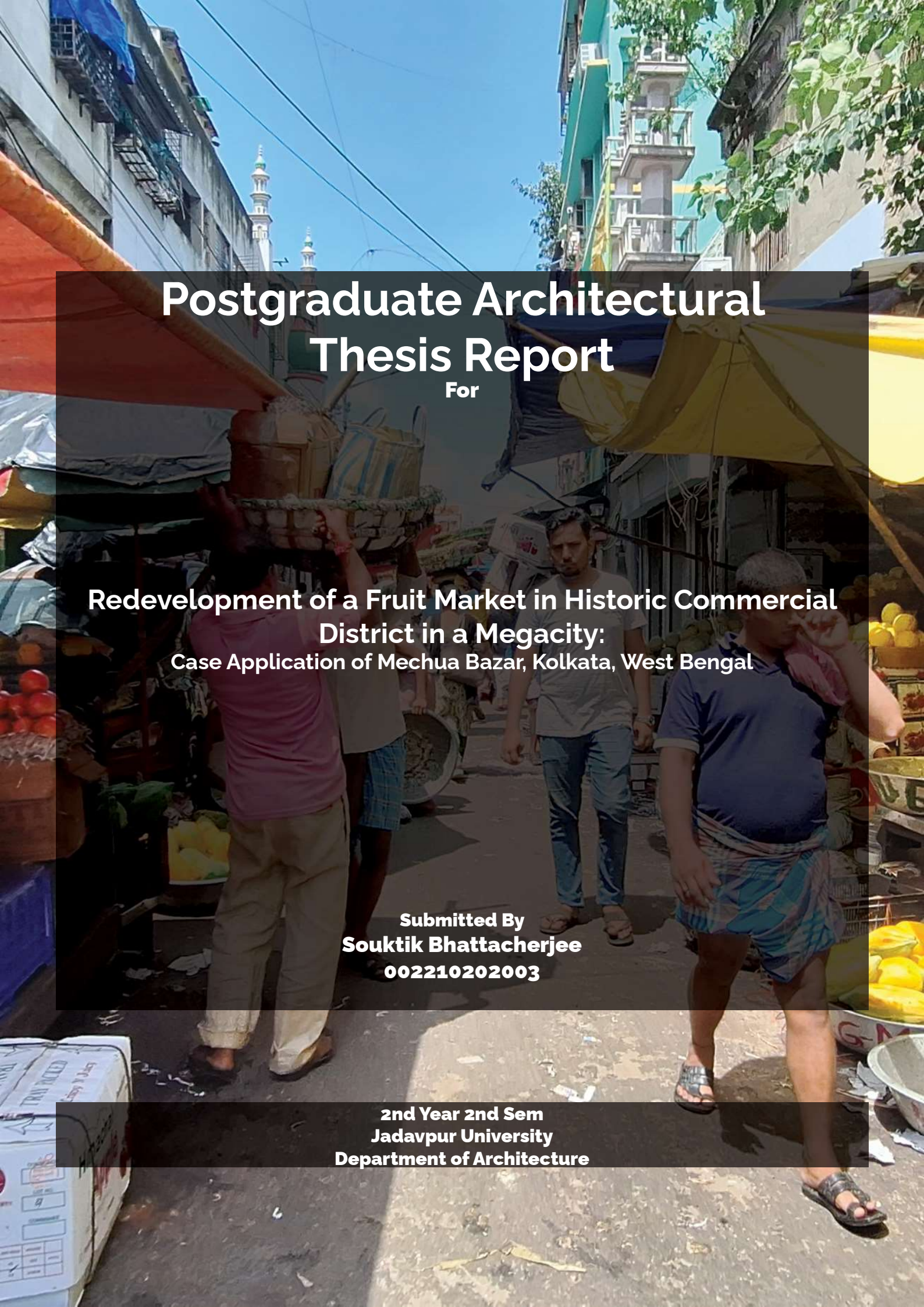

Postgraduate Architectural Thesis Report

For

Redevelopment of a Fruit Market in Historic Commercial District in a Megacity:

Case Application of Mechua Bazar, Kolkata, West Bengal

Submitted By

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I/We certify that the thesis entitled .....

.....

Submitted by Shri/Smt .....

In partial fulfilment of the requirements of the Bachelor's degree in Architecture of this University, is a bonafide work, to the best of my/our knowledge, and maybe placed before the Examination Board for their consideration.

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Supervisor

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External Examiner 1

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External Examiner 2

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External Examiner 3

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Head of the Department

Contents:

THESIS ABSTRACT

The thesis focuses on the redevelopment of Mechua Bazar Wholesale Fruit Market, situated in the historic commercial district of Bara Bazar, Kolkata. Kolkata, ranked as India's most unsustainable city, faces critical urban challenges like air pollution, poor sanitation, and ecological threats.

The aim is to redevelop Mechua Bazar into a modern, organized trade market, enhancing its functionality and urban integration. Objectives include organizing the market layout, improving accessibility from Central Avenue Road and the North-South Metro station, introducing sustainable measures, and conserving heritage structures. The scope involves modernizing the market, decongesting surrounding streets, creating a digital stakeholder database, implementing IoT technologies, and preserving heritage buildings. This research aims to provide a comprehensive urban design solution for Mechua Bazar, serving as a model for revitalizing historic commercial districts facing similar urban challenges globally.

ACKNOWLEDGEMENTS

For the successful completion of my Master's degree thesis, I would like to express my sincere gratitude to everyone who has helped me and guided me throughout.

I am beyond grateful to my guide Prof. Madhumita Roy for her constant guidance, support, and encouragement. Her insight into this topic has allowed me to explore the horizons of my subject in a new way.

I would like to thank each and every mentors who have provided me the opportunity to understand my site/project and encouraged me to take up project like this. I would also like to thank the Head of the Department and thesis coordinator, Prof. Tapas Kumar Bhattacharya; and our professor of subject "Term Paper Leading to Thesis", Prof. Sanjib Nag.

I am immensely grateful to all my teachers for guiding me throughout the entire course of study. Lastly, I would convey my gratitude to my parents, Sumit Kumar Bhattacherjee and Soma Bhattacherjee, and my uncle who supported and motivated me to work hard every day.

This work is dedicated to every friend of mine who came forward to share his or her experiences and helped me in gathering information and providing constant support.

List of Figures:

List of Figures:

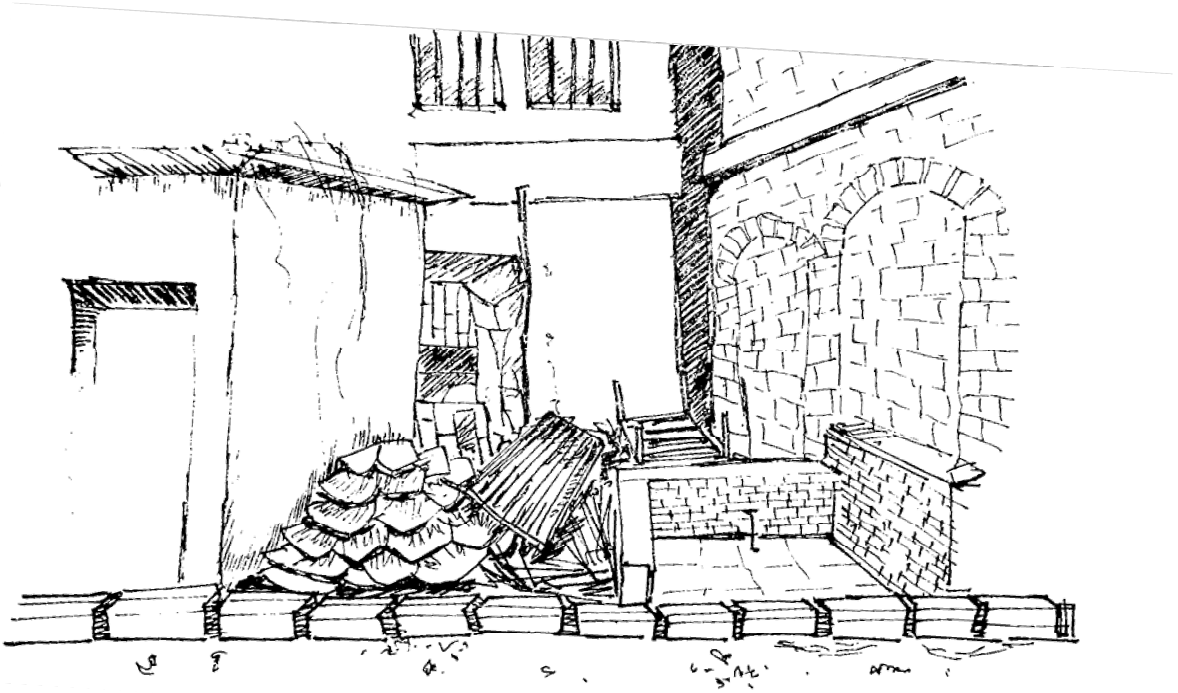
List of Figures:

List of Tables:

1.1 Background

Kolkata, once known as India's cultural capital, now faces severe sustainability challenges, ranking as the country's most unsustainable city in 2022. The city grapples with alarming levels of air pollution, inadequate sanitation facilities, high crime rates, and looming ecological threats. Forecasts suggest a drier climate and a staggering 54% population increase to 23.4 million, exacerbating these issues [1]. This pressing scenario demands a comprehensive urban design approach to tackle Kolkata's urban problems, offering insights applicable to similarly at-risk cities worldwide.

The historic commercial district of Bara Bazar, nestled within Kolkata's Central Business District, is slated for a transformative shift. The Government of West Bengal plans to relocate 3,500 shops and traders to Dankuni's trading hub, altering Bara Bazar's urban fabric significantly. Recent fire outbreaks highlight the urgent need for regeneration to ensure the efficient operation of commercial districts and address broader urban challenges. Mayor Firad Hakim's statement underscores the necessity of rethinking Kolkata's urban landscape, advocating for a modernized approach to market locations. [2]



1.1. Background

1.1.1. Definitions

REDEVELOPMENT OF AN AREA

"Urban redevelopment is the reconstruction or upgrade of current urban built-up areas; it revitalizes old towns and contributes to sustainable development." [3]

"Urban redevelopment means demolition and reconstruction or substantial renovation of existing buildings or infrastructure within urban infill areas or existing urban service areas." [4]

"The term redevelopment is used to describe any project that constructs new buildings, structures, and land uses on a site with previous or existing uses. Redevelopment projects can vary in significance from demolishing old buildings to replace them with new buildings, constructing new buildings or structures on abandoned or previously demolished sites, or significantly renovating or adding to existing buildings." [5]

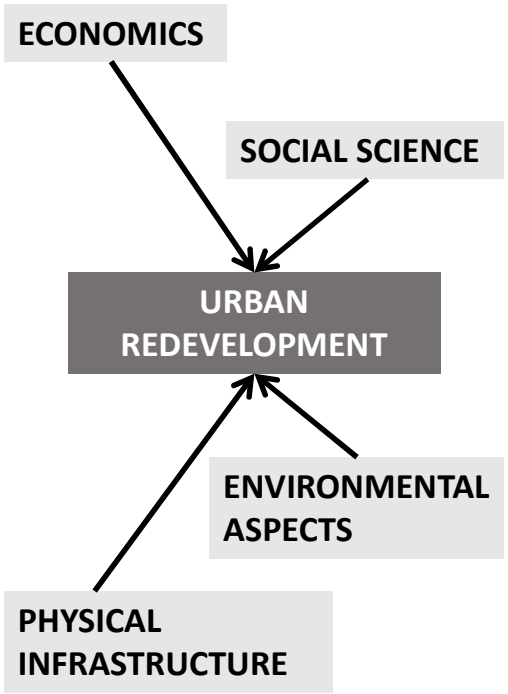


Fig. 1.
Different aspects of urban redevelopment.

1.1. Background

1.1.1. Definitions

COMMERCIAL DISTRICT

Commercial District means part of a city or town where the primary land use is for commercial activities, for example, shops, offices, theaters, or restaurants [6].

A commercial district or commercial zone is any part of a city or town in which the primary land use is commercial activities (shops, offices, theaters, restaurants and so on), as opposed to a residential neighborhood, an industrial zone, or other types of neighborhoods. In some cities, authorities use planning or zoning laws to define the boundaries of commercial districts [7].

Commercial districts play a significant role in the local economy. They provide job opportunities for residents and generate tax revenue for the city or town. They also contribute to the overall vibrancy and identity of a community, attracting visitors and fostering a sense of community pride [8].

Fig. 2.
Types of activities in comercial district.

1.1. Background

1.1.1. Definitions

MEGACITY

"A very large city that has a population of more than 10 million people and that is often made of two or more urban areas that have grown so much that they are connected." [9]

BARA BAZAR, KOLKATA

Bara Bazar Kolkata, the largest wholesale market in India. Originally known for its trade in yarn and textiles, this bustling market was a thriving hub for merchants during British rule. Despite enduring several fires over the years, including one ignited by Siraj-Ud-Daulah in 1756, Bara Bazar has remained resilient. Referred to as "Barobazar" in Bengali, the market derived its name from Shiva, as the word "Bara" also signifies the deity. The Hindi-speaking traders who displaced the older native traders called it "Bara." [10]

Fig. 3.
Holi celebration in Bara Bazar, Kolkata [11]

1.1. Background

1.1.2. Justification of Thesis

KOLKATA IS THE INDIA'S MOST UNSUSTAINABLE CITY

As per the Ecological Threat Report 2022, Kolkata is India's 1st and World's 6th unsustainable city. The main reason for this claim is the high levels of air pollution, poor sanitation, high homicide rates and substantial ecological threats. The report further predicts that the weather of Kolkata will get drier in future, and the population will increase to 23.4 million or an increase of 54% could be observed. [1]

For this reason, Kolkata city presents us with an unique set of challenges, which needs to be understood in depth through this project and aim to solve these with urban design. It would provide further scope to address the urban problems of cities with similar risks.

20 cities and projected megacities most at risk

City	Overall Rating	Pop 2050	Population Increase	Population Increase Rating	ETR Rating	GPI Score	PPI Score	Homicide Rating	Terrorism Rating	Violent Demonstration Rating	Pollution Rating	Traffic Congestion Rating	Expected Climatic Changes
Kinshasa	4.36	29.0M	84%	5	5	3.95	4.31	5	1	5	5	5	Drier
Nairobi*	4.15	10.4M	101%	5	5	2.79	3.54	4	5	4	4	4	Drier
Lagos	4.03	28.2M	82%	5	5	3.44	3.84	5	1	3	5	5	Hotter, Wetter
Dhaka	3.81	34.6M	53%	4	4	2.46	3.81	5	2	5	3	5	Wetter
Baghdad*	3.77	13.0M	71%	5	5	3.79	4.1	5	5	4	4	1	Hotter, Wetter
Lahore	3.75	21.4M	57%	5	4	3.05	3.74	4	4	4	4	2	Hotter
Kolkata	3.67	23.4M	54%	4	3	2.78	3.22	3	3	5	4	5	Drier
Delhi	3.67	49.6M	54%	4	4	2.78	3.22	3	1	5	5	5	Hotter
Karachi	3.64	26.6M	57%	5	4	3.05	3.74	4	5	4	2	2	Hotter, Wetter
Dar es Salaam*	3.55	16.4M	118%	5	5	2.41	3.5	3	4	1	4	4	Wetter
Luanda*	3.47	14.6M	62%	5	5	2.41	3.84	4	1	3	5	2	Wetter

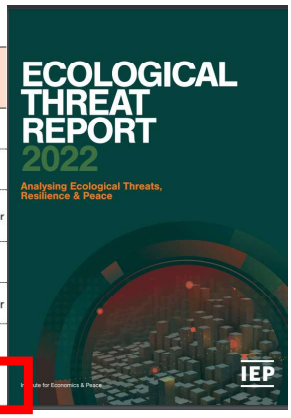


Fig. 4
List of 20 cities and projected megacities most at risk by Ecological Threat Report 2022.

1.1. Background

1.1.2. Justification of Thesis

WHY BARA BAZAR?

Bara Bazar, one of the oldest commercial districts, and now a part of Kolkata's Central Business District would transform its urban character due to the Government of West Bengal's proposal to shift 3500 shops and traders to Dankuni's trading hub [2, 12].

There has been frequent news of fire breakout in the past decade [13]. Regeneration of this area is needed for the efficient functioning of commercial districts and for holistically approaching urban issues.

"Offices can remain in the city proper but the godowns and trading have to be held at a location outside the city. We can't think of (Kolkata as) London with all these markets like phal patty (fruit trading hub Mechhua) remaining in the heart of the city." said the mayor of Kolkata, Shri Firad Hakim to The Telegraph in 2022. [2]

Fig. 5.
Recent news and headlines related to Bara Bazar.

1.2. Aim

Redevelop the study area (Mechua Bazar Wholesale Fruit Market) to an organized modern trade market.

1.3. Objectives

- To organize the wholesale market with segregation and delineation of area for parking and trade
- To enhance the permeability of the market from the Central Avenue Road and the North-South Metro station (MG Road Station)
- To introduce sustainable measures to improve the quality of life of the residents and stakeholders of the market in the study area
- To conserve heritage and urban features of the study area
- To introduce Internet of Things (IoT) based solutions to improve trade and management of the study area.

Fig. 6.
Sorting and wholesale selling of fruits in Mechua Bazar Wholesale Fruit Market.

1.4. Scope of Work

- Redevelopment of the fruit market to make it modern and organized.
- Decongestion of the streets connecting Central Avenue Road and Rabindra Sarani Road to the fruit market.
- Construction of digital database of the stakeholders of the markets in association with the trade and labor unions.
- Implementation of IoT based technologies to improve trade and management of the market.
- Conservation of the heritage buildings.

Fig. 7.
Photographs from Mechua Bazar area.

1.5. Methodology

The project was initiated by defining the aim, identifying the objectives to fulfil the aim, and understanding the scope of work in this urban redevelopment.

The literature study is done, where a Systematic Literature Review is performed to understand the research landscape, followed by an understanding of the market typology and wholesale market activities. The evolution of a marketplace is studied to understand how it transformed over the years. Further research is done to understand the history of Bara Bazar, and the planning history is studied. The urban design solutions provided by Patrick Geddes and Gordon Cullen are also studied.

The site study is then done, where the location for the study is selected through an extensive site selection process. The site is then surveyed with several parameters, and then site analysis is done where important maps, population prediction, SWOT analysis, demographic analysis,m street elevations, etc are done. Then the block model of the existing site is made to understand the urban fabric of the site.

The Primary and Secondary Case Studies are then done of the similar marketplace and the marketplace which the thesis aims for redevelopment. The case studies are then analysed through a set of parameters.

The site's urban problems are then identified and mapped on the existing site plan. The cause and solution of each urban problem are made, followed by an understanding of a few wicked problems like on-street parking, road infrastructure, etc.

Based on these studies, urban design solutions are developed. The National Level policy which is to be implemented is selected, and the policy for this urban redevelopment is made. The areas of intervention are selected, and the proposed masterplan is made. FAR analyses are made to understand the proposal in depth.

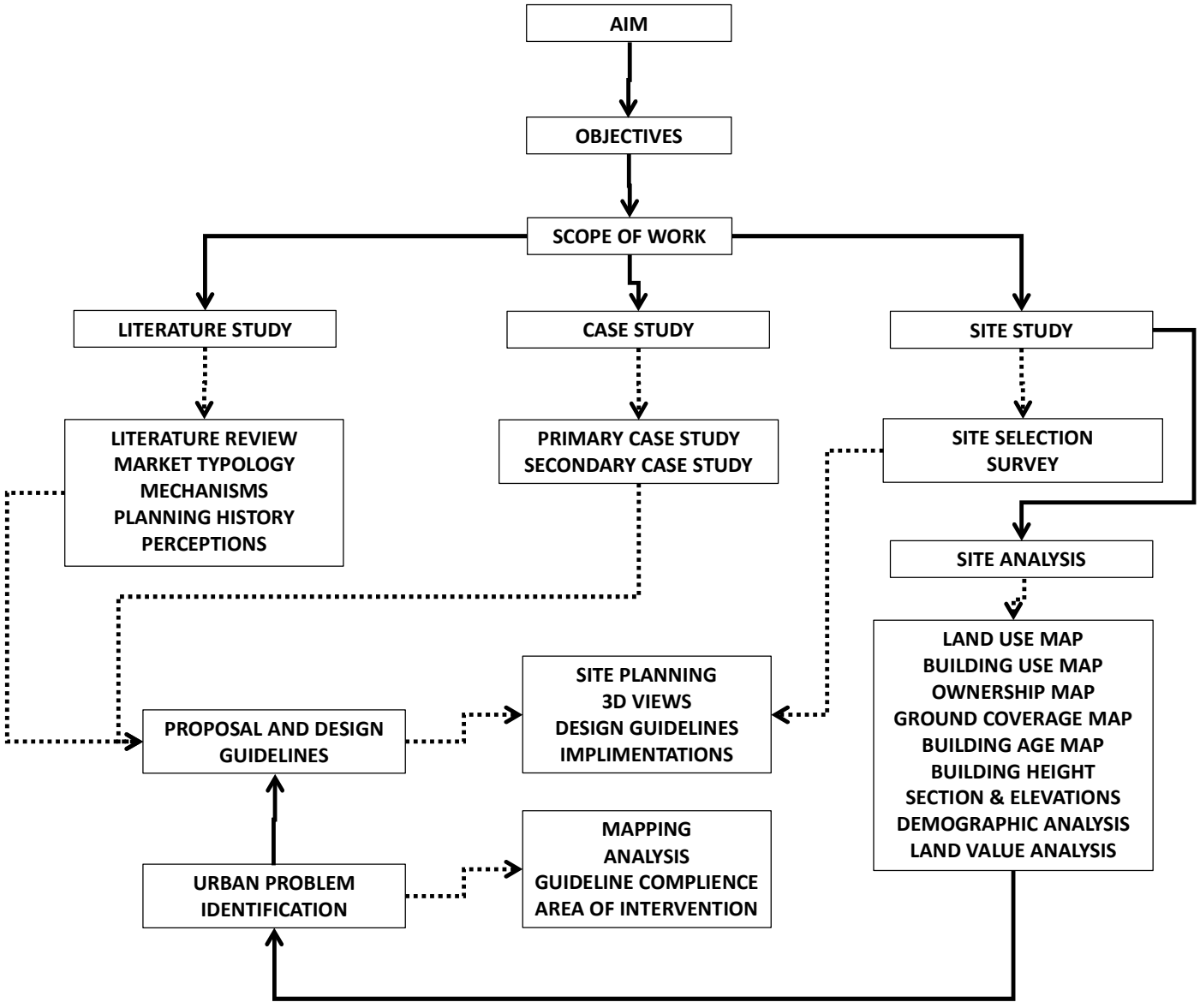


Fig. 8.
Methodology diagram of the thesis.

2.1. Systematic Literature Review

A Systematic Literature Review review is done to understand the present research landscape on the thesis topic. Through a scoping search on Google, the scoping documents are collected, from which the string of Keywords is made. With the string of Keywords, a search is made on Dimensions AI, which has databases including Scopus, Web of Science, and many more.

The project has three main keywords: Urban Redevelopment, Commercial District, and Kolkata, which is a South-Asian Megacity. Since the search is made to understand the different ongoing trends, the string of keywords is kept simple for a wider range of searches.

The string of keywords is
"Urban Redevelopment AND Commercial District AND South-Asian Megacity".

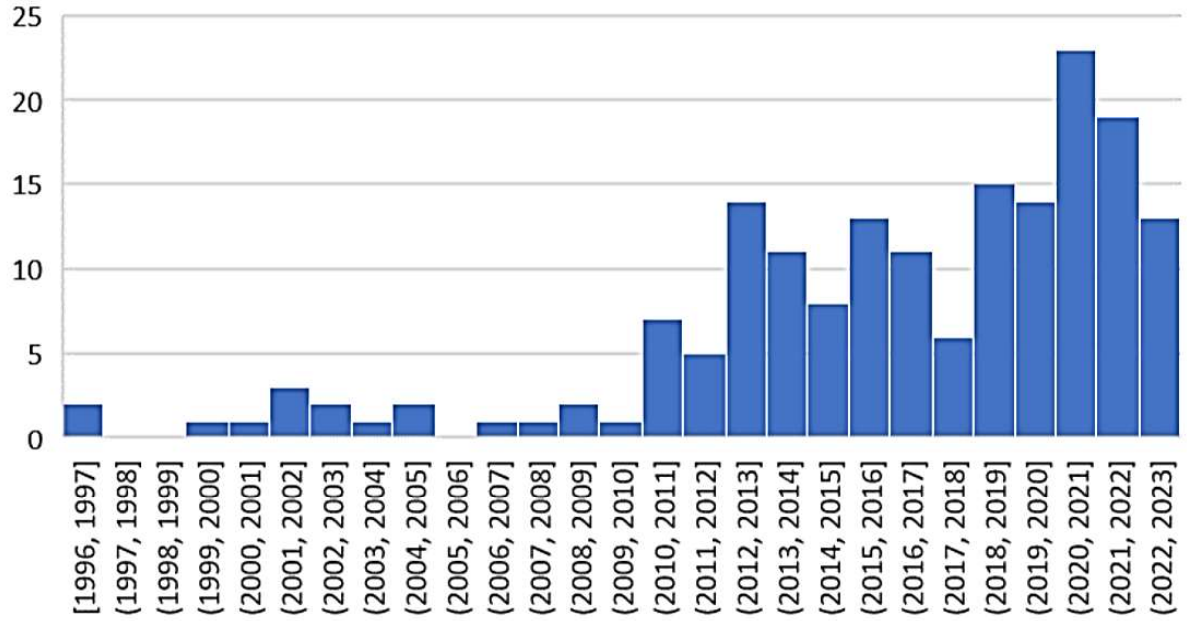


Fig. 9.
The number of journals published per year from literature search.

2.1. Systematic Literature Review

2.1.1. PRISMA framework

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework is utilized to sort the relevant documents. The exclusion criteria are as follows:

Exclusion Criteria 1: The categories with a minimal amount of papers are excluded. (Categories and sub-categories are made by Dimensions AI)

Exclusion Criteria 2: Grey literature like academic papers, research reports, etc, are excluded.

Exclusion Criteria 3: Duplicate records are removed.

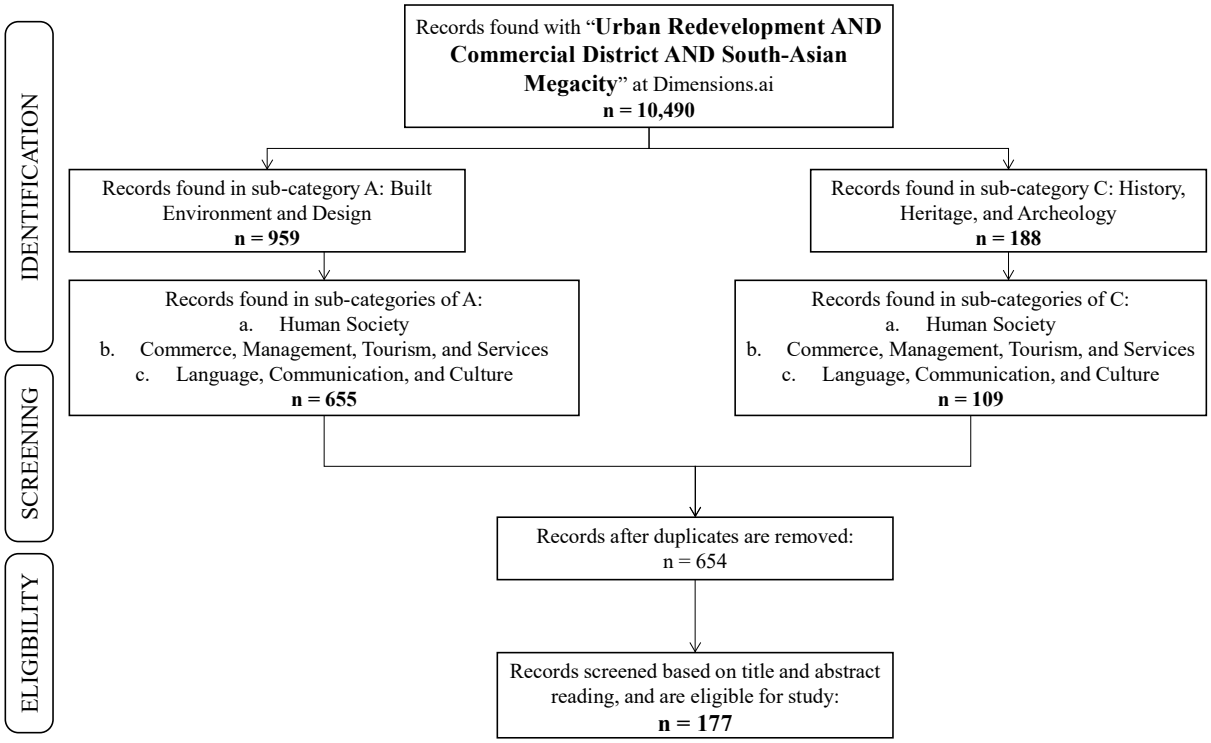


Fig. 10.
PRISMA framework diagram.

2.1. Systematic Literature Review

2.1.2. Results from Literature Review

From the number of selected journal published each year, it could be observed that The trend in redevelopment of commercial district is increasing over the years.

The network of keywords shows redevelopment of commercial district related researches can divided into three major sub-categories i.e. urban theory, policy making, and sustainable urban development.

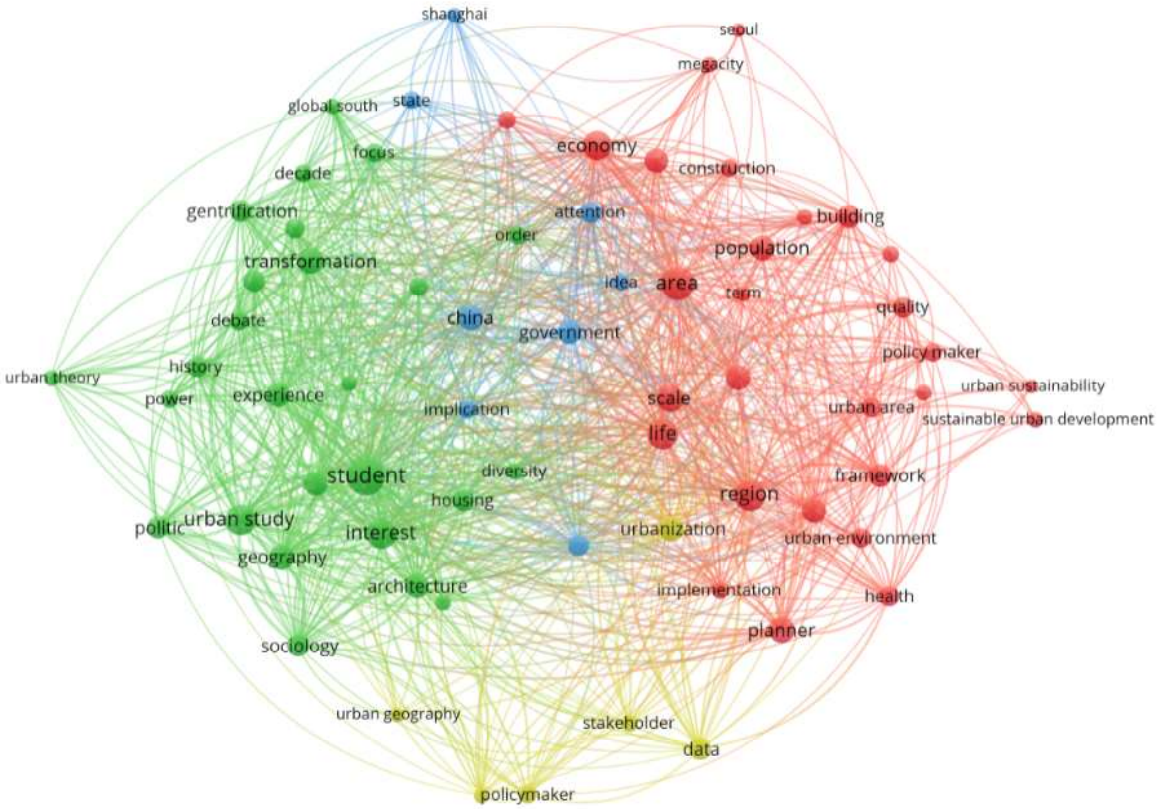


Fig. 11.
Diagram of Network of keywords (created with VOS Viewer).

The selected papers for the literature review are categorized into 6 categories, which are urban planning, urban sustainability, emerging trends, urban design, history and miscellaneous. These papers are further sub-categorized as shown in Fig. 12. So, from these the thesis would focus on urban restructuring, urban transport crisis, sustainable urban management, urban green spaces, urban inclusivity, and urban transformations.

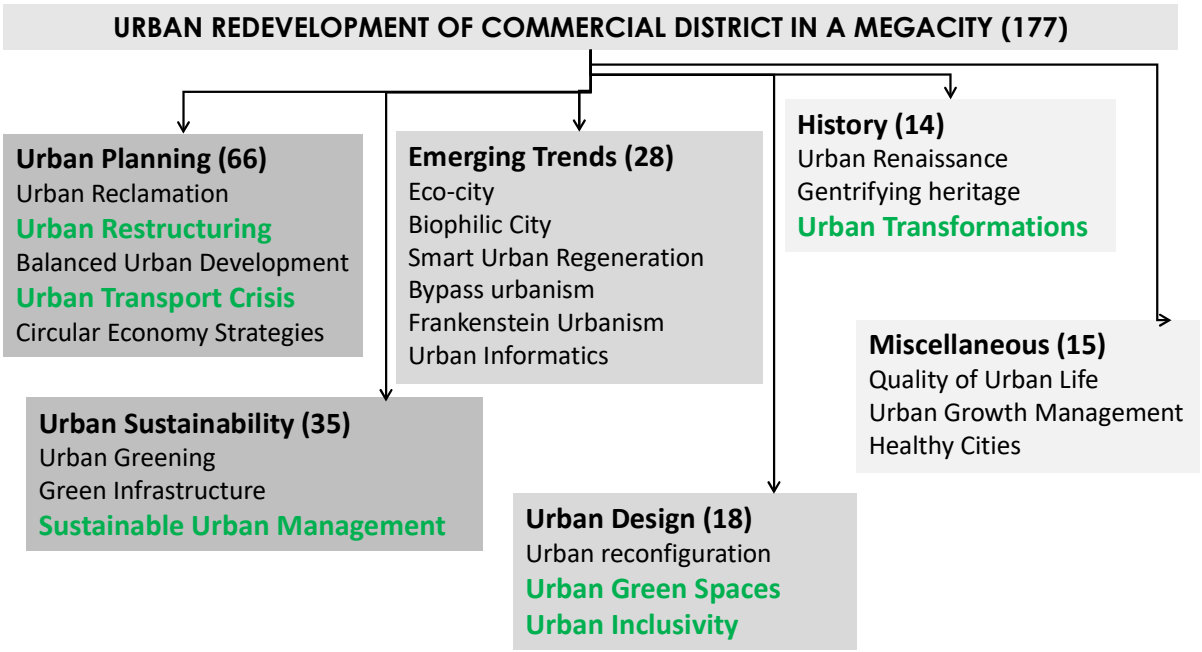


Fig. 12.
Keywords from literature review.

