

**PLANNING STRATEGIES FOR URBAN RENEWAL
OF CORE AREA IN NAGPUR CITY**

A DISSERTATION

*Submitted in partial fulfilment of the
Requirements for the award of the degree
of*

MASTER OF URBAN & RURAL PLANNING

Submitted By:

RISHIKESH DIXIT

(Enrollment No. 17511005)

Under the guidance of

Dr. UTTAM K. ROY



DEPARTMENT OF ARCHITECTURE AND PLANNING

INDIAN INSTITUTE OF TECHNOLOGY

ROORKEE - 247 667 (INDIA)

JUNE, 2019

CANDIDATE'S DECLARATION

I hereby declare that the work carried out in this seminar report entitled, “**Planning strategies for Urban renewal of core area in Nagpur city**”, is being submitted in partial fulfillment of the requirement for the award of degree of “**Master of Urban and Rural Planning**” submitted to the Department of Architecture and Planning, Indian Institute of Technology, Roorkee, under the supervision of **Prof. Uttam K. Roy**, Assistant Professor, Department of Architecture and Planning, IIT Roorkee.

Date: 27th June, 2019

Place: Roorkee

(**Rishikesh Dixit**)

Enrollment No. 17511005

CERTIFICATE

This is to certify that the above statement made by the candidate is correct to the best of my knowledge and belief.

(**Prof. Uttam K. Roy**)

Assistant Professor

Department of Architecture and Planning,

Indian Institute of Technology, Roorkee

ACKNOWLEDGEMENTS

I feel extremely grateful to all the people who helped me along the way. I would like to start off by thanking my guide, Dr. Uttam K. Roy, for his encouragement, guidance and suggestions throughout the tenure of this dissertation. His insights and knowledge has been helpful in completion of this study. I would also like to extend my appreciation to the co-ordinators and juries who have given their inputs for the betterment of the study.

I express my deep gratitude to friends Kshitij Gharde, Dhanshree Jangid, Arpit Tiwari and Kaushik Gorai for making me push my boundaries in order to achieve the most out of this study. I also would like to thank Professor Amit Wahurwagh for helping me with the data and materials.

This acknowledgement, like any other, would be incomplete without thanking the biggest supports of my life, my parents. They have been the inspiration and backbone of my educational journey, through all the thick and thins.

ABSTRACT

Many Indian cities are facing enormous level of urbanization which is putting excessive pressure on the infrastructure and resources, especially on inner-city areas or core areas. People in these areas are facing acute problems of traffic congestion, pollution, scarcity of resources, dilapidated built environment and overall reduction in quality of life. At the same time dependency of core areas on commercial sector and its decline due to economic evolution has led anti-magnet like situation. Nagpur is one of such city that has a history of 300 years and its urban growth expanded from the central historic core. The compact urban form characteristics of the city, present for decades, facilitated shorter travel distances, prevalence of mix land-use, higher densities with compact urban fabric in core and intermediate areas, high share of non-motorized travel modes, etc. However even with these positive indicators which an ideal city sought for, today it stands on the threshold between compactness and dispersion. The core city densities has declined over the years hinting that people are moving out to peripheral ones from central areas. Urban decay has prevailed in these areas. Once the sprawling centers of attraction for whole city, today are on a path of demise and losing their characteristic identity and pull factor. There is an immediate need to check this dispersion and strengthen the core areas through planning interventions. Keeping in mind the deteriorating conditions of Indian cities, especially the inner periphery, the Government of India has launched various renewal schemes for cities. However they have received meager response due to non-holistic approach.

Nagpur is one such study with extensive past and bright future ahead. However like many other Indian cities, Nagpur too has a core which is struggling with a lots of problems. The quality of living for people have taken a hit over the years. With increasing development and real estate pressure the central areas which have organically developed and are a part of city's identity are now showing signs of decay. The regional presence of Nagpur in the area is huge and thus it becomes necessary to conserve these areas and make the city a growth nucleus for the region.

This dissertation has attempted urban renewal of core city areas, specifically seven wards including the central business district areas of Sitabuldi. A comprehensive and integrated approach covering various facets of redevelopment has been covered making the effort in directions of sustainability. The recommendations are given in project formats with phasing and coverage. The identity is tried to be conserved with removal of negative influences and introduction of positive factors.

Keywords: Urban renewal, Core city area, CBD



Table of Contents

1.	PROLOGUE	1
1.1	Aim.....	1
1.2	Objectives.....	1
1.3	Need of the study.....	1
1.4	Scope	2
1.5	Outcome	2
1.6	Limitations.....	3
1.7	Methodology	3
1.8	Organization of the thesis.....	4
2.	BACKGROUND OF NAGPUR CITY.....	5
2.1	Geographical setting.....	6
2.2	Administrative Boundary	7
2.3	Location and connectivity	8
2.3.1	Road connectivity.....	8
2.3.2	Rail connectivity	9
2.3.3	Air connectivity.....	10
2.4	Climate	11
2.5	Evolution of City	12
2.5.1	Gond Period	13

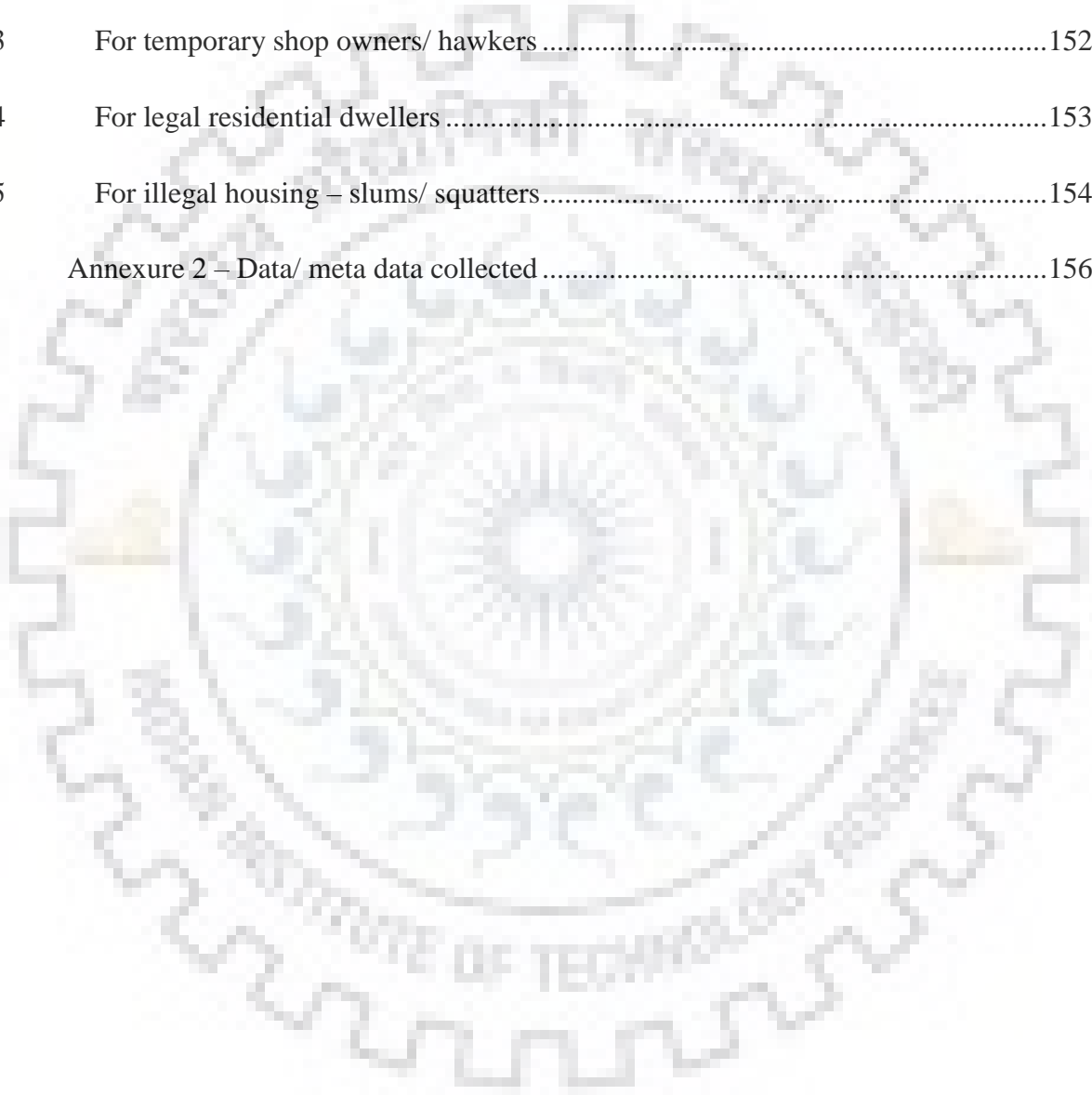
2.5.2	Bhonsale Period	15
2.5.3	British Period	18
2.6	Demography	20
2.7	Other characteristics	22
2.8	Economic base of Nagpur city	22
3.	CASE STUDY AREA	25
4.	LITERATURE REVIEW	31
4.1	Urban Renewal	31
4.1.1	The process	31
4.1.2	The baseline	32
4.1.3	Methods of urban renewal.....	32
4.1.4	Reason for urban renewal	33
4.1.5	Approaches of urban renewal	34
4.1.6	Evolution of urban renewal.....	35
4.1.7	Parameters of urban renewal.....	36
4.2	Schemes in Urban renewal	38
4.3	Relevant Case studies	40
4.3.1	Kwun Tong Town Centre renewal project, Hong Kong.....	40
4.3.2	Revitalization of City Core, Petta Zone, Bangalore.....	43
4.3.3	Khayelitsha’s Central Business District, Cape Town	44

4.4	Inference	48
5.	PARAMETERS/ INDICATORS IDENTIFIED FOR URBAN RENEWAL	51
6.	RESEARCH DESIGN AND DATA COLLECTION	53
7.	ANALYSIS AND FINDINGS.....	55
7.1	Survey data and findings	55
7.1.1	Survey data: residential permanent	56
7.1.2	Survey data: residential slum/squatters	57
7.1.3	Survey data: Shop owners permanent	60
7.1.4	Survey data : Shop owners temporary	61
7.1.5	Survey data: customers	64
7.1.6	Survey data: passers-by.....	66
7.1.7	Survey data: Heritage	68
7.1.8	Industrial development.....	69
7.1.9	Land use	70
7.1.10	Infrastructure	71
7.2	SWOT analysis.....	73
7.2.1	Physical Parameter: Physical Infrastructure status	73
7.2.2	Physical Parameter: Land-use effectiveness	74
7.2.3	Physical Parameter: Quality of built form	75
7.2.4	Physical Parameter: Congestion.....	75

7.2.5	Economic Parameter: Informality	76
7.2.6	Economic Parameter: Livelihood.....	77
7.2.7	Environmental Parameter: Atmospheric quality	78
7.2.8	Environmental Parameter: Disaster resilience	79
7.2.9	Socio-Cultural Parameter: Place making with community satisfaction.....	79
7.2.10	Socio-Cultural Parameter: Safety / security with social inclusion.....	80
7.2.11	Socio-Cultural Parameter: Social infrastructure status	81
7.3	Zoning and criticality mapping	82
7.3.1	Physical Parameter: Physical Infrastructure status	82
7.3.2	Physical Parameter: Land use effectiveness status	83
7.3.3	Physical Parameter: Quality of Built form.....	84
7.3.4	Physical Parameter: Congestion.....	86
7.3.5	Environmental Parameter: Disaster resilience	87
7.3.6	Environmental Parameter: Atmospheric quality.....	88
7.3.7	Socio-cultural Parameter: Place making and social cohesion requirement	89
7.3.8	Socio-cultural Parameter: Safety and security	91
7.3.9	Economic Parameter: Informality	92
7.3.10	Economic Parameter: Livelihood dependency.....	93
7.3.11	Social infrastructure	95
7.4	Weighing of Sub- Parameters.....	95

7.5	Critical zoning mapping and decution.....	97
8.	RECOMMENDATIONS	99
8.1	Integrated approach	99
8.2	Projects	107
8.2.1	Physical parameter: Physical Infrastructure status.....	107
8.2.2	Physical parameter: Quality of built form.....	110
8.2.3	Physical parameter: Land-use effectiveness	114
8.2.4	Physical parameter: Congestion.....	117
8.2.5	Economic parameter: Livelihood.....	120
8.2.6	Economic parameter: Informality	122
8.2.7	Socio-cultural parameter: Placemaking with community satisfaction.....	126
8.2.8	Socio-cultural parameter: Security/safety with social inclusion.....	129
8.2.9	Socio-cultural parameter: Social infrastructure status	131
8.2.10	Environmental parameter: Atmospheric quality	132
8.2.11	Environmental parameter: Disaster resilience	134
8.3	Phasing	136
8.4	Project validation.....	139
9.	CONCLUSION	141
10.	BIBLIOGRAPHY	143
11.	ANNEXURE.....	149

11.1	Annexure -1: Questionnaire/schedules prepared for survey.....	149
11.1.1	For customers.....	150
11.1.2	For permanent shopowners	151
11.1.3	For temporary shop owners/ hawkers	152
11.1.4	For legal residential dwellers	153
11.1.5	For illegal housing – slums/ squatters.....	154
11.2	Annexure 2 – Data/ meta data collected	156



List of Figures

Figure 1 Overview of Nagpur city	5
Figure 2 Administrative boundary (source: final cdp report 2015)	8
Figure 3 road connectivity (source: Nagpur maps).....	9
Figure 4 Nagpur railway junction	10
Figure 5 Nagpur international airport	10
Figure 6 Climate data for Nagpur (Source: Meteorological department).....	12
Figure 7 Old map of Nagpur city (Year 1906).....	15
Figure 8 population trends at various tiers. (Source: census 2011 and CRIS analysis).....	20
Figure 9 comparison of population density (source: census 2011, NMC and CRIS analysis).....	21
Figure 10 Comparison of literacy rate (source: census 2011, CDP2015).....	21
Figure 11 sex ratio (census 2011 and CDP-2015)	22
Figure 12 Map Showing Location of Nagpur (Source: Maps of India).....	25
Figure 13 Area Excluded in the NMA (Source: NIT).....	26
Figure 14 Nagpur Ward Map (Source: NMC)	26
Figure 15 Map of Nagpur in India and study area in it (Source: Google map imagery)	27
Figure 16 Live site images of study area	28
Figure 17 Base map of study area	29
Figure 18 Details/ characteristics of study area	29
Figure 19 urban renewal in foreign countires	34