2.2. Market Typologies

A **market** can be broadly categorzied into vendors, shops, market buildings, and malls. The definition of each of these are as follows:

Vendors: A vendor is a person or company that sells goods or services for profit. Vendors can operate in a business-to-consumer (B2C) or business-to-business (B2B) environment.

Shops: A place where you can buy goods or services.

Market Buildings: A market building is a permanent or temporary structure used to sell, display, or offer goods for sale by independent stall holders.

Malls: A mall is a large building or group of buildings that contain many different types and sizes of stores, often along with restaurants and other businesses.

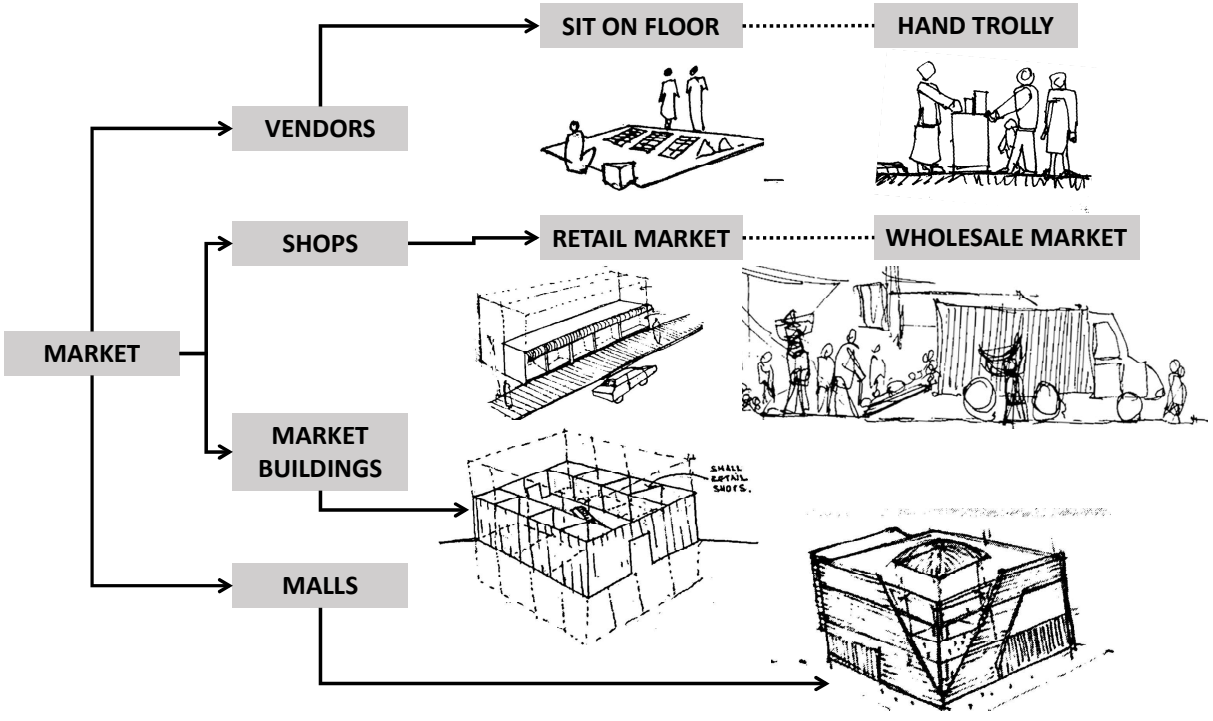


Fig. 13.
Market typologies.

2.3. Wholesale Market

A wholesale market functions as a hub where traders procure goods in large quantities from manufacturers and subsequently distribute them in smaller lots to retailers.

Wholesalers play a crucial role as middlemen, facilitating transactions between manufacturers and retailers. They purchase goods in bulk, often at discounted rates, and then sell them to retailers at a markup.

Retailers, in turn, repack these goods into smaller units and offer them to consumers at a further increased price point.

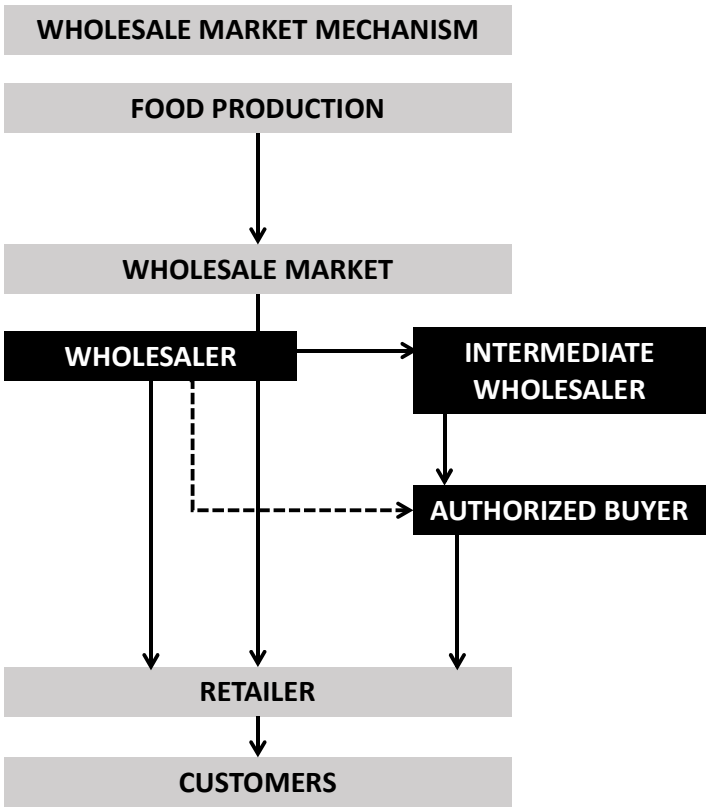


Fig. 14.
Wholesale market mechanism flowchart.

2.4. Evolution Of Market

The marketplace has always been an essential and integral part of human society evolution. It's a place where the exchange of goods takes place, and it evolved in the areas where the interaction between people takes place. It can be dated back to the Harappan Era, where people sold thriugh barter system [14]. Later, in the Greek Market, a dedicated building called Stoa was developed to accommodate a large number of sellers under one roof [15]. The concept of wholesale market initaited with the useage of coins, as the prodcer can sell to a retailer or a middleman, who can sell it to consumer. In medieval Europe, the market took place in middle of roads [17], whereas in Fatehpur Sikhri, the market took place along the main roads or axis of the city [19]. The features and the market area are given in Table 1.

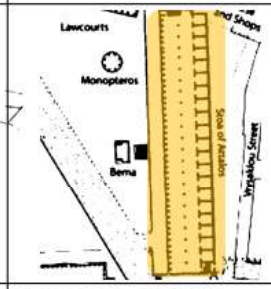
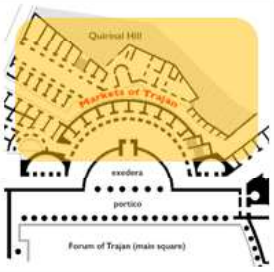
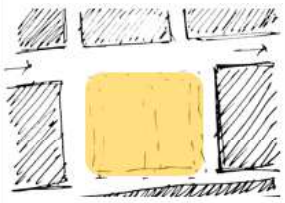
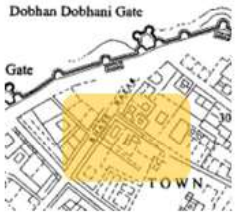
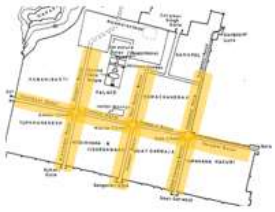
Harappan Market	Greek Market	Roman Market	Medieval European Market
			
3300 - 1300 BC	1200 BC - 600 AD	27 BC - 476 AD	500 – 1500 AD
• **Products sold directly** by at the workshops, while food markets were set regularly in **open areas** • **Small, identical rooms** aligned along a street have been interpreted as possible shops [14]	• **Colonnade shaded building** called Stoa were the public market place. • **Organized marketplace** but **scattered** around the Agora [15]	• **Organized** and **compact** marketplace inside a **complex**. • **multi-level** commercial complex • Markets of Trojan covers a space of approx. **110 x 150 m** [16]	• wherever a **trade route crossed** such a spiritual or worldly landscape, market settlements, warehouses and business centers would form. [17]

Table. 1.
Evolution Of market

Tughluqābād (First Planned City of Medieval Delhi)	**Fatehpur Sikri**	**Hampi Bazaar** (Virupaksha Market)	**Walled City of Jaipur**
			
1320 AD	1569 AD	14th-16th Cent CE	1727 AD
• Market inside the **fortified** city • **Series of single-stories rooms** were made for the shops. [18]	• Market inside the **fortified** city. • **Mixed-use residential buildings along the main axis road**s had the shops. [19]	• market place that's more than **1 km long** placed in **perpendicular axis with the port**. • **continuous series of pavilions on both the sides** – some single storied, some double storied – with more than 100 feet-wide-road in between [20]	• Market inside the **planned** city • **Mixed-use residential buildings along the main axis roads** had the shops. [21]

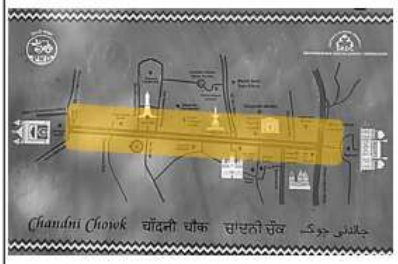
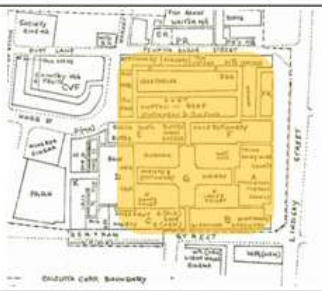
Chandni Chowk Market, Delhi (India's Largest Wholesale Market)	**Hogg Market, Kolkata** (First Municipal Market of India)	**Futian Market, China** (World's Largest Wholesale Market)
		
1648 AD	1874 AD	1980s
• located between the Red Fort and the Lahori gate of Fatehpuri Mosque. • boulevard of Chandni Chowk was **Shahjahanabad's commercial centerpiece**, with a distinct visual character. It had **shops lining it on both sides**, with **residences above the shops** and interspersed with chowks (squares). [22]	• **Planned government owned market** inside the city • Different types of commodities were sold in under the same roof. [23]	• **5 blocks of a city** is developed to build multi-stories commercial complex. • Total **built-up area of 5.5 million sq.m, 75,000 offline stores, 4 lakhs type of products** are sold. [24]

Table. 1. (ctd)
Evolution Of market

2.5. Perception Of Bara Bazar In Movies

Bara Bazar historically was one of the most important wholesale markets in Asia. Our perception of an area primarily develops from word of mouth or movies as a secondary source. The movie "Jana Aranya" by Satyajit Ray in 1976, one of the world's most famous Indian film markers, represented Bara Bazar as a business hub of Kolkata. It showed the poverty of people, damaged infrastructure, multiple types of trades, Marwaris doing business, etc. From this representation of a business hub with a bright future and hope, there is a sharp turn in the representation of the area as a Crime area. The two movies released in the 21st Century "Special 26 in 2016" and "Dawshom Avatar in 2023" told the story of a fraud trader living in this area, and a crime spot for a murder case respectively.

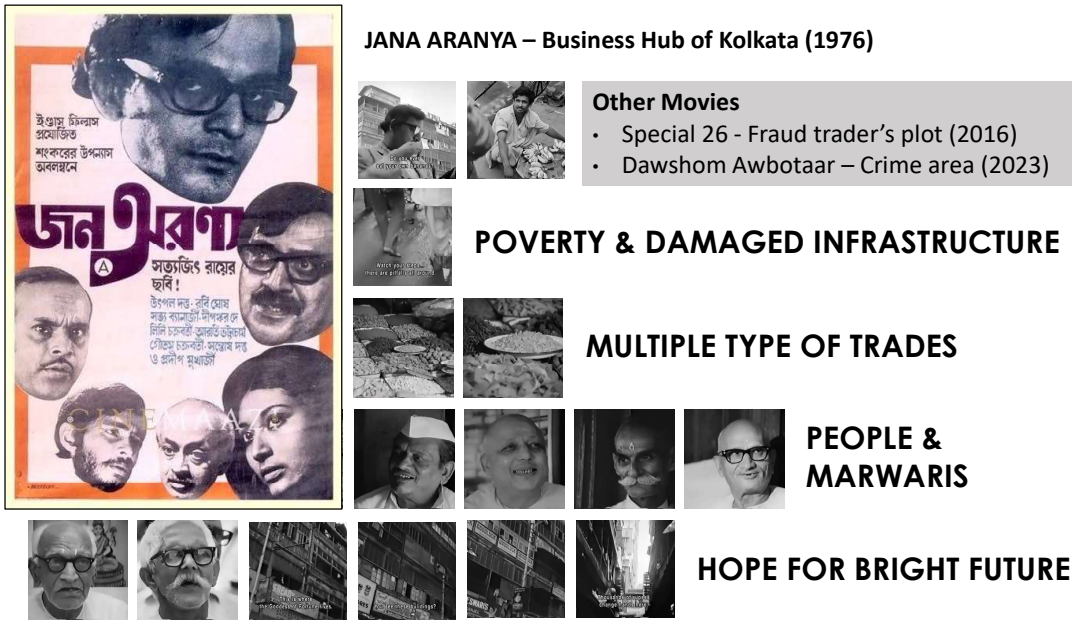


Fig. 15.
Bara Bazar in movies.

2.6. History of Bara Bazar

The development of Bara Bazar from the British advent are as follows:

- Houses and shops of the native traders were initially present during the British advent. Vaishnav Das Sett (Marwari) and Huzzari Mull (Sikh) were pioneering traders and had big house at Bara Bazar.

- In 1707, 80% of the market area was crowded with houses and shops.

- After the Battle of Palashi (1757), the Seths and Basaks were given land in Sutanuti, and the bi-weekly hat grew into Bara Bazar, a permanent residential wholesale market.

- In 1882, while the Chitpur Road was widened, the mew roads were constructed between Bartolla and Machuabazar.

- In 1919, a report is submitted to The Corporation of Calcutta by Prof. Patrick Geddes titled "Barra Bazar Improvement". In this document, he submitted the proposed strategy for development of Barra Bazar using the "Conservative Surgery" strategy.

- In 1970s, Gordon Cullen proposed several developmental strategies for development of Bara Bazar.

2.6. History of Bara Bazar

2.6.1. Patrick Geddes Approach

In a published article by Partho Dutta, titled "Patrick Geddes and the metropolis", the information on Patrick Geddes approach of urban planning in Bara bazar is available. [25]

Challenges:

- He observed the existing godowns in business areas are domestic buildings adapted for commercial use, thus it have less storage space. The courtyards of these houses are dirty from where the dust creates unhealthy environment of the living quarters in the upper floors.
- He also mentioned most of the houses have narrow front-age with great depth, but the space behind the house are stables and irregular housing by domestic servants and working population.

Proposal:

- Street alignment of the market should be East-West axis, not North-South axis as per CIT planning. (to help business thrive, workers move efficiently, and improve pedestrian circulation)
- Develop existing marketplace as modern business district (modern American and German methods of goods handling) and retain residential character of North-East Bara Bazar
- Demolition of insanitary property, with traditional urban form in mind, so that the character of the district remain intact. and rebuild.

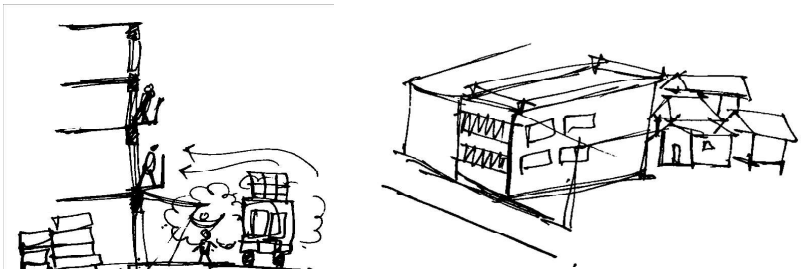


Fig. 16.
Sketch of urban problems identified by Patrick Geddes.

2.6. History of Bara Bazar

2.6.2. Gordon Cullen's Approach

In a published article by Gordon Cullen on Kolkata's Burra Bazar, he describes the market place as the Rich man's slum. [26]

He identifies the two major challenges of the market place as traffic congestion, overcrowding, lack of hygiene in houses, amenities, and open spaces.

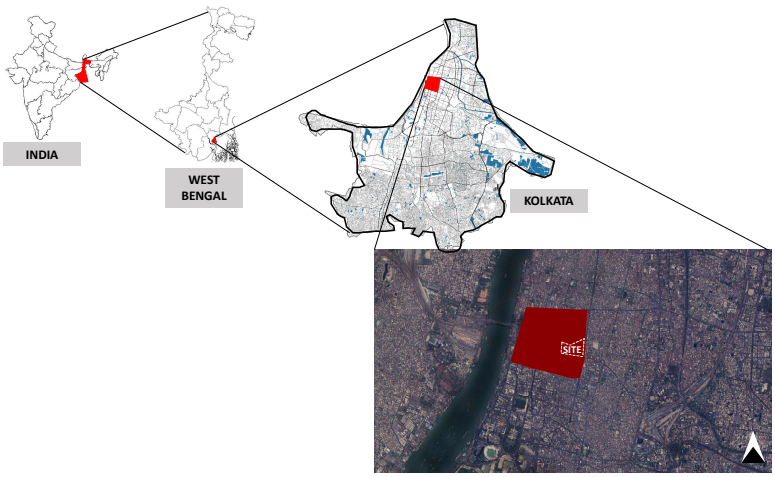
He proposed two traditional remedies as street widening, and removal of the market to a open land. The flow of goods must be improved and hygiene measures to be introduced.

Fig. 17.
Sketch published in magazine by Gordon Cullen (Copyright: University of Westminster, The Gordon Cullen Archive)

3.1. Location

The site is situated in the central area of Kolkata, West Bengal, India, specifically in the southern section of Ward-41 or the southern part of Munsi Sarauddin Street within Ward-41, known as the Mechua Bazar Fruit Market.

Site Address: Mechua Bazar, Ward No: 41,Kolkata, West Bengal- 700007



Mechua Bazar is a busy fruit wholesale market in Kolkata, West Bengal. It's one of the largest fruit markets in Eastern India. The market is open Monday to Saturday from 5 AM to 9 PM.

Site Area= 8.15 Hectares (or 20.14 Acre)

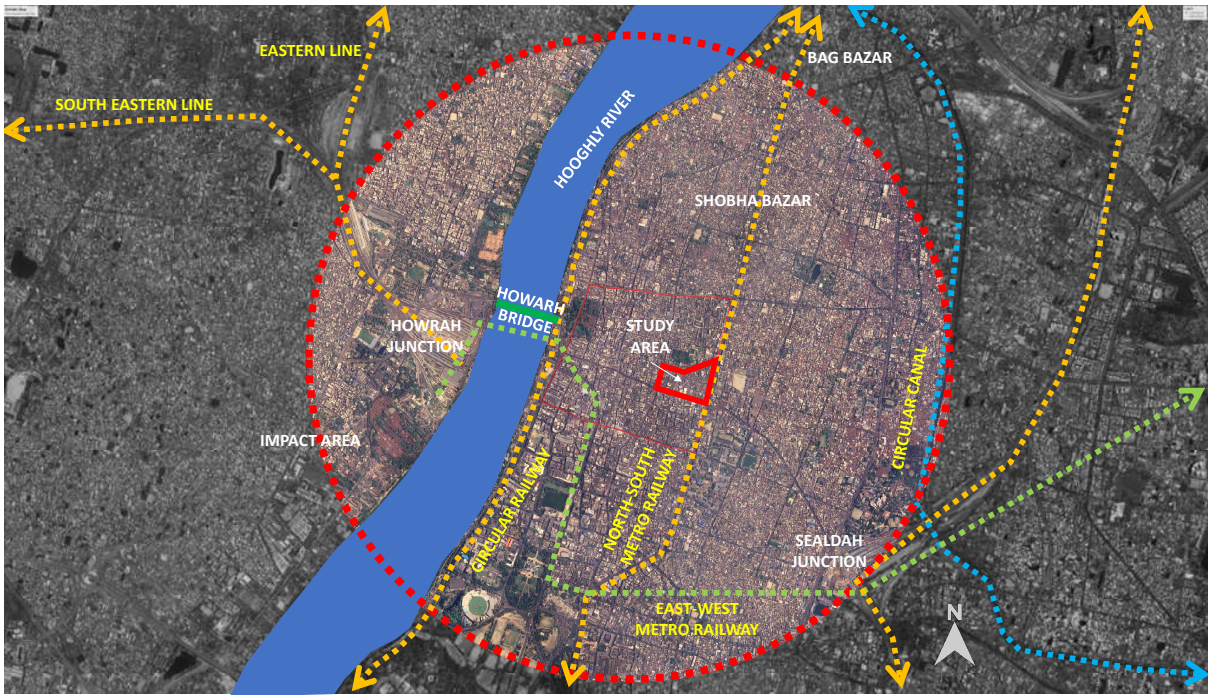


Fig. 18.
Site Location (top left), study area with 2.5 km of sarrounding area (above).

3.2. Site Selection

For the site selection, the initial focus was on Ward-7 (Bara Bazar ward), which was delineated by the British during colonial rule. Subsequently, the present wards that comprise Ward-7, namely Ward-22, 41, 42, 43, 44, and 45, as delineated by the Kolkata Municipal Corporation (KMC), were selected. This selection process involved overlaying the areas studied by other researchers onto this map.

The area chosen for study, which has not been previously researched by urban designers, is characterized by a homogeneous activity. This activity refers to the Wholesale Fruit Market, also known as the Mechua Bazar Fruit Market. This market plays a significant role in the local economy and urban fabric, making it a compelling subject for further investigation and urban design interventions.

Fig. 19.
Site selection maps.

3.3. Site Survey

3.3.1. Block and Plot Deliniation

To conduct a thorough survey of the site, the study area was divided into distinct blocks, with each block further subdivided into plot numbers. This division was undertaken exclusively for survey purposes and does not align with the plot numbers or addresses assigned by the Kolkata Municipal Corporation (KMC).

The division of the area into blocks and plot numbers was a systematic approach aimed at efficiently organizing the survey and data collection process. It allowed researchers to methodically examine each section of the study area, ensuring that no area was overlooked or underrepresented in the survey.

While the plot numbers used in the survey may differ from those officially designated by the KMC, they served as essential identifiers for the research project, facilitating accurate data collection and analysis.

3.3.2. Parameters for Survey

The survey parameters were chosen with the ultimate project goal in mind, as well as to support future research endeavors. These parameters include Plot Number, Plot Area (in square meters), Plot Dimensions (in meters), Ground Coverage Area (in square meters), Total Built-up Area (in square meters), Sub-plot Number & Name (used to identify multiple activities within one plot), Number of Floors, Approximate Building Height (in meters), Building Use (broken down by floor), Land Use (classified according to NBC standards), Plot Ownership (Private/Public), Type of Activity (Retail/Wholesale), Building Establishment Date, Architectural Style, and Photographs.

3.3.3. Survey Data

The collected data is put in Table 2.

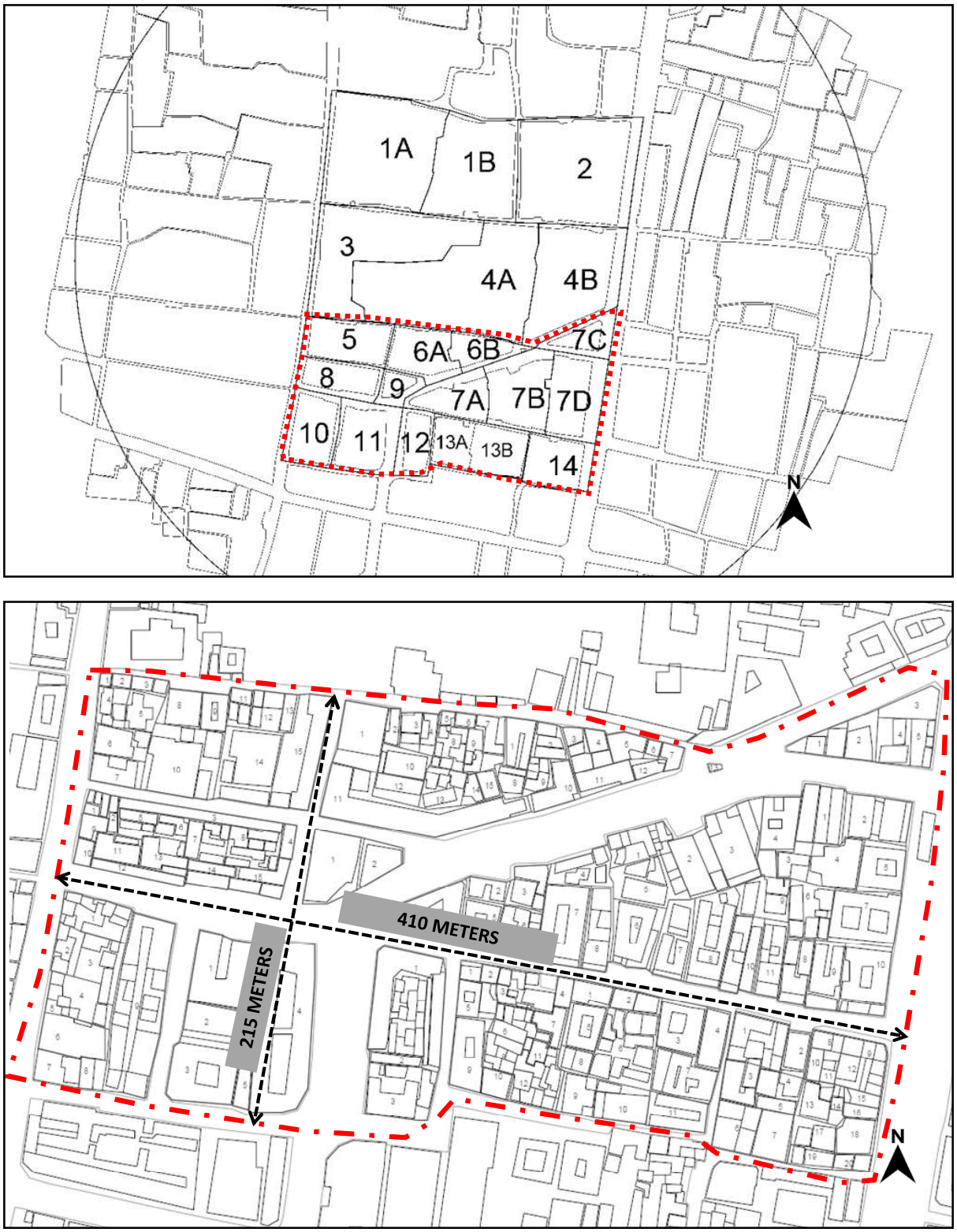


Fig. 20.
Block number in site (top most), study area with plot numbers (above).

WARD-41

PLOT NO:	PLOT AREA APPROX (SQ. M.)	PLOT DIMENSION (M x M)	GROUND COVERAGE AREA (SQ. M.)	TOTAL BUILTUP AREA (SQ. M.)	SUB-PLOT NO & NAME	NO: OF FLOORS	BUILDING HEIGHT APPROX. (M)	BUILDING USE				LAND USE (AS PER NEC)	PLOT OWNERSHIP	TYPE OF ACTIVITY (RETAIL/WHOLESALE)	BUILDING ESTABLISHMENT DATE	ARCHITECTURAL STYLE	PHOTOGRAPH
								GROUND FLOOR	FIRST F.COR	SECOND FLOOR	OTHER FLOORS						
BLOCK-5 (BOUNDARY ROADS- RABINDRA SARANI, 3LRMAN STREET, BALLAY DAS STREET, MADAN MOHAN BURMON STREET)																	
1	89	8 x 11.25	89	445		5	16	COMMERCIAL		RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL RETAIL	NOT SURE		
					RETAIL STORE									RETAIL			
					DARSHAN RESTURANT									RETAIL			
					MENS FOOTWARE SHOP									RETAIL			
					NEW DEKAR HAIR CUTTING SALOON									RETAIL			
2	115	12.77 x 9	112	560		5	15	PUBLIC/SEMI-PUBLIC				PUBLIC/SEM-PUBLIC	PRIVATE	MANDIR	2000		
					ARYA SAMAJ MANDIR												
3	134	19 x 7.05	124	496		4	12	COMMERCIAL		RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
					SHIV TEMPLE												
4	277	20 x 13.85	168	672		4	12	COMMERCIAL		RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL RETAIL	NOT SURE		
					3 NO: RETAIL SHOP												
5	305	19 x 16.05	203	609		3	10	RESIDENTIAL				RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
6	407	26 x 15.65	314	1256		4	12	COMMERCIAL		RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL RETAIL	NOT SURE		
					4 NO: RETAIL SHOP												
7	347	26 x 13.35	294	1176		4	12	COMMERCIAL		RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL RETAIL	NOT SURE		
					6 NO: RETAIL SHOP												
8	343	20 x 17.15	337	1348	AFREEN PALACE	4	12	COMMERCIAL				COMMERCIAL	PRIVATE	HOTEL RETAIL	NOT SURE		
					4 NO: FOOTWARE SHOP												
9	237	18 x 13.16	215	645		3	10	COMMERCIAL		RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL RETAIL	NOT SURE		
					2 NO: FOOTWARE SHOP												
10	1223	36 x 33.97	884	2652		3	12	RESIDENTIAL				RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		

Table. 2.
Site building survey data.

11	213	19 x 11.21	207	621		3	10	COMMERCIAL	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					BANGLES SHOP								RETAIL		
					SHARE BAZAR CONSULTANCY OFFICE										
12	294	19 x 15.47	172	172		1	3	COMMERCIAL			COMMERCIAL	PRIVATE	RETAIL SHOP	NOT SURE	
					FASHION WORLD- CLOTHING SHOP								RETAIL		
					VINAYAK VATIKA- CLOTHING SHOP								RETAIL		
13	138	15 x 9.2	134	536		4	10	COMMERCIAL	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					MIRAJ FAMILY WEAR- CLOTHING SHOP								RETAIL		
					S. CHAWLA RETAIL SHOP								RETAIL		
					STEEL GODOWN								WHOLESALE		
14	1033	36 x 28.69	824	3296		4	12	COMMERCIAL	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					FRUIT GODOWN								WHOLESALE		
15	1041	55 x 18.92	536	1608	SCHOOL	3	12	PUBLIC/SEMI-PUBLIC			PUBLIC/SEMI-PUBLIC	GOVERNMENT	SCHCOL	1903	
					SARASWAT KSHATRIYA VIDYALAYA- WB BOARD-SECONDARY SCHOOL										
	6196		4613	16092											
BLOCK-6A (BOUNDARY ROADS- RABINDRA SARANI, BURMAN STREET, BALLAV DAS STREET, MADAN MOHAN BURMON STREET)															
1	690	32 x 21.56	547	2735	AFREEN PLAZA	5	16	COMMERCIAL			COMMERCIAL	PRIVATE	GUEST HOUSE	NOT SURE	
					12 NO: RETAIL SHOP								RETAIL		
2	133	18 x 7.38	127	508		4	14	COMMERCIAL	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					1 NO: RETAIL SHOP								RETAIL		
3	189	18 x 10.5	174	696		4	12	COMMERCIAL	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					ASHA SHOE SHOP								RETAIL		
					WALK STYLE- SHOE SHOP								RETAIL		
					SHYARAM HALLMARK CENTER- JEWELLERY SHOP								RETAIL		
4	142	18 x 7.89	133	399		3	10	COMMERCIAL	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					RETAIL SHOP								RETAIL		
5	107	11 x 9.72	104	312		3	10	COMMERCIAL	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					6 NO: RETAIL SHOP								RETAIL		
					MANIHARI MASJID								RELIGIOUS PLACE		

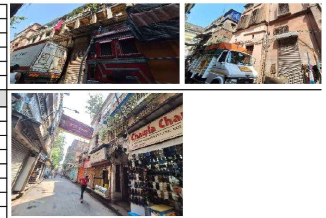
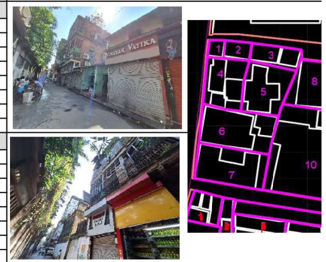
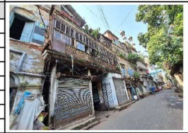







Table. 2 (ctd.).
Site building survey data.

6	125	12 x 10.41	119	357	3 NO: RETAIL SHOP	3	10	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL RETAIL	NOT SURE
7	221	18 x 12.27	208	624	2 NO: RETAIL SHOP	3	11	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL RETAIL	NOT SURE
8	337	21 x 16.04	274	518		2	6	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE
9	247	16.46 x 15	142	142		1	3	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE
10	323	24 x 13.45	318	636		2	6	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE
11	1601	75 x 21.34	1352	6760	INDIAN OVERSEAS BANK 9 NO: FRUIT RETAIL SHOP 14 NO: FRUIT WHOLESELLER FRUIT GODOWN	5	18	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL BANK RETAIL WHOLESALE WHOLESALE	NOT SURE
12	285	23 x 12.39	271	542		2	6	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE
13	372	19.57 x 19	267	534		2	6	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE
14	256	18 x 14.22	229	229		1	4	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE
	5028		4265	14992									
BLOCK-6E (BOUNDARY ROADS- RABINDRA SARANI, BURMAN STREET, BALLAV DAS STREET, MADAN MOHAN BURMON STREET)													
1	352	24 x 14.67	261	1044	2 NO: RETAIL SHOP	4	12	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL RETAIL	PRE-INDEPENDENCE



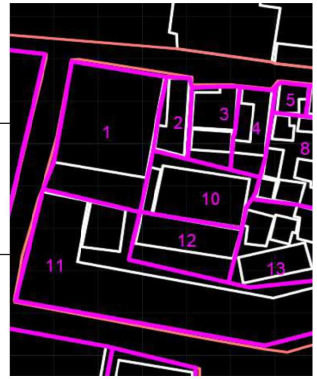
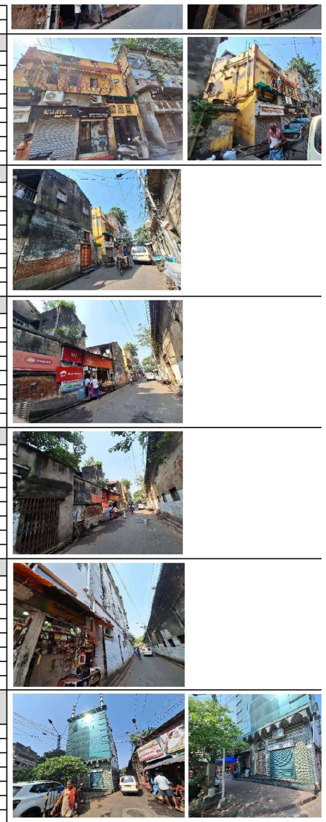


Table. 2 (ctd.).
Site building survey data.

2	251	18 x 13.94	203	406		2	8	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					STYLE ZONE- SALON									RETAIL		
					WAHID MEN'S WEAR- CLOTHING SHOP									RETAIL		
					TAJ BANGLES									RETAIL		
3	239	22 x 10.86	227	454		2	8	RESIDENTIAL				RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
4	190	18 x 10.55	186	186		1	4	RESIDENTIAL				RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
5	221	18 x 12.28	192	192		1	4	RESIDENTIAL				RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
6	104	11 x 9.45	101	303		3	10	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					2 NO: RETAIL SHOP											
7	117	12 x 9.75	112	448	MOHAMMADI MASJID	4	16	PUBLIC/SEMI-PUBLIC				PUBLIC/SEMI-PUBLIC	GOVERNMENT	MASJID	NOT SURE	
8	203	16 x 12.69	147	147		1	3	RESIDENTIAL				RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
9	212	16 x 13.25	158	158		1	3	RESIDENTIAL				RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
10	346	23 x 15.04	306	612		2	6	COMMERCIAL	RESIDENTIAL			COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE	
					4 NO: FRUIT RETAIL SHOP									RETAIL		
11	328	28 x 11.71	270	1350		5	15	COMMERCIAL		RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					4 NO: FRUIT RETAIL SHOP									RETAIL		
12	135	15 x 9	117	351		3	9	RESIDENTIAL				RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	



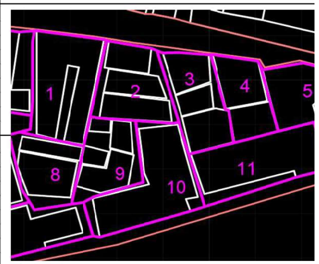


Table. 2 (ctd.).
Site building survey data.

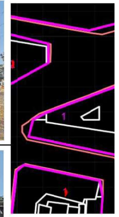
														
	2698		2280	5651										
BLOCK-7A (BOUNDARY ROADS- BAL MUKUNDA MAKKER STREET, MADAN MOHAN BURMON STREET)														
1	649	35 x 18.54	604	1722		3	10	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	 
					8 NO: FRUIT WHOLESALE SHOP					WHOLESALE				
					FRUIT GODOWN					WHOLESALE				
2	225	21 x 10.71	148	592		4	13	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					TEA SHOP					RETAIL				
					2 NO: FRUIT WHOLESALE SHOP					WHOLESALE				
					FRUIT GODOWN					WHOLESALE				
3	380	21 x 18.09	307	537	MOHAMMAD BUILDINGS	3	10	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	 
					FRUIT GODOWN					WHOLESALE				
					2 NO: FRUIT WHOLESALE SHOP					WHOLESALE				
4	446	30 x 14.86	258	1532	SIKRI BUILDINGS	4	13	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					12 NO: FRUIT WHOLESALE SHOP					WHOLESALE				
					FRUIT GODOWN					WHOLESALE				
5	414	23 x 18	318	954		3	10	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	 
					FRUIT GODOWN					WHOLESALE				
					2 NO: RETAIL SHOP					RETAIL				
6	495	25 x 19.8	459	1062		3	11	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	 
					FRUIT GODOWN					WHOLESALE				
					KAMIYABI DAWAIKHANA- PHARMACY					RETAIL				
					RETAIL SHOP					RETAIL				
7	872	39 x 22.35	819	2457		3	10	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					MASJID					RELIGIOUS ACTIVITY				
					FRUIT GOWDOWN					WHOLESALE				
					2 NO: RETAIL SHOP					RETAIL				
8	531	41 x 12.95	502	1506		3	10	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					EYAZ HOTEL- RESTURANT					RETAIL				
					HUSSAIN CLINIC					RETAIL				
					2 NO: RETAIL SHOP					RETAIL				
					4 NO: FRUIT WHOLESALE SHOP					WHOLESALE				
	4012		3415	10362										
BLOCK-7B (BOUNDARY ROADS- BAL MUKUNDA MAKKER STREET, MADAN MOHAN BURMON STREET)														
1	475	28 x 16.96	454	1816		4	15	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	

Table. 2 (ctd.).
Site building survey data.

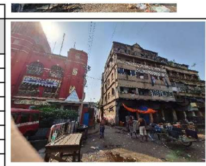
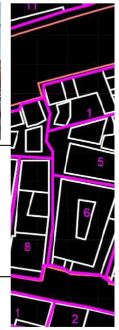
2	608	31 x 19.61	594	1782	POLICE STATION	3	12	PUBLIC/SEMI-PUBLIC			PUBLIC/SEMI-PUBLIC	GOVERNMENT	POLICE STATION	PRE-INDEPENDENCE		
3	843	36 x 23.17	834	5628	POST OFFICE	7	20	PUBLIC/SEMI-PUBLIC			PUBLIC/SEMI-PUBLIC	GOVERNMENT	POST OFFICE	POST-INDEPENDENCE		
4	605	28 x 21.61	589	1767		3	15	COMMERCIAL			COMMERCIAL	PRIVATE	OFFICE	PRE-INDEPENDENCE		 
5	731	28.11 x 26	409	1227		3	10	COMMERCIAL	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
6	714	32 x 22.31	722	2166		3	10	COMMERCIAL	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
7	604	38 x 18.89	427	1281		3	10	COMMERCIAL	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
8	881	45 x 19.57	629	1887		3	10	COMMERCIAL	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		 
9	509	24 x 21.21	486	974		2	6	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
10	585	37 x 15.81	574	1722		3	10	COMMERCIAL	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		 
11	465	37 x 12.56	457	1371		3	10	COMMERCIAL	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		

Table. 2 (ctd.).
Site building survey data.

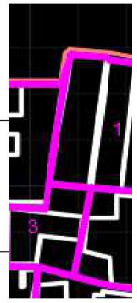
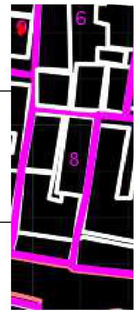
	7020		6175	21621											
BLOCK-7C (BOUNDARY ROADS- BA.. MUKUNDA MAKKER STREET, CENTRA.. AVENUE, MADAN MOHAN BURMON STREET)															
1	302	29 x 10.41	198	474		3	6	PUBLIC/SEMI-PUBLIC		PUBLIC/SEMI-PUBLIC	GOVERNMENT	TMC PARTY OFFICE	POST-INDEPENDENCE		 
					GARBAGE COMPACTING STATION										
					TMC PARTY OFFICE										
2	335	21 x 15.95	183	732		4	12	PUBLIC/SEMI-PUBLIC		PUBLIC/SEMI-PUBLIC	GOVERNMENT	HINDU TEMPLE	NOT SURE		 
					SHREE SHREE RAMESHWAR NATH MAHADEV TEMPLE										
					Rani Sati Dadi MANDIR										
3	319	29 x 11	154	154		1	3.5	RECREATIONAL		PUBLIC/SEMI-PUBLIC	GOVERNMENT	WARD HEALTH UNIT & PARK	NOT SURE		 
					WARD HEALTH UNIT										
					PUBLIC GARDEN										
					NETAJI MEMORIAL STATUE										
4	372	23 x 16.17	109	109		1	3	PUBLIC/SEMI-PUBLIC		PUBLIC/SEMI-PUBLIC	GOVERNMENT	PUBLIC TOILET	NOT SURE		 
					PUBLIC TOILET										
					GARDEN										
5	251	24 x 10.45	90	180		2	6	PUBLIC/SEMI-PUBLIC		PUBLIC/SEMI-PUBLIC	GOVERNMENT	GOVT. OFFICE	NOT SURE		
	1579		734	1649											
BLOCK-7D (BOUNDARY ROADS- BAL MUKUNDA MAKKER STREET, MADAN MOHAN BURMON STREET)															
1	598	28 x 21.35	543	2136		4	12	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		 
					JUSTICE CAFÉ					RETAIL					
					FRUIT BASKET- WHOLESALE SHOP					WHOLESALE					
2	713	32 x 22.28	559	3913		7	23	COMMERCIAL		COMMERCIAL	PRIVATE	COMMERCIAL	POST-INDEPENDENCE		 
					GUPTA BROTHERS										
3	254	17 x 14.94	119	119		1	3	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
4	564	25 x 22.56	534	534		1	3	RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
5	518	24 x 21.58	368	1840		5	20	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		

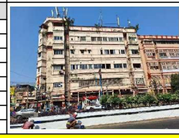
Table. 2 (ctd.).
Site building survey data.



6	571	25 x 22.84	383	766		2	6	RESIDENTIAL				RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
7	853	33 x 25.84	565	2825		5	20	COMMERCIAL		RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
8	428	33 x 12.96	407	1221		3	12	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
9	542	33 x 16.42	479	1437		3	12	PUBLIC/SEMI-PUBLIC				PUBLIC/SEMI-PUBLIC	GOVERNMENT	DHARMASHALA	NOT SURE	
10	782	34 x 23	558	2528		5	20	COMMERCIAL		RESIDENTIAL		RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
	5823		4515	17319												
BLOCK-8 (BOUNDARY ROADS- RABINDRA SARANI, BURMAN STREET, BALLAV DAS STREET, MADAN MOHAN BURMON STREET)																
1	125	11.5 x 10.87	118	354		3	10	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL WHOLESALE	PRE-INDEPENDENCE	
2	97	19 x 5.01	95	190		2	6	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
3	425	80 x 5.31	418	1254		3	10	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
4	113	17 x 6.64	226	452		2	8	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
5	235	19 x 12.36	230	327		1	4	COMMERCIAL				COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE	









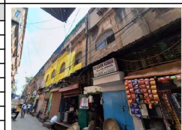



Table. 2 (ctd.).
Site building survey data.

6	184	15 x 12.26	182	209		1	4	COMMERCIAL				COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE	
7	406	20 x 20.3	374	487		1	4	COMMERCIAL				COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE	
8	489	25 x 19.56	452	504		1	4	COMMERCIAL				COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE	
9	142	13 x 10.92	134	536		4	12	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
10	108	13 x 8.3	102	102		1	3	COMMERCIAL				COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE	
11	305	22 x 13.86	297	594		2	6	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
12	228	46 x 4.95	214	428		2	8	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	PRE-INDEPENDENCE	
13	368	23 x 16	354	370		1	4	COMMERCIAL				COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE	
14	275	21 x 13.09	251	753		3	10	COMMERCIAL	RES DENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
15	371	24 x 15.45	342	684		2	8	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	

Table. 2 (ctd.).
Site building survey data.

	3871		3789	7244													
BLOCK-9 (BOUNDARY ROADS- BAL MUKUNDA MAKKAR ROAD, BALLAV DAS STREET, MADAN MOHAN BURMON STREET)																	
1	276	25 x 11.04	254	1270		5	20	PUBLIC/SEMI-PUBLIC				PUBLIC USE	GOVERNMENT	PUBLIC USE	NOT SURE	CONTP. ISLAMIC	
					12 NO: WHOLESALE FRUIT SELLERS									WHOLESALE			
2	335	20 x 16.75	258	258		1	4	COMMERCIAL				COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE		
					4 NO; WHCLESALE FRUIT SELLER									WHOLESALE			
	611		512	1528													
BLOCK-10 (BOUNDARY ROADS- BA_ MUKUNDA MAKKAR ROAD, RABINDRA SARANI, MADAN MOHAN BURMON STREET)																	
1	575	34 x 16.91	450	1132		3	8	COMMERCIAL	RESIDENTIAL			COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE	TEMP. STRUCTURE-DILAPITATED STATE	
					SURENDRANATH MASALA SHOP									RETAIL			
					SANDEEP SHARMA STORE									RETAIL			
					FRUIT GODOWN									WHOLESALE			
					DEBI PADADAS & SONS									RETAIL			
2	292	22 x 13.27	273	819		4	13	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
					SHREE LAKSHMI ALANKAR JEWELLERS									RETAIL			
					PARAS JEWELEERS									RETAIL			
					RAMKRISHNA BHANDAR									RETAIL			
3	546	24.81 x 22	365	730		3	10	RESIDENTIAL				RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
4	497	24 x 20.71	326	652		2	6	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
					SHANI SEWEING MACHINE												
					SHREE GANESH PAPASJI												
					4 PRASAD SHOP												
					SHAGUN SHOP												
					BOBBY & CO												
5	182	14 x 13	174	2856		4	13	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
					SHYAM STUDIO												
					HARSH ENTERPRISE												
					PAUL BROS & CO												
					SAVITA STORE												
					LAKSHMI STORE												
6	582	33 x 17.63	487	974		2	8	PUBLIC/SEMI-PUBLIC				PUBLIC/SEMI-PUBLIC	GOVERNMENT	PUBLIC USE	NOT SURE		
					SHREE DIGAMBAR JAIN NEYA MANDIR									RELIGIOUS ACTIVITY			
7	321	21 x 15.28	55	95		1	4	COMMERCIAL				COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE		
					HP PETROL PUMP - PREM SERVICE STATION												
8	182	15 x 12.13	178	534		3	10	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
					REZA ENTERPRISE									WHOLESALE			
					SASHI TEXTILE									WHOLESALE			







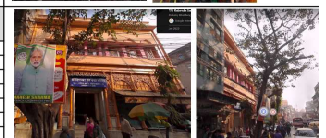


Table. 2 (ctd.).
Site building survey data.

9	1978	87 x 22.73	1658	6632		4	15	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					4 NO: FRUIT GODOWN							WHOLESALE		
	5155		4006	14424										
BLOCK-11 (BOUNDARY ROADS- BAL MUKUNDA MAKKAR ROAD, RAMLOCHAN MULLICK STREET, MADAN MOHAN BURMON STREET)														
1	1099	33.30 x 33	887	4435		5	16		COMMERCIAL	COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE	
					RITURAJ HOTEL							HOMESTAY/HOTEL		
					MO DRY FRUIT TRADERS							WHOLESALE		
2	608	36 x 16.89	405	1620		4	12	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					ASHTRA TRADING COMPANY- FRUIT WHOLESELLER							WHOLESALE		
					ARIHANT GARMENTS							WHOLESALE		
3	992	32 x 31	763	3815		5	18		PUBLIC/SEMI-PUBLIC	PUBLIC/SEMI-PUBLIC	PRIVATE	DHARMASHALA	NOT SURE	
					SHRI DIGAMBAR JAIN BHAWAN- DHARMASHALA							HOMESTAY		
					OM SHAKTI- LOGISTICS SERVICES							SERVICES		
					SHAHBAN AZAR STORE- ELECTRONICS STORE							RETAIL		
4	2224	83 x 26.47	1702	5106		3	12	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					STAN PRO TECH- SOFTWARE COMPANY							SERVICE		
					IDEAL FASHION PRIVATE LIMITED							RETAIL		
					RAJ & SONS							RETAIL		
					COMCORP INDIA PRIVATE LIMITED- COMPUTER SUPPORT & SERVICES							SERVICE		
					ANANIYA TRADERS							WHOLESALE		
					DRY FRUITS WHOLESELLER							WHOLESALE		
5	198	30 x 6.6	175	525		3	12	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					DRY FRUITS WHOLESALER							WHOLESALE		
	5121		3932	15501										
BLOCK-12 (BOUNDARY ROADS- RAMLOCHAN MULLICK STREET, MADAN MOHAN BURMON STREET, SAYED SALLET LANE)														
1	1756	51 x 34.43	1432	2832		3	10	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					PAC TRADERS- WHOLESALE FRUIT SHOP							WHOLESALE		
					8 NO. FRUIT WHOLESELLER FACING MMB STREET							WHOLESALE		
					15 NO. FRUIT WHOLESELLER FACING SAYED SALLEY STREET							WHOLESALE		
					COURTYARD FRUIT GODOWN							WHOLESALE		
2	144	26 x 5.54	78	234		2	6	COMMERCIAL	RESIDENTIAL	COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE	
					4 NO. FRUIT WHOLESALE FRUIT SHOP							WHOLESALE		
					FRUIT GODOWN							WHOLESALE		
3	804	32 x 25.13	634	2538		6	25	COMMERCIAL	RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					FRUIT GODOWN							WHOLESALE		
					FRUIT RETAIL SHOPS							RETAIL		
					FRUIT WHOLESELLERS							WHOLESALE		
	2704		2144	5604										
BLOCK-13 A (BOUNDARY ROADS- SAYED SALLEY LANE- 3 SIDES, MADAN MOHAN BURMON STREET)														
1	100	10 x 10	70	350		5	15		RESIDENTIAL	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	

Table. 2 (ctd.).
Site building survey data.

2	81	9 x 9	78	234		3	12	PUBLIC/SEMI-PUBLIC				PUBLIC/SEMI-PUBLIC	GOVERNMENT	PUBLIC USE	NOT SURE	CONTP. ISLAMIC
					Atar Masjid									RELIGIOUS ACTIVITY		
3	523	37 x 14.13	383	1149		3	12	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					NEW HAIR CUTTING SALON									RETAIL		
					2 NO. FRUIT GODOWN									WHOLESALE		
					RESTURANT (RICE HOTEL)									RETAIL		
					4 NO. GROCERY SHOP									RETAIL		
					JOGENDRA COTTON & CLOTH STORE									WHOLESALE		
					GN TRADE- FRUIT WHOLESALE									WHOLESALE		
4	115	15 x 7.6	110	220		2	9	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	COMMERCIAL	NOT SURE	
					2 NO. FRUIT GODOWN											
5	334	19 x 17.57	263	789		3	10	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					2 NO. FRUIT GODOWN									WHOLESALE		
					MEAT SHOP (GOAT)									RETAIL		
6	384	22 x 17.45	350	422		2	6	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					FRUIT GODOWN									WHOLESALE		
7	222	24.67 x 9	202	404		2	6	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					FRUIT GODOWN									WHOLESALE		
8	290	17.05 x 17	276	384		2	6	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					FRUIT GODOWN									WHOLESALE		
9	553	35 x 15.8	453	1278		3	10	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					3 NO. FRUIT GODOWN									WHOLESALE		
					TN TRADERS- FRUIT WHOLESELLER									WHOLESALE		
					KMC STORE- DRY FRUIT WHOLESELLER									WHOLESALE		
					GROCERY SHOP									RETAIL		
10	185	16 x 11.56	164	328		2	8	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					RESTURANT - RICE HOTEL									RETAIL		
					2 NO. GROCERY SHOP									RETAIL		
					FRUIT GODOWN									WHOLESALE		
11	444	22.2 x 20	365	647		2	6	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					FRUIT GODOWN									WHOLESALE		
12	256	24 x 10.67	225	450		2	6	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
					RELIANCE JIO TELECOM LIMITED									RETAIL		
					FRUIT GODOWN									WHOLESALE		

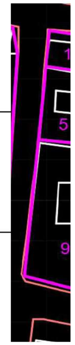


Table. 2 (ctd.).
Site building survey data.

					MENS SALON									RETAIL			
					GROCERY SHOP									RETAIL			
	3487		2939	6655													
BLOCK-13 B (BOUNDARY ROADS- SAYED SALLEY LANE- 3 SIDES, MADAN MOHAN BURMON STREET)																	
1	220	20 x 11	175	350		2	6	COMMERCIAL	RESIDENTIAL			COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE		
					THE ROYAL STORE- GIFT SHOP												
					AYEEN GIRLS TAIRLORING SCHOOL												
					GOUSHIA LIBRARY- BOOK STORE												
					OSMANIA LIBRARY- BOOK STORE												
2	237	24 x 9.87	203	453		3	10	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
					ISLAMIA LIBRARY- BOOK STORE									RETAIL			
					KIRAN FRUIT AND VEGETABLE SUPPLY- FRUIT WHOLESELLER									WHOLESALE			
					2 NO. FRUIT GODOWN									WHOLESALE			
3	529	24 x 22.04	394	788		3	10	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
					3 NO. GROCERY SHOP									RETAIL			
					FRUIT GODOWN									WHOLSALE			
4	355	30 x 11.83	311	1866		6	20	RESIDENTIAL				RESIDENTIAL	PRIVATE	RESIDENTIAL	2023		
					UNDER CONSTRUCTION SITE												
5	393	22 x 17.86	264	792		3	10	RESIDENTIAL				RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
6	1026	36 x 28.5	865	1054		2	6	RESIDENTIAL				RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
7	619	31 x 19.96	494	519		1	3	COMMERCIAL				COMMERCIAL	PRIVATE	COMMECIAL	NOT SURE		
					GROCERY SHOP									RETAIL			
					BHUJIA SHOP									RETAIL			
					CARDS SHOP									RETAIL			
					HARDWARE SHOP									RETAIL			
					GODOWN									WHOLESALE			
8	195	17 x 11.47	152	304		2	6	RESIDENTIAL				RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
9	331	20 x 16.55	225	675		5	16	PUBLIC/SEMI-PUBLIC				PUBLIC USE	GOVERNMENT	PUBLIC USE	NOT SURE	CONTP. ISLAMIC	
					MUSTAFABIBI JAMA MASJID									RELIGIOUS ACTIVITY			
10	469	26 x 18.03	400	744		2	5	COMMERCIAL	RESIDENTIAL			COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE		
					NEW MASTER GROUP- CONSTRUCTION CONSULTANCY OFFICE									SERVICE			
					2 NO. GROCERY SHOP									RETAIL			
					GODOWN									WHOLESALE			

Table. 2 (ctd.).
Site building survey data.

11	448	29 x 15.44	298	596		2	8	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	COLONIAL ARCH WINDOWS
					GODOWN									WHOLESALE		
					GROCERY SHOP									RETAIL		
					RESTURANT- RICE HOTEL									RETAIL		
	4822		3781	8141												
BLOCK-14 (BOUNDARY ROADS- SAYED SALLEY LANE- 2 SIDES, MADAN MOHAN BURMON STREET, CENTRAL AVENUE)																
1	629	27 4 x 24.1	607	842		2	8	COMMERCIAL	RESIDENTIAL	N.A.	N.A.	COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE	
					BIHARI HOTEL									RETAIL		
					KGN PURE MILK SHOP									RETAIL		
					DIARY PRODUCT RETAIL SHOP									RETAIL		
					FRUIT WHOLESELLER									WHOLESALE		
					RETAIL SHOP (GUTKA+TOBACCO)									RETAIL		
					JANATA TELECOM									RETAIL		
					RETAIL SHOP (GROCERRY ITEMS)									RETAIL		
					TIN BENDING SHOP									MANUFACTURING		
2	237	19 4 x 11.3	184	552		3	11	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	MIXED	NOT SURE	
					SKYLINE TELECOM									RETAIL		
					RETAIL SHOP (WITH VI TELECOM BANNER)									RETAIL		
					FRUIT GODOWN (2 NO.)									WHOLESALE		
					SRI KRISHNA IMPORTED FRUIT									RETAIL		
3	357	18 9 x 17.3	272	272		1	5	COMMERCIAL & RESIDENTIAL		N.A.	N.A.	RESIDENTIAL	PRIVATE	MIXED	NOT SURE	
					PLASTIC BAG MAKING SHOP									MANUFACTURING		
					TIN BENDING SHOP (2 NO.)									MANUFACTURING		
					SAHAZADA BIRIYANI									RETAIL		
4	302	22 3 x 12.3	209	209		1	4	RESIDENTIAL	N.A.	N.A.	N.A.	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	
5	134	21.1 x 6.4	64	64		1	4	COMMERCIAL & RESIDENTIAL		N.A.	N.A.	RESIDENTIAL	PRIVATE	MIXED	NOT SURE	
					A.J. CREATIONS									RETAIL		
					INVITATION CARD SHOP									RETAIL		
6	487	24 4 x 21.5	371	371		1	4	COMMERCIAL & RESIDENTIAL		N.A.	N.A.	RESIDENTIAL	PRIVATE	MIXED	NOT SURE	
					MUSICAL INSTRUMENT SHOP									RETAIL		
					MEAT SHOP (BEEF)									RETAIL		
					HOTEL									RETAIL		
					RETAIL SHOP									RETAIL		
7	422	23 9 x 16.4	377	1508		4	11	COMMERCIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	MIXED	NOT SURE	
					RETAIL SHOPS									RETAIL		
8	141	15.9 x 8.8	124	124		1	5	COMMERCIAL	N.A.	N.A.	N.A.	COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE	
					WASIRA HOTEL									RETAIL		
					FRUIT GODOWN									RETAIL		
9	375	20 x 18.75	298	596		2	7	COMMERCIAL	RESIDENTIAL	N.A.	N.A.	COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE	
					GODOWN AND LABOUR'S RESTING AREA									RETAIL		
					NEROLAC PAINT SHOP									RETAIL		
					HARWARE SHOP									RETAIL		
					RETAIL SHOP (6 NO.)									RETAIL		
					SWEET SHOP									RETAIL		
10	119	15.9 x 7	101	303		3	9	RESIDENTIAL	RESIDENTIAL			RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE	















Table. 2 (ctd.).
Site building survey data.

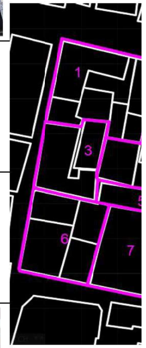
11	213	24.1 x 8.83	185	185		1	4	RESIDENTIAL	N.A.	N.A.	N.A.	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
12	210	16.2 x 12.5	123	246		2	7	RESIDENTIAL	RESIDENTIAL	N.A.	N.A.	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		 
13	262	18.2 x 14.4	190	190		1	4	RESIDENTIAL	N.A.	N.A.	N.A.	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
14	70	13.5 x 6.2	52	52		1	4	RESIDENTIAL	N.A.	N.A.	N.A.	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
15	115	17.6 x 7.4	85	85		1	4	COMMERCIAL	N.A.	N.A.	N.A.	COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE		
16	118	17.6 x 6.2	104	104	GODOWN	1	4	COMMERCIAL	N.A.	N.A.	N.A.	COMMERCIAL	PRIVATE	COMMERCIAL	NOT SURE		
17	300	21.2 x 14.6	208	208		1	4	RESIDENTIAL	N.A.	N.A.	N.A.	RESIDENTIAL	PRIVATE	RESIDENTIAL	NOT SURE		
18	318	18.1 x 17.5	227	477	PANCHAYAT MASJID	3	15	PUBLIC/SEMI-PUBLIC				PUBLIC USE	GOVERNMENT	PUBLIC USE RELIGIOUS ACTIVITY	NOT SURE	CONTP. ISLAMIC	 
19	205	22.3 x 9.4	157	157	NEW WARSIA HOTEL RETAIL SHOPS (3 NO.)	1	4	COMMERCIAL	N.A.	N.A.	N.A.	COMMERCIAL	PRIVATE	COMMERCIAL RETAIL RETAIL	NOT SURE		 
20	142	17.5 x 8.3	127	174	GODOWN CENTRAL DIAGONISTIC CENTER & PATHGOLOGY LAB FRUIT SHOP	2	7	COMMERCIAL	RESIDENTIAL	N.A.	N.A.	COMMERCIAL	PRIVATE	COMMERCIAL RETAIL MEDICAL RETAIL	NOT SURE		 

Table. 2 (ctd.).
Site building survey data.

3.4. Site Analysis

3.4.1. Land Use Map

Land use map refers to a graphical representation of how land in a particular area is utilized. It typically categorizes land into different uses such as residential, commercial, industrial, recreational, etc. These maps are important for urban planners as they provide a visual overview of the distribution of different land uses within a city or neighborhood. They help in understanding the existing urban fabric, identifying areas for potential development or redevelopment, and planning for efficient land use allocation.

Analysis of the study area reveals that over 50% of the land is designated for residential use, indicating that the area can be characterized as a residential neighborhood with a thriving wholesale market. This suggests a mixed-use environment where residential activities are predominant, complemented by the presence of a vibrant wholesale market.

Fig. 21.
Landuse map of the study area.

3.4. Site Analysis

3.4.2. Building Use Map

Building use map illustrates how individual buildings are utilized within a given area. It provides a detailed breakdown of the functions and activities occurring within each building, such as residential, commercial, industrial, or institutional use.

Approximately 70% of the ground floor area of the buildings in the study area is actively used for the wholesale fruit market, serving as fruit stores and storage (godown) facilities. This underscores the importance of integrating these spaces into the urban design proposal, along with the public spaces of the area. Such integration is crucial for creating a cohesive and functional urban environment that supports the needs of both the market activities and the broader community. The primary usage of the first floor of the buildings is predominantly residential, with some extension of commercial activities from the ground floor. The second floor and those above it are mainly dedicated to residential purposes.

Fig. 22.
Net building use map (dominant floor area) of the study area.

Fig. 23.
Building use map of the study area. From top- ground floor, first floor, second floor, and above floors building use plans.

3.4. Site Analysis

3.4.3. Plot Ownership Map

Plot ownership map illustrates the ownership status of land parcels within a specific area, distinguishing between private, public, and communal ownership. This map is crucial for understanding the ownership patterns that can influence development decisions and strategies, particularly regarding land acquisition, zoning regulations, and public-private partnerships.

The majority of the land in the area is privately owned, with a few government-owned buildings dedicated to religious and urban services. This indicates that urban development efforts in the area will require collaboration between private stakeholders and government entities.

Fig. 24.
Plot ownership map of the study area.

3.4. Site Analysis

3.4.4. Ground Coverage Map

Ground coverage map represents the proportion of the ground area covered by buildings within a given area. It shows the spatial distribution and density of building footprints, providing insights into the urban form, land use efficiency, and potential for open space development.

The area's building blocks exhibit a dense, compacted arrangement, which has resulted from the subdivision of large single plots into multiple smaller plots. This pattern of development has led to the formation of a block pattern characterized by closely packed buildings.

Fig. 25.
Ground coverage map of the study area.

3.4. Site Analysis

3.4.5. Building Height Map

Building height map represents the varying heights of buildings within a specified area. It provides insights into the vertical profile of the urban environment, indicating areas of high-rise development, low-rise structures, and potential discrepancies in building heights.

Along the road edges, buildings are predominantly four stories or higher, while within the blocks, they are primarily one story in height, reflecting an organic development pattern.

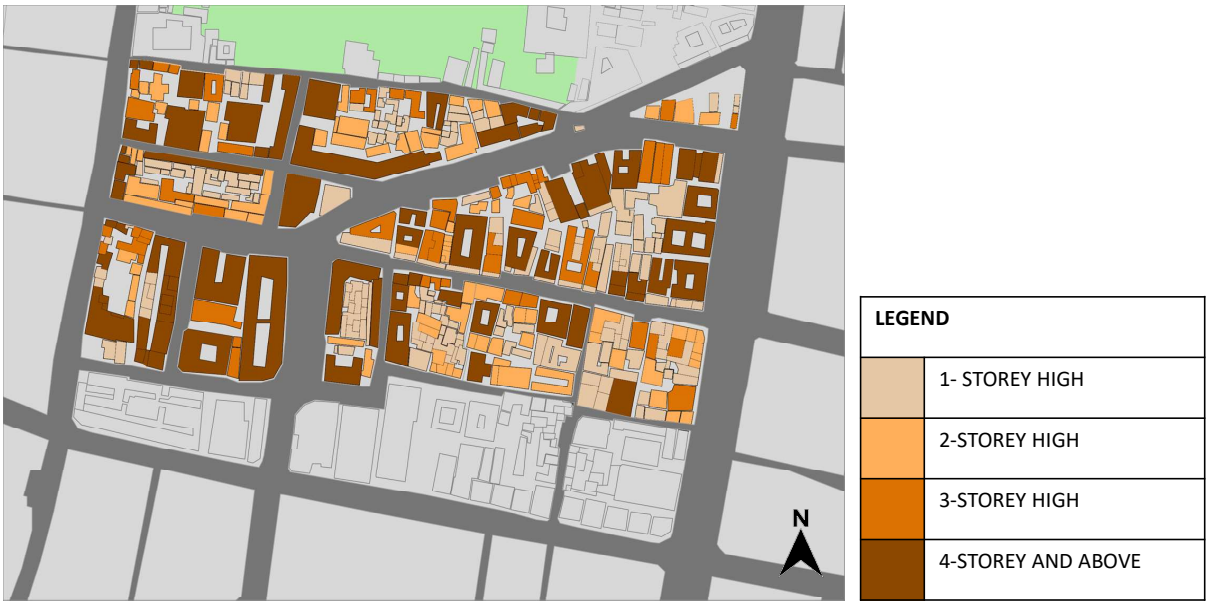


Fig. 26.
Building height map of the study area.

3.4. Site Analysis

3.4.6. Site Sections

Site sections are important in urban design as they provide a vertical cut through the site, revealing the relationship between different levels and elements such as buildings, streets, and open spaces. They help designers visualize the topography, understand the scale and massing of structures, and plan for efficient use of space and infrastructure.

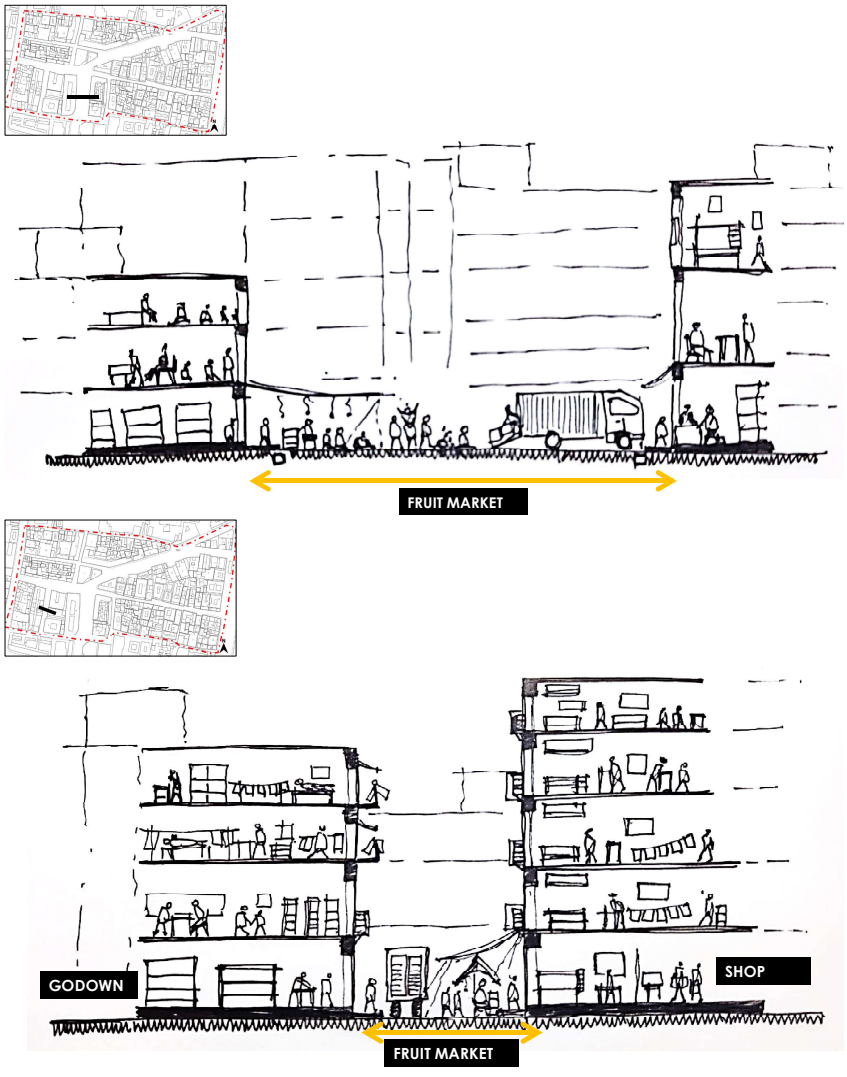


Fig. 27.
Site Sections of the study area.