Figure 20 Urban renewal in India.	35
Figure 21 Dimensions of urban renewal	37
Figure 22 Map and images of Kwun Tong Town Centre renewal project, Hong Kong	41
Figure 23 proposals for Kwun Tong Town Centre renewal project, Hong Kong	42
Figure 24 Petta region Bangalore location and statistics	43
Figure 25 PPP model for Petta zone renewal project.....	44
Figure 26 Khayelista CBD renewal project proposals.....	45
Figure 27 Survey points for permanent residents	56
Figure 28 Survey points for temporary residents.....	58
Figure 29 Survey points for permanent shop owners	60
Figure 30 Survey points for temporary shop owners.....	62
Figure 31 Survey points for customers	64
Figure 32 Survey points for passersby.....	66
Figure 33 Survey points for heritage data.....	68
Figure 34 Industrial land use.....	70
Figure 35 Land use according to DP of Nagpur city 2011	71
Figure 36 Infrastructure	72
Figure 37 physical parameter: Physical infrastructure.....	83
Figure 38 physical infrastructure: Land use effectiveness.....	84
Figure 39 Physical parameters: Quality of built form.....	85

Figure 40 Physical parameters: Congestion	87
Figure 41 Environmental Parameter: Disaster Resilience	88
Figure 42 Environmental parameter: Atmospheric Quality	89
Figure 43 Socio-cultural Parameter: Place making and social cohesion requirement	90
Figure 44 Socio-cultural Parameter: Safety and security	92
Figure 45 Economic Parameter: Informality	93
Figure 46 Economic Parameter: Livelihood dependency	94
Figure 47 Social infrastructure	95
Figure 48 Contextual Weightage	96
Figure 49 Expert Average	96
Figure 50 Cumulative Weightage	97
Figure 51 Critical Zones	97
Figure 52 Cumulative Criticality Mapping	98
Figure 53 Road design guidelines (Source : Pune smart city)	107
Figure 54 Sitabuldi main road redesign principles	108
Figure 55 Internal road considerations	109
Figure 56 before and after pictures (Source: India water portal)	109
Figure 57 Physical infrastructure project mapping	110
Figure 58 Before and after pictures (Source: Harvard.edu and PK das associates)	111
Figure 59 Before and after pictures (Source: Singapore guide)	112

Figure 60 Before and after pictures (Source: Dreamstime.com)	113
Figure 61 Quality of built form project mapping.....	114
Figure 62 Before and after pictures (Source: Washington Post)	115
Figure 63 Before and after pictures (Source: DTAH).....	116
Figure 64 Land-use project mapping	117
Figure 65 Before and after pictures (Source: Dubai metro).....	118
Figure 66 Before and after pictures (Source: Cycling weekly)	119
Figure 67 Congestion improvement project mapping.....	120
Figure 68 Livelihood project mapping.....	122
Figure 69 Before and after pictures (Source: Pinterest).....	123
Figure 70 before and after pictures (Source: Times of India).....	124
Figure 71 Before and after pictures (Source: Pune smart city road design)	125
Figure 72 informality project mapping	126
Figure 73 Before and after pictures (Source: Whiting Lakefront Department)	127
Figure 74 Before and after pictures (Source: Pinterest).....	128
Figure 75 Place making with community satisfaction project mapping.....	129
Figure 76 CPTED Principles (Source: International Foundation for Protection Officers).....	130
Figure 77 Place making (Source: PPS.org).....	130
Figure 78 Before and after pictures (Source: Colorado springs)	131
Figure 79 Social infrastructure projects	132

Figure 80 before and after pictures (Source: Cheonggyecheon-Site Plan).....	133
Figure 81 Atmospheric quality improvement project mapping	134
Figure 82 Before and after pictures (Source: Haloweeb).....	135
Figure 83 Disaster resilience improvement project mapping	136
Figure 84 Passerby opinion survey questionnaire.....	149
Figure 85 Customer opinion survey questionnaire	150
Figure 86 Permanent shopowner opinion survey questionnaire	151
Figure 87 Temporary shopowner opinion survey questionnaire	152
Figure 88 Permanent house dwellers household survey questionnaire.....	153
Figure 89 Temporary/illegal house dwellers household survey questionnaire.....	154
Figure 90 questionnaire Weightage ranking from experts.....	155
Figure 91 Slum Data	156
Figure 92 Heritage visited Data	157
Figure 93 Heritage Knowledge Data	157
Figure 94 Heritage Improvement Opinion Data	158
Figure 95 Heritage Metadata.....	158
Figure 96 Passerby Info Data.....	159
Figure 97 Passerby Info Metadata.....	160
Figure 98 Customer Info Data	160
Figure 99 Customer Info Metadata	161

Figure 100 Permanent Shop owner Data	161
Figure 101 Permanent Shop owner Metadata	161
Figure 102 Temporary Shop owner Data.....	162
Figure 103 Temporary Shop owner Metadata	163
Figure 104 Residential Legal Data.....	164
Figure 105 Residential Legal Metadata	164
Figure 106 Residential Illegal Data	165
Figure 107 Residential Illegal Metadata	166

LIST OF TABLES

Table 1 Parameter integration	106
Table 2 Phase 1 projects.....	137
Table 3 Phase 2 projects.....	138
Table 4 Phase 3 projects.....	139
Table 5 Weightage wise project for sub-parameters.....	139
Table 6 Zone wise projects	140

1. PROLOGUE

Every city is affected by trends of transformations or the process of change. The term decline in the context of urban development is used to describe undesirable changes. Local policies and strategies designed to deal with urban decline, decay or transformation are termed as urban renewal. Urban renewal has come up to be a commendable exercise in many cities to solve its problems and make a way forward. This dissertation would be focusing on urban renewal of core area of Nagpur city. It would be a study of the area, study of the concept and strategizing for solutions.

1.1 Aim

The Aim is to revitalize the core areas of Nagpur city

1.2 Objectives

The objectives of the study are:

1. To study concept of urban renewal and identify its parameters with special reference to Indian context.
2. To assess and analyze the urban renewal strategies in various schemes for Nagpur city.
3. To analyze the core-city areas of Nagpur city (based on spatial arrangement) and identify the lacking and critical areas of intervention for renewal.
4. To recommend suitable alternatives of strategies for urban renewal for Nagpur city as an Outcome.

1.3 Need of the study

Many Indian cities are facing enormous level of urbanization which is putting excessive pressure on the infrastructure and resources, especially on inner-city areas or core areas leading to rise of acute problems like traffic congestion, pollution, scarcity of resources, dilapidated built environment and overall reduction in quality of life. Nagpur is one of such city that has a history of 300 years and its urban growth expanded from the central historic

core. The city center densities has declined during the last few decades hinting that people are moving out from central areas to peripheral ones (Kotharkar, 2014). Urban decay has prevailed in these areas and they are losing their characteristic identity and pull factor. Smart city mission of Nagpur city has identified core areas that are dense in nature, with unauthorized layouts, very less green spaces and trend of outward people flow. These areas are considered under area based development and needs a renewal on lines of decentralized planning and urban renewal through schemes like Jnnurm, Amrut, NTCPC: 'Urban Renewal, Redevelopment and Regeneration' and Smart city mission.

1.4 Scope

The scope of the study is:

The scope is to prepare time bound strategies and regulations under area based development for CBD in the core area of Nagpur city. It will cater to the residing and floating population in the area and solve problems on Physical, socio- cultural, economic and environmental parameters and give an integrated and comprehensive solution

1.5 Outcome

The outcome of the study is:

- Area based development plan – Strategies and guidelines for urban renewal of CBD area in core area of Nagpur city
- Specialized control regulations – Visual and spatial regulation specially designed for the study area.
- Data bank - A congregation of data and analysis on urban renewal especially in Indian context would be collected that may be used in future by other faculties.
- Policy Review - A review of existing schemes, policies and mission will also be done thereby giving a critical view of the existing framework. Comparative analysis will be done to find the lacking points with respect to other successful policies.

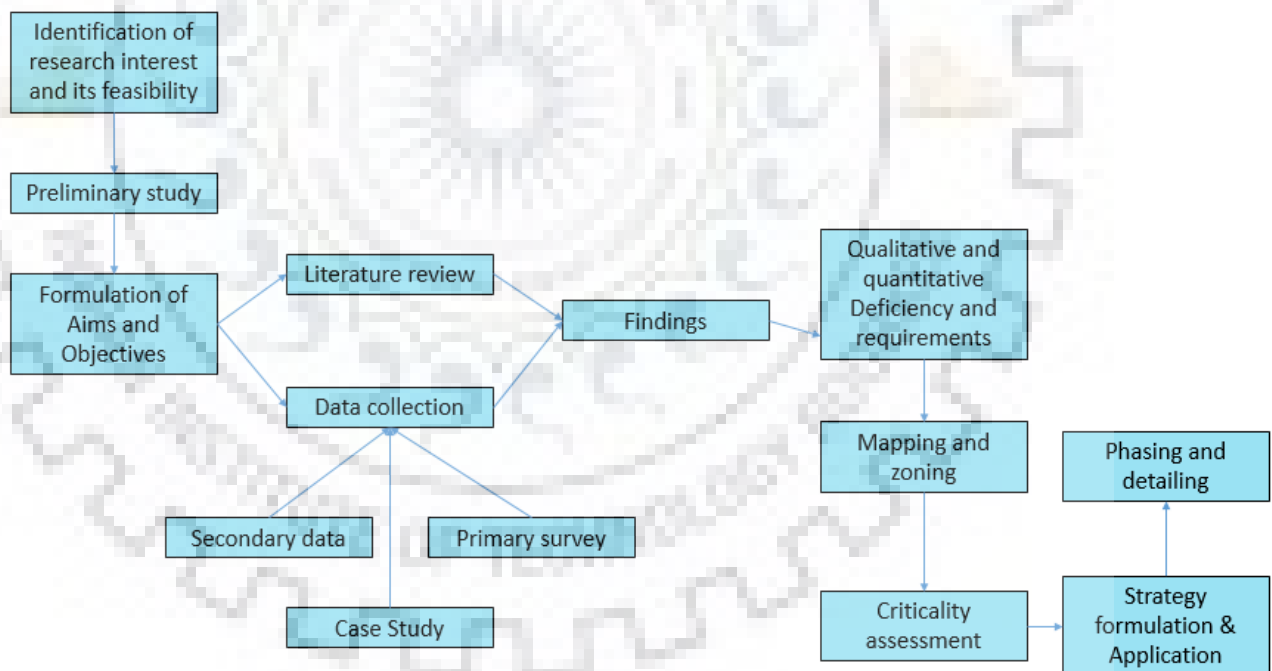
1.6 Limitations

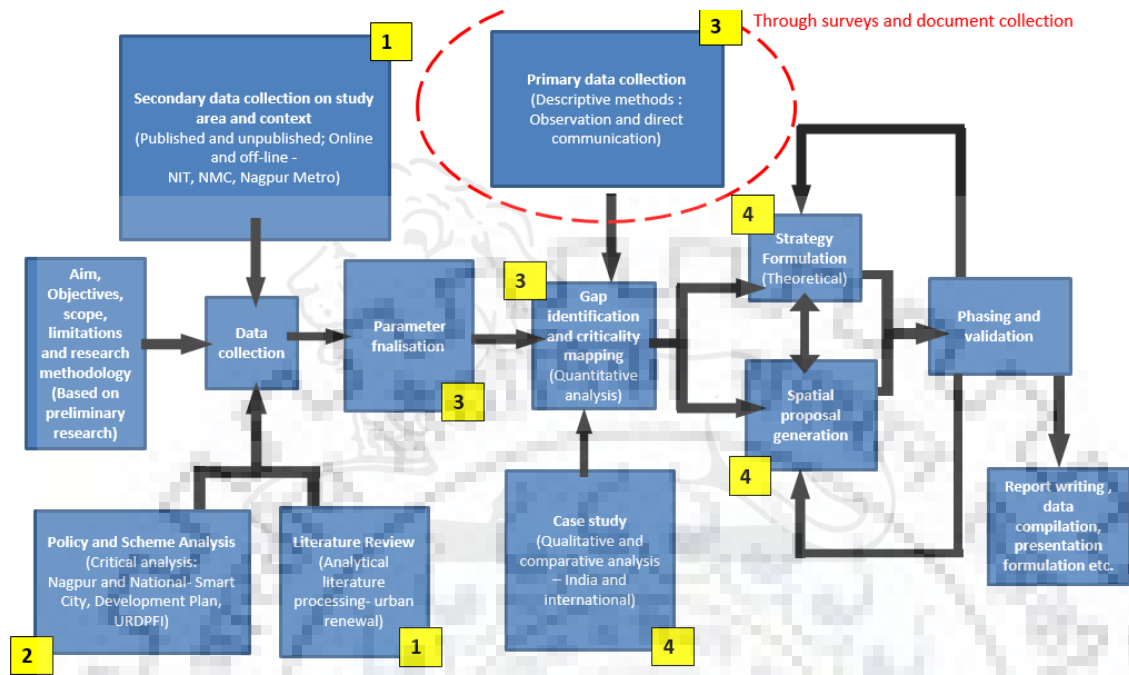
The limitations to the study are:

1. The time and resource factor would limit the renewal area to be a part of the huge multi point core area based on best possible documentation.
2. Sampling, surveying, documentation etc. will be subjected to availability of sources and situations. The spatial mapping would be done according to maps and data available.
3. Urban renewal is complex process involving multitude of aspects. Only highly relevant would be considered in the study due to academic constraints.

1.7 Methodology

The study will follow following methodology:





1.8 Organization of the thesis

The thesis has overall 11 chapters. Summary of each chapter is as follows:

- i. Chapter 1: Introduction to the topic, aim, objectives and methodology
- ii. Chapter 2: An overview of Nagpur city of which urban renewal is being attempted
- iii. Chapter 3: The site area and its imagery for a basic understanding
- iv. Chapter 4: Literature review on topic of urban renewal, certain successful case studies and some scheme review in that regard
- v. Chapter 5: Parameter and sub-parameter listing
- vi. Chapter 6: Research design and survey patten discussion
- vii. Chapter 7: Discussion and analysis discussion
- viii. Chapter 8: Recommendation as proposal for urban renewal
- ix. Chapter 9: Conclusion
- x. Chapter 10: Annexure for various data and questionnaire

2. BACKGROUND OF NAGPUR CITY

Nagpur is one of the Fast developing India's metro city which is ranked third in the list of urban centers in the state of Maharashtra. Nagpur enjoys the privilege of being Greenest city, richest city, Health care hub and also the Tiger Capital of the country. Nagpur has always enjoyed the status of capital city that continues till date, it is the winter capital of Maharashtra state. It is completed 300 years of establishment in 2002. City is also known with the name of Orange city'. With the population of 20.5 lakhs according to year 2001, it has a density of 95 persons per hectare.

The city is home to the MIHAN comprising an international airport, a multiproduct special economic zone IT Park. Nagpur is the only city after New Delhi, which is connected to all the states through the railways; it is the focal point or point of convergence of different routes. The city also has good road connectivity with the neighboring states.



Figure 1 Overview of Nagpur city

Nagpur is famous for the Nagpur Orange and is known as the "Orange City" for being a major trade center of oranges cultivated in the region. Nagpur lies precisely at the center of the country with the Zero Mile Marker indicating the geographical center of India.

2.1 Geographical setting

The geographical setting of Nagpur is as follows:

Centre

Geographically, Nagpur city lies at the origin (vertex) of the „V“ shaped Nag River Basin with its vertex at the edge of the Deccan trap plateau and arms spread eastward in the alluvial plain up to the mighty Wainganga River. There is a well-demarcated drainage with a continuous slope from east to west in the central areas of the city. This demarcation is prominently visible in the city, especially at its western edge. Also Nag River and its main tributary and the Pili River originate within Nagpur and are considered to be main rivers in this basin.

West

The areas to the west are interspersed with low elevation and are located into the valleys covered with black cotton soil, mixed with stones. An important bio-geographic system close to the city is the extensive grassland of the Deccan Plateau, extending from Rajasthan to Andhra Pradesh.

Although, Nagpur city and the surrounding region are slightly away from the „arid zone“, the character of the areas in the west of the city can best be described as scrubland and grassland. The major tanks are located at the western edge of the city, on a rim of elevated hills from which two rivers appear to rise and flow eastward.

South

Southward, the area is similar to the west. To the southeast, east, and the northeast the surface is, for the most part, a plain covered with alluvial deposit of the Kanhan and its tributaries.

East

The corridor in which Nagpur city lies roughly coincides with the Satpura and Vindhya ranges and connects the Western Ghats and Aravali Range. The city stands on the eastern edge of the undulating trap, which includes Sitabuldi Fort one of the historical structures in the city. The eastward slope extends right up to the mighty Wainganga, which is about 80 km away. In the city, especially along the rivers, large amount of greenery and open space exist, which can be used for further eco-development.

2.2 Administrative Boundary

Nagpur is a main urban center in the Vidarbha region. Nagpur is the managerial capital of the district and the major urban center in the constituency in terms of inhabitants and capacity. The city is a part of the Nagpur division. The Nagpur Municipal Corporation (NMC) is the only corporation in the district with a jurisdictional area of about 225.08 sq. km and is divided into 136 administrative wards.

NMC and NIT are the dual foremost consultants and are liable for provision of services. NMC is the chief authority and responsible for carrying out all the mandatory roles as per the relevant act (Maharashtra Municipal Corporation Act, 2012). NIT was the development authority for Nagpur city till the year 2000. As on date, NIT is a distinct development authority for the Nagpur Metropolitan Region and is also responsible for provision of infrastructure and certain services in the outside of the NMC jurisdiction.

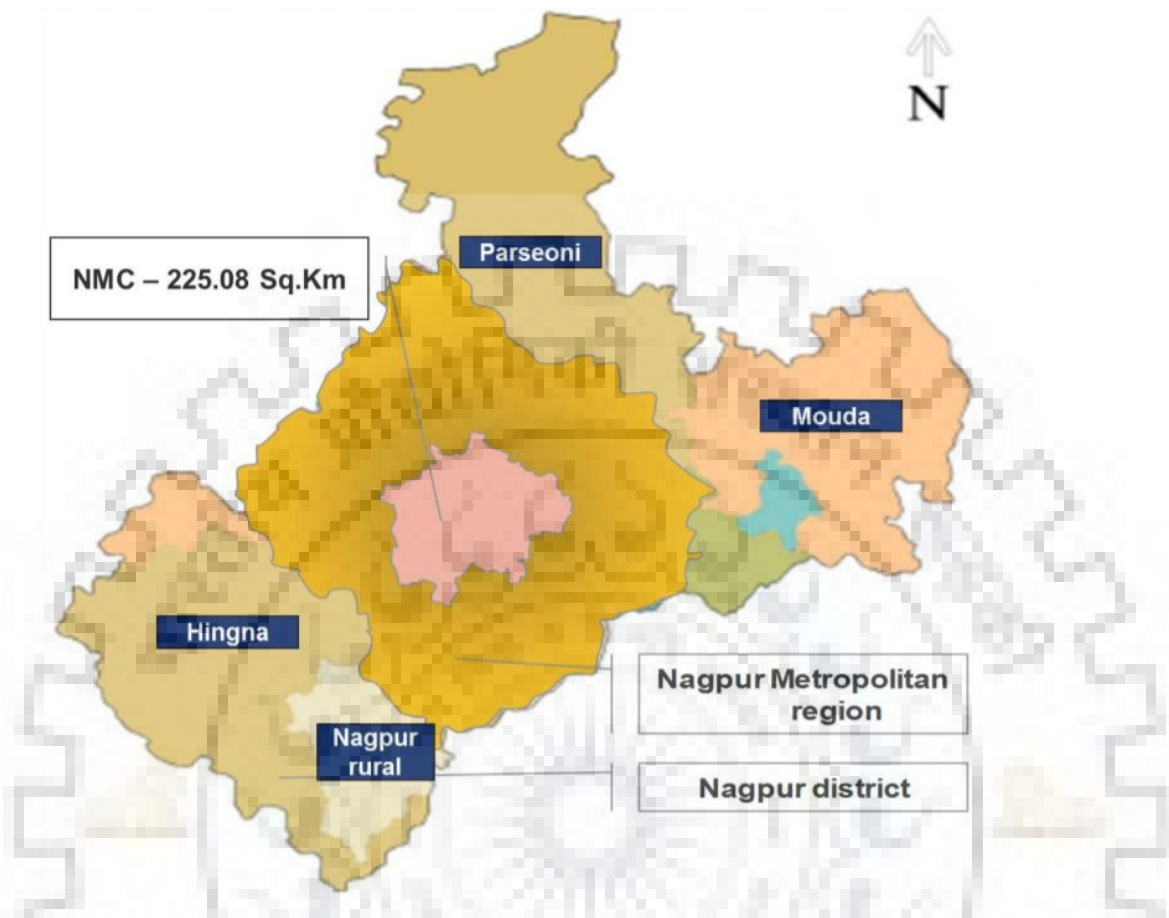


Figure 2 Administrative boundary (source: final cdp report 2015)

2.3 Location and connectivity

Nagpur is situated in the eastern part of Maharashtra. The city is located between 78°30" to 79°30"E and 20°30" to 21°45"N latitude. Nagpur is situated at an altitude 310.5 m above mean sea level.

2.3.1 Road connectivity

Nagpur city is well interconnected with all major towns by the motorway linkage. All major arteries and railways pass through Nagpur. Due to the good connectivity, the city has become a major trade and transportation centre in the region.

The following national highways (NH) and state highways (SH) pass through the city.

- NH 7: Connecting Varanasi-Jabalpur-Nagpur-Hyderabad-Bangalore-Kanyakumari

- NH 6: Connecting Hajira, Gujarat-Surat-Dhule-Amravati-Nagpur-Raipur-Sambalpur-Kolkata
- NH 69: Connecting Nagpur-Betul-Obedullaganj near Bhopal
- SH 9: Nagpur-Umred-Nagbhid-Chandrapur
- SH 248, SH 255, and SH 260



Figure 3 road connectivity (source: Nagpur maps)

2.3.2 Rail connectivity

In Nagpur, the railway service was started in the year 1867. Nagpur is an important railway junction and a transit for all the trains that connect the four major metropolitan area Mumbai, Delhi, Chennai, and Kolkata. Within the city, there are minor railway stations located at Ajni, Itwari, Kalamna, Kamptee, and Khapri. As on currently, about 160 trains from several terminuses pass through the city. Additionally, 65 trains pass through the city on a regular basis; about 26 trains start or end at Nagpur. Annually, Nagpur railway station caters to about 1.6 lakh travelers.



Figure 4 Nagpur railway junction

2.3.3 Air connectivity

Nagpur has an airport situated in the MIHAN zone, and the domestic airlines connect with major cities such as Mumbai, Delhi, Ahmedabad, Pune, Bengaluru, Hyderabad, Indore, and Kolkata. Nagpur is also connected to international destinations such as Bangkok, Singapore, Doha, Dubai, and Sharjah.



Figure 5 Nagpur international airport

Thus, distance and connectivity with all the important Indian cities gives Nagpur an inherent advantage. It can be seen as a transport hub, connecting the Indian cities to each

other and international destinations as well. Various IT and ITES companies are also viewing this characteristic as a strong positive factor. The city provides access to its own skilled manpower and also to that of entire region.

2.4 Climate

The climate of Nagpur city is categorized by hot summers and is sited in the arid zone. Also, typical cyclic weather pattern is observed in Nagpur with good rainfall in the rainy season, cold, and dryness with hot summer. The cold season is from December to February and is followed by the hot season from March to May. The southwest monsoon season is from June to September, while the period October-November constitutes the post-monsoon season.

Temperature and humidity

Nagpur is categorized as a city with tropical wet and dry climatic conditions. Summers are hot and winters are cold. The average rainfall in a day is about 92 mm. Nagpur gets rainfall during the period of June to September due to the southwest monsoon. The city experiences extreme hot summers (March to May) with temperatures rising up to 48°C. Extreme summers are experienced during the month of May, and those days are locally referred to as „Nava Tappa“. During November to February, the temperature drops as low as 10°C to 12°C. The least temperature is recorded during winters in the month of December, around 4°C. (CDP, march2015)

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	20.7	23.4	28.1	32.5	35.3	31.5	27.6	27.1	27.6	26.2	22.7	20.1
Min. Temperature (°C)	13.1	15.4	19.7	24.4	27.9	26.1	24	23.8	23.3	20.1	15.6	12.5
Max. Temperature (°C)	28.4	31.5	36.5	40.6	42.7	37	31.3	30.5	31.9	32.3	29.8	27.7
Avg. Temperature (°F)	69.3	74.1	82.6	90.5	95.5	88.7	81.7	80.8	81.7	79.2	72.9	68.2
Min. Temperature (°F)	55.6	59.7	67.5	75.9	82.2	79.0	75.2	74.8	73.9	68.2	60.1	54.5
Max. Temperature (°F)	83.1	88.7	97.7	105.1	108.9	98.6	88.3	86.9	89.4	90.1	85.6	81.9
Precipitation / Rainfall (mm)	12	10	19	15	16	163	317	271	195	50	7	17

Figure 6 Climate data for Nagpur (Source: Meteorological department)

Rainfall

In Nagpur, the average annual rainfall is 1161.54 mm. The southwest rainy season usually touches the city in the second week of June. Nearly 90% of the entire rainfall happens during June to September period. The maximum rainfall is reported in the month of July. The difference in the annual rainfall after year to year is not much.

Wind direction

Winds are generally light to moderate throughout the year, some increase in wind speed is observed during the later months of summer season and the monsoon months. Winds during the monsoon season are from the southwest direction. In January, winds from directions between northwest and northeast are common in the morning hours and changes directions to northeast to southeast during the afternoon hours. While the winds in the morning hours during February and March months are similar to that in January; however, the afternoon winds become variable. In the rest of the summer season, the winds are mostly from southwest to northwest. (CDP, 2015)

2.5 Evolution of City

Nagpur has a long history with advents of different rulers. A basic understanding is given below:

2.5.1 Gond Period

Nagpur attained the status of a capital city for the first time in 1692, when Gond Raja Buland shifted his capital from Deogad to Nagpur. At that time there were 12 hamlets in Nagpur and hence Nagpur then was called "Rajapur Barsha".

The Gond King Bakht Buland went to Delhi and came back with the determination of developing his territory after appreciating the advantages of the civilization which he saw in Delhi. He invited artisans to settle in the plain country and founded the city of Nagpur.

The Gond Raja built a fort and a wall around the settlement in 1708 A.D. for the protection and the security of the settlement. This was the important feature which influenced the physical structure in Gond period and continued to influence it even in the subsequent period also. It was a rectangular mud wall about 3 miles long, 12 feet broad and 12 to 15 feet high and enclosed about 850 acres of leveled ground. The enclosed settlement opened up to the surrounding neighborhoods and open countryside through six main entrances. The two entrances - Budhwar and Ajitwar Darwaja were to establish contact with 15 century Jagnath Budhawari temple and trade route Great Northern Highway. The Bhandar Darwaja in the Northwest was an opening to keep contact with the fertile rice producing plains of Mahanadi River (Chattisgarh). The Umred Darwaja provided the contact with flourishing lower Wyneganga Valley (Umrer and Chanda). The Bhutis Darwaja in the south-east was not only the outlet to the Nag stream but also a passage connecting the trade route the southern highway at Ajni village. The three small gates in the southern wall were opening to the fields on the banks of southerly flowing Nag. The contact with the western suburb was through Jumma Darwaja which linked the walled town with the 16 century Jamma Talao and fields on the banks and the Sitabuldi military camp.

To ensure free traffic flow in all directions within the wall these entrances were connected with one another by somewhat straight streets which bore the norms after these entrances e.g. the streets in the north were the Bhandar & Agitwar, the Budhwar to the northwest and the Umred to the east, the Bhutia to the southwest and the damma to the west. The convergence of these streets at the focal point about 50 yards ways in front of the Gond Mund Fort created an open air market the "gochipaga" and a temple to meet the economic.