3.4. Site Analysis

3.4.7. Site History (Past 12 years)

The site development history is important in urban design as it provides insights into the evolution of the area, including the establishment of key infrastructure, changes in land use, and the development of prominent landmarks. Understanding the site's history helps designers appreciate its cultural and historical significance, informs decisions regarding preservation or redevelopment, and enables the integration of past influences into future design proposals.

Since 2011, the area has witnessed the construction of several government buildings, including the Bara Bazar Police Station, Post Office, and Waste Compaction Center, along with the development of a large private residence.

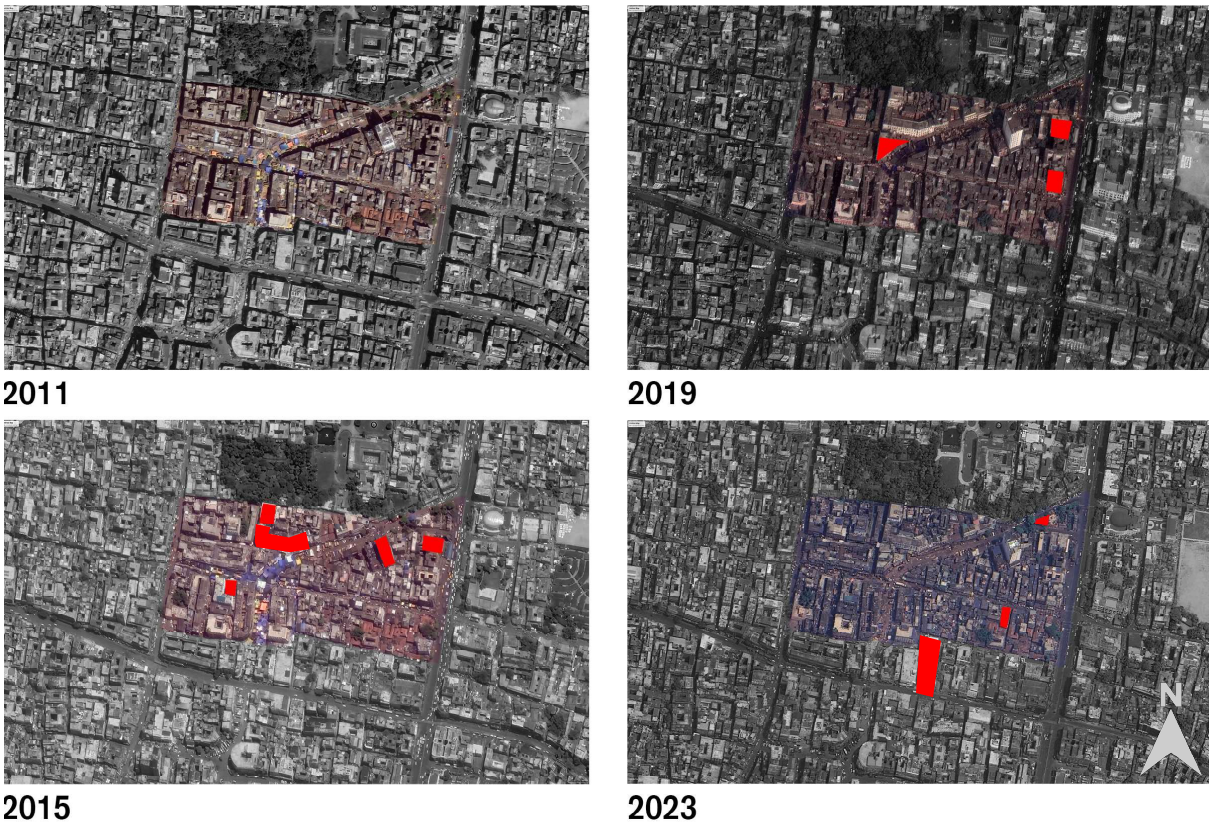


Fig. 28.
Site development history from 2011 to 2023 of the study area.

3.4. Site Analysis

3.4.8. Popluation Prediction

POPULATION OF KOLKATA CITY:
1991 – 4,399,819
2001 – 4,572,876
2011 - 4,496,694
2023 – 6,200,000 (estimate)
POPULATION OF WARD-41:
2001 – 25,486
2011 – 19,946
Population of Ward-41 after 15% decrease (estimation after considering, the overall population of the city will increase):
P_{2023} = **16,954**
The total population of the study area in 2023
= (4.401 / 14.865)*16954 = **5019**
The total amount of household in the study area in 2023
= (4.401 / 14.865)*3814 = **1129**
Population Density of Ward-41 in 2023
= 16,954/0.2046 = **82,864 people per sq.km**

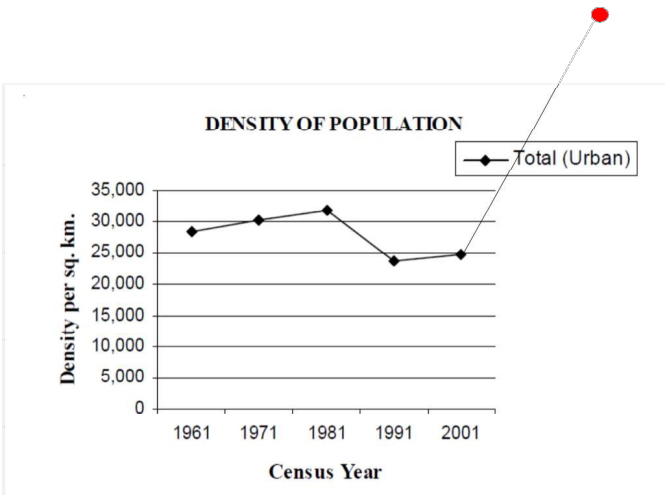


Fig. 29.
Predicted density of population in the study area.

3.4. Site Analysis

3.4.9. Site SWOT Analysis

STRENGTHS:

- Close proximity to Central Avenue Road and North-South Metro station (MG Road Station)
- Presence of active wholesale fruit market (One of the largest in India)
- Presence of strong network of sellers and other stakeholders with Worker's and Labour Unions

WEAKNESS:

- Lack of permeability of the fruit market from MG Road (in South) and Central Avenue Road (in East)
- Unorganized parking spaces of vehicles for loading/unloading of materials
- Improper methods in handling of fruits and technique of disposal
- Poor quality of life in public spaces and residential areas
- Congestion in public spaces due to increase of trade over time.

OPPORTUNITIES:

- Government support present in decongestion and shifting of market place.
- Scope available to implement IoT based technologies to improve trade and management of the market
- Availability of heritage buildings for conservation.

THREATS:

- Limited market space, with gradually increasing trade and population.
- Attitude of stakeholders towards development and organization of commodities.

3.4. Site Analysis

3.4.10. Demographic Analysis

OBSERVATIONS:

- Population and number of households is having a decreasing trend.
- Schedule Caste and Schedule Tribe population increased significantly from 2001 to 2011
- Number of literates almost remained same from 2001 to 2011, but the women literacy have increased during this time period.
- Number of illiterates reduced significantly, but female illiteracy didn't reduced compared to male.
- Total number of workers have reduced from 2001 to 2011, but female workers have increased in this time-period.
- Similar trend could be observed in number of main workers (workers who had worked for the major part of time period or more than 50%)
- Marginal workers (workers who had not worked for the major part of time period or worked less than 50%) have increased.
- The non-workers (workers who do not work or paid for the work) have reduced from 2001 to 2011. The number of female non-workers reduced more than male non-workers.

ANALYSIS:

- Extension of commercial activities and increase of floating population in the market place resulted in decresing trend in households.
- Increase in trade/expansion of commercial activities, resulted in migration of people from remote areas resulted in ST/SC population increase.
- With expansion of commercial activities, more workers are working on contracts, rather than permanent employments.
- Workers are employed in contractual basis is again proved with these demographic data, but more people are employed during this time period.

3.4. Site Analysis

3.4.10. Demographic Analysis

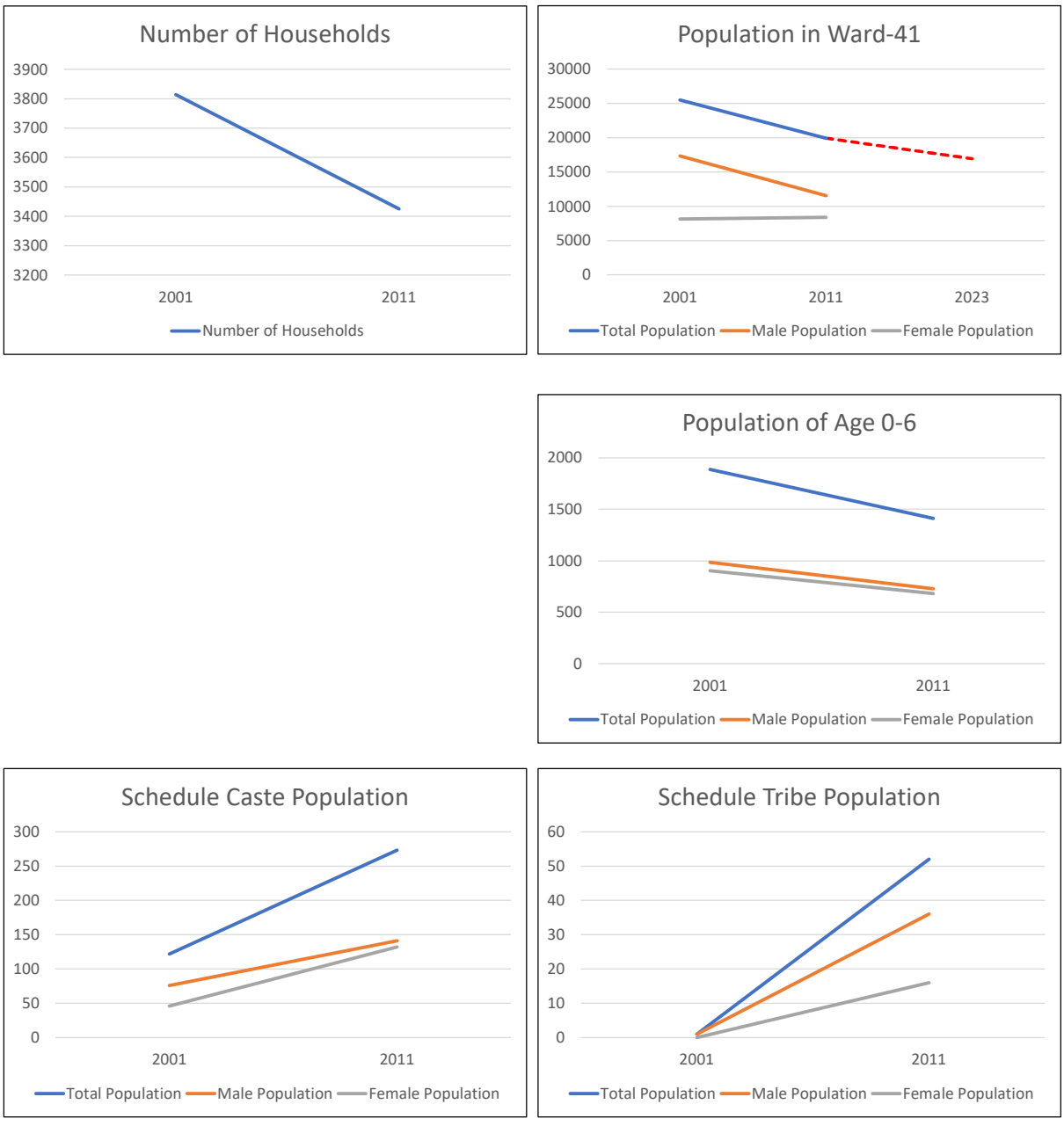


Fig. 30.
Demographic data charts from census of Ward-41 in 2001 and 2011.

3.4. Site Analysis

3.4.10. Demographic Analysis

Fig. 30. (ctd.)
Demographic data charts from census of Ward-41 in 2001 and 2011.

3.4. Site Analysis

3.4.11. Property Value Survey

PROPERTY VALUE DATA COLLECTED
(FROM GROUND SURVEY):

SHOP VALUE
INR 20,000 – 25,000 per sq.ft

RESIDENCE VALUE
INR 9,000 – 10,000 per sq.ft

GODOWN VALUE
INR 15,000 – 17,000 per sq.ft
(most of the godown are on rent)

TRUCK PARKING ON-STREET VALUE
INR 40,000 – 50,000 per sq.ft
(paid to the shopkeeper adjacent to the parking lot)

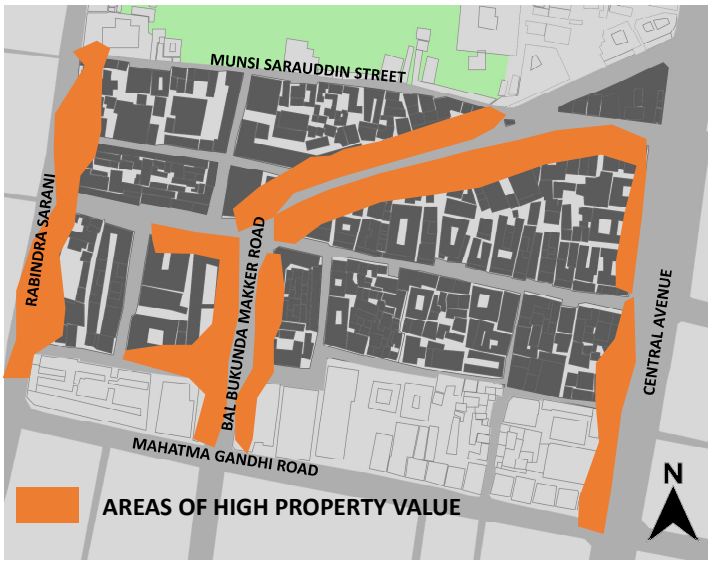


Fig. 31.
Areas of high property value in the study area.

3.4. Site Analysis

3.4.12. Building Age Map

The building age map provides a chronological record of when buildings were constructed, indicating the historical development of the area. This information helps in understanding the architectural heritage, identifying buildings of historical significance, and assessing the overall age and condition of structures within the urban fabric.

Most buildings in the market area were constructed after independence. However, a few buildings predating 1950 are in a dilapidated state, yet they are still used for commercial and residential purposes.

Fig. 32.
Building age map of the study area.

3.4. Site Analysis

3.4.13. Damaged and Temporary Buildings Map

The damaged and temporary building map provides information on the condition and usage of buildings that may require immediate attention or future planning considerations. It helps identify areas prone to safety hazards, blight, or disrepair, allowing for targeted interventions to improve the urban environment. Additionally, this map can highlight areas with a high turnover of temporary structures, indicating dynamic or transitional land uses that may influence long-term planning decisions.

The design age of the buildings are 70 years, so the buildings above 70 years of age and not maintained are marked as damaged.

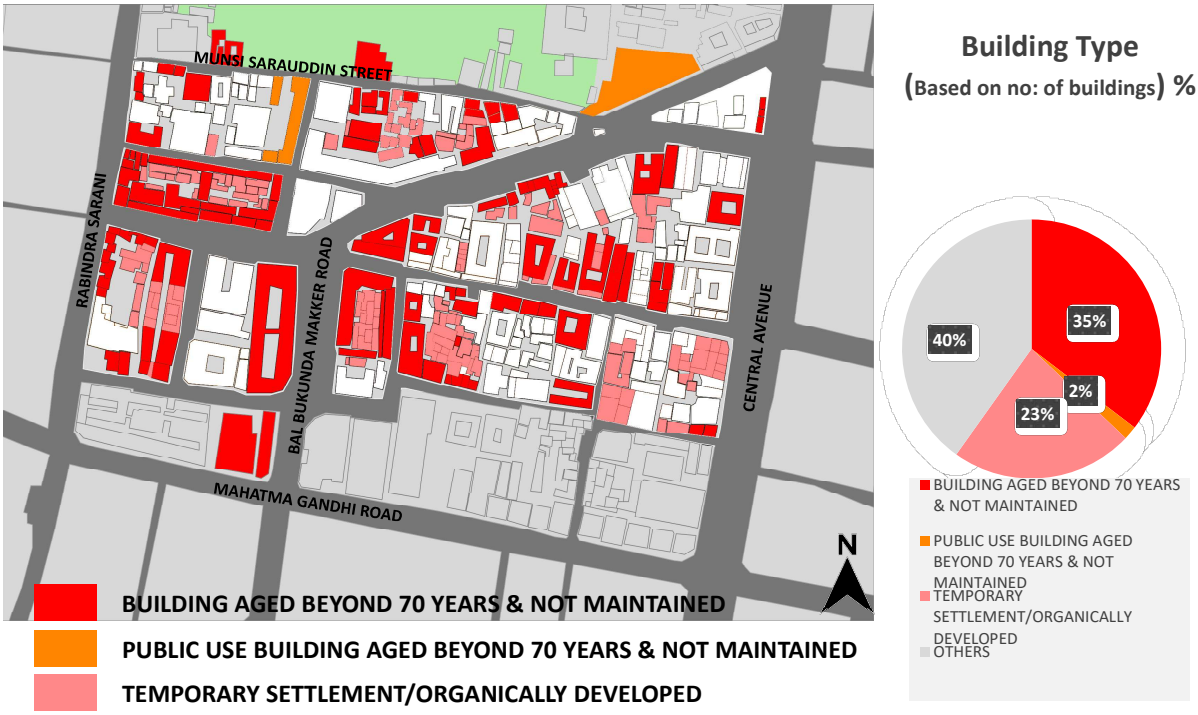


Fig. 33.
Damaged and temporary building map in the study area.

3.4. Site Analysis

3.4.14. Market Area Map

The market area map provides an idea of the location of activities and the regions where the commercial activities take place.

The main activities that takes place in the market are loading unloading of goods with supply and distribution trucks, auctioning, sorting, storage, and wholesale and retail marketing of the fruits. The areas where most these activities takes place are marked in Figure 34.

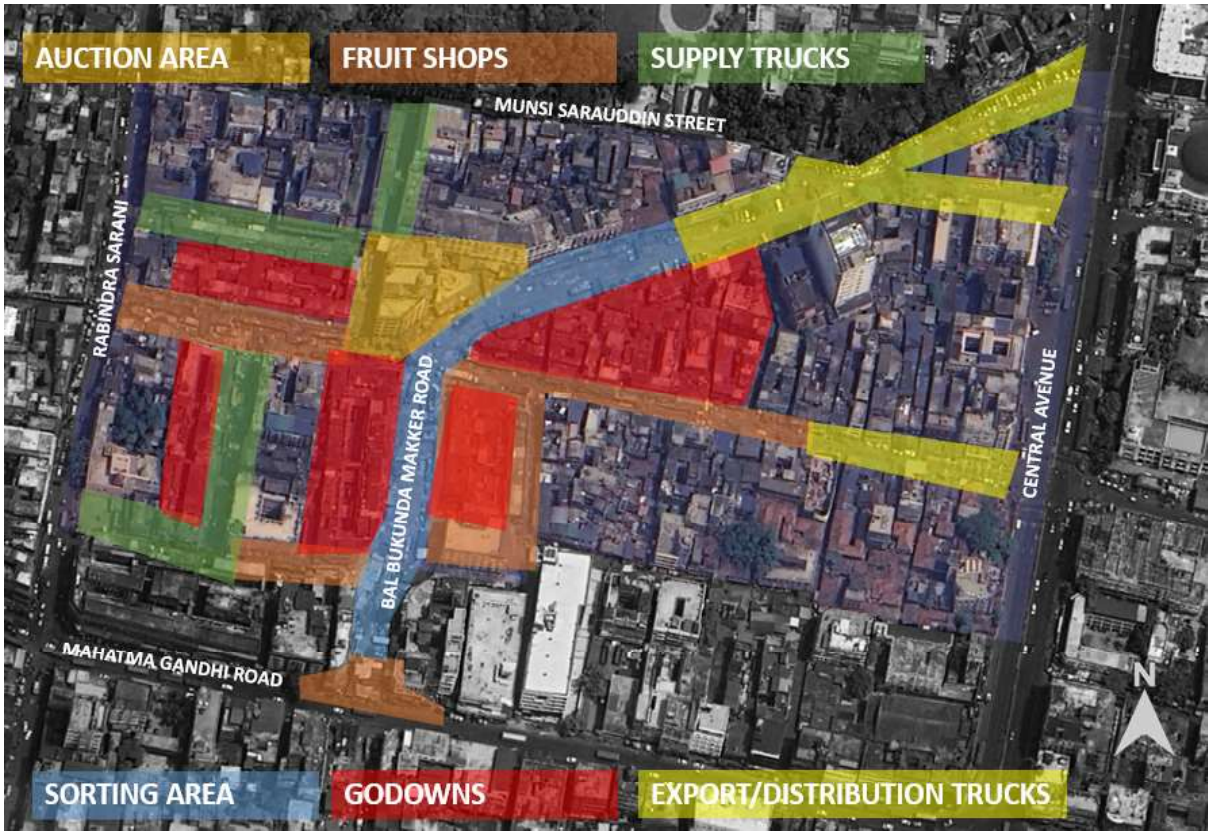


Fig. 34.
Areas of activities in the market area.

3.4. Site Analysis

3.4.15. Flow of Activities in Market

The supply trucks comes to the market in the morning at around 5:00 AM in Class-4 trucks. Then the goods are unloaded by labourers and majority of the goods are taken to the sorting area. Then the fruits are sorted my manual labours and it is transported to the auction area, and some to the godowns. From the auction area, some fruits goes for distribution and some goes to godown, which are supplied to the retailers. The distribution trucks (mainly Class-1 trucks) leaves the market around 4:30 PM. The retail market stays active till 9:30 to 10:00 PM.

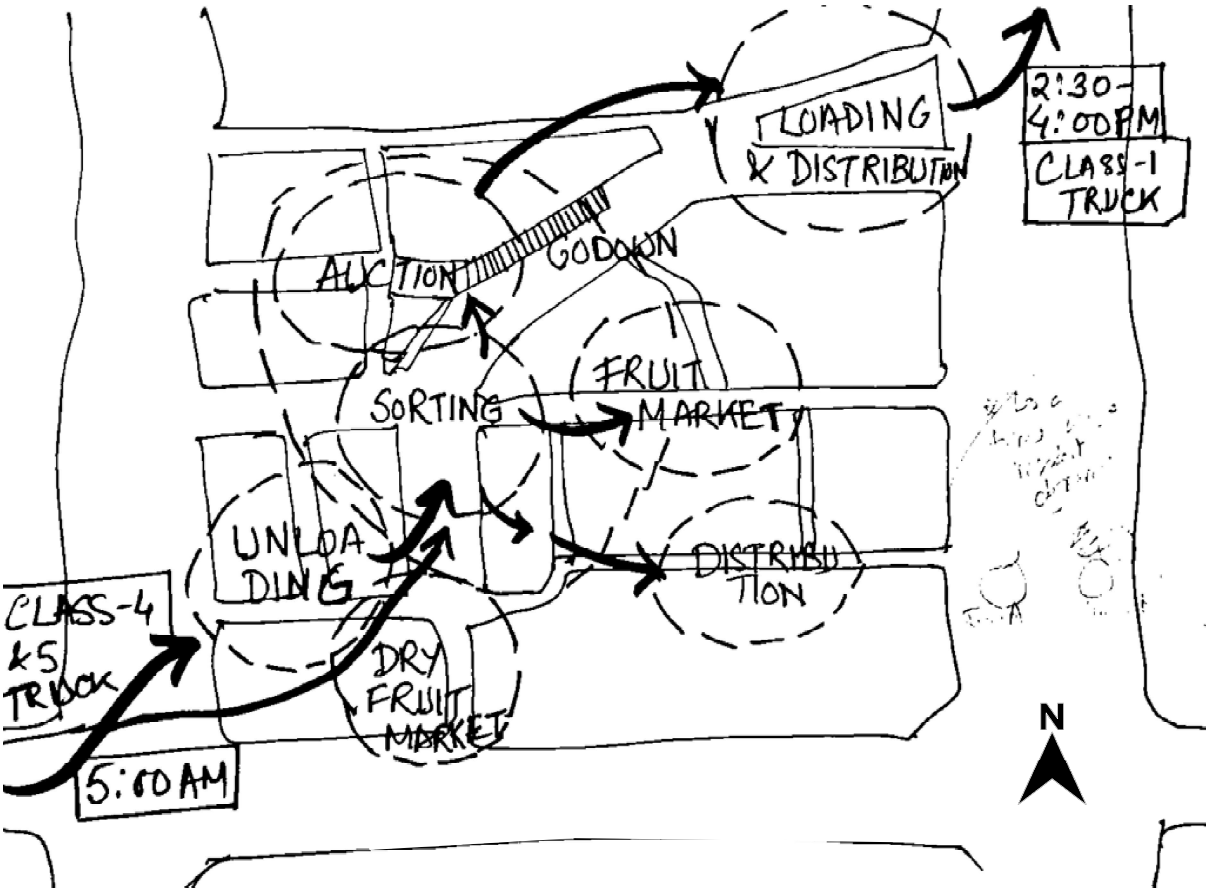


Fig. 35.
Sketch of flow of activities in the market area.

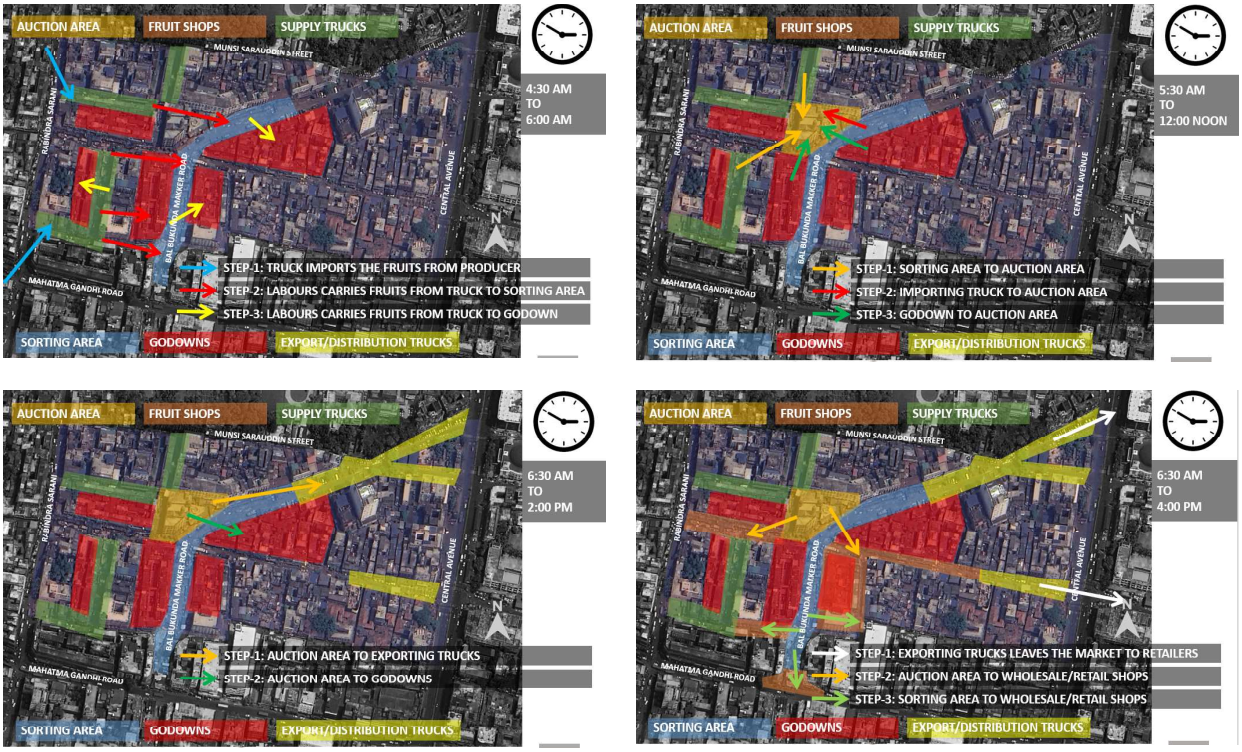


Fig. 36.
Sequence of activities in the market with time.

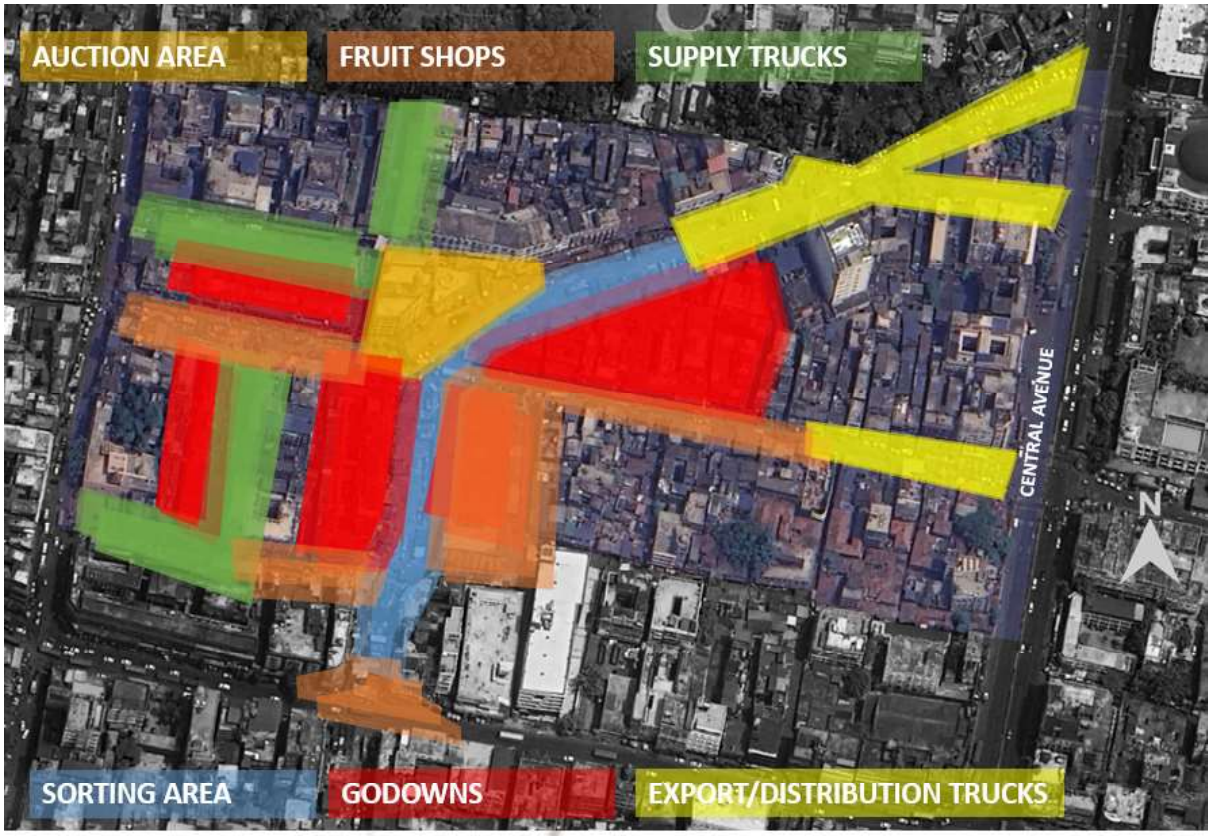


Fig. 37.
Most active areas of the market, through overlapping of activities throughout the day

3.4. Site Analysis

3.4.16. Street Elevations

Street elevations provide a visual representation of the built environment along a street or road. This information is crucial for understanding the scale, character, and architectural features of buildings within the urban fabric. Street elevations help designers assess the overall visual quality and coherence of a street, identify opportunities for enhancement or preservation, and guide decisions regarding urban form, façade treatments, and public realm improvements. They also aid in creating a cohesive and harmonious streetscape that contributes to the overall urban experience.

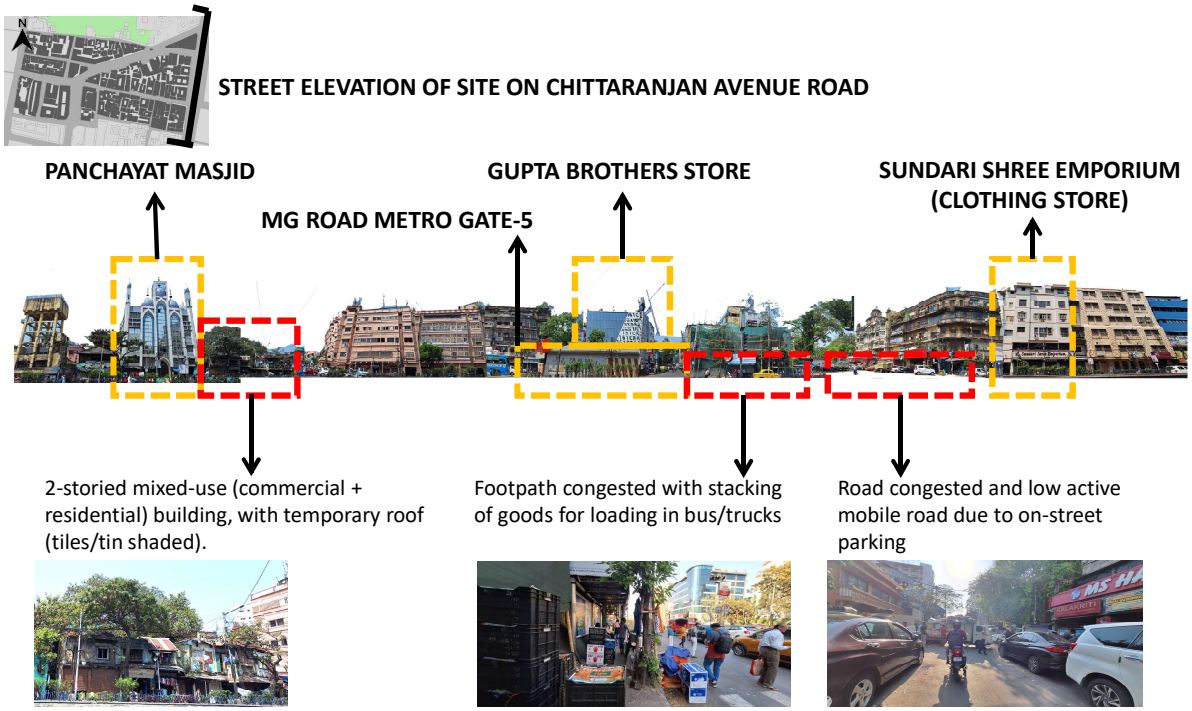
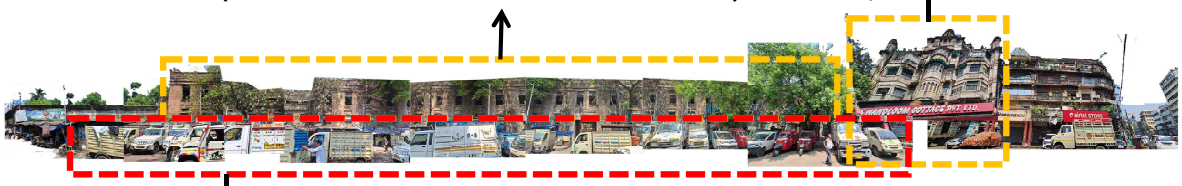


Fig. 38.
Street elevations of the market area.