Recreational and religious need of the inhabitants. Their central location resulted in the linear expansion of the settlements on the Budhwar Ajitwar and Jamma streets which were the main thoroughfares of the settlements

Agriculture was the main occupation. So the need to protect livestock and fields was essential. So the fields found space around the settlement due to availability of ample space and irrigation facilities by walls. It is obvious that the growth was spontaneous as there was no segregation between the residence, business and industrial zones. The workers lived where they worked. The spatial arrangement of dwelling units adjusted itself to the site and configurations. The dwelling units were formed according to the needs and comforts of dwellers. The built form consisted of small, low, grass thatched, mud plastered bamboo huts. Grouping of dwelling units was spontaneous as compactness was necessary to offer effective resistance during invasion and also to be as near as possible to carry on normal work and to share amenities like bazar, place of workshop etc. The plan was irregular one leaving space only for lines and alleys.

The street pattern consisted of two types of streets. One type was the major streets which originated from the various entrance. These were broad and straight and converged in front of the Killa at Gochipaga. The other type of streets was the narrow, winding streets which were several in number. These were formed by the left out spaces in the compact unit mass. Need for vehicles on these narrow roads was absent. Soon the lanes were pedestrian and followed the least line of resistance. The major street adjusted to the relief and ensure free movement to those who assembled weekly for transacting business. Later on they became the arterial routes of trade and commerce of the city

To sum up during Gond rule town wall for security was the important factor. The physical structure of the town was dominated by the town wall, the Gond Rajas Killa as the focus and the various roads connecting the entrances in the wall. Through the entrances contact was kept with the surrounding region. All the roads convergence in front of the Gond Rajas Killa thus creating the visual impact of the dominance of the King. The settlement was pro-urban in nature. Workplace and residence was complimentary in nature.

On the death of Chand Sultan invoked the aid of Raghuji Bhonsle, who was governing

Berar on behalf of Peshwa Raghujji replaced the two sons of Sultan on the throne and retired to Berar with a suitable reward. Dissension however, broke out between two brothers and in 1743 A.D. Raghujji again intervened at the request of elder brother & ousted his rivals. But this time he did not go to Berar but kept the country in his grasp. Gond Raja was practically a state prisoner. Raghujji Bhonsle expanded his territory by conquering Chanda & Chattisgarh between 1745 & 1755 the year of his death.

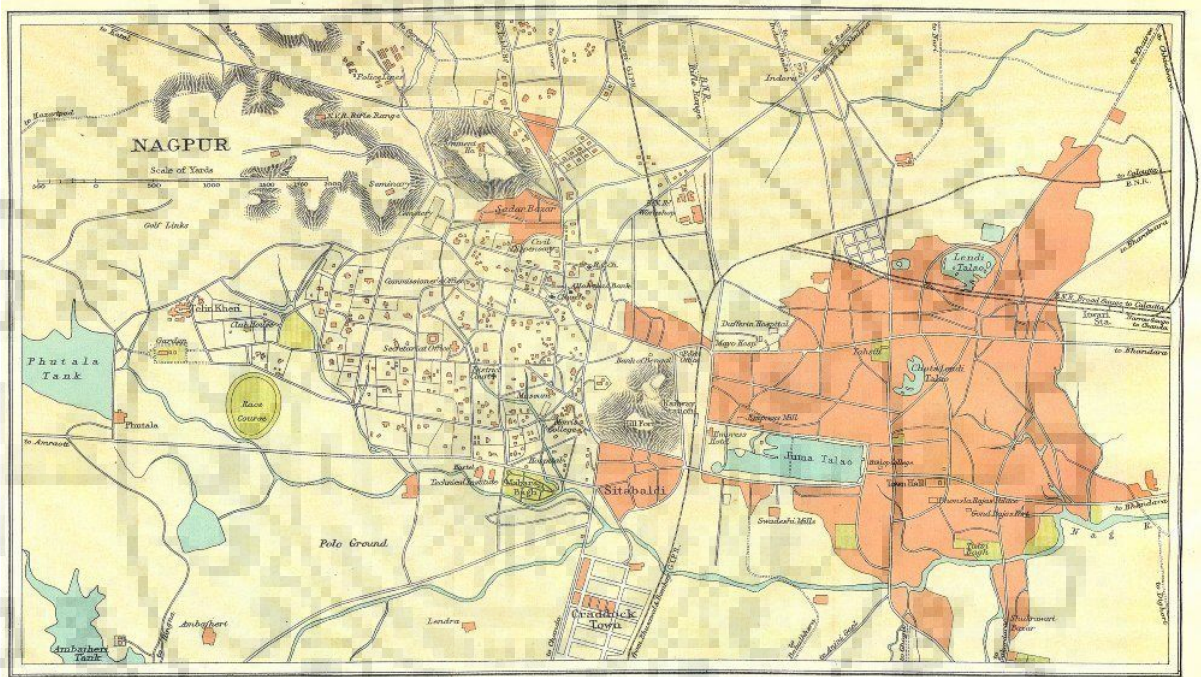


Figure 7 Old map of Nagpur city (Year 1906)

2.5.2 Bhonsale Period

The Bhonsale period 1746-1816 A.D, is considered as Golden Age in the history of Nagpur. The city achieved its urban character during this period. The city evolved and grew despite the fact that its growth received a setback thrice.

- 1) Due to sudden death of Chand Sultan in 1739 A.D. and Raghujji Bhosale the great in 1755 A.D. who were the architects to Nagpur.
- 2) The complete devastation of the city by the combined forces of Nizam and Peshwa in 1768 and

3) The treaty of 1804 and its partial destruction by the Pendharis in 1811.

Social stratification has greatly influenced the physical structure. The Bhonsale were originally from Satara.. So the first influx of immigrants was of royal families and the Maratha Sardars who came with Raghuji. The centralization of the administration of the Bhonsale Royal Palace in 1788 AD. Several royal mansions called Wadas were also erected. The needs of the royal families demanded large spaces and compare grouping eg, royal gardens, temples, burial grounds, stables etc. So the central part of the walled city and the adjacent land on the west and south-west outside the wall on the western side was reserved for them.

The second influx brought two types of immigrants

- i. Rigvedi Brahmins, who were orthodox and rigid in following traditions.
- ii. Maratha Sardars and Ministers.

These were statesmen, state bankers, wealthy businessmen, warriors and officers. Since they were the administrators of the Bhonsale court imposed by the Peshwas on the Bhonsales, they were given palace inside the wall near the palace of the King. The locality was named Fadnavis Pura, Chitnavispura, etc. after the state Accountant, Munimji. Raghuji-I was mainly responsible for promoting weaving industry in Nagpur. The third influx of the immigrants constituted Kostis' (weavers) and the Kunbis (agriculturists) who came from the drier parts of wert Berar and Khandesh and created areas like Kostiura etc. They occupied the area between the northern wall and the Great Eastern Road. In the same way. Telipura, Nagpur, Bhaldarpura etc. developed.

Thus, the muhallas were named after the particular caste. There were some Muslim sardars in the Raghuji's court and Muslim soldiers in his army. They were given the area on the West called as Mominpura.

The Bhonsale established their army camps at Indora, Sitabuldi and Sakkardara. The recreational need created several suburban royal gardens Nazarbagg, Lashkaribagg. Motibagg on the northwest, Sakkardara on the southwest similarly Kelibagg, Tulsibagg and Rukminibagg cropped up within the town wall, several 'akharas' and 40 fruit orchards came along the

Ayachil and Nag streams and on the banks of the Jumma Talao.

The period 1818 to 1853 is considered as Dark Age in the history of Nagpur when all the economic, social and cultural activities were suspended. But inspite of the political and economic setback the topographic growth of the city found favourable environment. The boundary was no more the town wall but it has reached the suburbs of lansapuri. Bhankheda and Binakhi on the north Sakkardara on the southwest, Dhantoli on southwest, Sitabuildi on west. Till 1816 A.D. the expansion was confined to the north of the Nag stream and east of the Jumma tank. It avoided western side owing to the unfavourable geographical conditions such as dominance of swamps and marshes, but after the establishment of British Residency in 1804 the city grew to the west of Jamma tank upto the sitabuldi hills.

In Bhonsale period. The town goes in and around the existing pre-urban settlement the wall was in existence till the battle of Sitabuildi in 1817. The presence of wall resulted in the compact built from. The city was congested, compact and regular. Gradually the city grew outside the wall also but the city retained its originality inspite of complete destruction by the Peshwas and Nizam and partial destruction by the Pendhan in 1811. Change in building material le stone, burn brick and tiles made the vertical expansion possible. This changed the Storm of the city.

The street patterns consisted of three types

- a) National highways which became more prominent because of the promotion of wade and commerce.
- b) Arterial routes or main roads which were more or less straight and broad.
- c) Narrow winding lanes serving the neighborhoods

Thus the city became politically important when it was made the capital of Bhonsale Kingdom. Many people migrated to Nagpur. The first influx was of the people who came with the Bhonsales and the second influx consisted of those who got royal patronage. Traders and artisans clustered under the royal patronage and formed their own neighborhood. Thus social stratification has influenced the physical structure of the city

2.5.3 British Period

According to the treaty of 1804, a resident was appointed in the court of Bhonsales. The establishment of residency led to the foundation of another nucleus for the creation of the Civil Lines, exclusively for the use Europeans who were in the army. Various military establishments like the arsenal magazine, barracks to embraced the entire suburb of Sitabuldi. The residential needs of military natives servants, grooms, tailors etc. created localities like Tailor line, Khalasi line, Tent line, etc. which occupied another suburb, the northwest of the Sitabuldi hills. To meet the needs of these people a bazaar was created on the southern lace of Sitabuldi hills i.e. Temple Bazar.

In 1864, municipality was established. Municipality carried out some improvement in the city area. After plague of the 1899 AD new schemes were taken up to reduce the congestion in the city area and new colonies were established. Thus planned growth of the town started in the British period Railway came in 1867 providing connection to Bombay. The early decade of the 20 century revived trade and commerce, business and industries owing to the opening of a series of railway lines,

- a) Nagpur-Bombay Link – 1807 the Great Indian Peninsular Railway
- b) The Bengal Nagpur Railway 1883
- c) The Chhindwara Line 1908
- d) Delhi-Nagpur-Madras Link 1923

The railway line divided the city in two parts. On one side the old city and on the other side the British establishments. The difference even continues today.

With the coming of British a new trend was set up in the evolution of the city. After Nagpur became the capital of Governor's Province in 1921, the centralization and concentration of various activities relating to administration civil and military of the entire province introduced zoning for the first time Different zones were established for different activities. An administrative zone was set up with a view of central location and proximity to the Residency and Military headquarters (Sitabuldi Fort) and commanding position carry to control the old Bhonsale city about a mile and half away to the east. A residential area.

Civil Lines was created for the European administrators. These residential areas are totally on contrast to the old areas of city. The compact built form of the traditional area is contrasted by the vastness of open space in these areas. This was a diversion point in the history of town building. Till now, the growth of the city was governed by natural factors

Human efforts were conditioned by the site conditions etc. But now modifications were made in the site by leveling of surface, filling up depressions, etc. Marshes and swamp in the vicinity of Sitabuldi hills especially to the southwest and northeast and on the banks of Jammu Talao were allowed to drain by a set of Nallus. Thus an attempt was made to bridge the gap between the bold city and new areas and to give continuity to built up area. Distinction was made between the white and natives. Gora Bazar (present Sadar Bazar) to serve the military the Takli suburb, was established on the southern fear of the Takli hill. Recreational institutes and sports fields for Europeans covered large areas of land of the south-western and northern outstation. Cricket Association Ground Football Field, Palo Ground, Gold Ring, three clubs-C.P. Club, Gondwana Club, Maharaj Bagh Club were conspicuous.

Thus it can be said that the city development took a new direction in the British period which was continued even after Independence. The important factor affecting the physical structure was alien culture. For the first time zoning of different uses was done. Man made efforts were made to overcome natural barriers by leveling the surface, draining out marshes, swamps, etc. The trend which was set up the British was never reverted even after Independence.

To conclude with the following factors and events have influenced the physical structure of the city during different periods:

Gond King, Buland Bakhta shifted the capital to Nagpur in 1702

Construction of fort and town wall in 1708.

In this period, the physical structure of the town was determined by the town wall and the various roads connecting the entries in the wall with Gond Raja Killa as focus

City got political importance when it was made the capital of Bhonsale kingdom in 1748.

The evolution of the city area as it exists today took place in this period only. The presence of the wall resulted in the compact urban development. But the city grew outside the wall also. Social stratification influenced the physical pattern of the city to a great extent in the Bhonsale period. With the coming British new nucleus for development was established and a new trend was set up in the physical development of the city with the introduction of zoning for different land uses. Topography as a factor determining physical structure lost its relevance as man-made efforts were made to overcome the drawbacks of the site.

Post-Independence Period - After Independence, Nagpur has grown very fast. Industrial development took place. Migration of people from nearby areas increases due to which Nagpur spreads along all the 4 directions. Recently due to the Butibori-MIDC, Nagpur is spreading towards Wardha Road. Change in land use pattern of Nagpur shows how it is growing.

2.6 Demography

Nagpur city is the third largest urban agglomeration in the state of Maharashtra in terms of population. As per Census 2011, Nagpur accounted for 6% of the total urban population of the state and 76% of the district urban population of Nagpur district. In addition, 52% of the total district population resides within NMC. In the past, Nagpur attracted the migration and floating population from the neighboring districts of Maharashtra for education, employment, and business. However, the trend has decreased over the last decade. (CDP, 2015)

Indicator	Population (2011) (In Lakhs)			% of Urban Population w.r.t. Total Population	NMC comparison – Urban Population- %	NMC comparison – Total Population- %
	Total	Rural	Urban			
Maharashtra	1124	616	508	45%	6%	2%
Nagpur District	47	15	32	68%	76%	52%
NMC	24.48	0.0	24	100%	100%	100%

Figure 8 population trends at various tiers. (Source: census 2011 and CRIS analysis)

Population density

City is spread over an area of 225.08 sq. km with a population of 24.48 lakhs; the

population density is 10,873 persons/sq. km, which is high when compared to the density of 9,400 persons/sq km in 2001. Same trend of increase in the population density during last decade (2001-11) can be seen for district and state too. Nagpur district's population density increased from 411 persons/sq km in 2001 to 470 persons/sq. km in 2011. Similarly, state population density increased from 315 persons/sq. km to 365 persons/sq. km in 2011.

Parameter/Year	Population Density (Persons/sq km)		
	NMC	Nagpur District	Maharashtra
2001	9,457	411	315
2011	10,873	470	365

Figure 9 comparison of population density (source: census 2011, NMC and CRIS analysis)

Literacy rate

As per Census 2011, the literacy rate stands at 92% of the total population; male literates are about 90%, whereas female literacy is about 78% of the female population. It is observed that literacy rate has increased from 2001 to 2011; it is attributed to the increase in the enrolment of students in the schools. The same scenario has continued at the district and state levels, where the literacy rates improved by 5% and 7%.

Parameter/Year	Literacy rate (Population with person of age 7 and above) in %		
	NMC	Nagpur District	Maharashtra
Total Population			
2001	84%	84%	77%
2011	92%	88%	82%
Male Population			
2001	90%	90%	86%
2011	94%	92%	88%
Female Population			
2001	78%	77%	67%
2011	89%	85%	76%

Figure 10 Comparison of literacy rate (source: census 2011, CDP2015)

Sex ratio

As per Census 2011, the sex ratio in Nagpur is 963 females per 1000 males, whereas at the district and state level, the ratio is about 932 and 922 respectively. The sex ratio has improved at all the three levels, i.e., Nagpur city, district, and state levels, at the district

level; the sex ratio has improved from 932 during 2001 to 951 during 2011.

Parameter/Year	Sex ratio		
	NMC	Nagpur District	Maharashtra
2001	936	932	922
2011	963	951	929

Figure 11 sex ratio (census 2011 and CDP-2015)

2.7 Other characteristics

India has a very young population with a median age of 24 years. About 65% of the total population is less than 35 years old. Nagpur is also reflective of this demographic characteristic with the median age being closer to the national level: 66% of the total population is under age of 35 years. The 10-25 year age group forms the largest proportion of the total population. This offers a valuable resource for economic development of the city. But, at the same time, I not given optimum opportunities, the tendency to migrate will probably be the highest within this age bracket.

The sex ratio in Nagpur is quite healthy at 936, which nearly equals the all India figure of 933. The figure is even healthier for the slum population of Nagpur at 948. The figures are significantly better than those obtaining in many other Indian cities like Bangalore and Ahmedabad

2.8 Economic base of Nagpur city

About 30 percent of the city's population is working as per Census of India 2001. About 85 percent of the working population is male. Trade, hotels and restaurants is the largest industry group in the city. About 36.3 percent of the working population is engaged in this industry group. Transportation sector employs 17.6 percent of the total working population. Nagpur's location on the confluence of various transportation routes has probably contributed to the large share of employment generation in the trade and transportation sector. Manufacturing also has a significant presence in Nagpur with 15.4 percent of the working population involved in this sector.

Nagpur has presence of industries located in the periphery of the city and in region, which

are contributing to city's economy and supports the local economic development. Apart from the industries, there is trade and commerce in the city that comprises of retail and wholesale trade both contributing to the city's economy. (CDP, 2015)

Some of the industries present in Nagpur are:

- Chemicals
- Cements
- Coal based
- Engineering
- Electrical
- Electronics
- Food Processing
- Paper products
- Wood based
- Pharmaceuticals

Secondary sector

There 8 industrial estates of Nagpur, which make the foundation of the economy for the city. These estates are spread over an area of 3,887 ha, with majority of the area located at the Butibori industrial estate. 100% of the land is developed against the earmarked land for MIDCs and it is occupied by 2195 working industrial units.(CDP,2015)

Tertiary sector

Along with formal economic activities there are markets (both formal and informal), which are part of the Nagpur's economic profile and provide employment to many people. There are various types of markets like retail and wholesale and further it can be classified based on the goods that are sold in these markets. Some markets are held on daily basis, and some markets are held on specific days only. These markets are regularized by NMC and is

maintained by the Market department with a dedicated team.(CDP,2015)



3. CASE STUDY AREA

The city center densities has declined during the last few decades hinting that people are moving out from central areas to peripheral ones (Kotharkar, 2014).

Sitabuldi is one such part of core area which is the CBD in the centre of the city with a density of about 400 pph and is a high mix of residential, commercial and industrial area.

Congestion, inefficient land-use, improper transportation management, slum and squatter formation, etc. are some of the points of concern in this area.

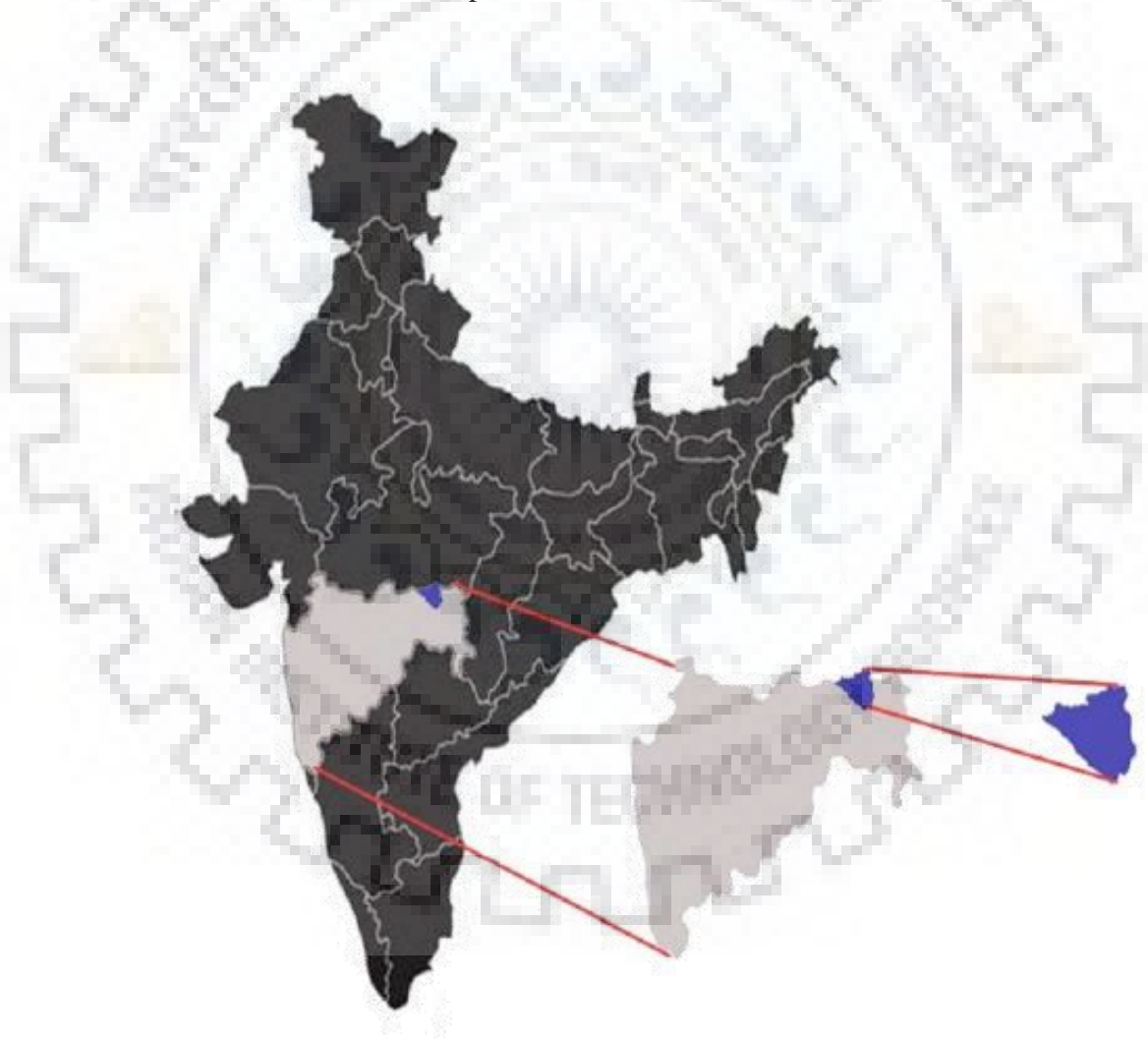


Figure 12 Map Showing Location of Nagpur (Source: Maps of India)

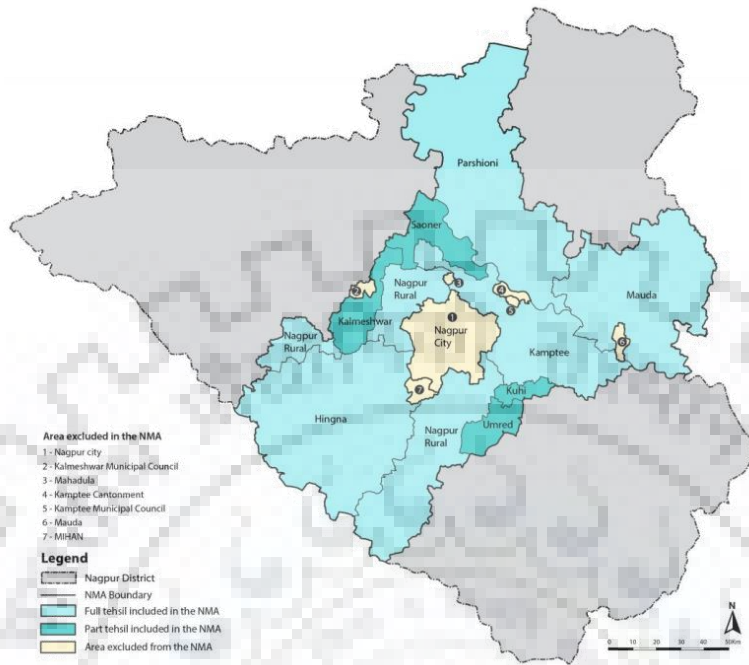


Figure 13 Area Excluded in the NMA (Source: NIT)

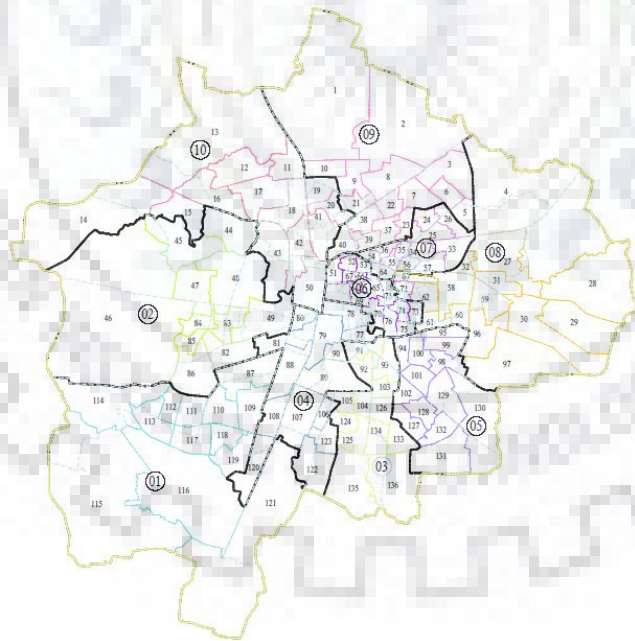


Figure 14 Nagpur Ward Map (Source: NMC)

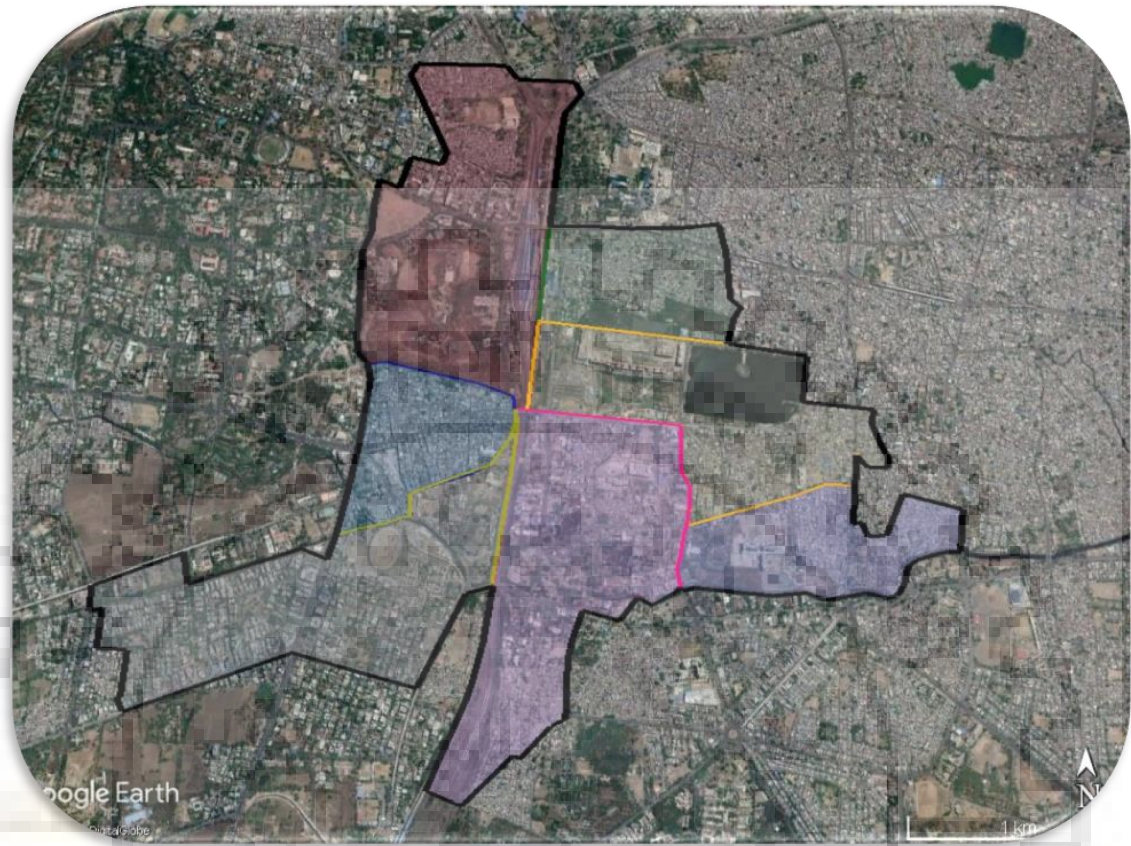
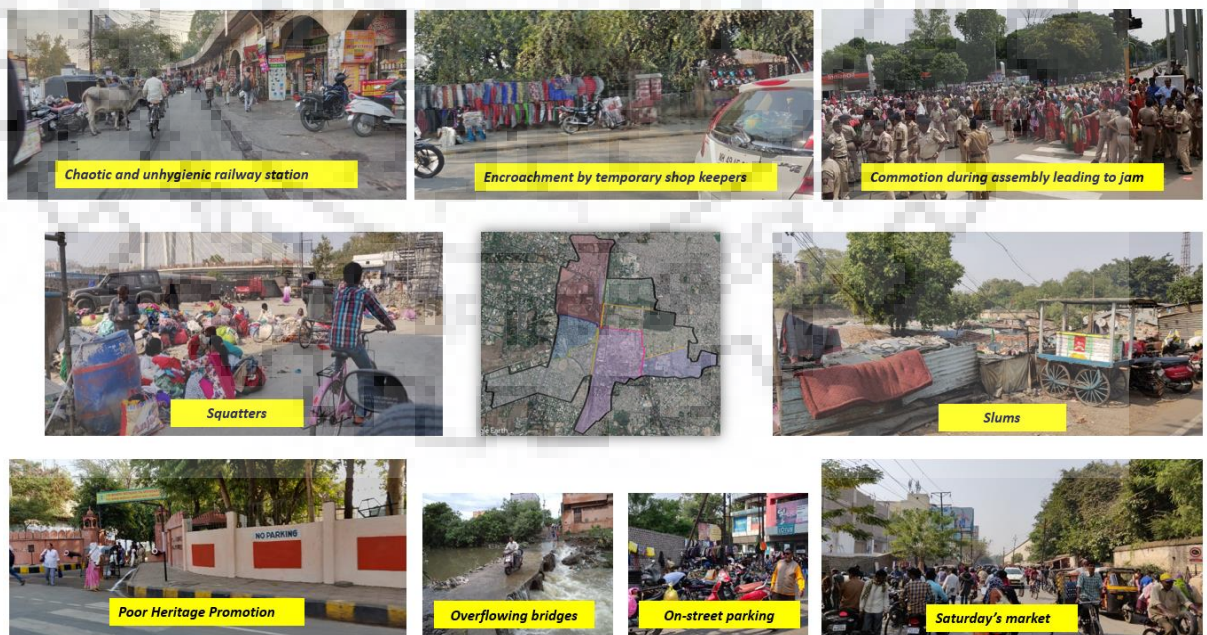