STREET ELEVATION OF SITE BOUNDARY ON BAL MUKUNDA MAKKAR ROAD

OLD BARABAZAR POST AND TELEGRAM OFFICE (PRIVATE PROPERTY IN DILAPITATED CONDITION)

HAVELI (GRADE- II A HERITAGE AS PER KMC)

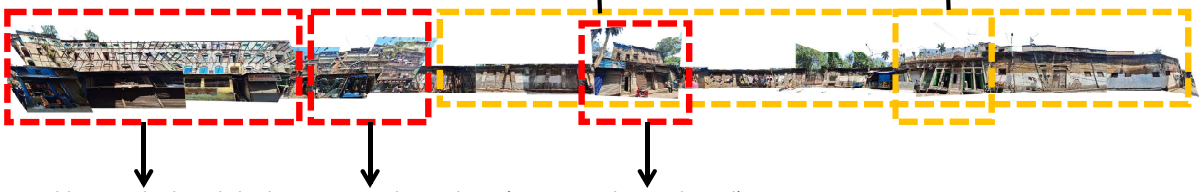


Parking of trucks for loading/unloading of goods.

STREET ELEVATION OF SITE BOUNDARY ON MUNSI SARAUDDIN STREET

BOUNDARY OF MARBLE PALACE

BAGAN MASJID



Building partly-demolished for road construction

4-storied mixed-use (commercial + residential) building, with temporary roof (tiles/tin shaded).

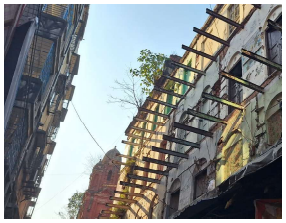


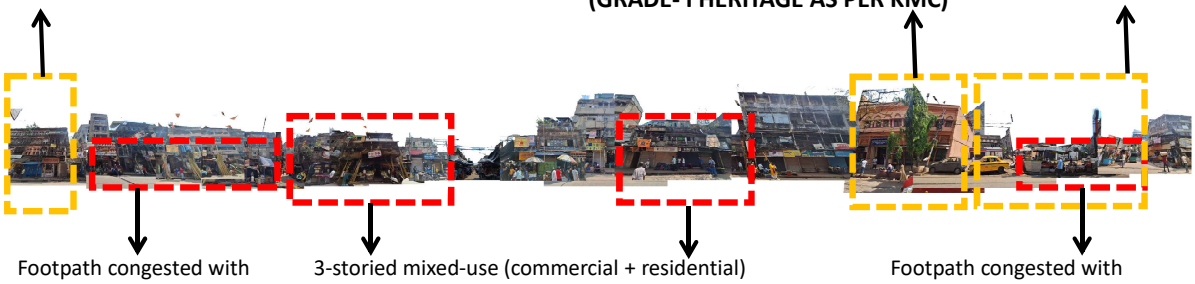
Fig. 38. (ctd.)
Street elevations of the market area.

STREET ELEVATION OF SITE ON RABINDRA SARANI

RESIDENCE WITH COLONIAL STYLE FACADE

BRAHMO PRAYER HALL (GRADE- I HERITAGE AS PER KMC)

HP PETROL PUMP



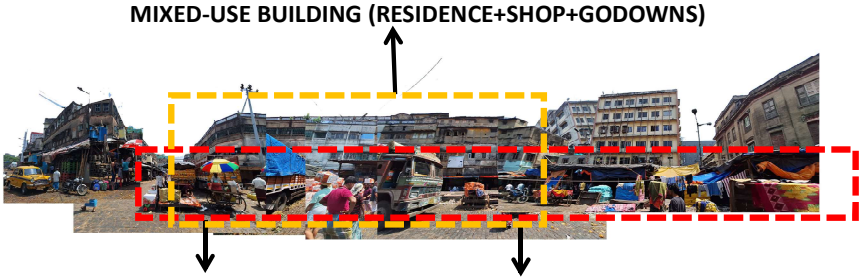
Footpath congested with temporary shops and vendors

3-storied mixed-use (commercial + residential) building, with temporary roof (tiles/tin shaded).

Footpath congested with temporary shops and vendors

STREET ELEVATION OF SITE ON BAL MUKUNDA MAKKAR ROAD

MIXED-USE BUILDING (RESIDENCE+SHOP+GODOWNS)



Shops, godowns & trucks for wholesale activities of fruit

Fig. 38. (ctd.)
Street elevations of the market area.

STREET ELEVATION OF SITE ON BAL MUKUNDA MAKKAR ROAD

STREET ELEVATION OF SITE ON BAL MUKUNDA MAKKAR ROAD

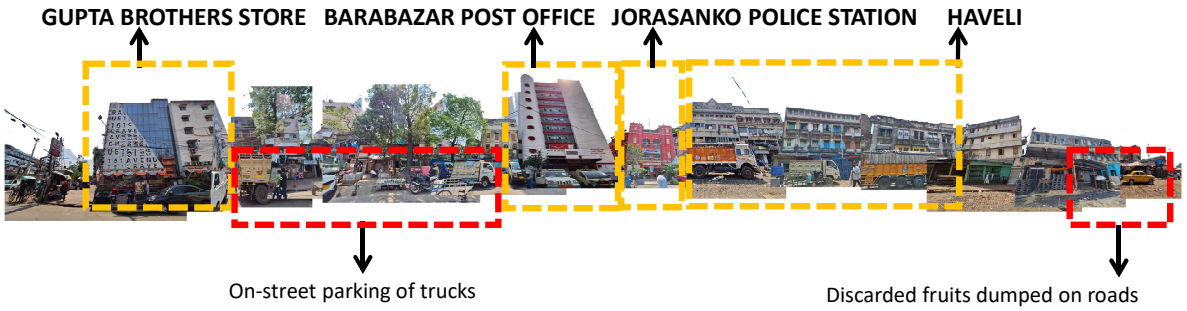


Fig. 38. (ctd.)
Street elevations of the market area.

3.5. 3D Block Model

The 3D block model of an existing site provides a realistic and comprehensive representation of the site's physical characteristics and spatial relationships. This model allows designers to visualize the site in three dimensions, enabling a deeper understanding of its topography, building heights, and massing. It helps identify potential design challenges and opportunities, such as views, sunlight exposure, and pedestrian access.

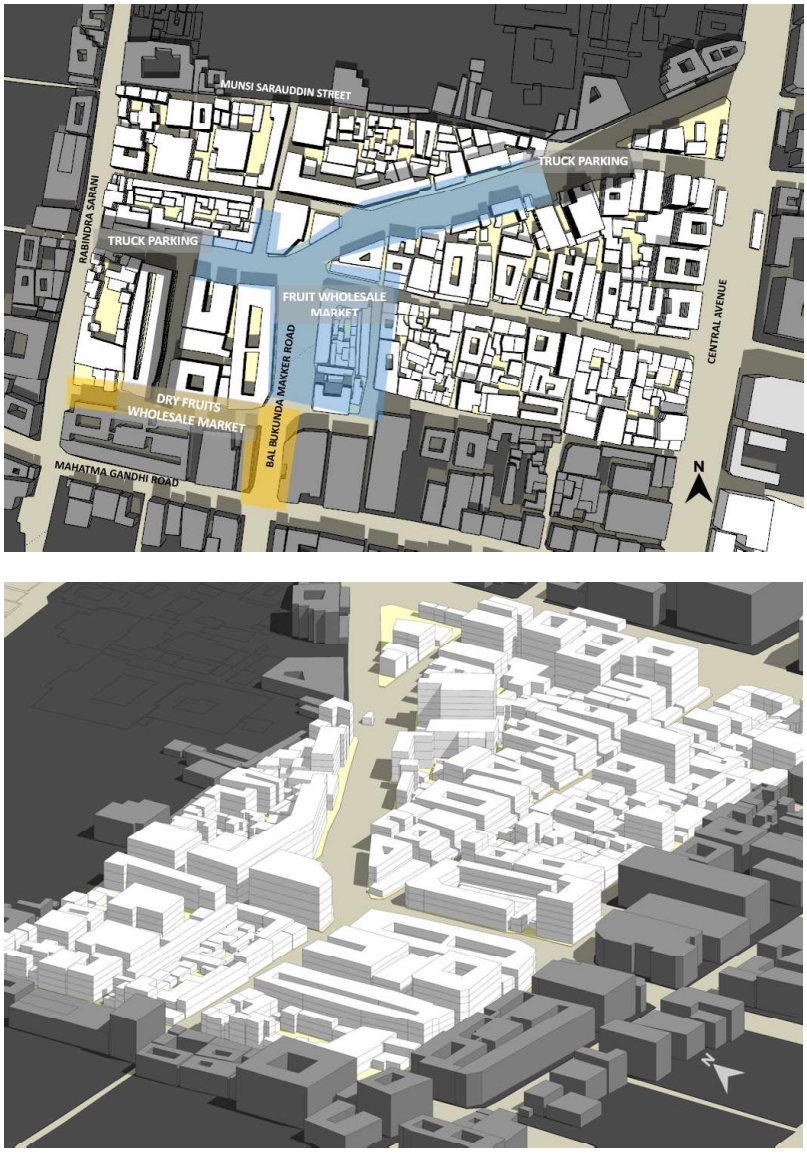


Fig. 39.
3D Block model of the study area.

3.6. Conclusions

The conclusion of the site study are as follows:

- Though the market is located at the heart of the city and can be reached easily with public transport, there lacks permeability and visibility to the market from the main roads due to congested roads.

- A strong network of sellers and other Stakeholders are available, and their inputs on redevelopment could be taken for better urban design decisions.

- The increase in congestion leads to pollution and a chaotic marketplace, so decongestion of the marketplace must be done, which is also supported by the government of West Bengal.

- Urban amenities and services are damaged and ill-maintained, which needs to be repaired with the implementation of IoT-based solutions for traffic and population management.

- Smart management of parking areas, and improvement in fruit loading/ unloading systems, needs to be done, to enhance the efficiency of the marketplace.

- As the floating population increases, the urban amenities to support them should be improved and increased like the toilets, resting area, etc.

- Buildings that have aged over 70 years, lies in unhygienic condition (and not heritage property), and temporary structures could be redeveloped with present building by-laws.

- The activities in the market and spaces for movement of HMF and laborers should be reorganized to decongest.

4.1. Primary Case Study

4.1.1. Metro Cash & Carry, Kolkata

REASON FOR SELECTION:

METRO Cash & Carry, a unit of Reliance Retail Ventures Ltd., is India's leading wholesale company, with food and non-food assortments, and specializes in serving the needs of Traders, Kiranas; Hotels, Restaurants, and Caterers (HoReCa); Services, Companies, Offices (SCO) and as well as independent businesses.

This wholesale center also aligns with the aim of the thesis, and have several modern systems in wholesale market which could be implemented.

KEY LEARNINGS FROM THE CASE STUDY:

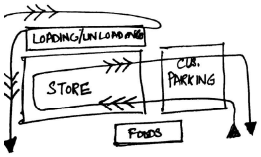
- The wholesale market must have separate movements for customer cars and goods trucks. It enhances the efficiency of the wholesale market and provides scope to access services to each group as per requirements.

- Customers shopping in the market, can park their cars, put them in the car washing centre, and eat food at the store. It saves time for customers and spends leisure time at the wholesale market.

- The goods trucks can park their vehicles, put goods in cold storage, and distribute the goods to retail stores in the same area. It reduces the transportation cost and effectively manages resources.

- Proper stacking of resources enhances the utility of the space, which can further be used for multiple purposes.

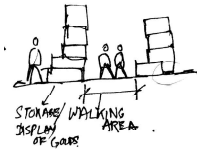
1. WHOLESALE MARKET FOR PRODUCER TO CUSTOMER



2. ONE-STOP SOLUTION FOR EACH CUSTOMER REQUIREMENTS

3. STORAGE AND DISTRIBUTION UNDER ONE ROOF

4. STACKING OF CRATES TO UTILIZE SPACE EFFECTIVELY



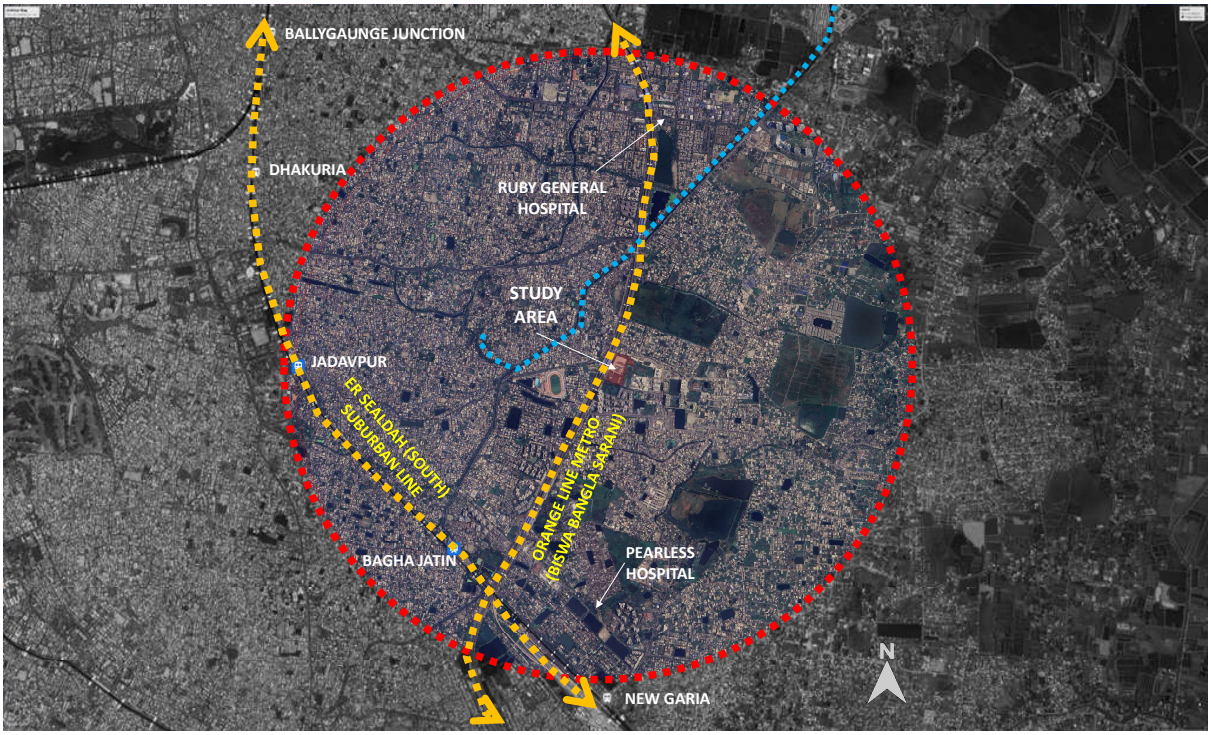


Fig. 40.
Location of Metro Cash & Carry, Kolkata.

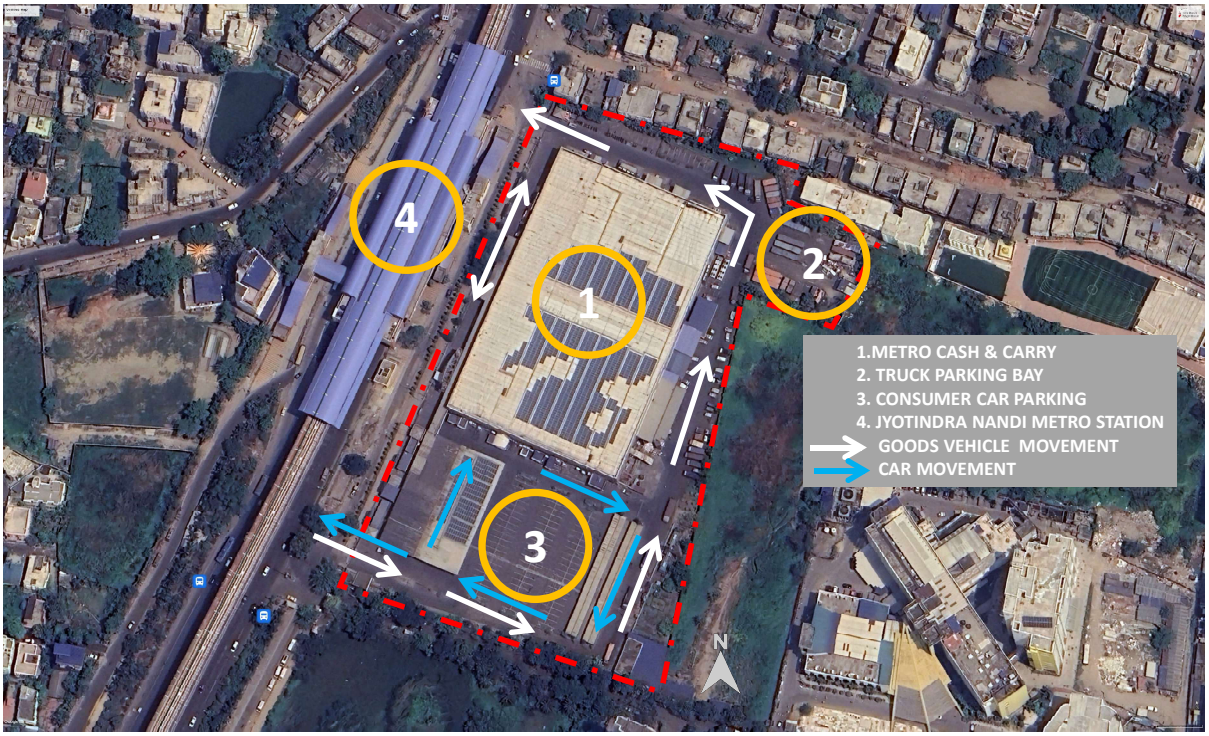


Fig. 41.
Site plan of Metro Cash & Carry, Kolkata.

4.1. Primary Case Study

4.1.2. Pasir Panjang Wholesale Centre, Singapore

REASON FOR SELECTION:

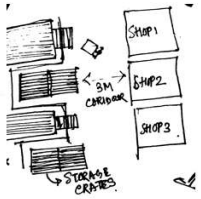
The Pasir Panjang Wholesale Centre (PPWC), is located south of the West Coast Highway. It is well-known for its bustling morning activities, the centre is Singapore's main distribution point; an important node in the fruits, vegetables and dried goods supply chain in Singapore.

This wholesale center also aligns with the aim of the thesis, and have several modern systems in wholesale market which could be implemented in the Indian wholesale market context.

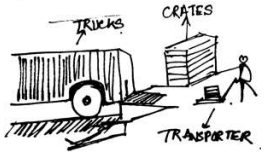
KEY LEARNINGS FROM THE CASE STUDY:

- A compact organized wholesale center enables easy trade and efficient management of resources with controlled distribution.
- An active and free-flowing corridor for transportation of loading/unloading goods is required for easy distribution of resources among wholesalers.
- A raised platform for loading/unloading of goods from trucks enables easy and direct movement of goods from trucks to wholesalers.
- Utilizing mechanized transportation systems and innovative waste disposal techniques could improve the work environment in the wholesale market.
- Stacking of goods in each shop enables efficient management of space and provides a passage for the users to walk uninterrupted.

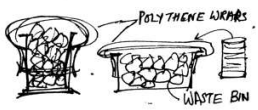
1. PLANNING OF RESOURCES



2. RAISED PLATFORMS FOR LOADING/UNLOADING



3. INNOVATIVE WASTE DISPOSAL



4. STACKING OF GOODS

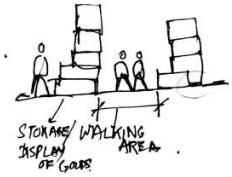


Fig. 42.
Location of Pasir Panjang Wholesale Centre, Singapore.

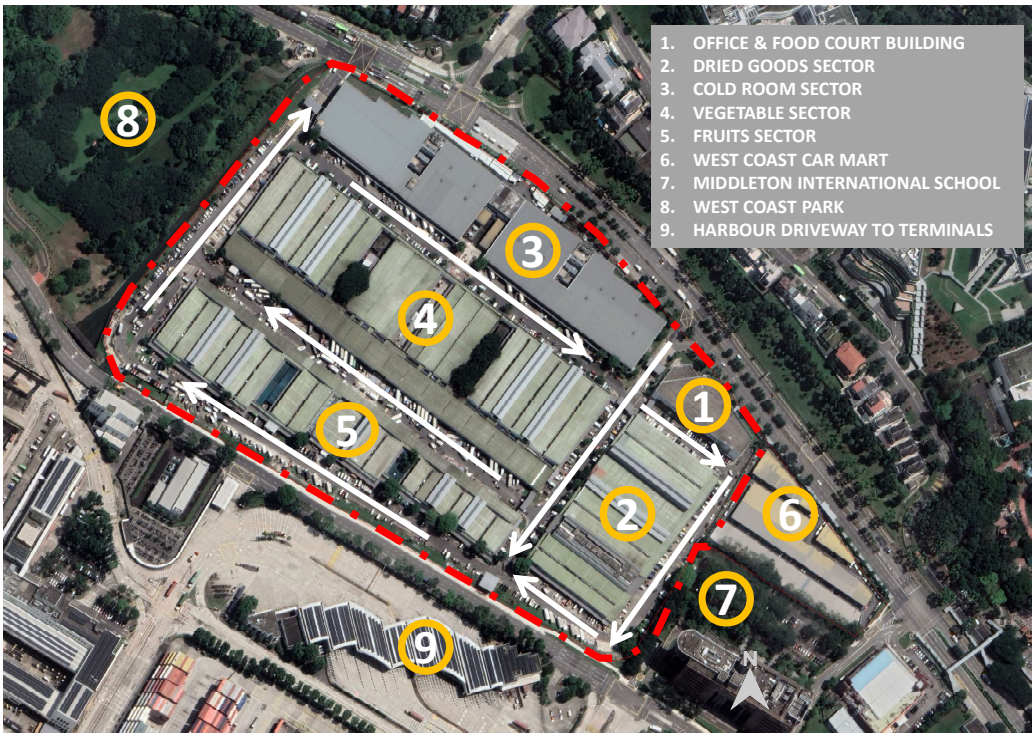


Fig. 43.
Site plan of Pasir Panjang Wholesale Centre, Singapore.

4.2. Secondary Case Study

4.2.1. Chandni Chowk, New Delhi

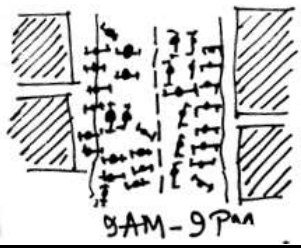
REASON FOR SELECTION:

Chandni Chowk, one of the largest and oldest wholesale markets of the Walled City in Delhi is currently being remodelled by the Shahjahanabad Redevelopment Corporation (SRDC). It provides an opportunity to study the redevelopment strategies for a wholesale market.

It is recent and well documented redevelopment project, and have information available in public forum, which makes it an appropriate topic for the Secondary Case Study.

KEY LEARNINGS FROM THE CASE STUDY:

- Hybrid pedestrianization could be introduced in the market area to reduce congestion and control the traffic load on a road.
- Improvement of public amenities enhances the quality of life of the stakeholders and develops scope for economic development.
- The inclusive design approach enhances the usability of public spaces, improves active mobility, and permeability of the place
- A strategy for traffic management, phase planning of the redevelopment project, and provision for parking lays a foundation for strategic redevelopment and implementation of the strategies in place.



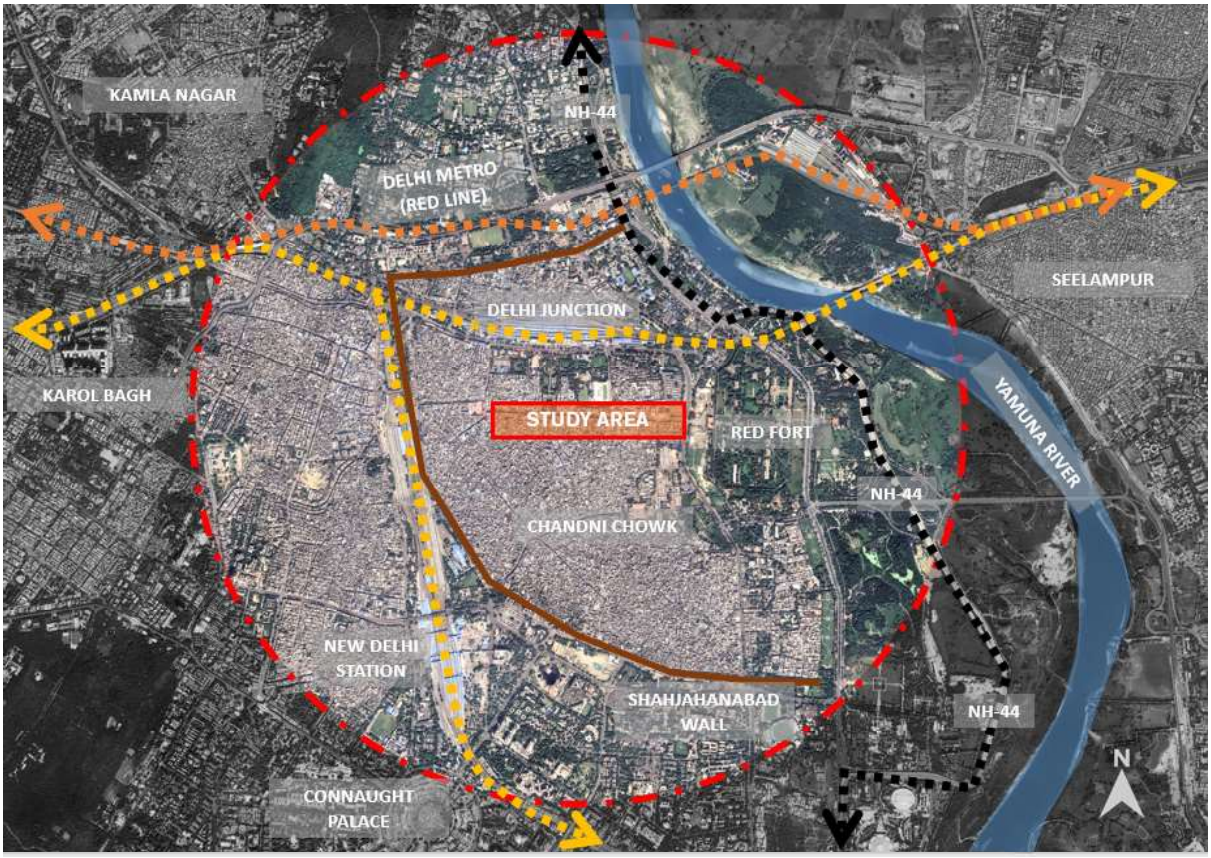


Fig. 44.
Location of Chandni Chowk, New Delhi.

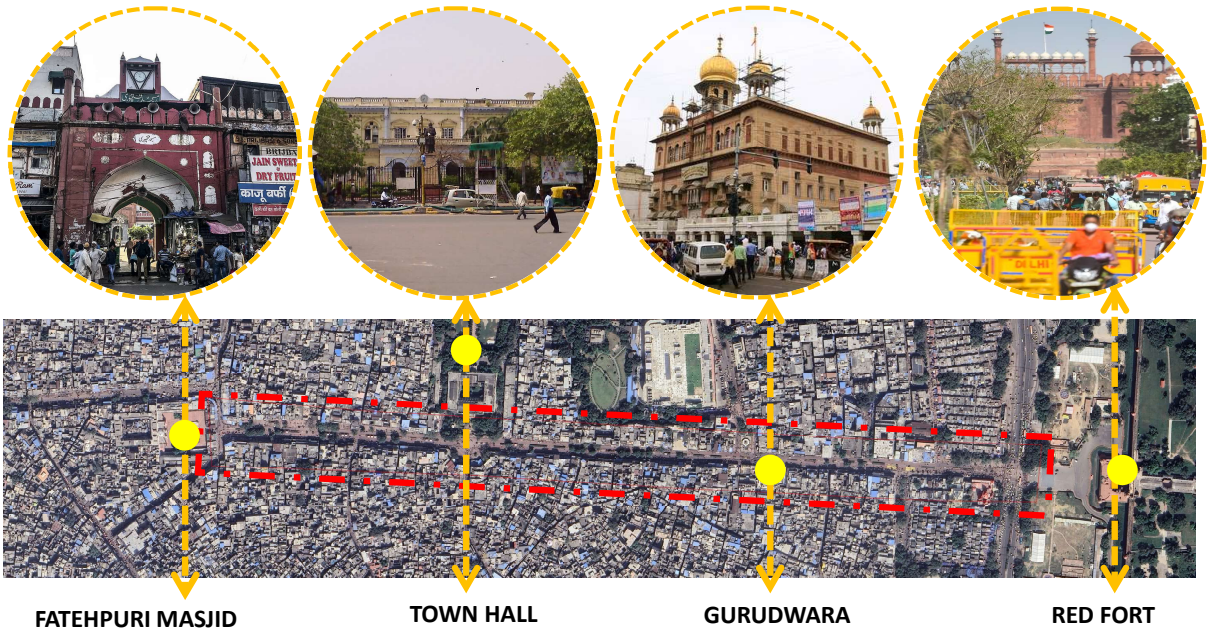


Fig. 45.
Landmarks of Chandni Chowk, New Delhi.

4.2. Secondary Case Study

4.2.1. Chandni Chowk, New Delhi

REDEVELOPMENT STRATEGY UTILIZED:

- Hybrid Pedestrianization: Only Pedestrians and NMT allowed from 9 AM to 9 PM
- Integrated Utilities: Drainage, water pipeline and, sewerage, Electrical, Solid waste, Fire, CCTV, and Cables
- Provided public amenities: Toilets, Police post, Booths, Street furniture, Multilingual Signages, and Dustbins
- Inclusive Design Approach: Streets as public space, Prioritizing Active mobility, Accessible for all, and Contextual elements
- Comprehensive Implementation: Traffic Management Plan, Designed Intersections in vicinity, Entry and exit Barricading, Phase Planning, and Parking Provisions

DECONGESTION WITH HYBRID PEDESTRIANIZATION

IMPROVING THE VISUAL AESTHETICS OF THE PLACE

INTRODUCTION OF STREET FURNITURE AND GREEN AREA

INTRODUCTION OF SIGNAGE AND UTILITIES

Fig. 46.
Before and after photographs of the Chandni Chowk, Redevelopment.

4.3. Conclusion

The conducted case studies are evaluated based on criteria such as market planning, public amenities infrastructure, user experience, resource management, waste management methods, traffic management, and inclusive design approach. Among these, the Metro Cash & Carry in Kolkata is distinguished for its exceptional user experience, offering customers a comprehensive shopping experience that includes car maintenance, dining options, and shopping facilities. The Pasir Panjang Wholesale Center in Singapore excels in market planning, resource management, and waste management practices. Conversely, Chandni Chowk in Delhi is notable for its superior public amenities infrastructure, traffic management strategies, and inclusive design approach.

Parameters	Case Study 1: METRO Cash & Carry, Kolkata	Case Study 2: Pasir Panjang Wholesale Centre, Singapore	Case Study 3: Chandni Chowk, Delhi
Market Planning			
Public amenities infrastructure			
User Experience			
Resource Management			
Methods of waste management			
Traffic Management			
Inclusive Design Approach			

LEGEND	WORST	MID	BEST

Table. 3.
Comparison of the case studies on certain parameters.

5.1. Introduction

The urban issues are identified through the following methods:

- Problems identified in site study and site visits
- Urban issues observed in case studies that are similar to the site
- In-person surveys and interaction with administrative body (Ward Counselor and Head of Worker's Union)
- Checking compliance for certain parameters with the standards (like URDPFI)

Fig. 47.
Some photographs of the urban issues in the site.

5.2. Urban Issues Map

The map (Figure 48.) highlights and labels urban issues. Key problems include the absence of active mobility areas on roads and the encroachment of footpaths. These problematic areas are indicated on the base map featuring Damaged and Temporary Buildings (Figure 48).

The urban issues are compiled to explore their commonalities and interdependencies, providing insight into their root causes and potential solutions. This process lays the groundwork for further research and the implementation of appropriate interventions to address these core problems.

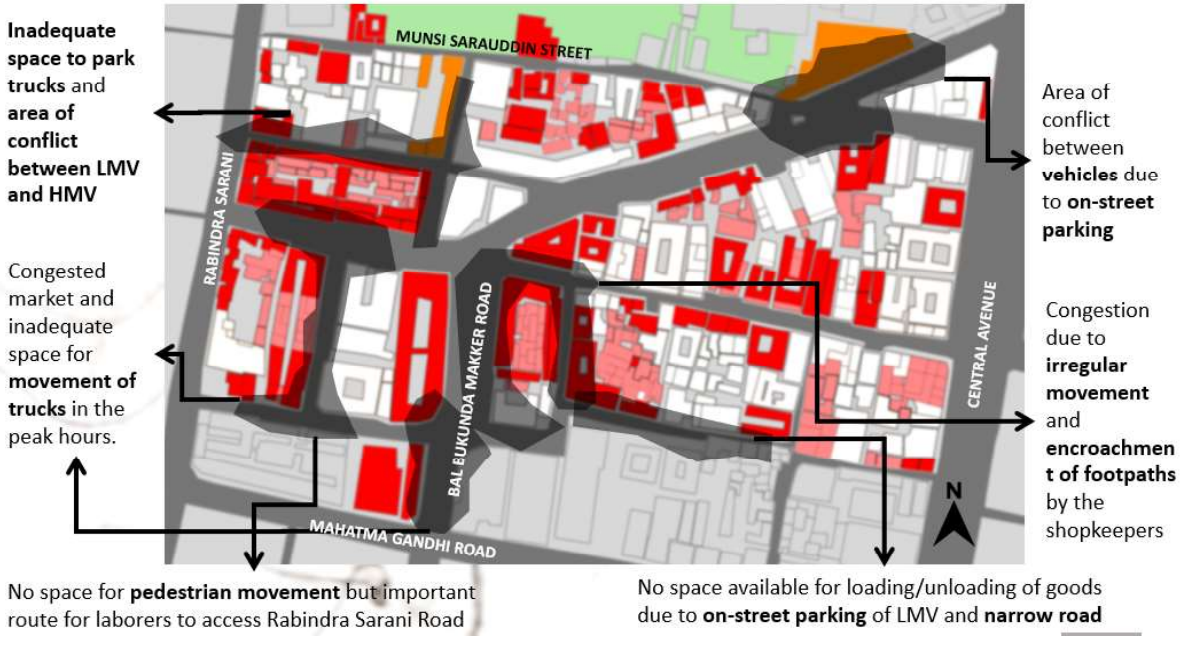


Fig. 48.
Urban issues map.

5.3. List of Urban Issues

ISSUES IN PHYSICAL INFRASTRUCTURE:

- Around 65% of buildings are damaged and have crossed the design age of 75 years.
- Unhealthy environment of the residence and public spaces.
- Unplanned, irregular, and temporary houses made by the working population
- Lack of open space and recreational areas
- No dedicated area for loading/unloading of goods from trucks. It result in congestion of roads and footpaths
- Air pollution caused by the market activities, godown, and waste compactor station
- Noise pollution caused by market activities and vehicles on road.
- No dedicated garbage disposal area present, garbage are disposed on road sides which are handpicked to compactor on regular basis.
- Shortage in quantity of public toilets.
- Unhygienic and ill maintained public toilets.
- Water clogging/ drainage issue exists in some access streets
- Inadequate amount of collection and improper management of solid waste from the site.