Figure 15 Map of Nagpur in India and study area in it (Source: Google map imagery)



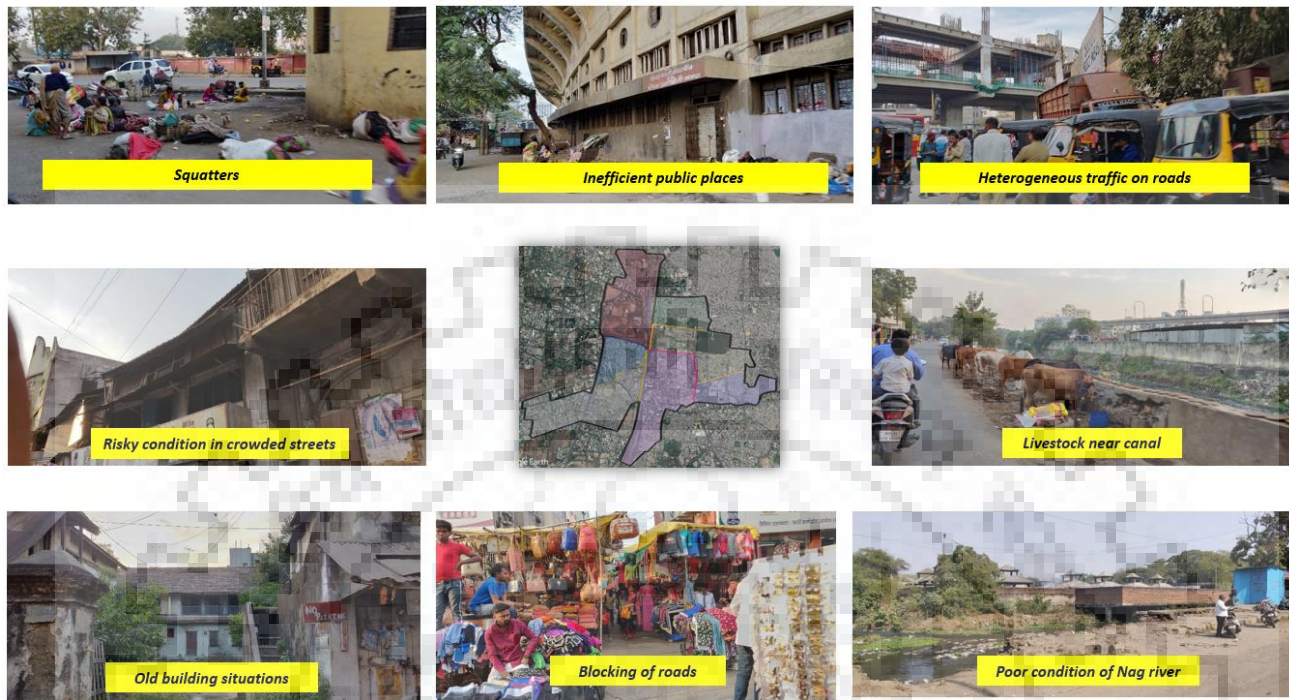


Figure 16 Live site images of study area

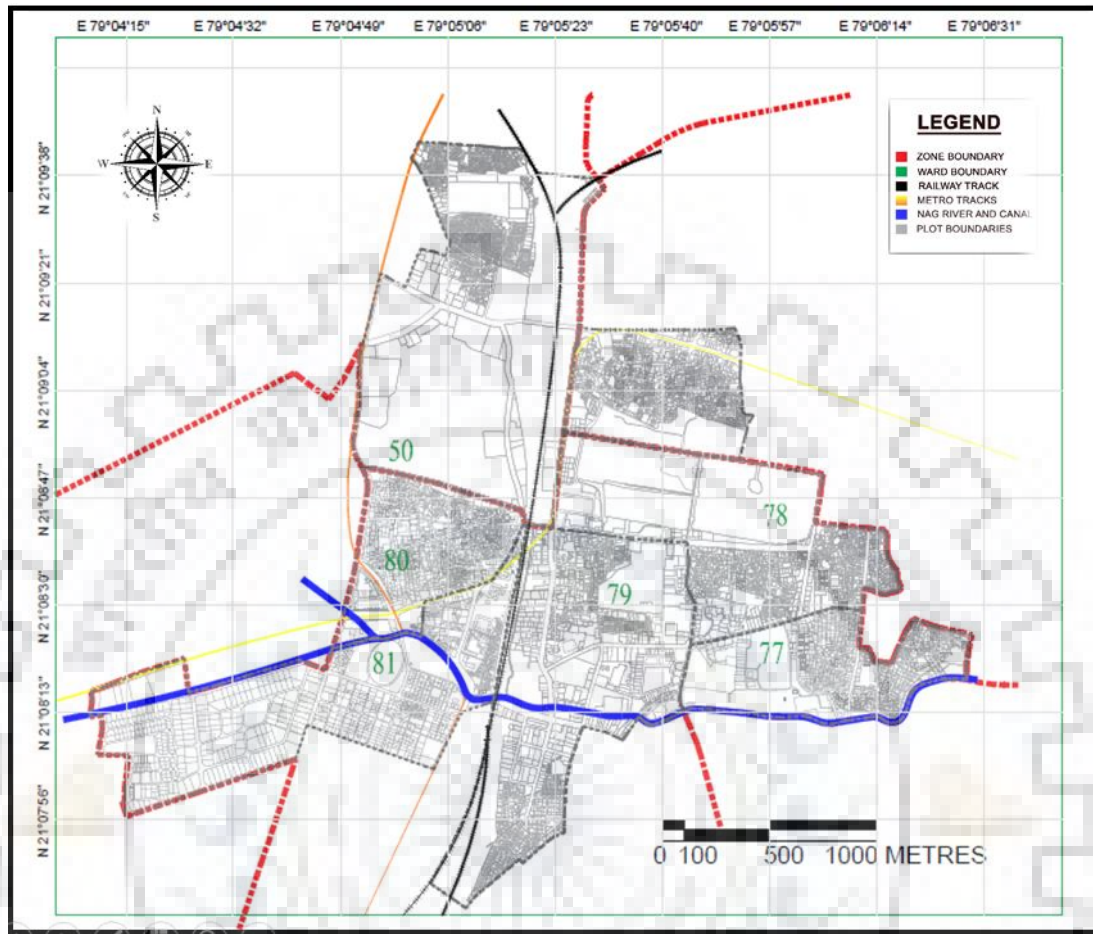


Figure 17 Base map of study area

Neighbourhoods	Population Density	Population Density Including Floating Population	Age of Neighbourhood (Years)	Spatial Distribution	Mix Characteristics
Buldi—CBD and centrally located	230.29	394.62	150	core area, compact, organic, medium rise high density	high mix of commercial and residential land-use
Itwari—known for wholesale market	466.46	596.56	150		
Mahal—known for heritage and retail market	323.62	442.48	150		

Figure 18 Details/ characteristics of study area



4. LITERATURE REVIEW

A literature review or narrative review is a type of review article. A literature review is a scholarly paper, which includes the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic. Following literature review helps in understanding the topic of urban renewal, similar case studies and an overview of schemes in this area.

4.1 Urban Renewal

Urban renewal is complex process with many definitions, dimensions, area of appeal, authors and implications. It is necessary to understand the basics of it so that one can deal with the application with right methodology and consequences. A review based on research paper, publications and books is done below.

4.1.1 The process

The literature review is a 5 step process which is done as follows:

1. About 40 research papers from national and international journals, conferences and books are studied in detail with search keywords being
 - Urban renewal;
 - core city area;
 - urban renewal policies
 - Urban renewal in India
2. Variation of Urban renewal in different spatial and temporal context is studied
3. The basic parameters of urban renewal are identified and its indicators are listed that would form the basis of further studies.
4. The parameters and indicators are compared with Schemes on urban renewal applicable in Nagpur city

5. To better understand the working of these indicators in live projects, case studies in Indian and international contexts are done

4.1.2 The baseline

The baseline for this literature review is:

- Urban regeneration is a comprehensive and integrated vision and action which leads to the resolution of urban problems and which seeks to bring about a lasting improvement in the economic, physical, social and environmental condition of an area (Ladd 2006).
- A political reconceptualization of the inner city as a spatial coincidence (Ward 1994). Historical urban areas are part of the history and memory of a city, and history would be discontinuous without them (Wang 2011). Many cities link the revitalization of the central business district and gentrification of residential neighborhoods to urban renewal programs based on objectives to integrate 'people, business and place' (Onkar 2008)
- The basis for the planning structure of the city must be put to a more flexible concept than rigid functional zoning as delineation of elements of planning structure can not be implemented based only on the grounds that one of the activities is predominant in the area. For high populations and land costs, Mixed-used Development offer viable approaches for urban regeneration (Grant and Perrott 2011; Tucker 1980; Witherspoon et al. 1976). Accessible development with a wide variety of uses and businesses attracts visitors and consumers as their time for searching various products and services can be saved. (Chan and Lee 2008)

4.1.3 Methods of urban renewal

According to Land (2005) various approaches of urban renewal are:

- **REDEVELOPMENT:** The demolition of an existing building and its replacement by a new building
- **CONSERVATION:** To retain intact or unchanged.
- **REHABILITATION :** The repair and improvement of existing structurally sound

property

- **RECONSTRUCTION:** Rebuilding to original state.
- **SLUM CLEARANCE:** Demolition of dilapidated dwellings located in a slum
- **HOUSING IMPROVEMENT :** Improvements of dwellings by provision of essential basic amenities
- **ENVIRONMENTAL IMPROVEMENTS :** Main emphasis is to improve environmental conditions
- **ECONOMIC RENEWAL :** Improvement of economic conditions of dwellers

According to Kong (2005) they are:

- “top-down” centrally-controlled
- “bottom-up” individual-dominant
- “bottom-up” collective-dominant

4.1.4 Reason for urban renewal

Reasons for carrying out urban renewal (Chris Couch, Urban renewal: Theory and practice, 1990):

- Urbanization has increased, urban areas are growing older and denser and thus a need of renewal is required to make urban fabric accommodating.
- Expansion of cities into agricultural hinterland even when the inner parts haven't been fully utilized.

Factors to be identified that defines requirement of urban renewal (Kühn and Liebmann, 2012) that is seen in Nagpur city:

- shrinking of the employment basis of cities as a result of deindustrialization and the closing down of industries
- The shrinking of the population due to labour -market related migration. Long-distance migration to prospering cities as a result of a lack of jobs and high unemployment.

- The shrinking of the population due to housing-market related migration. Moving to suburban locations is a result of changed housing preferences where growth of municipalities in the suburban area occurs at the expense of the core city

4.1.5 Approaches of urban renewal

There are various reasons and thereby approaches to urban renewal for different countries according to Onkar (2008) and Dhote (2013). For example in foreign context

- large-scale destructive redevelopment of urban area
- Dependency on cars led to sprawls and vacuum situations
- re-planning of towns or urban centers, to modernize them and provide solution to existing problems
- Gentrification as a solution for urban decay leads to

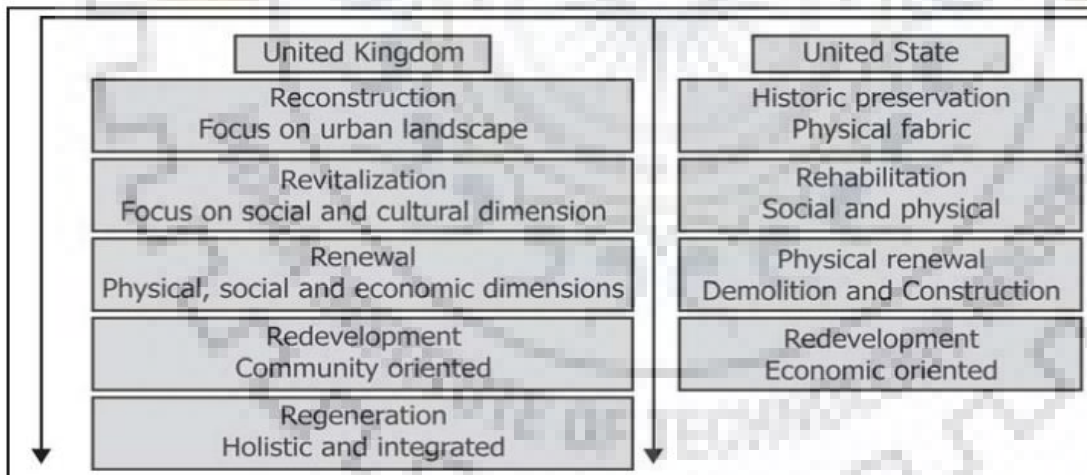


Figure 19 urban renewal in foreign countries

While in Indian context

- Different rulers impacted layered nature of cities
- Post independence Agrarian base.
- It was only in the 1990's, the era of economic liberalization and globalization it was

realized that the cities are the engines of economic growth.