ISSUES IN TRANSPORTATION INFRASTRUCTURE:

- Shortage of footpaths and road for active mobility in local and access streets of the site.
- Irregular pedestrian movement due to encroachment of footpaths by shops and parking.
- Congestion of vehicles and conflicts on road at peak hours.
- Unorganised, irregular, and unregulated on-street parking.
- Lack of permeability from the main road to the market.
- Signages and markings are absent in the roads
- Damaged, and ill maintained street furniture
- No barrier free urban amenities for disabled persons.

5.4. Cause and Solution of Urban Issues

PROBLEMS IDENTIFIED	CAUSE OF THE PROBLEM	POSSIBLE SOLUTIONS OF THE IDENTIFIED PROBLEMS	EXISTING GOVT. INITIATIVES TO ADDRESS PROBLEMS
Unsanitary condition of the market	Dumping of solid waste on the streets	• More frequent street sweeping • Introduction of dustbins on the streets	• Swachh Bharat Abhiyan • Community-Led Total Sanitation (CLTS) • E-toilets • Bio-digesters • Mobile Toilets • Sanitation Workers' Training • National Clean Air Programme (NCAP) • Comprehensive Action Plan (CAP)
	Open public toilets and damaged public infrastructures	• Develop toilets with improved sanitation • Perform maintenance of damaged infrastructures and introduce capital punishment	
	Lack of personal hygiene (e.g. Throwing gutka/tobacco on walls)	• Introduce capital punishment for unsanitary activities (with better monitoring of people) • Make awareness campaign on personal hygiene	
	Air pollution due to motor vehicles and waste	• Restrict vehicles from entering the core market • Develop/modify infrastructures to enhance ventilation in the market	
	Water logging and drain clogging on footpaths and roads	• Restrict throwing of clogging materials in the drains • Provide slope to roads/ repair road infrastructures wherever required	
	Bathing/washing utensils on roads	• Restrict unsanitary activities on roads and build dedicated spaces for these activities	
Congestion of roads	On-street parking	• Demarcate the parking areas on the roads • Introduce parking fees on-streets • Increase mobility areas on the streets	• Increase in Road tax or Vehicle Registration Cost • No Car/Two-Wheeler/Truck/Bus zones • Improvement in Public Transport • Encouragement for Car Pooling • System for Intelligent Signalling
	On-street hawkers and encroachment by shops	• Provide hawkers a separate area (e.g., Hawker's center or Bugis Street of Singapore) • Restrict commercial activities on roads (or stopped during the peak hours)	
	Loading/unloading of goods	• Provide dedicated area for loading/unloading of goods	
	Over loading of traffic and lack of transportation planning for the market	• Introduce traffic signages and traffic lights • Restrict movement of motorable vehicles in narrow roads	
Poor pedestrian movement	Encroachment of footpaths by shop owners	• Provide hawkers a separate area (e.g., Hawker's center or Bugis Street of Singapore)	• Clearance of footpath encroachments Removal of bus-stop to a far place from the junction • Creation of fund for pedestrian improvement
	Multiple activities are done on road (salon, labor's resting area, parking, etc.)	• Restrict commercial activities on footpaths (or stopped during the peak hours)	
	Stacking of goods on streets	• Provide dedicated area for loading/unloading of goods • Restrict stacking of goods on footpaths during the peak hours.	

Table 4.
Urban problems that are identified with cause and possible solutions.

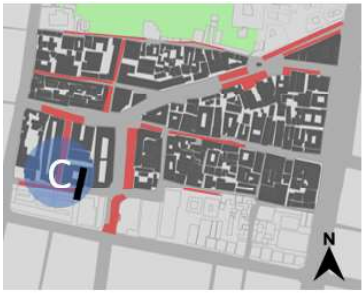
5.5. Detail of Urban Issues

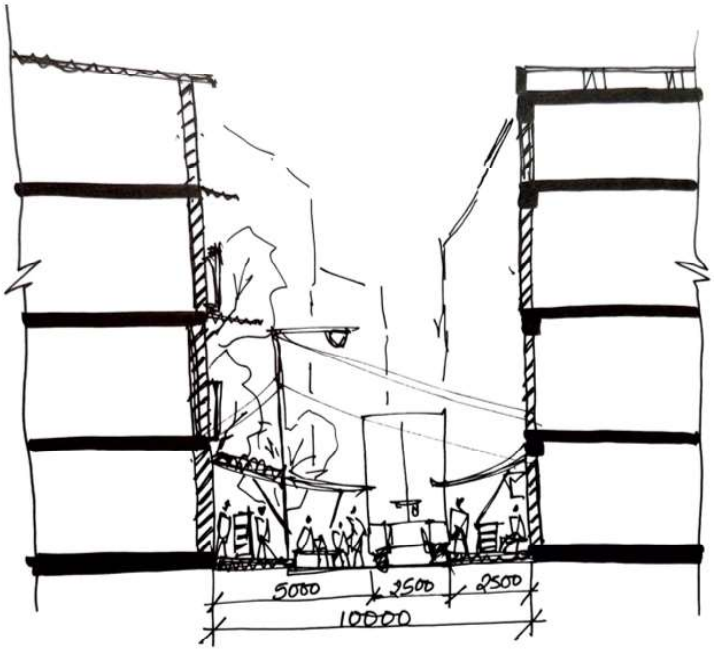
5.5.1. On-street Parking

On-street parking provides convenient access for vehicles to businesses and residences. However, it often presents challenges that can impact the urban environment. Issues such as limited parking availability, traffic congestion due to vehicles circling in search of parking, and reduced pedestrian safety due to obscured sightlines are common problems associated with on-street parking. Additionally, the aesthetic appeal of streetscapes can be negatively affected by the presence of parked vehicles.

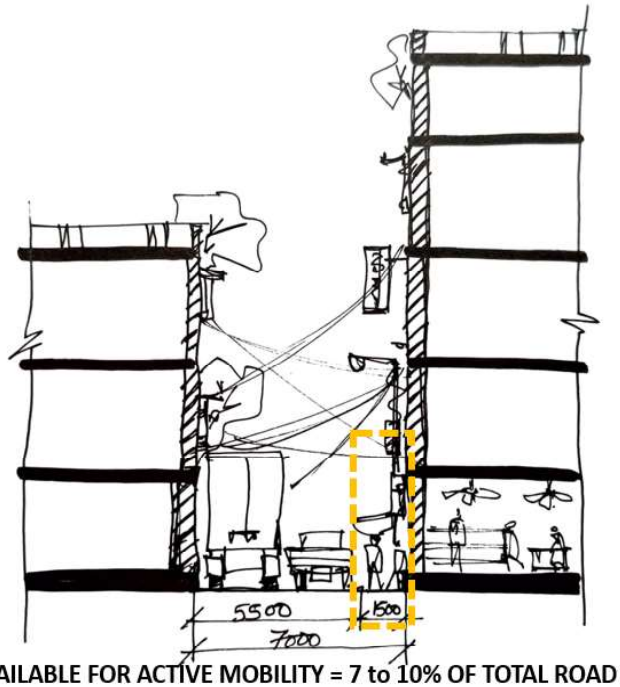
Fig. 49.
Areas of on-street parking and the areas where congestion occurs due to it.

Fig. 50.
Section of areas with on-street parking.





ROAD AVAILABLE FOR ACTIVE MOBILITY = 5 to 0% OF TOTAL ROAD WIDTH



ROAD AVAILABLE FOR ACTIVE MOBILITY = 7 to 10% OF TOTAL ROAD WIDTH

Fig. 50. (ctd.)
Section of areas with on-street parking.

5.5. Detail of Urban Issues

5.5.2. Footpath Encroachment

Footpath encroachment is a significant concern as it restricts pedestrian movement and poses safety hazards. Businesses and street vendors often extend their activities onto footpaths, reducing the available space for pedestrians. This can lead to overcrowding, especially in densely populated areas, and impede the flow of pedestrian traffic. Encroachment also creates accessibility issues for people with disabilities, as well as children and the elderly. Furthermore, the visual clutter caused by encroachments can detract from the aesthetic appeal of the urban environment.

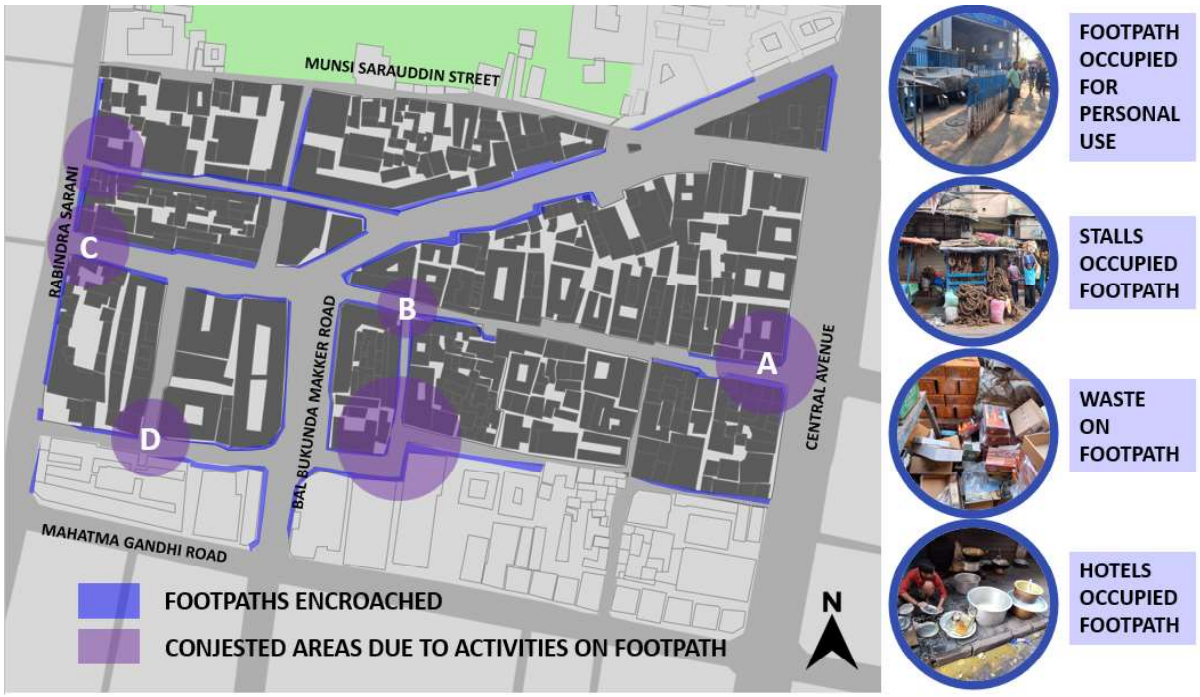


Fig. 51.
Areas of footpath encroached and the areas where congestion occurs due to it.

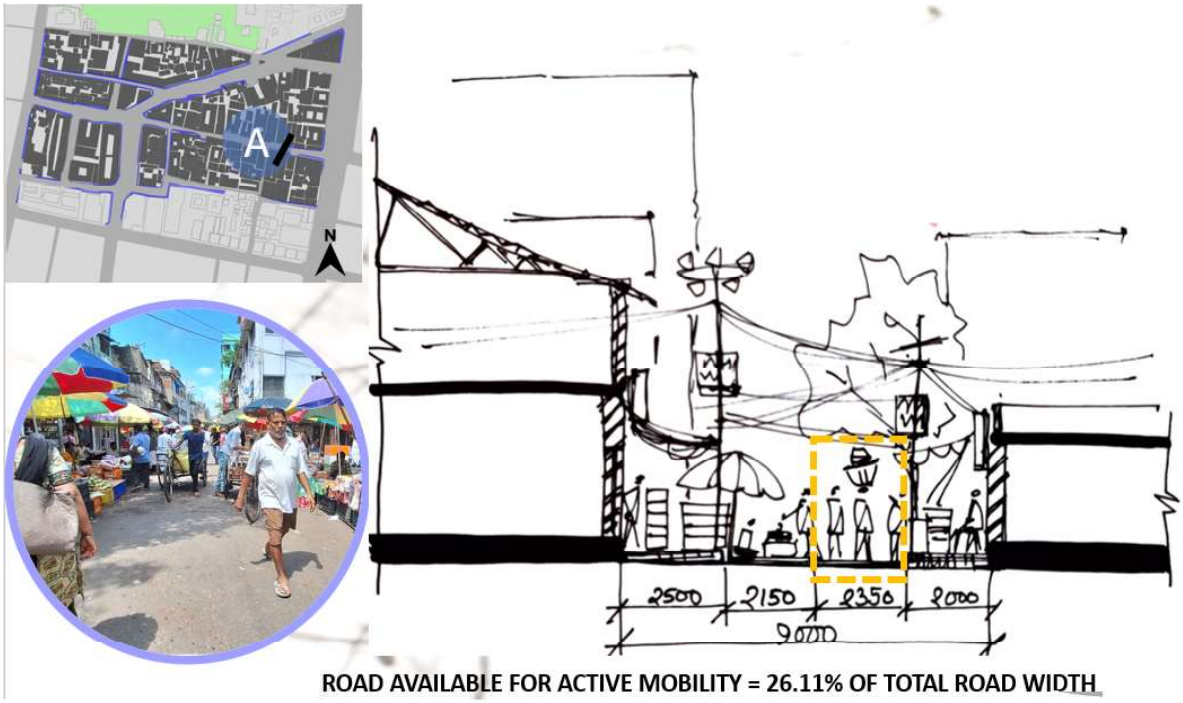


Fig. 52.
Section of areas with footpath encroachment.

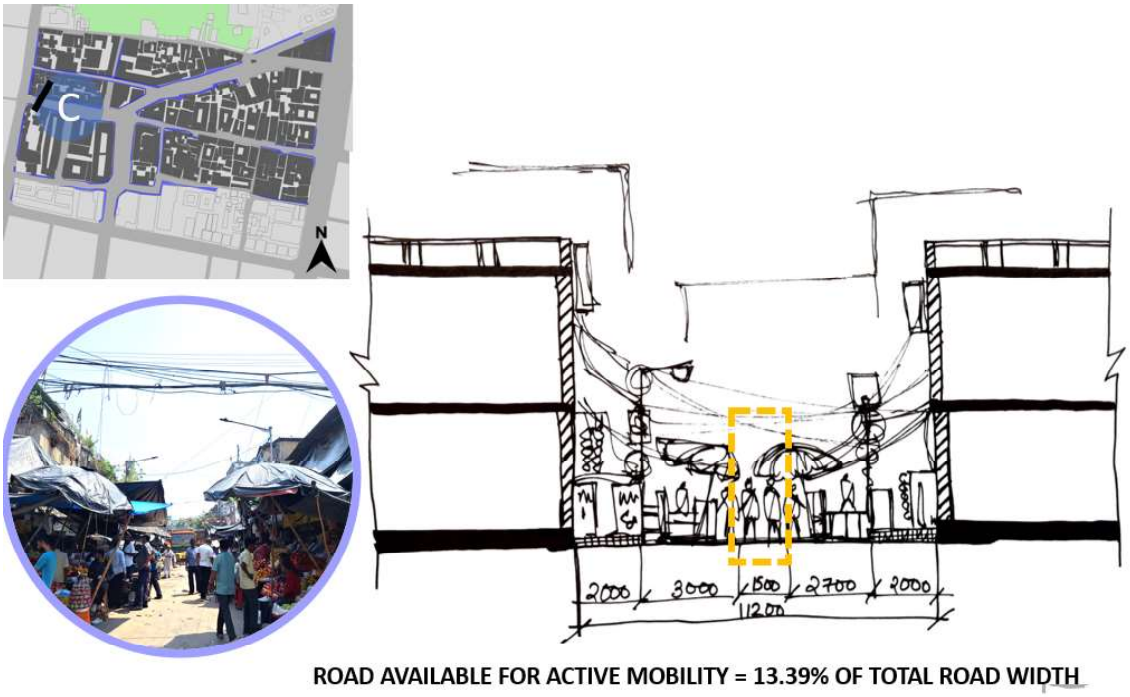


Fig. 52. (ctd.)
Section of areas with footpath encroachment.

5.5. Detail of Urban Issues

5.5.3. Road Infrastructure

Road infrastructure is crucial for facilitating transportation and connectivity within cities. However, inadequate road infrastructure can lead to a range of problems. Congestion is a common issue, caused by factors such as narrow lanes, lack of proper signage, and poorly designed intersections. Insufficient pedestrian infrastructure, such as sidewalks and crosswalks, can result in unsafe conditions for pedestrians. Inadequate public transportation infrastructure can also contribute to increased reliance on private vehicles, exacerbating congestion and air pollution.

All the roads are surveyed to find out the type of road, with it's total width, carriageway width, footpath width, and number of on-street parking. (Table 5.)

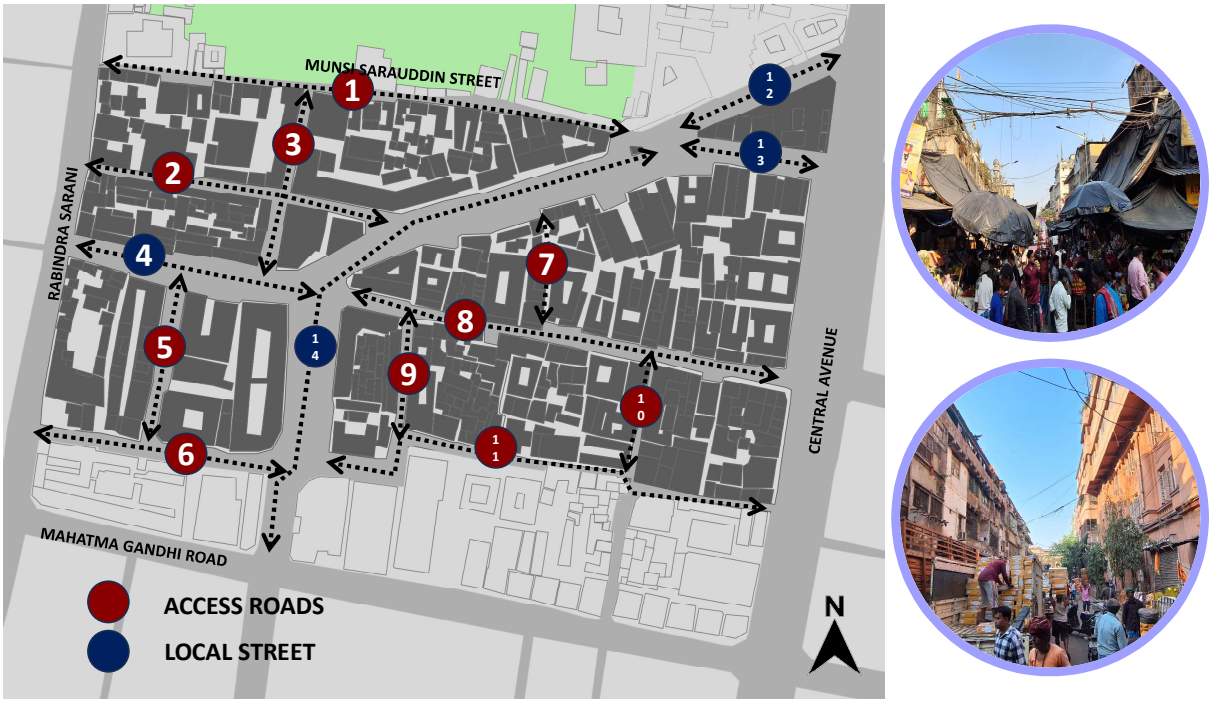


Fig. 53.
Access and Local Roads of the site.

Road Code	Road Name	Road Width (m)	No: of Vehicles in on-street parking					Carriageway width (m)	Footpath width (m)	Remarks
			Bicycle	2-wheelers	Cars	3-wheelers	Trucks			
1	Munsi Sarauddin Street	3 to 5	25	30	10	0	0	3 to 5	0	
2	Ballav Das Street	5 to 8	15	20	0	10	3	3 to 6	2	Footpaths are utilized for auctions
3	Munsi Sarauddin Street	8	30	15	0	10	40	8	0	
4	Madan Mohan Burmon Street	15	15	25	0	20	25	12	3	Shop is extended on the footpath. Temporary shops are present on footpath
5	-----	13	25	30	10	25	60	11	2	Shop is extended on the footpath.
6	Bal Mukunda Makker Road	5 to 8	20	15	0	5	24	3 to 6	2	Shop is extended on the footpath.
7	-----	3 to 5	15	30	25	30	5	3 to 5	0	
8	Madan Mohan Burmon Street	15	60	50	30	40	50	12	3	Shop is extended on the footpath. Temporary shops are present on footpath

Road Code	Road Name	Road Width (m)	No: of Vehicles in on-street parking					Carriageway width (m)	Footpath width (m)	Remarks
			Bicycle	2-wheelers	Cars	3-wheelers	Trucks			
9	----	3 to 5	30	15	0	5	0	3 to 5	0	Shop is extended on the road
10	----	5	25	20	15	20	5	5	0	
11	----	8 to 10	50	35	10	55	0	8 to 10	0	Shop is extended on the road
12	Bal Mukunda Makker Road	15	30	25	40	60	90	12	3	Shop is extended on the footpath.
13	-----	10 to 12	35	60	25	30	20	10	2	Shop is extended on the footpath.
14	Bal Mukunda Makker Road	30	80	50	20	70	115	26	4	The market is on this road
Total on-street parking:			455	420	185	380	437			
ECS (Equivalent Car Space):			45.5	105	185	190	1092.5			

Table 5.
Road infrastructure survey of the site.

5.5. Detail of Urban Issues

5.5.4. Waste Management

Waste management directly impacts the health, aesthetics, and sustainability of cities. Inefficient waste management practices can lead to a range of problems, including environmental pollution, public health hazards, and aesthetic degradation. Improper disposal of waste, such as littering or illegal dumping, can result in the accumulation of waste in public spaces, water bodies, and vacant lots, detracting from the overall quality of the urban environment. Inadequate waste collection and disposal infrastructure can also lead to the proliferation of pests and diseases, posing health risks to residents.

The different types of waste in the study area are identified and marked on the map to understand the activies that are generating these waste and the existing waste management in the site.

Fig. 54.
Different types of waste with it's regions in the study area.

All waste discarded on the roads undergoes collection through street sweeping. Garbage pickers manually sweep the waste and deposit it into a hand-held trolley twice daily. Subsequently, the waste is compacted at the Waste Compaction Center of Ward-41, situated in the study area's northeast corner. Trucks and dumpers transport the compacted waste to the Dhapa landfill, the designated disposal site. This process is illustrated in Figure 55.

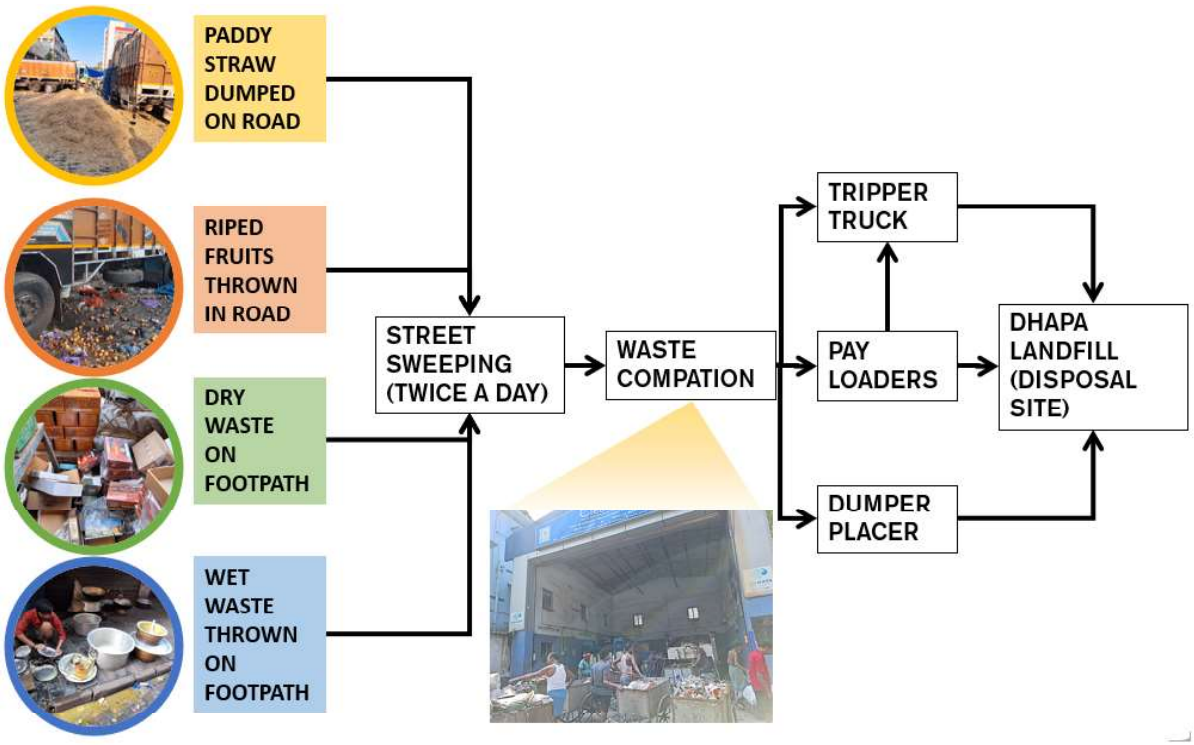
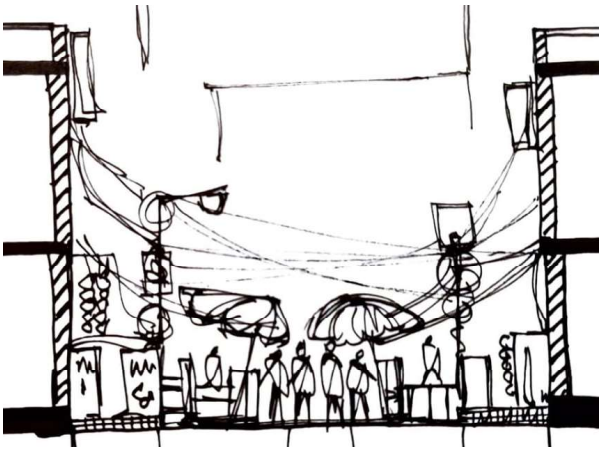


Fig. 55.
Flowchart of existing waste management in the site.

5.6. Conclusions

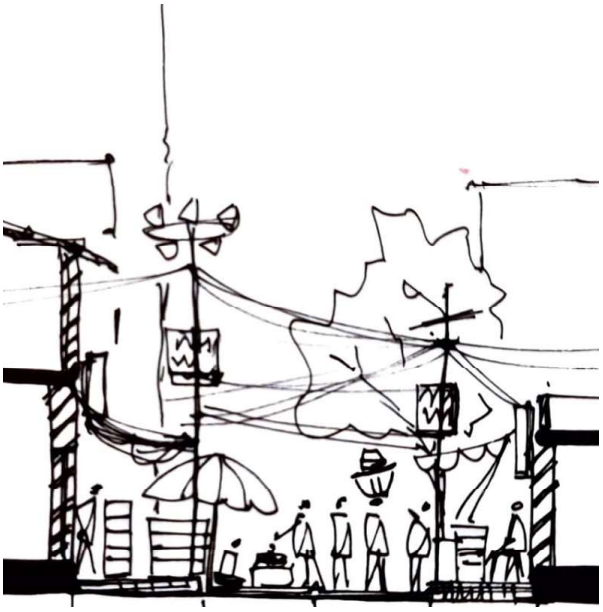
The urban problems that are idenfified from the study are as follows:

- The location of the occurring conflicts in the site is identified with its cause and possible solutions. So, the redevelopment should address these conflicts with proper infrastructural needs.



- The issues in transportation and physical infrastructure are identified, and solutions to address a few of them are made. These solutions should be considered during the redevelopment process.

- The road width for active mobility must be increased by addressing the issues of on-street parking and on-street vendors.



- The footpath encroachments by the shops should be restricted to the building's edge so that pedestrian movement on the foot-path could be revived.

- The issue with the site's waste manage-ment is identified and could be improved with the application of innovative waste management measures.

6.1. Introduction

The process of redeveloping the market area with urban design solutions is a multifaceted endeavor that involves several key steps aimed at addressing the area's specific urban challenges. These challenges, which include issues such as on-street parking, the provision of public toilets, and improving vehicular movement, are not only complex but also interconnected, making them particularly challenging to solve.

To tackle these challenges effectively, the first step is to overlap the various urban problems within the market area to identify areas where interventions can be made. Following this, a comprehensive redevelopment proposal is formulated in three stages:

- The first stage involves understanding the existing infrastructure and ensuring that any proposed solutions adhere to relevant guidelines and regulations.

- The second stage focuses on identifying appropriate policies and guidelines that can be implemented to address the identified urban issues.

- Finally, the third stage involves developing a masterplan for the redevelopment while ensuring its feasibility and practicality.

- Additionally, a detailed list of requirements and guidelines is compiled to guide and facilitate the redevelopment process, ensuring that it is carried out effectively and efficiently.

6.2. Solutions of Urban Issues

6.2.1. On-street Parking

EXISTING ON-STREET PARKING: (During peak hours, from Table 5.)
No: of bicycle: 455
No: of 2-wheelers: 420
No: of cars: 185
No: of 3-wheeler van: 380
No: of trucks: 437
Total existing ECS: 45.5 + 105 + 185 + 190 + 1092.5 = 1618

REQUIRED ON-STREET PARKING: (During peak hours)
Total commercial floor area of the market: 28,333 sq.m
ECS required for parking (3 ECS/100 Sq.m of floor area): 3 x 283.33 = 850
Existing ECS in parking: 1618
So, 768 ECS or 768 x 23= 17,664 sq.m of on-street parking is not desirable in the market.

SOLUTION-1: Demarcate the areas of on-street parking and introduce systems to monitor possible violation.
ADVANTAGE: Cost-effective approach. The total number of vehicle in the site would be restricted. Possibility to rent/charge for the parking areas by the municipality.
DISADVANTAGE: It would take paper works by the shopkeepers to rent the parking lot, which would reduce the ease of doing business.

SOLUTION-2: Create provision of steady inflow and outflow of traffic from the site, so that limited number of vehicles can operate at a time.
ADVANTAGE: The total number of vehicle in the site would be restricted.
DISADVANTAGE: The vehicles which needs to be parked all day, would not get space inside the market. The transportation cost of materials would increase by this.

6.2. Solutions of Urban Issues

6.2.2. Public Toilets

Public toilets provides a basic sanitation facility. However, inadequate provision of public toilets can lead to several problems. One major issue is the lack of access to clean and safe facilities, which can result in unhygienic practices such as open defecation. This not only poses health risks but also contributes to environmental pollution. Additionally, the absence of public toilets can disproportionately affect certain groups, such as women, children, the elderly, and people with disabilities, limiting their mobility and access to public spaces.

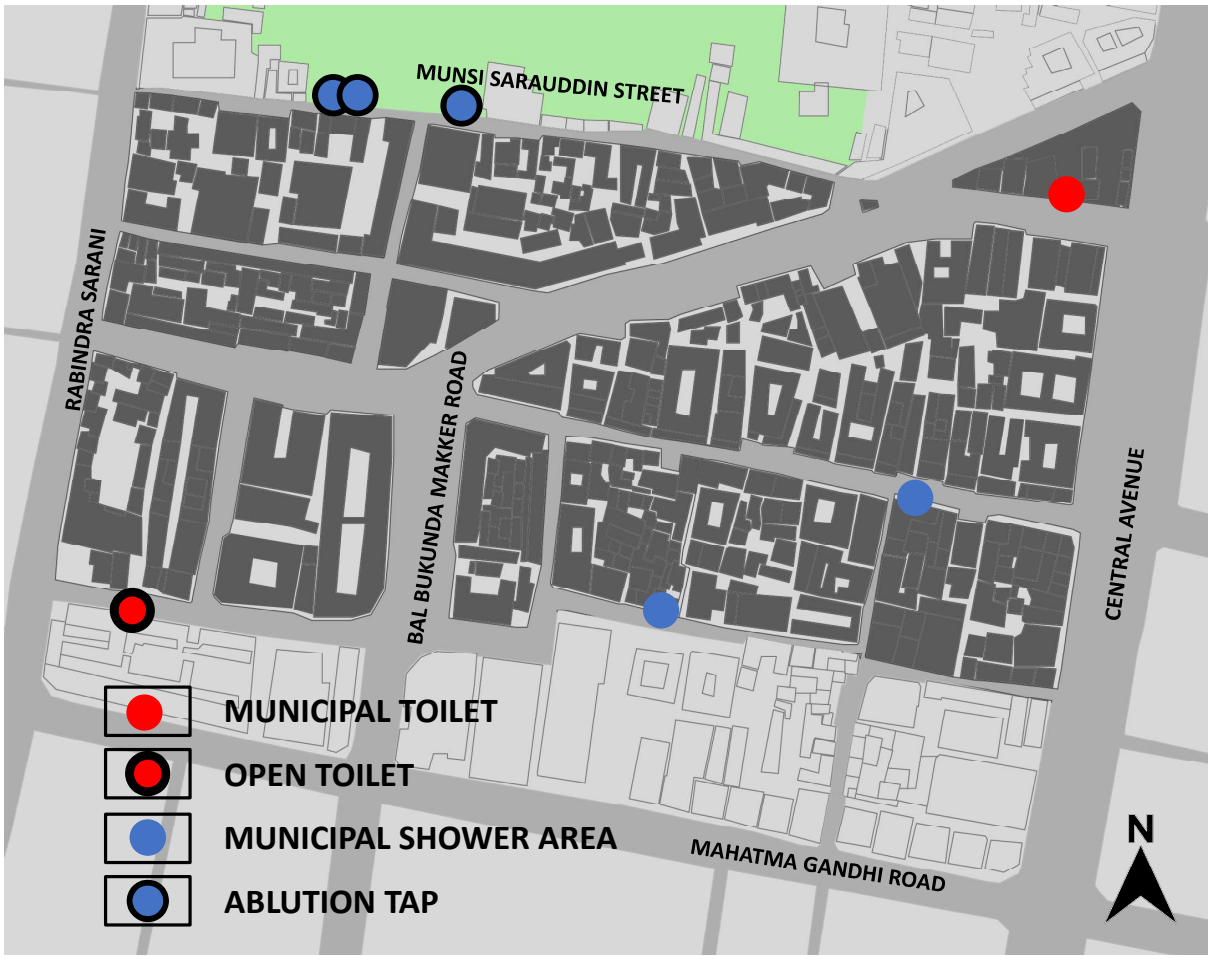


Fig. 56.
Map of public toilets in the study area.

The public toilets in the study area are marked (Figure 56.) and the different types of public toilets are identified (Figure 57.). The requirement of the number of public toilets is calculated based on the floating population, and the floor area required is calculated. Based on this requirement, the proposed toilet areas are marked, some are demolished, and some are retained.

Fig. 57.
Different types public toilets in study area. Municipal toilet (top-left), open toilet (top-right), ablution tap (bottom-left), and municipal shower area (bottom-right).

6.2. Solutions of Urban Issues

6.2.2. Public Toilets

A survey of each type of public toilets are done, and the present condition of each toilets are understood, based on which the toilets to be retained and demolished are identified.

The observations from the survey for each type of public toilets are:

MUNICIPAL TOILET (Figure 58.):
- The toilet is maintained daily by the KMC and is used by commuters free of cost.
- Bathing unit/Wash Basin/ Garbage bin is not available inside the toilet.

ABLUTION TAP (Figure 59.):
- Ablution tap is only present with an area of 700 x 500 mm marked for showering, washing and urinating in the same area.
- Causes water logging around the area when used frequently.
- Activities here congest and pollute the adjacent road when utilized by more than two people.

OPEN TOILET (Figure 60.):
- Toilet is not maintained but used frequently by the contract laborers and truck drivers.
- The toilet's smell spread around the area as it is open.
- The walls of the toilet is covered with gutka spits and no ablution tap is present in the urinals.

MUNICIPAL SHOWER AREA (Figure 60.):
- Residents and contract laborers shower here before/after doing the works. It is maintained regularly by KMC.
- 3 to 4 men can shower simultaneously in the shower area.
- The shower area is approximately 1800 x 1200 mm with ablution taps present.

EXISTING INFRASTRUCTURE:

No: of urinals: 3 (open) + 6 (municipal)= 9
No: of WC for male: 1 (municipal)
No: of WC for female: 0
No: of Ablution Taps: 3
No: of bathing places: 2 (municipal)

REQUIRED INFRASTRUCTURE:

Total Floating Population: 4,400 (2023, predicted from demographic data)
Male Floating Population: 2,640
Female Floating Population: 1,760

As per IS 1172 (1993): Code of Basic Requirements for Water Supply, Drainage and Sanitation.
No: of urinals: 176 (minimum, for M & F both)
No: of WC for male: 106
No: of WC for female: 70
No: of Ablution Taps: 176
No: of bathing places: 15 (suitable number)

AREA REQUIREMENT:

For urinals: 68.31 sq.m (0.575 x 0.675 m each)
For WC (Male): 114.48 sq.m (0.9 x 1.2 m each)
For WC (Female): 75.6 sq.m (0.9 x 1.2 m each)
Bathrooms: 18.9 sq.m (1.05 x 1.2 m each)

Ref. ADVISORY ON PUBLIC AND COMMUNITY TOILETS by Central Public Health and Environmental Engineering Organisation 2018

NAME: Salim
AGE: 55

OCCUPATION Fruit Seller
INCOME Rs 1000-2,000 per day

User gives ranking (1 to 5, with 1 for worst, 5 for highest) on the following about the toilet

Sr. No.	Parameters	Ranking (Tick as appropriate)				
		1	2	3	4	5
	General					
1	Access of toilet from outside					✓
2	Condition of toilet seats	✓				
3	Condition of urinals			✓		
4	Condition of bathing units	NOT AVAILABLE				
5	Cleanliness		✓			
6	Water availability				✓	
7	Smell (Ventilation)		✓			
8	Lighting			✓		
9	Water logging		✓			
10	Amenities (bucket, cups etc.)	✓				
11	Wash basins	NOT AVALLABLE				
12	Condition of floor and walls		✓			
13	Condition of doors		✓			
14	Timings					✓
15	Waiting period				✓	
16	User charges	NO CHARGE TAKEN				
17	Behaviour of caretakers and cleaners	NOT AVAILABLE				
18	Complaint mechanism	NOT AVAILABLE				
	Gender					
19	Safety				✓	
20	Privacy				✓	
21	Usability for children				✓	
22	Garbage bin for napkins	NOT AVAILABLE				
	Differently abled					
23	Ramps & Rails	W	4			
24	Space for movement	W	n			
25	Facilities	4	n			

Additional remarks (by the user) for improvement of toilet block: _____

Fig. 58.
Survey for municipal toilet in the study area.

NAME: Faraz
AGE: 32

OCCUPATION: Works in small metal workshop
INCOME: Rs 200 per day

User gives ranking (1 to 5, with 1 for worst, 5 for highest) on the following about the toilet

Sl. No.	Parameters	Ranking (Tick as appropriate)				
		1	2	3	4	5
	N.A. → NOT AVAILABLE.					
	General					
1	Access of toilet from outside			✓		
2	Condition of toilet seats	N.A.				
3	Condition of urinals	N.A.				
4	Condition of bathing units	✓				
5	Cleanliness	✓				
6	Water availability			✓		
7	Smell (Ventilation)		✓			
8	Lighting		✓			
9	Water logging	✓				
10	Amenities (bucket, cups etc.)	✓				
11	Wash basins	N.A.				
12	Condition of floor and walls	✓				
13	Condition of doors	N.A.				
14	Timings			✓		
15	Waiting period			✓		
16	User charges	N.A.				
17	Behaviour of caretakers and cleaners	N.A.				
18	Complaint mechanism	N.A.				
	Gender					
19	Safety			✓		
20	Privacy			✓		
21	Usability for children			✓		
22	Garbage bin for napkins	N.A.				
	Differently abled					
23	Ramps & Rails	N.A.				
24	Space for movement	N.A.				
25	Facilities	N.A.				

Additional remarks (by the user) for improvement of toilet block: Only Ambulation tap present, used as urinal, shower, wash basin, as per requirement.

Fig. 59.
Survey for ablution taps in the study area.

NAME: Altamash
AGE: 48

OCCUPATION: Contract Labourer
INCOME: Rs 300 - Rs 500 per day

User gives ranking (1 to 5, with 1 for worst, 5 for highest) on the following about the toilet

Sr. No.	Parameters	Ranking (Tick as appropriate)				
		1	2	3	4	5
	N.A. → NOT AVAILABLE					
	General					
1	Access of toilet from outside				✓	
2	Condition of toilet seats	N.A.				
3	Condition of urinals	✓				
4	Condition of bathing units	N.A.				
5	Cleanliness	✓				
6	Water availability	✓				
7	Smell (Ventilation)	✓				
8	Lighting	✓				
9	Water logging	✓				
10	Amenities (bucket, cups etc.)	✓				
11	Wash basins	N.A.				
12	Condition of floor and walls	✓				
13	Condition of doors	N.A.				
14	Timings			✓		
15	Waiting period		✓			
16	User charges	N.A.				
17	Behaviour of caretakers and cleaners	N.A.				
18	Complaint mechanism	N.A.				
	Gender					
19	Safety			✓		
20	Privacy			✓		
21	Usability for children				✓	
22	Garbage bin for napkins	N.A.				
	Differently abled					
23	Ramps & Rails	N.A.				
24	Space for movement	N.A.				
25	Facilities	N.A.				

Additional remarks (by the user) for improvement of toilet block: The toilet can't be used when trucks are parked in front of it.

Fig. 60.
Survey for open toilet in the study area.

NAME: Md. Samim

AGE: 51

OCCUPATION: Resident / Retail Shop Owner

INCOME: Rs 500 - Rs 1500 per day.

User gives ranking (1 to 5, with 1 for worst, 5 for highest) on the following about the toilet

Sr. No.	Parameters	Ranking (Tick as appropriate)				
		1	2	3	4	5
	N.A. → NOT AVAILABLE					
	General					
1	Access of toilet from outside					✓
2	Condition of toilet seats	N.A.				
3	Condition of urinals	N.A.				
4	Condition of bathing units			✓		
5	Cleanliness			✓		
6	Water availability				✓	
7	Smell (Ventilation)				✓	
8	Lighting			✓		
9	Water logging		✓			
10	Amenities (bucket, cups etc.)	✓				
11	Wash basins	N.A.				
12	Condition of floor and walls		✓			
13	Condition of doors	N.A.				
14	Timings			✓		
15	Waiting period			✓		
16	User charges	N.A.				
17	Behaviour of caretakers and cleaners	N.A.				
18	Complaint mechanism	N.A.				
	Gender					
19	Safety			✓		
20	Privacy			✓		
21	Usability for children			✓		
22	Garbage bin for napkins	N.A.				
	Differently abled					
23	Ramps & Rails	N.A.				
24	Space for movement	N.A.				
25	Facilities	N.A.				

Additional remarks (by the user) for improvement of toilet block: _____

Fig. 61.
Survey for municipal shower area in the study area.

6.2. Solutions of Urban Issues

6.2.2. Public Toilets

From the survey, it could be concluded that the municipal toilets and shower area are comparatively in better condition, newly built, and are maintained regularly by KMC. So, these toilets are retained. On the other hand the ablution taps, and the open toilet are a cause of congestion and air pollution, so these needs to be demolished.

So, three toilets are proposed as in Figure 63. The detail of each toilet are as follows:

1. MUNICIPAL SHOWER AREA – On the plot of govt. school, adjacent to the road. The minimum built-up area for this toilet should be 30 sq.m.

2. MUNICIPAL TOILET – Should be on the side of road. Might charge for urinal and WC use. The minimum built-up area for this toilet should be 300 sq.m, with clear signage for male and female toilets.

3. FRUIT/VEGITABLE WASHING AREA – A fruits washing area is a designated space within a market or public area where fruits can be washed before sale or consumption. This area is essential for maintaining hygiene standards and ensuring the safety of consumers.

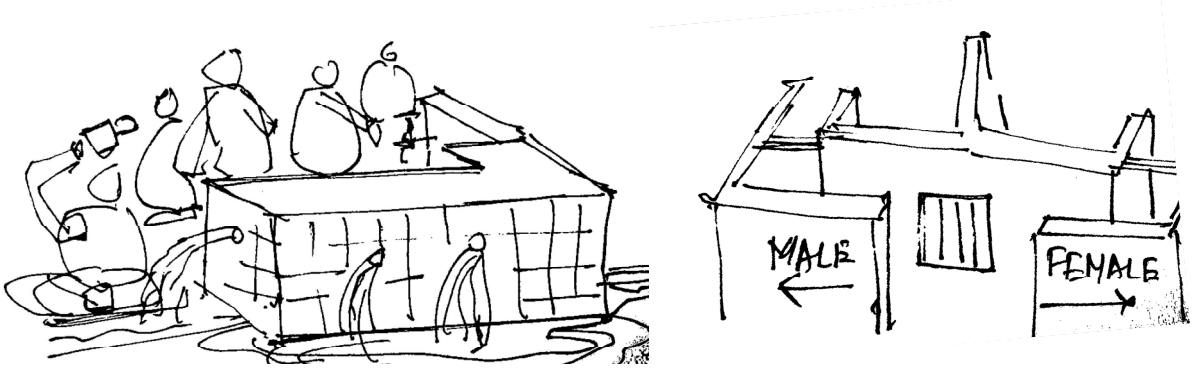


Fig. 62.
Sketch of typical municipal shower area (left), and toilet (right).

A well-designed fruits washing area should be equipped with facilities such as running water, drainage systems, and sanitary equipment to facilitate proper washing and cleaning of fruits. This area is utilized mainly for sorting, and distribution of fruits, and the washing of fruits are required in this process.

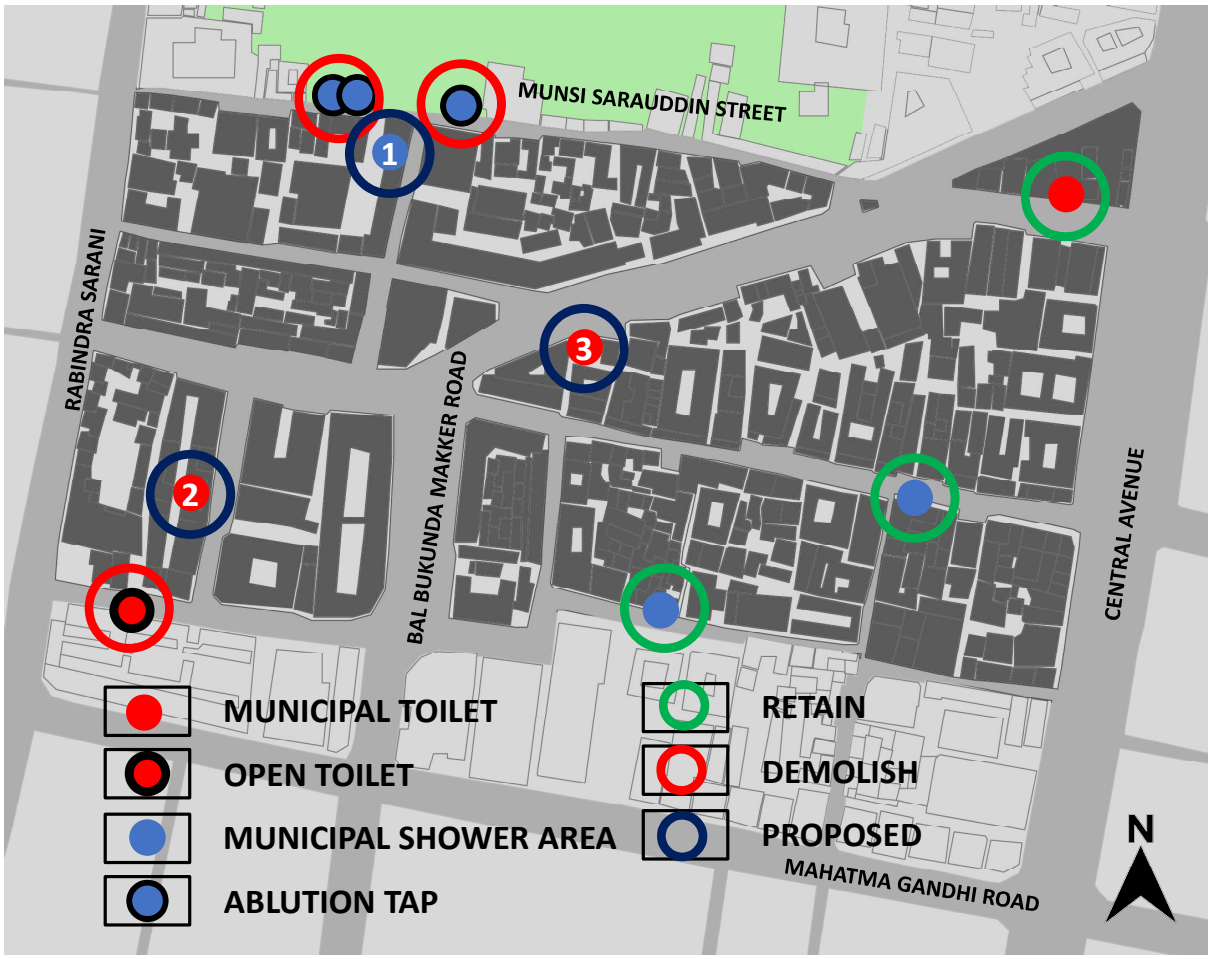


Fig. 63.
Map of proposed public toilets in the study area.

6.2. Solutions of Urban Issues

6.2.3. Movement

Movement within a site is a crucial consideration in urban design, as it directly impacts the functionality, accessibility, and overall experience of the space. Efficient movement patterns can enhance the usability of a site, ensuring that people can move safely and easily between different areas. On the other hand, poor or inefficient movement patterns can lead to congestion, confusion, and decreased usability.

The areas of conflict have been identified (Figure 64.) and marked, and a proposed movement map has been devised to mitigate these conflicts (Figure 65.). Subsequently, the road junctions are being redeveloped by reorganizing shops and creating dedicated space for vehicular movement (Figure 66.).

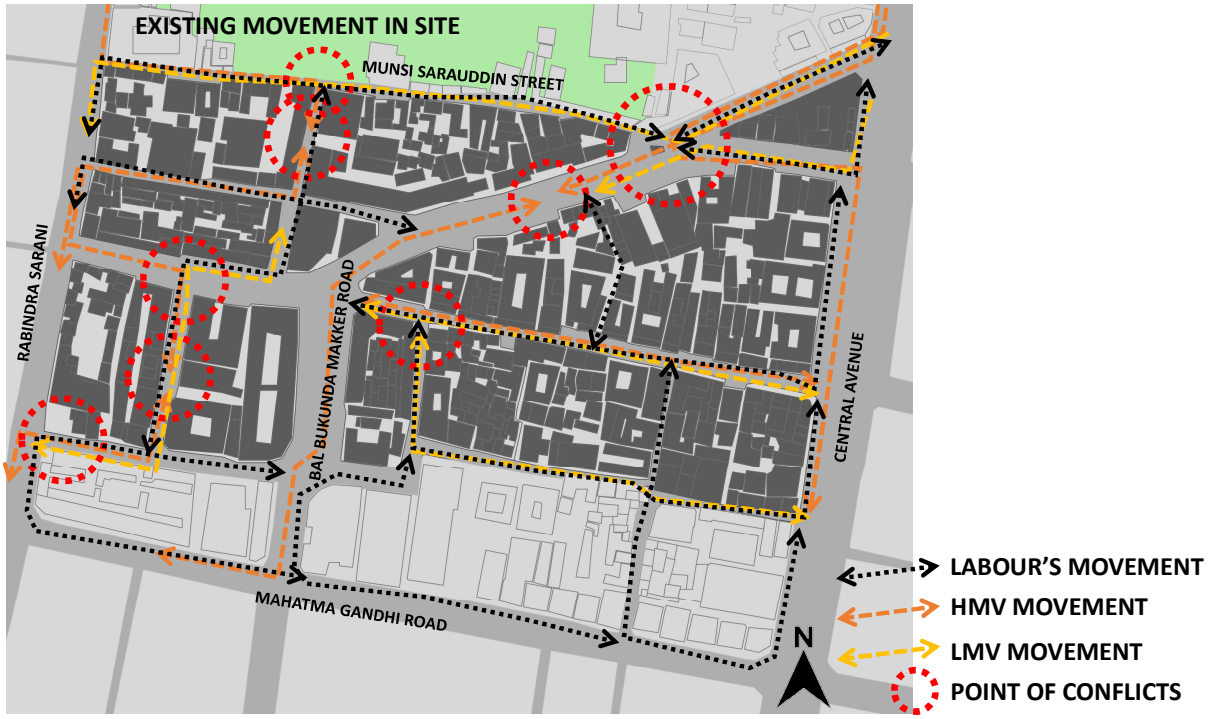


Fig. 64.
Map of existing movement in the study area.

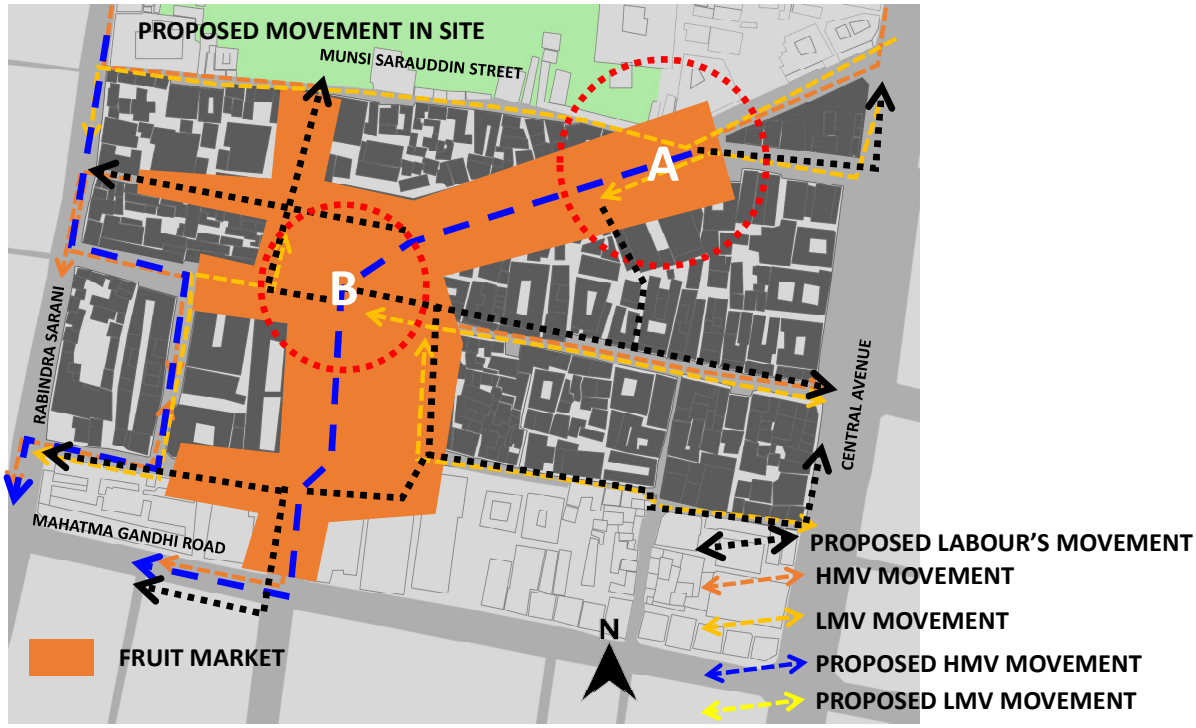


Fig. 65.
Map of proposed movement in the study area.

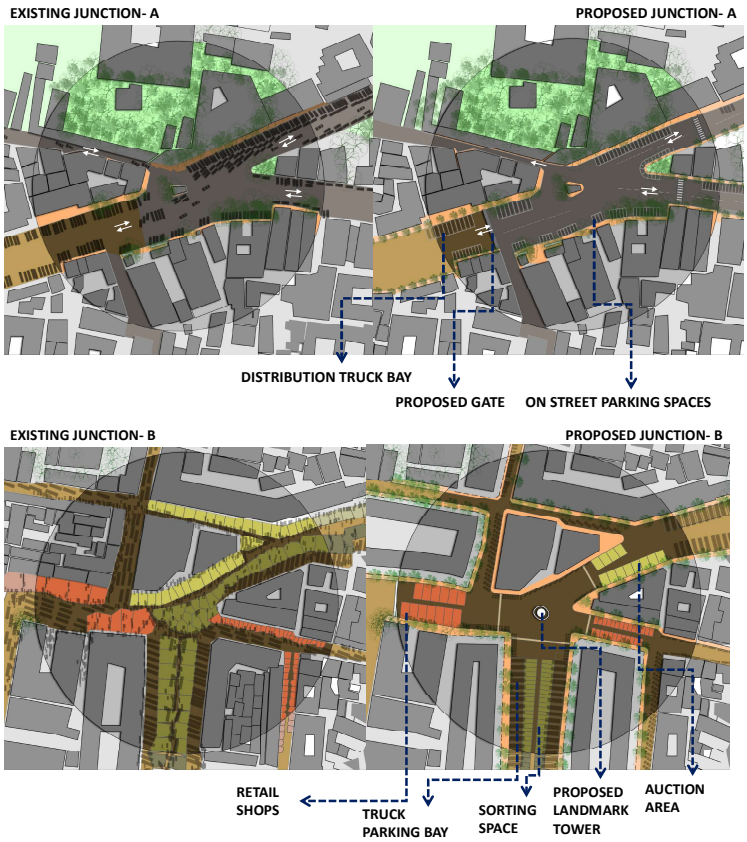


Fig. 66.
Plan of existing and proposed road junctions (A and B of Figure 65.).

6.3. Policy Applied for Market Redevelopment

- **Decongestion of the market** is required with provision of spaces of street vendors and reorganization of market activities.
  Ref. Policy and documents:
  - National Policy on Urban Street Vendors of India, 2009
  - Street Vendors (Protection of Livelihood and Regulation of Street Vending) Bill, 2012
  - Inclusive Design for Street Vendors in India, Centre for Urban Equity (CUE), CEPT

- Redeveloping the market to make it more **permeable and walkable**.
  Ref. Policy and documents:
  - Street Design Guidelines, Delhi Urban Art Commission, 2020

- **Increase green cover** of the market area with urban greening strategies.
  Ref. Policy and documents:
  - The Green City Guidelines: Techniques for a healthy livable city

- **Redevelop damaged infrastructure** and introduce **American/German methods of goods handling** practices to modernize the market, as per the vision of Patrick Geddes.
  Ref. Policy and documents:
  - Gfi Guide Wholesale Markets In Germany
  - Kolkata Municipal Corporation Buildings Rule, 2009

The policies that are utilized for market redevelopment from some policies are as follows:

National Policy on Urban Street Vendors of India, 2009

Section 4.1. Spatial Planning Norms

"There is need for the master / zonal / local / layout development plans to be 'inclusive' and address the requirements of space for street vending as an important urban activity through norms for reservation of space for street vendors in accordance with their current population, projected growth of street vendors, based on the rate of growth in the previous five years and the average number of customers that generally visit informal markets in vending zones".

Section 4.2 Demarcation of Vending Zones

"The demarcation of 'Restriction - free Vending Zones', 'Restricted Vending Zones' and 'No-Vending Zones' should be city / town specific.

1. Spatial planning should take into account the natural propensity of street vendors to locate in certain places at certain times in response to the patterns of demand for their goods/services.
2. Municipal Authorities should frame necessary rules for regulating entry of street vendors on a time sharing basis in designated vending zones
3. Municipal Authorities should allocate sufficient space for temporary 'Vendors' Markets' (e.g. Weekly Haats, Rehri Markets, Night Bazaars, Festival Bazaars, Food Streets / Street Food Marts etc.) whose use at other times may be different (e.g. public park, exhibition ground, parking lot etc.).
4. Mobile vending should be permitted in all areas even outside the 'Vendors Markets', unless designated as 'No-Vending Zone' in the zonal, local area or layout plans under the master / development plan of each city /town". However, the use of 'No-Vending Zones' should be minimised as conflicts can often be resolved through inclusive design rather than an outright ban.

Section 4.4 Provision of Civic Facilities

"Municipal Authorities need to provide basic civic facilities in Vending Zones / Vendors' Markets which would include; solid waste disposal, public toilet, electricity, drinking water, storage facilities etc."

6.3. Policy Applied for Market Redevelopment

Street Vendors (Protection of Livelihood and Regulation of Street Vending) Bill, 2012

Chapter VI, Plan for Street Vending Section

21.(1) Every local authority shall, in consultation with the Planning Authority, once in every five years, make out a plan to promote a supportive environment for the vast mass of urban street vendors to carry out their vocation. The first schedule (street vending plan) states that Paragraph (1) The plan shall,—

1. Ensure that urban street vending activities do not lead to overcrowding and unsanitary conditions of public spaces, areas and streets and not impede the movement of the general public;
2. Ensure that the provision of space or area for street vending is reasonable and consistent with existing natural markets;
3. Take into account the civic facilities for appropriate use of identified spaces or areas as vending zones;
4. Paragraph (2) The plan shall contain all of the following matters, namely :—
5. Determination of spatial planning norms for street vending;
6. Earmarking of space or area for vending zones;
7. Determination of vending zones as restriction-free-vending zones, restricted vending zones and no-vending zones;
8. Making of spatial plans conducive and adequate for the prevalent number of street vendors in that city or town and also for the future growth, by adopting such norms as maybe necessary;
9. Consequential changes needed in the existing master plan, development plan, zonal plan, layout plan and any other plan for accommodating street vendors in the designated vending zones.

Street Design Guidelines, Delhi Urban Art Commission, 2020

3.2.5. Parking: ON-STREET PARKING:

No on-street parking should be permitted at locations where the carriageway width is less than 7 meters.

Street parking should not be allowed on roads with heavy vehicular traffic having speed less than 20 km/hr.

Parking and other encroachments should not be allowed on intersections and other critical locations for a minimum distance of 50 m on all junction arms.

Kerb-side area should be kept clear of on-street parking especially near bus bays.

Parking should not be allowed on footpaths or other corridors meant exclusively for pedestrians. Vehicles if parked on footpaths should be penalized.

In some areas, street parking may be permitted on one side of the road based on requirements.

Kerb extensions should be included at crossings, transit stops, and junctions.

Angled and perpendicular parking should be avoided except in retrofit cases and on streets where there is ground floor retail with a need for front door parking.

A minimum of 0.5 m horizontal clearance in the edge zone should be provided for parallel on-street parking and 0.7 m clearance where there is angled parking.

Parallel parking should be ideally 2.4 m wide.

Vehicles parked on the sides of the street is defined as On street parking and is usually controlled by local government agencies itself.

3.1. Pedestrian Zone

1. DESIGN: Street should be designed such that the space encourages people to walk & engage in social activities.

2. ECOLOGY: Along with the basic necessity of a good design & unhindered movement of pedestrians, it is very important to consider the ecological aspect. The design should focus on maximizing natural drainage systems using pervious paving materials, reducing heat island effect, and providing for planting for shade and beauty.

3. SAFETY / COMFORT: Pedestrian safety & comfort should be kept on a fore front. The design should address differently-abled by providing accessibility ramps and tactile paving and also focus on areas for trees & high- albedo materials in order to ensure optimal climatic comfort.

6.4. Areas of Intervensions

In order to alleviate congestion within the market, the key focus is on relocating activities currently conducted on the roads into designated buildings. Buildings that have surpassed their design lifespan and require redevelopment have been identified and earmarked for this purpose. Additionally, supply truck bays are being developed, and dedicated Multi-Utility Zones are being created for street vendors. The redevelopment plan also includes amenities to cater to the needs of the transient population. Furthermore, the proposal suggests the installation of three gates along the market's main axis to enclose the market within a defined space, thereby imparting a distinct identity to the market.

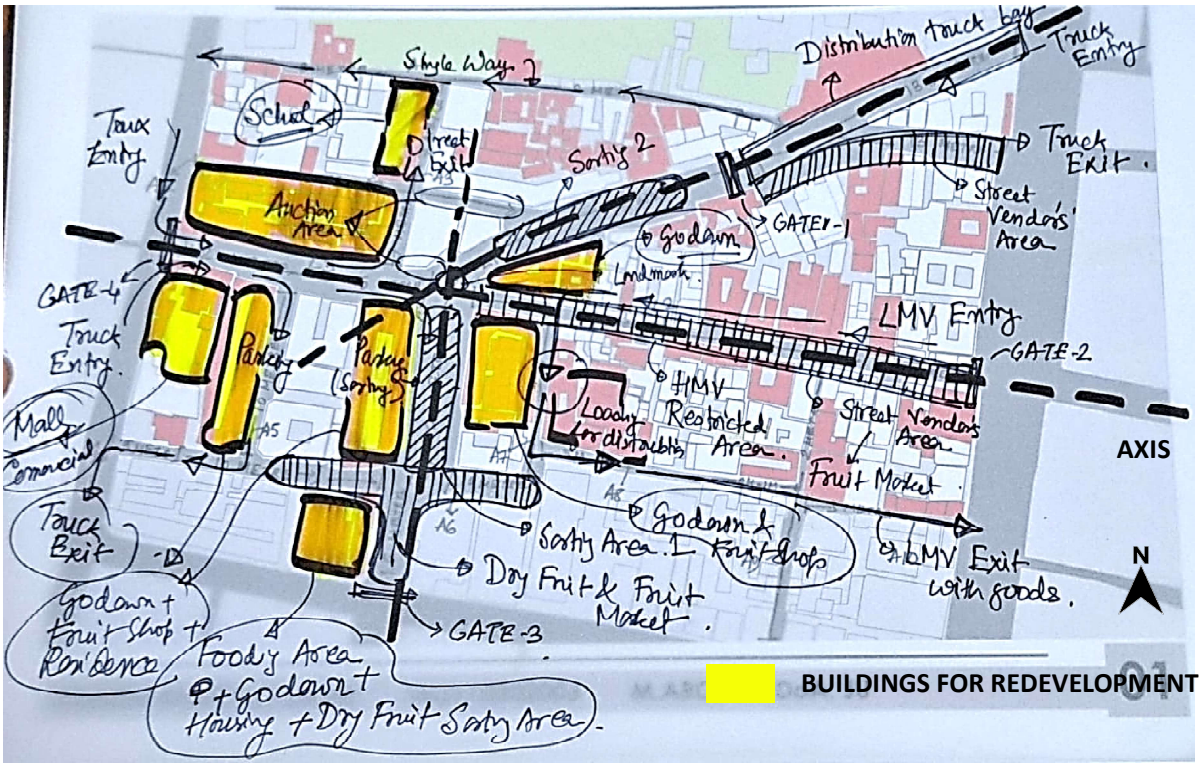


Fig. 67.
Map of areas for intervention in the study area.

6.5. Proposed Flow of Activities in Market

The envisioned activity flow closely mirrors the current flow, with a primary focus on reducing the movement of laborers. Upon arrival, supply trucks deliver fruits directly to the Auction House before proceeding to the Parking Bay. From here, trucks have the option to exit the market or proceed to the distribution area if their cargo is intended for distribution. Fruits from the Auction House are either sent to the wholesale market or stored in godowns. Additionally, sorted fruits may re-enter the Auction House for distribution. Finally, fruits from the sorting area are either loaded onto distribution trucks or sold to the retail market. This process is illustrated in the form of a flow chart in Figure 68.

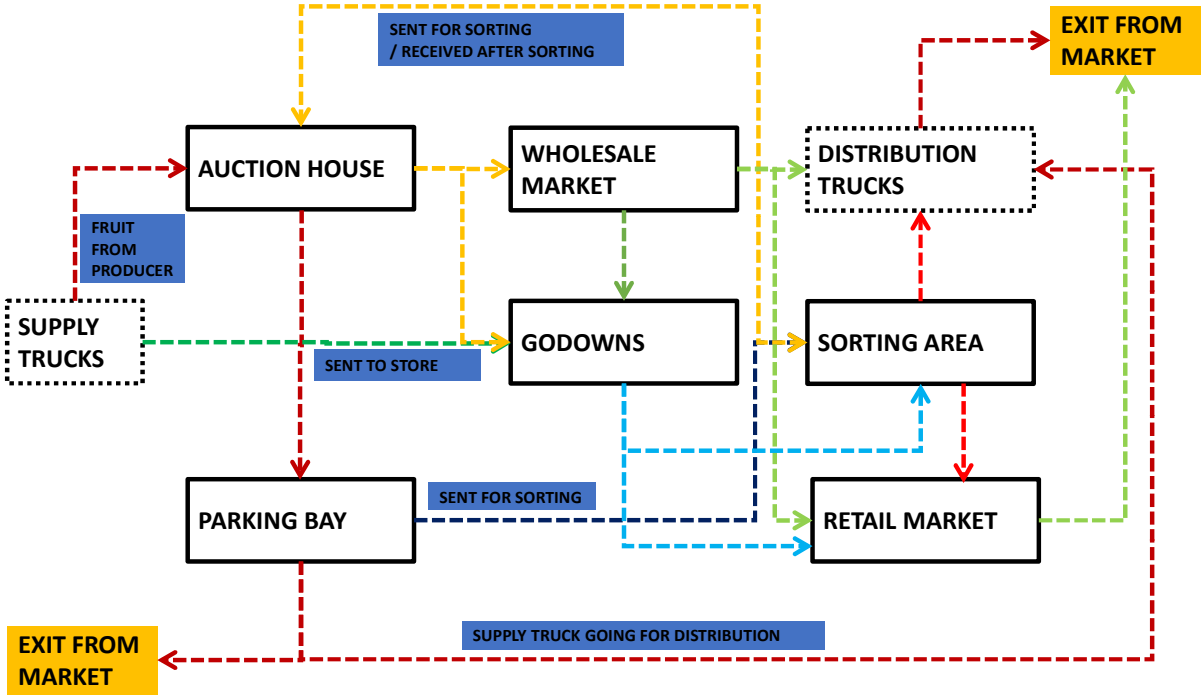


Fig. 68.
Proposed flow of activities in the wholesale market area.

6.6. Policy for Market Redevelopment

The urban design guidelines for the Mechua Bazar Wholesale Fruit Market re-development plan aim to achieve:

A Modern Trade and User-Friendly Market:

- By introducing modern infrastructure for activities in the fruit Market.
- By introducing activities through which customers can buy fresh fruits directly from the wholesale market.
- By encouraging the development of necessary amenities for the stake-holders of the wholesale market like public toilets and bathrooms, resting areas, fruit washing areas, etc.