- High density population and slum development leads to

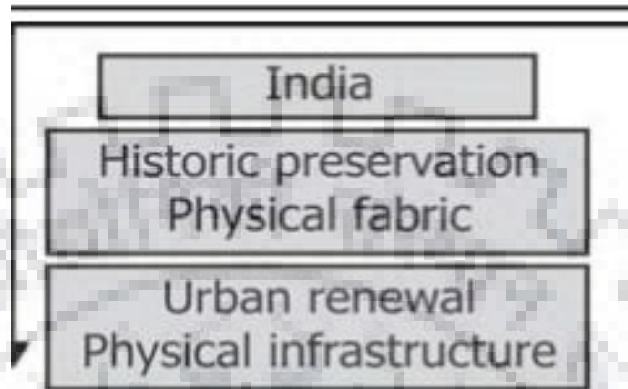


Figure 20 Urban renewal in India.

4.1.6 Evolution of urban renewal

According to Onkar (2008) urban renewal policies have evolved since the 50's. Singular approach has become integrated, government funding has become private, the outreach has changed from local to city, private money is being used instead of people's money, beauty has changed to sustainability, and community is being involved in the process.

Period	1950's	1960's	1970's	1980's	1990's	1990's to date
Policy Type	Reconstruction and extension of older areas of towns and cities often based on a Master Plan, suburban growth	Continuation with some early attempts of rehabilitation	Focus on institutional and neighborhood schemes in continuation to development of peripheries	Many major schemes of development and redevelopment projects	Move towards a more comprehensive form of policy and practice more emphasis on integrated treatments	Focus on urban living quality
Key actors and stake holders	National and local government private sector developers	Move towards a greater balance between public and private sectors	Growing role of private sector and decentralization of local government	Emphasis on private sector and special agencies, growth of partnership	Devolution of power to the local authorities, Community empowerment	Public private partnership, Governments, semi public
Spatial activity level	Local and site level	Regional level and activity emerged	Local emphasis	Site level	Strategic perspective, growth of regional activity	City and regional level
Economic focus	Public sector investment with some private sector involvement	Private investment	Economic renewal Resource constraints in public sector and growth of private investment	Private sector dominant with selective public funds	Greater balance public, private and voluntary funding	Private sector taxation
Social context	Improvement and housing and living standards	Social and welfare improvement	Community based action and greater empowerment	Community self help with very selective state support, High rise housing for displaced citizens Became centers of social ills	Emphasis on the role of community	Emergence of new social organization, community participation
Physical context	Replacement of inner areas and peripheral development Gentrification in UK	Rehabilitation of existing areas	More extensive renewal of older urban areas	Major schemes or replacement and new development	Heritage and retention	Revitalization, comprehensive renewal
Environmental approach	Landscaping and some greenery	Selective improvements	Environmental improvement with some innovation	Growth of concern for wider approach to environment	Introduction of broader idea of environmental sustainability	Environmental sustainability impact assessments.

Table 1: Policy evolution in urban renewal

4.1.7 Parameters of urban renewal

There are multiple of papers quoting various parameters involved in urban renewal. Some of the primary ones are as follows:

- **According to Onkar (2008):**
- Physical

- Social
- Economic
- Environmental
- Cultural

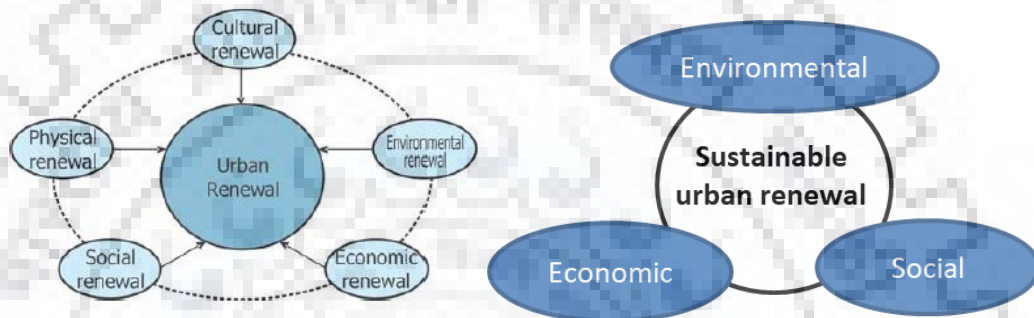


Figure 21 Dimensions of urban renewal

These dimensions further have different perspectives and objectives. However it's important to note here that the dimensions are not interlinked here and there is need to look at them in comprehensive manner

- **According to Lee and Chang (2008):**
 - **Indicators of Economic parameters**
 - Quality welfare planning and provisions
 - Conservation and preservation
 - Land strategic utilization
 - Community contributions
 - Integrated design
 - Transport arrangement
 - **Indicators of Environmental parameters**

- Quality welfare planning and provisions
- Quality living condition
- Conservation and preservation
- Provision of welfare facilities
- Integrated design
- Conservation of existing properties

➤ **Indicators of Social parameters**

- Quality welfare planning and provisions
- Conservation and preservation
- Image building
- Daily living provisions
- Development strategy
- Open space design and provisions

These are typical indicators for a general scenario for sustainable urban renewal. Depending on the context certain indicators may be added

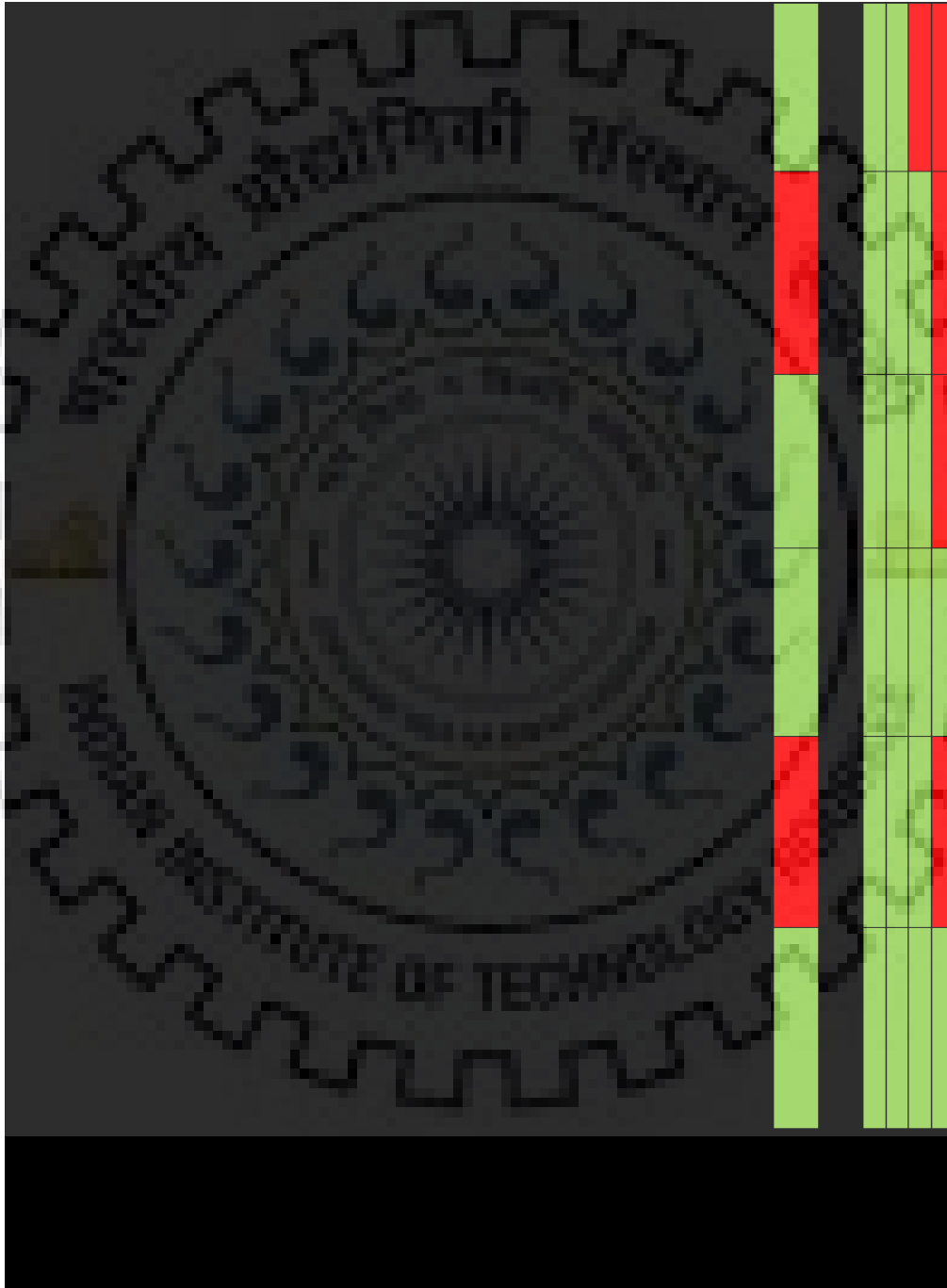
4.2 Schemes in Urban renewal

There are many urban development schemes of urban development. Some are dedicated for urban renewal while others are not. A brief overview is sought below:

Apart from this the schemes/planning proposals applicable in Nagpur city especially for the purpose of urban renewal are mentioned below.

- Swachh Bharat Abhiyan - e-toilets and solid waste management.
- Ministry of skill development – multi skill development centre under PPP.
- Town planning scheme – original land with infrastructure

- CMP – pedestrian, metro, BRTS, cycling
- Lake and river front development DPR



A recent trend change has been seen where new understanding is taken up by Indian government for urban changes are there. Two such approaches are also studied.

National Urban Policy Framework

This deals with new sutras and new functions for working. The baseline approach as understood from draft document is that NUPF is:

- Bottom's up approach
- Local and contextual solution
- Sustainable development and job creation
- Social and economic mobility

It follows 10 sutras and functions that if applied can have progressive solutions for problems of an area.

Form Based Codes Policy Framework

This follows form and people's approach and has basic direction like:

- Develop contextual planning
- Compatibility of uses
- Mixed-use compact development
- Prioritize community needs and Participative planning
- Produce functional and vital urbanism: prioritize pedestrian access, safety and foster social interaction.

4.3 Relevant Case studies

Various cases of urban renewal are going on in India and other parts of the world. Some of them are discussed below.

4.3.1 Kwun Tong Town Centre renewal project, Hong Kong

Its the largest renewal and redevelopment project in Hong Kong undertaken by Urban

renewal Authority. Obsolete design, inadequate services, deteriorating sanitation and hygiene conditions, security and safety concerns, lack of green areas, very limited communal facilities, traffic congestion, Back-lane hawker stalls and temporary structures in the area pose a lot of problems and need for renewal. Entrepreneurs and industrialists started to move their factories up north into the Mainland and Hong Kong's local industries started to diminish. Kwun Tong district has been gradually growing old and empty.



Figure 22 Map and images of Kwun Tong Town Centre renewal project, Hong Kong

The project aims in developing a mixed-use proposal comprising of residential, commercial, institutional, recreational uses along with community centres and public transport exchange. The underlying theme of the project is to meet needs of 'grass roots' local population. Since the Kwun Tong Town Centre redevelopment project affects many households and business, a careful consultation process has been adopted in its proactive, bottom-up approach (District Council, stakeholders such as those owners of properties,

professional bodies) so as to ensure that the scheme is wide accepted by the people. Traditional kaifong-style (neighbourhood) street and bazaars are proposed with investment stakeholders involved for revenue generation.



Figure 23 proposals for Kwun Tong Town Centre renewal project, Hong Kong

The participation process is as follows:

1. **Sizing Community Aspirations:** Community aspiration study through focus group meetings and interviews
2. **Developing planning parameters:** Committee formation involving Council members, resident representatives and other professionals
3. **Road Show:** Surveys, participatory community design workshop and holding a series of Roadshows

4.3.2 Revitalization of City Core, Petta Zone, Bangalore

Many cities in India have old or historic inner-city areas of considerable historic and cultural value. These city centers are not only valuable old assets but opportunities for revitalization of local economic development and national cultural identity and can become important opportunities for public and private investments with a good potential for bankable and profitable public-private partnership projects. City core of Petta is the largest informal economy of the city (1305 square kilometres), trade and commerce is its primary activity. It is a mix of uses, the live-work culture and the unique special concentration of activities that lend to the self-sustaining character of the Petta. Government of Karnataka has prepared a renewal plan for it.

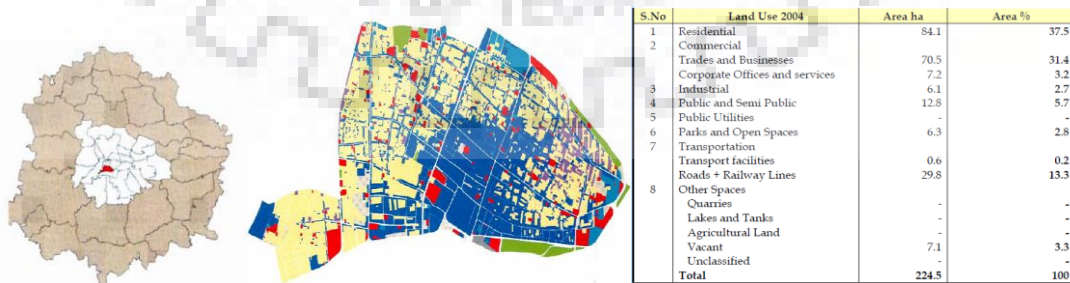


Figure 24 Petta region Bangalore location and statistics

The objectives of the study are:

- To rejuvenate the petta area and restore its heritage character.
- Preserve the cultures, traditions and trading practices that have been in use for centuries now.
- To decongest the area with good planning and adding high end infrastructure by keeping the future and long term requirements of the city in mind.
- Restoration of Monuments to their original glory wherever possible for display and re-use.
- Identification of projects that can be undertaken under PPP model.