A Walkable and Pedestrian-Friendly Market:

- By ensuring seamless, all-weather connectivity and accessibility between developments and the nearby Central Avenue Road and MG Road Metro station.
- By promoting various active uses along the streets and within the market area to enhance its vibrancy and appeal.

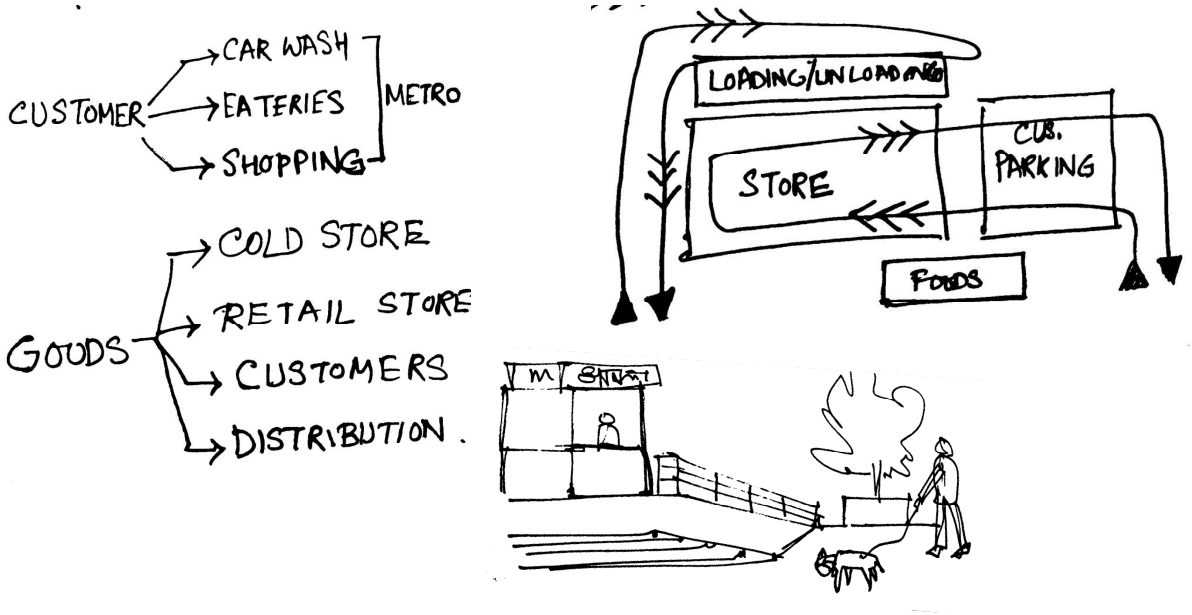


Fig. 69.
Sketch for aims of redevelopment in the study area.

6.6. Policy for Market Redevelopment

Building uses at the Ground and Above Floors:

To create attractive and pedestrian-friendly streets, activity-generating uses (AGU), such as retail, food & beverage, and other active uses are to be provided at the ground floor of developments fronting key pedestrian streets, side streets and public spaces.

The ground floor must accommodate the activities of the wholesale market like Auction House, Godowns, Retail Shops, etc. The floors above the ground floor could have extended commercial activities and residential apartments for the existing residents.

Fig. 70.
Pedestrian-friendly streets with AGU in Bugis Street, Singapore.

6.6. Policy for Market Redevelopment

Building Form and Massing:

The overall building form and massing of individual buildings is to consider the scale, form and architectural expression of the surrounding buildings.

The design of the building form and massing, together with the architectural treatment, is to consider how the building will be viewed as well as impact views from major approaches, key open spaces and footpaths, as well as to create engaging and varied shopfronts along the footpath.

Building Height:

Different building heights are specified for individual precincts to create a layered, three-dimensional skyline profile, to respond to the specific site context and to reinforce the character of the district.

The maximum allowable building height is subject to the prevailing Kolkata Municipal Corporation's Building Bylaws (Chapter 10: Area and Height Limitations- 74, 75, and 76).

Fig. 71.
Rows of mixed-use buildings at Little India, Singapore.

6.6. Policy for Market Redevelopment

Building Setback and Building Edge:

Buildings must follow Kolkata Municipal Corporation's Building Bylaws (Chapter 9: Open Spaces- 61 to 68), to determine the open space between the building line and its plot line.

The buildings should allow open spaces around the building for continuous pedestrian movement and restrict physical barriers between the footpath and pedestrian movement along the building's open space.

Up to 40% of the building frontage can be set back further from the building's plot line for articulation of the building form, so that a variety of spaces, as well as interesting building fronts, can be created.

Up to 50% of the podium facade area can also be projected within the building's plot line, in the form of Façade Articulations, to create more interesting and varied building frontages.

Buildings featuring multi-storied shop fronts with a high level of transparency and attractive lighting are highly encouraged to add vibrancy and variety to the streetscape.

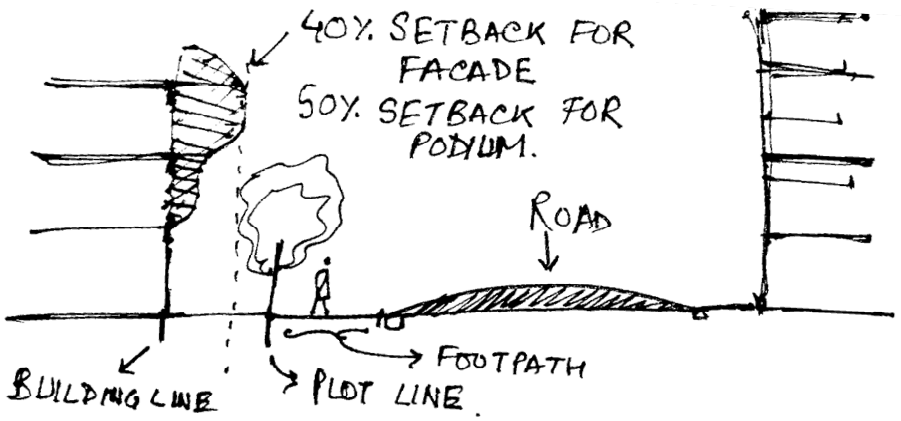


Fig. 72.
Section of a building edge with it's permissible setbacks.

6.6. Policy for Market Redevelopment

Public Space:

The open spaces should be well-landscaped with a high degree of visual and physical porosity. These public spaces are to be designed to be conducive to the staging of events and be publicly accessible at all times.

Night Lighting:

All commercial developments are strongly encouraged to have a well-designed night lighting scheme that expresses the architectural design and building form when seen from the street level, to contribute to the vibrancy and variety of the streetscape.

Fig. 73.
Photographs of footpath in day and night at Orchard Road, Singapore.

6.6. Policy for Market Redevelopment

Pedestrian Network:

The fruit market is planned as a pedestrian-friendly area via a comprehensive pedestrian network at the road level. This network provides convenient, comfortable, and seamless connections between developments, transport facilities, and key spaces and attractions, and ensures all-weather comfort for pedestrians.

The pedestrian network is augmented by covered walkways which provide all-weather protected pedestrian routes. All developments are required to provide covered walkways on the ground floor along the site's plot line and the building line. The covered walkways function as public amenities. They are to be kept free of obstruction at all times. In exchange, the redevelopment receives an extra 30% of the existing FAR provided by Kolkata Municipal Corporation's Building Bylaws (Chapter 10: Area and Height Limitations- 69 to 73).

The minimum width of the covered walkways is to be 3m. Where colonnades are provided, the internal clear width of the covered walkways is to be a minimum of 2m. To provide adequate protection for pedestrians during inclement weather, the external soffit heights are to minimally match the width of the covered walkway. To maintain a distinct precinct character, all covered and open walkways are to be predominantly paved in flamed-finish heavy-duty grey granite tiles, laid parallel to the footpath.

The pedestrian networks are to be designed for universal access.

6.6. Policy for Market Redevelopment

Servicing, Vehicular Access & Car Parks:

To maintain an attractive streetscape, any car parking and service areas, including refuse bin centre(s), and loading/unloading bays are to be located away from the footpath, fully integrated within the overall building form, and visually well-screened from above and on all sides.

Electrical substation(s), where required, can be located on the ground floor, but are to be well-integrated as part of the overall building design and are not to front onto the main roads, footpaths, or public spaces.

Sufficient holding bays for the vehicular access points to the car parks and service areas are to be provided within the development to ensure the smooth flow of vehicles on the roads.

All car parks are not in front of the footpath, to create a seamless and pedestrian-friendly mall that is uninterrupted by vehicles. Developments fronting the footpath are encouraged to provide basement car parks.

Fig. 74.
Photographs of drop-off bay at Suntec City, Singapore.

6.7. Proposed Masterplan

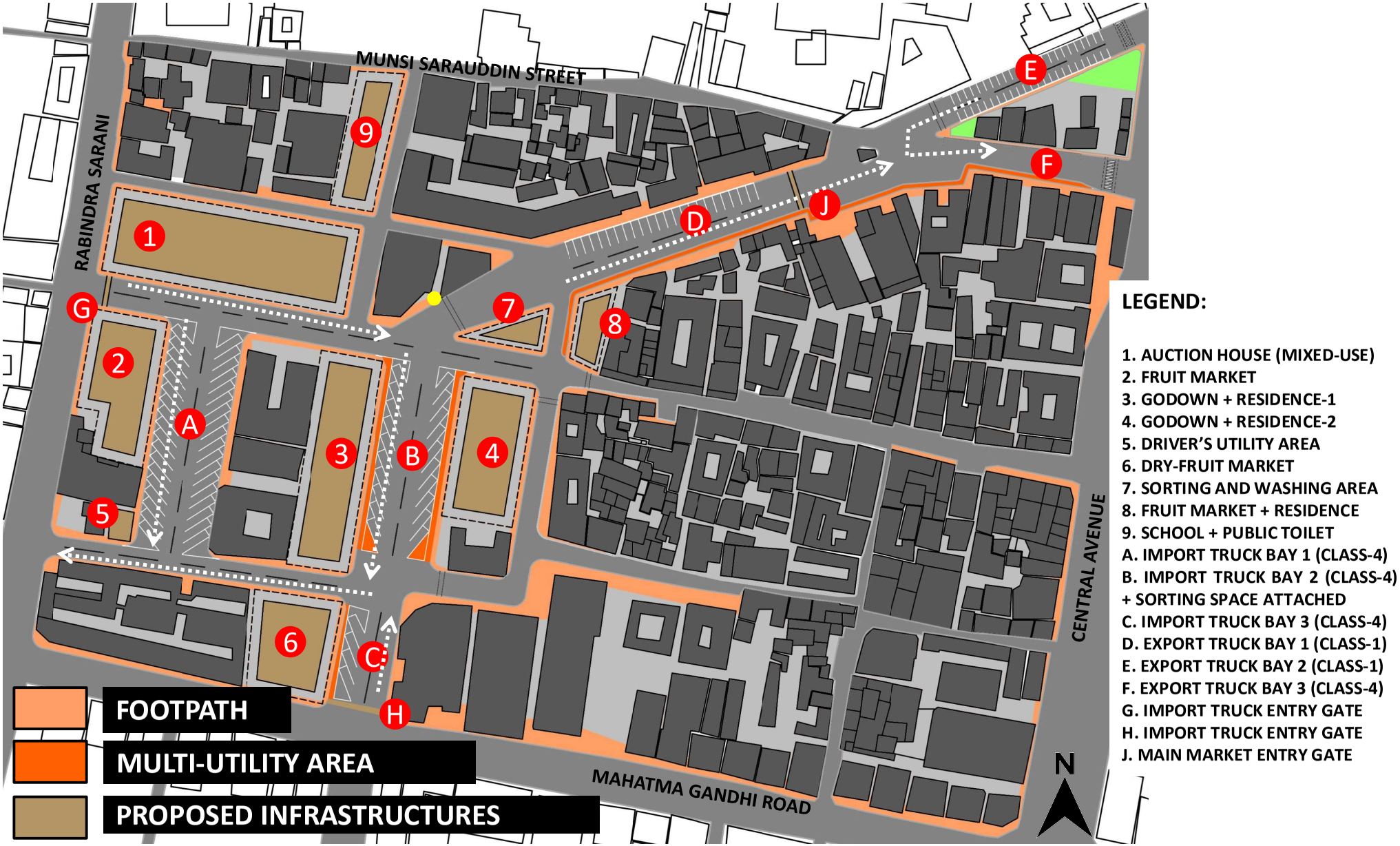


Fig.75.
Proposed masterplan of the study area.

6.8. Analysis of Interventions

The analysis of each building is done from the persepctive of existing and proposed infrastructure's FAR.

Proposed Intervention	**Existing Infrastructure**	**Relocated/ Essential Additional Infrastructure**	**Proposed Infrastructure**
Auction House	Plot Area: **3871 sq.m** Ground Coverage: **3789 sq.m** No: of stories: **4 (max)** Built-up Area: **7244 sq.m** FAR: **1.87 (existing)** Area Statement: Residence- **2446 sq.m = 26329 sq.ft** Commercial- **1744 = 18772 sq.ft** Godown- **3054 sq.m = 32873 sq.ft**	Auction Area: **1158 sq.m**	Plot Area: **3800 sq.m** Ground Coverage: **1900 sq.m (50%)** **FAR: 2.5875 (2.25+15%)** Built-up Area: **9832.5 sq.m** No: of stories: **5** Built-up area (must required): **8402 sq.m** Additional Built-up area available: **1430.5 sq.m** **Check for project feasibility (economic perspective).** **Land cost:** Rs.20000 x 40903 = Rs. 81,80,60,000 **Demolition charge:** Rs. 1000 x 77974= Rs. 7,79,74,000 **Construction cost of required Built-up**=Rs.2000 x 90439= Rs. 18,08,78,000 **Re-selling cost** = (26329 x Rs. 10000)+(18772 x Rs. 20000)+(32873 x Rs. 15000) = Rs.113,18,25,000 **Total profit:** Rs. 5,49,13,000 (4.85%) **Typical profit required=** 20% (Total resale value- Rs. 129,22,94,400) **Additional FAR required (assuming residential)=** Rs.160469400/10000= 16047 sq.ft= 1490 sq.m **Additional Built-up area available:** 1430.5 sq.m **So, redeveloping this plot is economically feasible**

Proposed Infrastructure	**Existing Infrastructure**	**Relocated/ Essential Additional Infrastructure**	**Proposed Infrastructure**
Fruit Market	Plot Area: **2019 sq.m** Ground Coverage: **1588 sq.m** No: of stories**: 4 (max)** Built-up Area: **6189 sq.m** FAR: **3.065 (existing)** Area Statement: Residence- **3297 sq.m** Commercial- **2892 sq.m**	(The building replaced by truck bay) Godown- **1658 sq.m** Residence- **3316 sq.m**	Plot Area: **2004 sq.m** Ground Coverage**: 1002 sq.m (50%)** FAR: **2.5875 (2.25+15%)** Built-up Area: **5185 sq.m** No: of stories: **5** Built-up area (must required): **11163 sq.m** Additional Built-up area required: **5978 sq.m**
Driver's Utility Area	Plot Area: **182 sq.m** Ground Coverage: **178 sq.m** No: of stories: **3** Built-up Area: **534 sq.m** FAR: **2.93** Area Statement: Residence- **178 sq.m** Commercial- **356 sq.m**	Public Toilet- **90 sq.m**	Plot Area: **180 sq.m** Ground Coverage: **90 sq.m (50%)** FAR: **2.5875 (2.25+15%)** Built-up Area: **465.75 sq.m** No: of stories: **5** Built-up area (must required): **624 sq.m** Additional Built-up area required: **158.25 sq.m**
Dry-fruit Market	Plot Area**: 1795 sq.m** Ground Coverage**: 1158 sq.m** No: of stories: **3** Built-up Area: **3474 sq.m** FAR**: 1.935** Area Statement: Residence- **1158 sq.m** Commercial- **2316 sq.m**	Dry fruit market (on-street): **632 sq.m**	Plot Area: **1697 sq.m** Ground Coverage: **848.5 sq.m (50%)** FAR: **2.5875 (2.25+15%)** Built-up Area: **4390 sq.m** No: of stories: **5** Built-up area (must required): **4106 sq.m** Additional Built-up area available: **284 sq.m**

Table 6.
Analysis of interventions.

Proposed Infrastructure	Existing Infrastructure	Relocated/ Essential Additional Infrastructure	Proposed Infrastructure
Godown + Residence-1	Plot Area: **2224 sq.m** Ground Coverage: **1702 sq.m** No: of stories: **3** Built-up Area: **5106 sq.m** FAR: **2.295 (existing)** Area Statement: Residence- **3404 sq.m** Godown- **1702 sq.m**	-	Plot Area**: 2210 sq.m** Ground Coverage: **1105 sq.m (50%)** FAR: **2.5875 (2.25+15%)** Built-up Area: **5718.375 sq.m** No: of stories: **5** Built-up area (must required): **5106 sq.m** Additional Built-up area available: **612.38 sq.m**
Godown + Residence-2	Plot Area: **1900 sq.m** Ground Coverage: **1510 sq.m** No: of stories: **3 (max)** Built-up Area: **4530 sq.m** FAR: **1.613 (existing)** Area Statement: Residence- **3098 sq.m** Godown- **1432 sq.m**	Fruit market (on-street): **1200 sq.m**	Plot Area: **1685 sq.m** Ground Coverage: **842.5 sq.m (50%)** FAR**: 2.5875 (2.25+15%)** Built-up Area: **4360 sq.m** No: of stories**: 5** Built-up area (must required): **5730 sq.m** Additional Built-up area required: **1370 sq.m**
Sorting And Washing Area	Plot Area: **1288 sq.m** Ground Coverage: **1070 sq.m** No: of stories**: 4 (max)** Built-up Area: **3268 sq.m** FAR: **2.537 (existing)** Area Statement: Residence- **2288 sq.m** Godown- **980 sq.m**	Fruit market (on-street): **500 sq.m**	Plot Area: **300 sq.m** Ground Coverage: **150 sq.m (50%)** FAR: **2.5875 (2.25+15%)** Built-up Area: **776.25 sq.m** No: of stories: **5** Built-up area (must required): **3768 sq.m** Additional Built-up area required: **2992 sq.m**

Proposed Infrastructure	Existing Infrastructure	Relocated/ Essential Additional Infrastructure	Proposed Infrastructure
Fruit Market + Residence	(calculated with Sorting And Washing Area)	(calculated with Sorting And Washing Area)	Plot Area: **452 sq.m** Ground Coverage: **226 sq.m (50%)** FAR: **2.5875 (2.25+15%)** Built-up Area: **1170 sq.m** No: of stories: **5** Built-up area (must required): **00 sq.m** Additional Built-up area available: **1170 sq.m**
School + Public Toilet	Plot Area: **1179 sq.m** Ground Coverage: **670 sq.m** No: of stories**: 4 (max)** Built-up Area: **2144 sq.m** FAR: **1.818 (existing)** Area Statement: School- **2144 sq.m**	Public Toilet- **180 sq.m**	Plot Area: **1102 sq.m** Ground Coverage: **551 sq.m (50%)** FAR: **2.3 (2.0+15%)** Built-up Area: **2534.6 sq.m** No: of stories**: 4** Built-up area (must required**): 2324 sq.m** Additional Built-up area available: **210 sq.m**
NET RESULT	Total Built-up area available: **3706 sq.m** Total additional built-up required**: 10,498 sq.m** Total required built-up for redevelopment= **6792.25 sq.m**	Total plot area: **13430 sq.m** Built-up area (available+ additional= required): **34432.475 + 6792.25= 41224.725 sq.m** FAR (required): **3.069=3.07 (approx.)**	So, to decongest the streets and shift activities inside the buildings, additional **0.482 (18.63%) FAR** required for successful re-development of market.

Table 6. (ctd.)
Analysis of interventions.

6.9. Views

Fig. 76.
View of supply truck bay with sorting area.

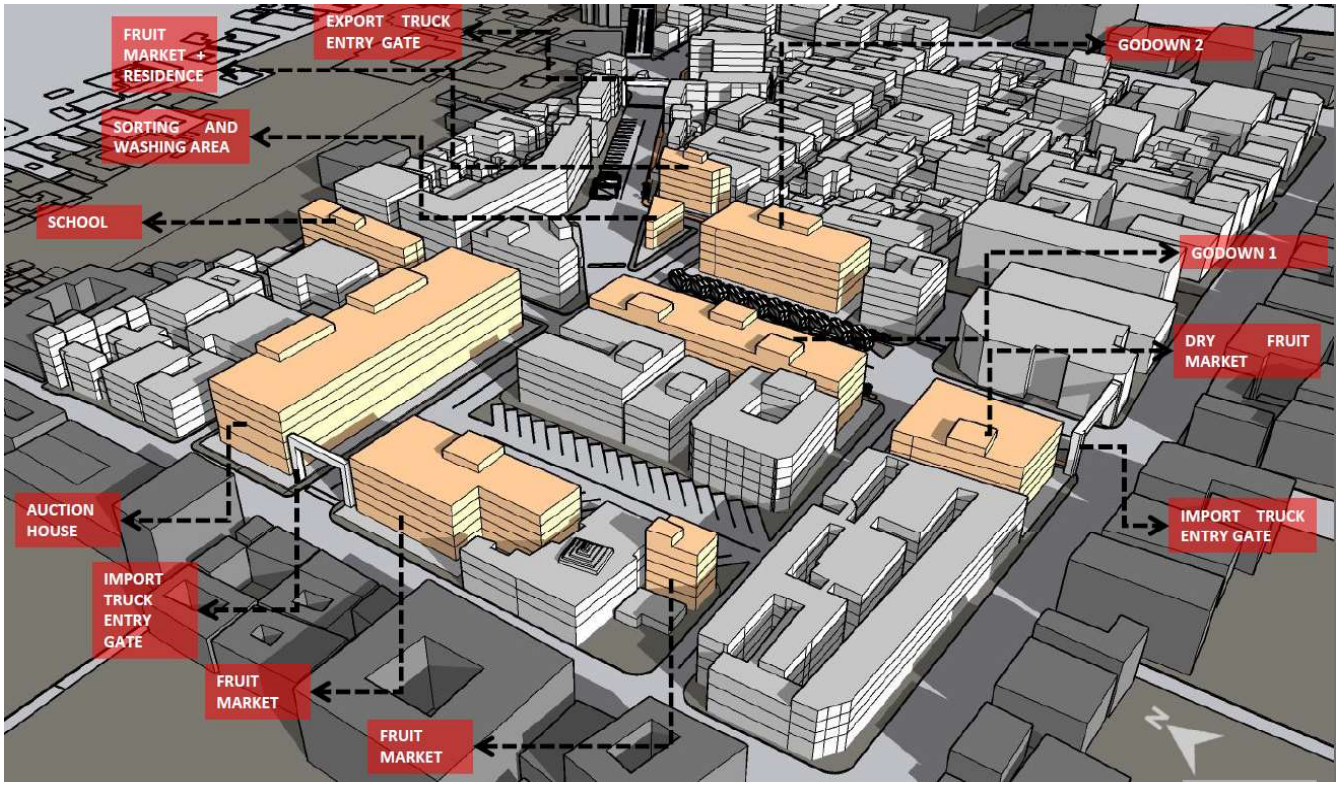


Fig. 77.
Bird's eye view of the proposed market.

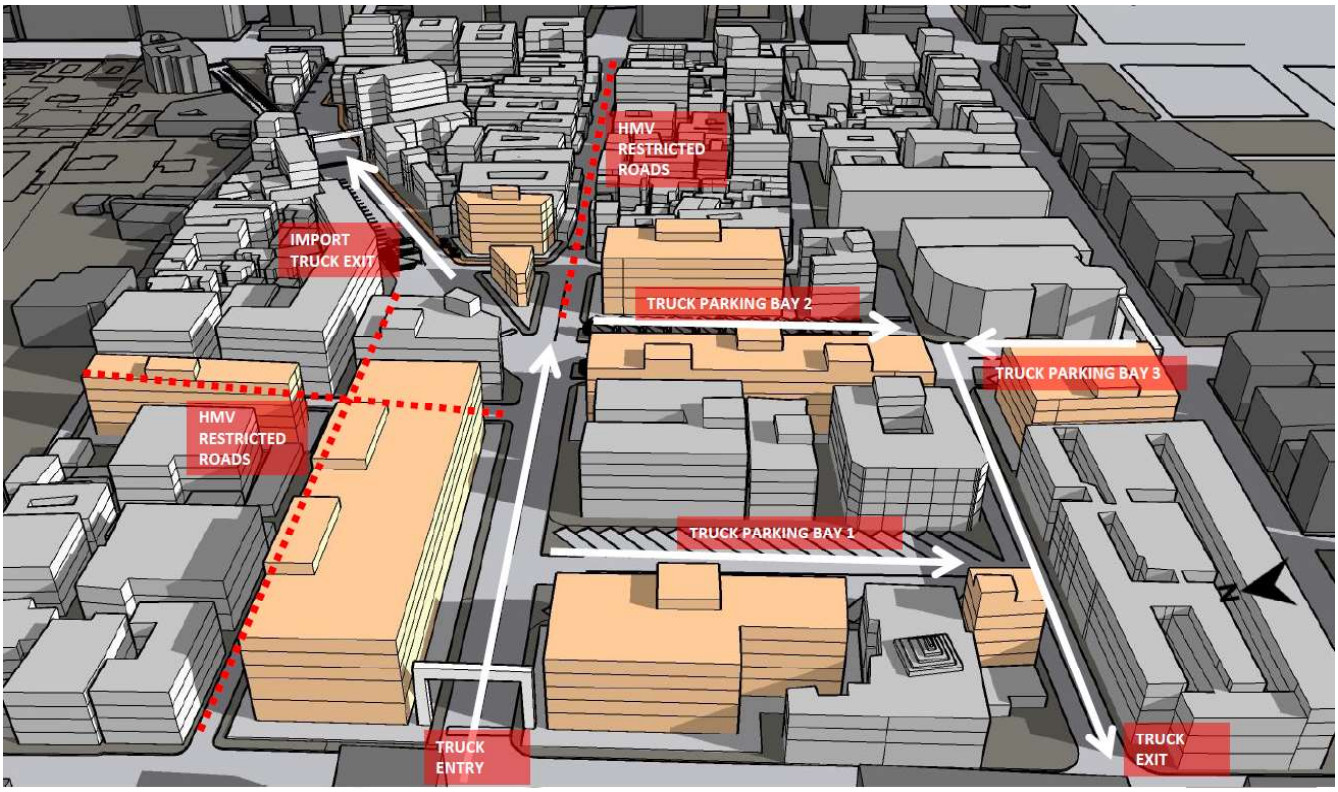


Fig. 78.
Bird's eye view of the proposed market.

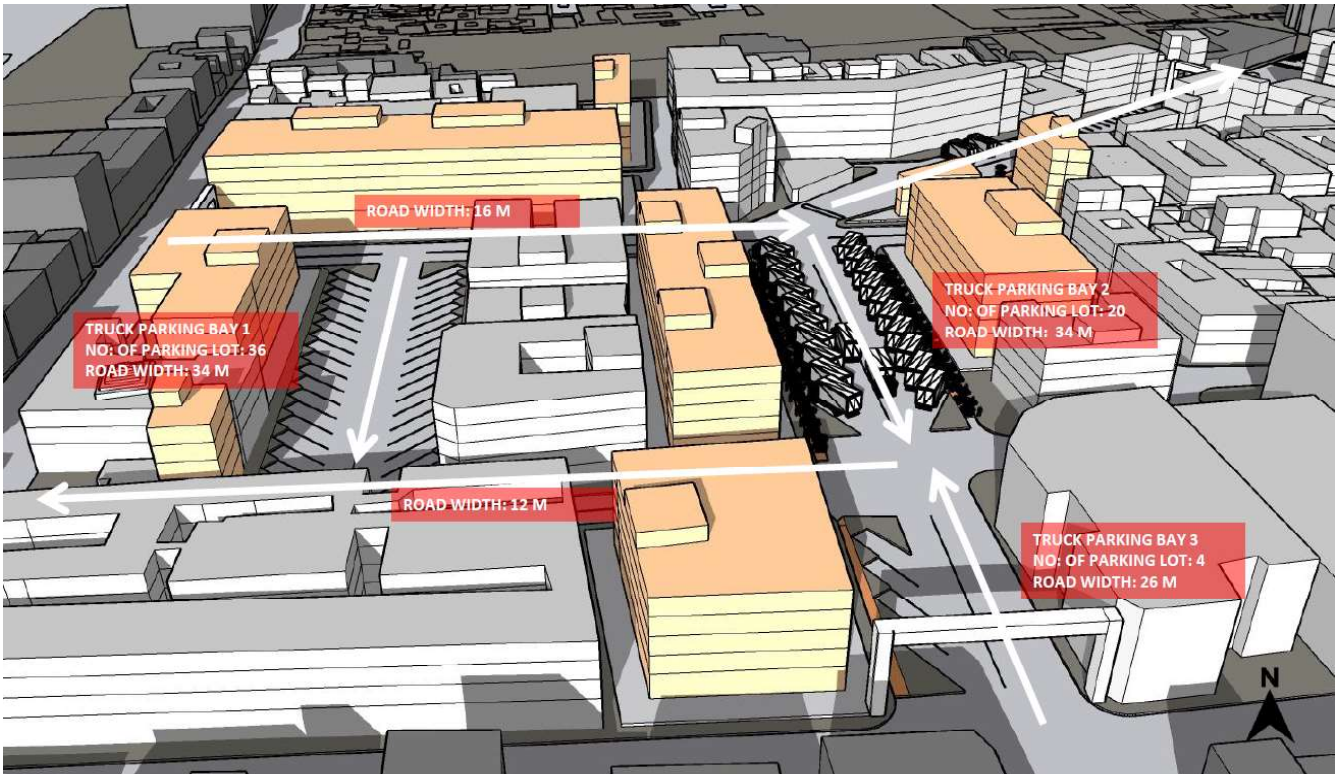


Fig. 79.
Bird's eye view of the proposed market.

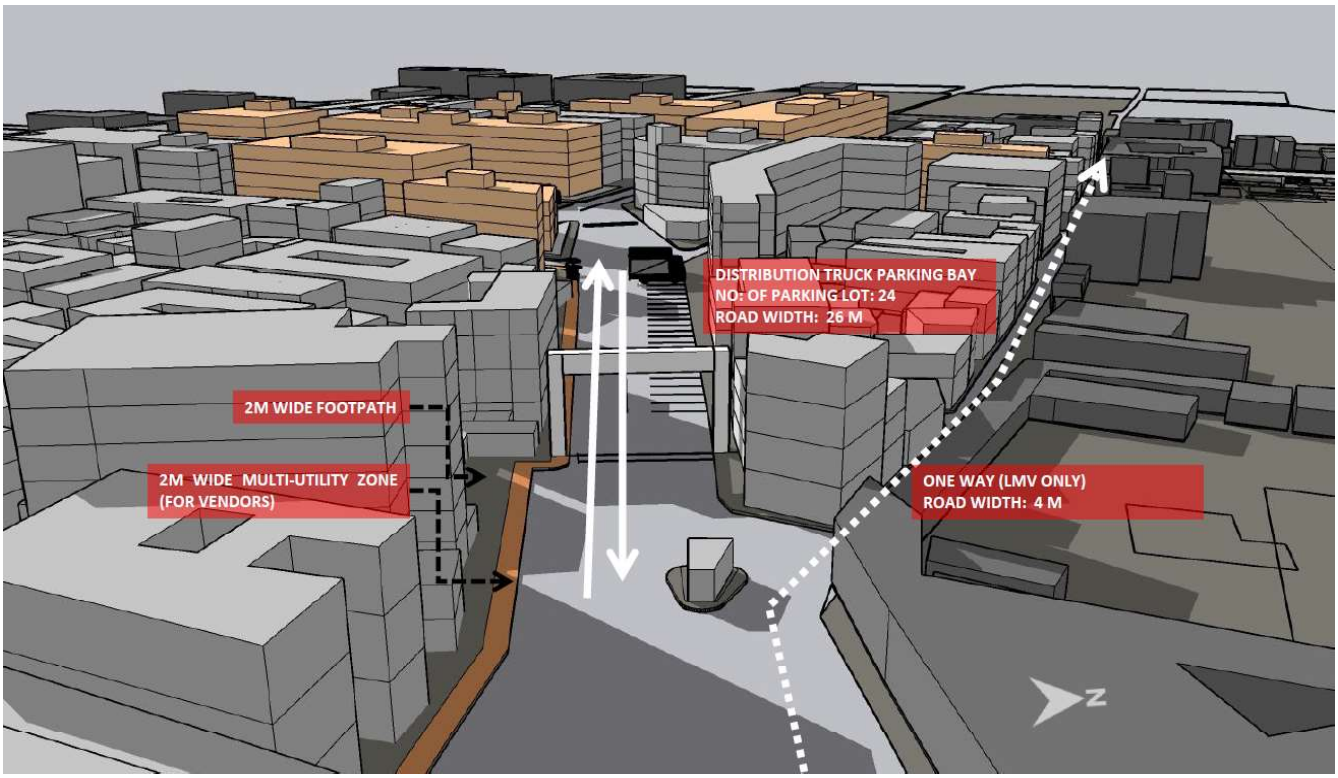


Fig. 80.
Bird's eye view of the proposed market.

6.10. Conclusion

BUILDING GUIDELINES:

• An additional 19% to 30% FAR must be allowed on the existing FAR to move the commercial activities inside the buildings with the preservation of existing infrastructure. It would also give 20% to 35% of profit to developers for redevelopment. The built-up area available for commercial activities must be restricted to its present values to restrict further expansion of the market.

• These additional FARs could be awarded with the development of facilities with infrastructure for modern facilities, implementation of green building strategies, and construction of allweather footpaths.

TRANSPORTATION AND ROAD INFRASTRUCTURE GUIDELINES:

• The number of vehicles in on-street parking must be reduced to decongest the marketplace. It could be achieved with the demarcation of parking spaces and widening the roads for steady inflow and outflow of the traffic in the site.

• Parking in the junction of roads must be removed and proper signages must be provided to enable the free flow of traffic.

• The HMV movement must be restricted on the access roads and it must be utilized by the labourers to transport goods from one building/zone to the other.

6.10. Conclusion

URBAN AMENITIES AND PUBLIC INFRASTRUCTURE GUIDELINES:

• Additional 180 sq.m of urinals, WC (for male and female), and bathroom must be constructed to serve the floating population. It would reduce the unhygienic condition of the market to a large extent.

• The footpath needs to be widened and redeveloped with all amenities and green covers, and encroachments from shopkeepers must be removed to enable free-flowing pedestrian movement.

• An additional 2 meters wide strip of Multi Utility Zone (MUZ) should be provided along the footpath (where it is feasible, and demand of street vendors exists), to provide space for on-street vendors for commercial activities.

• An additional 2-meter-wide strip for an on-street sorting area along the truck parking bay (import trucks) must be provided to preserve the traditional sorting methods, yet in an organized manner, without creating traffic congestion or areas of conflict.

• To re-establish the identity of the market among common people of Kolkata and contain the fruit market inside the existing blocks, three gates are proposed along the three main axes of the market. A tower can also be built at the intersection of the three axes to provide a visual clue to navigate and also to build a landmark of the market's identity.

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