Areas of Investment	Interventions	ULBs	PPP
Infrastructure rehabilitation	<ul style="list-style-type: none"> • Roads and sidewalks • Water supply, sewerage, and storm water drainage • Electrical supply system, surface and underground cabling • Garbage disposal • Traffic management & public transport system 		
Arts, handicrafts, and tourism	<ul style="list-style-type: none"> • Handicraft centers, and artists' and artisan centers • Give priority to production of local handicrafts • Provide urban design guidelines, and necessary technical and financial support to facilitate proper conservation practices. 		
Enterprise formation	<ul style="list-style-type: none"> • Establish operational guidelines and regulations • Provide information services, advisory services, and marketing assistance • Establish a business stakeholders' board that involves representatives of key groups 		
Preservation And promotion of cultural values	<ul style="list-style-type: none"> • Develop boutique hotels, markets, and museums • Conserve religious and historic buildings 		

Figure 25 PPP model for Petta zone renewal project

4.3.3 pe Town

South African government launched a dedicated Urban Renewal Programme (URP) in 2001 as an area-based approach to address poverty and underdevelopment in targeted areas, with specific emphasis on improving joint government planning and implementation. Cape Town's Khayelitsha node, a CBD, is a township area which has spatially dispersed poor populations, crime and violence. This was a part of the URP project to be developed in phases.

PHASE 1 (completed 2006) - bulk services and road infrastructure, various institutions

PHASE 2 (Ongoing) – extensions and improvements to the retail centre and the transport interchange, a mixed-use office complex, including informal trading facilities and a transport interchange

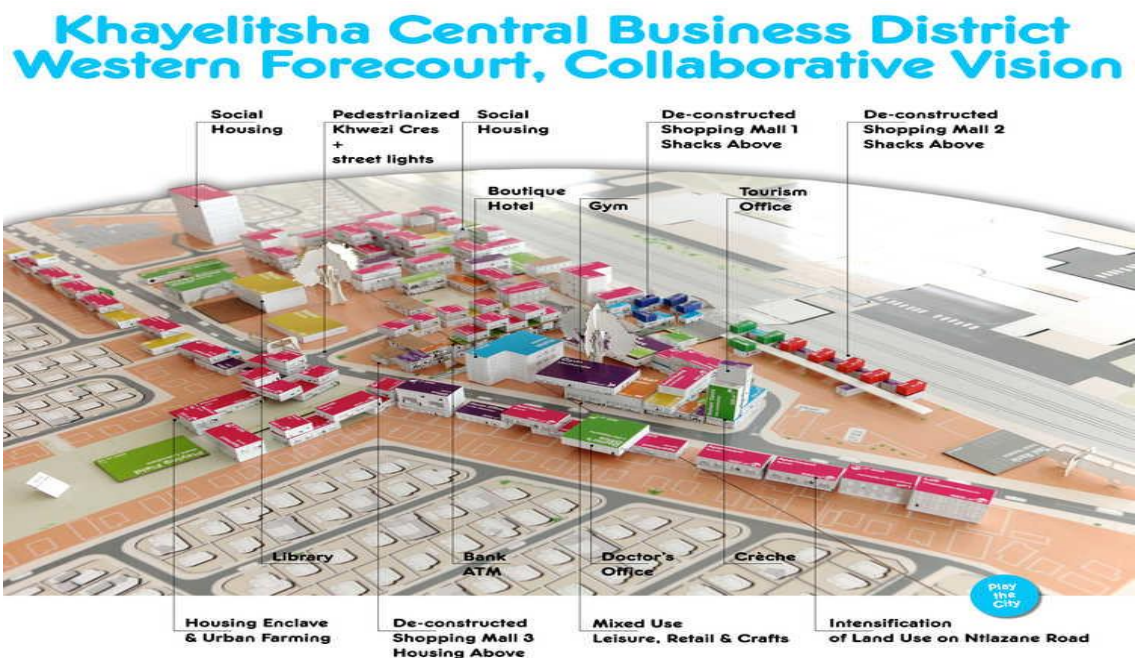
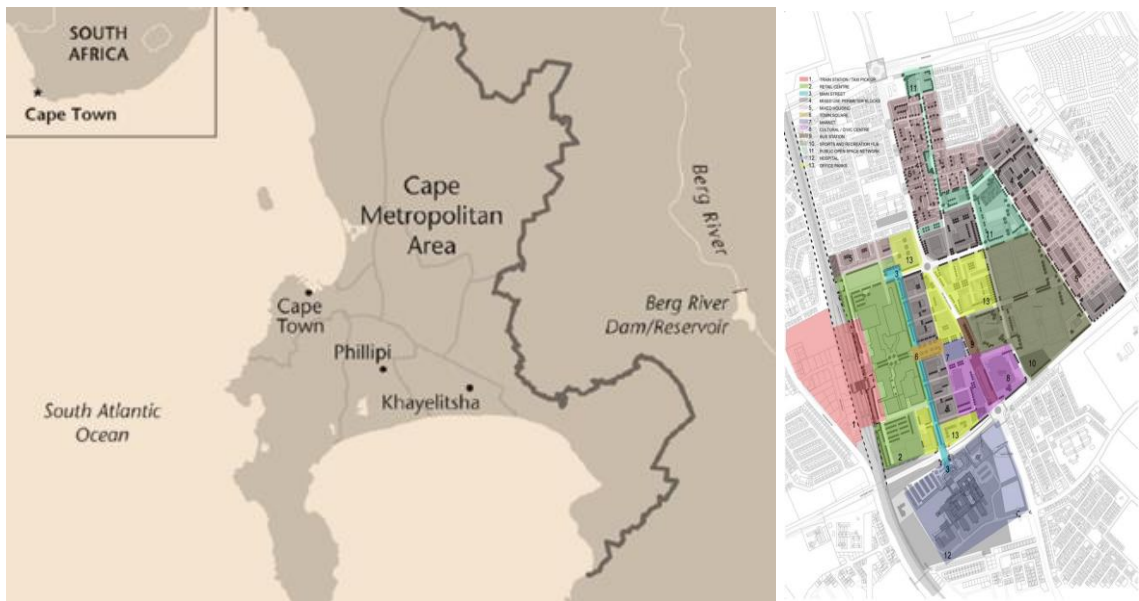


Figure 26 Khayelitsha CBD renewal project proposals

The project is a huge commercial success and is partly because of cooperation from private sector. Key learnings are:

- **Mixed Land use:** A more flexible system of land-use management may be more desirable, particularly when dealing with private investment and a range of different public investments in a single project area.
- **Social integration and contextuality:** provision of business space for informal businesses in shopping complex developments (such as hawkers) is also essential for sustainable upliftment.
- **Participation:** Sustainability requires community trust and involvement
- **Financial:** Public investment and commitment is required to participate in the development of infrastructure in rural and underserved areas to leverage private investment and development
- **Institutional support:** project champions play a crucial role in the success of intra-organizational projects which require the coordination of diverse departments
- **Participation:** All the role players need to share the same commitment to community development.

After studying the concepts by various researches certain inferences have been made. Talking about the contextual behaviour of urban renewal Greene (2017) says that underused land in the vicinity of Metro is an urban resource, and it has been considered a potential instrument to counteract two well-known problems of the city: its expansion and the social-spatial segregation. It is necessary to understand the specifics of the urban settings of each case or type of urban setting, and to design ad hoc packages of incentives for them. While Teaford (2000) has summarised that a sensitivity to the city and its citizens is far more desirable than devotion to a currently fashionable aesthetic, planning, or political dogma. Problems vary drastically and thus one solution is not possible.

Talking about heritage of the core area Yung (2017) says heritage conservation in urban

renewal districts should not only address the physical fabric of the historic buildings and the surrounding environment, but also the social impact and the intangible values of a community as a whole as they are of paramount importance. On same front Wang (2012) says aside from the physical structures, the culture and cultural diversity in historical urban areas should be protected as well. The cooperation between the government and its citizens produces a favourable result, in which the government is responsible for improving infrastructure and the environment, and the residents are responsible for improving their own living conditions.

In terms of integrated planning approach in urban renewal Manupati (2018) has coined that In the urban renewal process, the decision makers not only need to have a thorough knowledge the influencing factors for urban renewal, but also, there should be a deep understanding of the cause and effect relationship of all these criteria and sub-criteria identified. According to Alpopi (2013) sustainable urban rehabilitation is an absolutely necessary and irreversible process, aiming to: revitalizing urban structure, rehabilitation of public use areas, rehabilitation of entire urban infrastructure, of residential buildings, including the rehabilitation of their total energy, of the monuments and historical areas, of collective use equipment, and improving mobility and urban transport too.

Talking about the use of mixed land use in urban renewal project, Dilisle (2013) has view that recent emphasis on sustainability and the need to address global warming is likely to lead to added pressure to develop mixed-use projects as part of urban infill and densification strategies. Grant (2002) also says that Mixing land uses in the inner city has become part of a strategy for replacing disappearing industrial uses. Infilling core areas with new mixed uses has many benefits and rezoning central business districts should allow mixed use.

In terms of public participation Perez (2013) has written that the interaction between the different spatial scales, notably the neighbourhood's, which acts as a physical gateway between the building scale and the city scale, highlights the increased need for multidisciplinary work and collaboration between public and private stakeholder. To this Couch (2011) adds that nature and perceptions of the problems that urban regeneration policy seeks to address, and the approaches adopted in pursuing their resolution, are

strongly conditioned by contextual factors like local people.

Sustainability is another domain of urban renewal where Zheng (2014) emphasis that Urban renewal processes and sustainable development share temporal and spatial perspectives. There are planning sub-system and social sub-system involved in the urban renewal process. Only by scrutinizing the complexity of this interaction, as well as evaluating the past, present and future situation of urban renewal, can solutions and strategies for sustainable urban renewal be proposed. Peng (2015) notes that Measuring the sustainability of urban regeneration is important to push the project to move toward the right direction given that it usually has long-term and huge effects on environmental, economic, and social development. Lee (2006) has summed up that to ensure that right decision can be made, the characteristics of the region undergoing urban renewal, site constraints and preference of affected residents should be well known. The ideal will be to have an urban renewal proposal that is capable to achieve possible economic growth without sacrificing environmental and social needs for the benefits of current and future generations.

Thus an idea can be summarised from the above literature about the dimensions of urban renewal and what each of it brings to the table.

4.4 Inference

- Every case of urban renewal is area specific and all areas are different in nature.
- Thus it is important to study the area and then extract relevant additional indicators which are problem and context specific
- An understanding of local needs and people is must in this regard
- It is important to have financial aspects clear and feasible to undertake urban renewal project or else the expected results can't be met. This can be done through private sectors involvement. They can also help with acquisition process.
- A successful urban renewal project have positive impacts on health of residents.
- Heritage is an integral part of core areas of old cities. It gives them identity and intangible values.

- This needs to be conserved not only in physical aspects but in socio-cultural too.
- Specialists approach should be taken in this regard along with involvement of community.
- The cause and effect of all parameters should be studied and modulated while carrying out urban renewal.
- The approach should be comprehensive in nature so that no parameters are left out. Interdependency should be formed between ‘people, place and environment’.
- Integration should be done at different levels including the micro-level and should be a thorough approach.
- Public participation has proved to be the most important indicator for a successful urban renewal project in today’s world.
- Apart from it co-operation of various stakeholders like people, private investors government, NGOs and other agencies is must.
- Mixed use has been found to be very advantageous way of land in urban renewal projects.
- It provides flexibility and thus draws interest of private stakeholders.
- A guided mixing should be allowed which can lead to many positive sustainable impacts.
- Sustainability is the sought after feature in all planning context and urban renewal is no exception.
- It helps in creating urban renewal that tackles problems at both temporal and special facets.

5. PARAMETERS/ INDICATORS IDENTIFIED FOR URBAN RENEWAL

Based on study of various literature and analysis of schemes certain parameters are shortlisted which would form the framework of urban renewal to be carried out in the study area. These parameters are further subdivided into indicators that helps in sub-categorization of headings. The parameters and their indicators are as follows:

➤ **Physical indicators**

1. Physical Infrastructure status
2. Land-use effectiveness
3. Quality of built form
4. Congestion

➤ **Economic indicators**

1. Livelihood
2. Informality

➤ **Socio -cultural indicators**

1. Social Infrastructure status
2. Security/ safety with social inclusion
3. Identity/place making with social satisfaction

➤ **Environmental indicators**

1. Atmospheric quality
2. Disaster resilience

Depending on these parameters further the study is done so that proposals can be brought up. This will help in dealing all the important sectors of urban renewal leading to a comprehensive approach that would be most effective contextual to the study area.

6. RESEARCH DESIGN AND DATA COLLECTION

The renewal process requires public participation as mentioned earlier. It's very important to conduct surveys and collect data at grassroots level so that the situation on ground can be understood and thereby a feasible and practical solution can be achieved derived from that data. For this study data was collected at 3 levels pertaining to primary data collection. These are as follows:

➤ **Transect survey:** Self-observation survey

Overview was taken into consideration so as to what parts require renewal and what are the degraded areas. This was done based on factors like original knowhow of the area, single tour of the wards and areas, news and journalism about issues and problems of the city.

➤ **Reconnaissance survey and RAT :** Shopkeepers, planning authority, residents, visitors, plot owners

In this part a quick survey was done through the area going deep into the parts. A basic review was taken from the people of the area about their overviews and feedbacks. This input was further taken to sum the headings and questions of questionnaires.

➤ **Questionnaire and Opinion surveys:**

To know the situation, questions were asked to the people and their answers were noted.

1. Household survey : House owners/ slum dwellers

About 50 entries from legal houses and 50 entries from slum and squatter dwellers were taken.

2. Opinion survey : For heritage, shop owners and customers

Opinion of people on matters where they visit and of business were taken.

3. O-D and transportation survey

Inputs of people on road were taken in this regard.

7. ANALYSIS AND FINDINGS

It is necessary to analyse the collected data from a non-biased and comprehensive perspective as it helps in understanding the nature of situation on the ground and what areas needs to be focused upon and which are already sustaining well. This helps in setting a direction for formulation of recommendations and strategies.

7.1 Survey data and findings

After collecting the data obtained from various questionnaires, an analysis was done for each major category. A brief idea about the nature of data collected and findings from each category are explained below along with its survey point on spatial map. For independent categories without particular space specific measures, its extent and area of effect is portrayed in the map.

7.1.1 Survey data: residential permanent

The CBD area has about 35% occupied area to be residential. This is generally coupled with multiple uses like commercial.

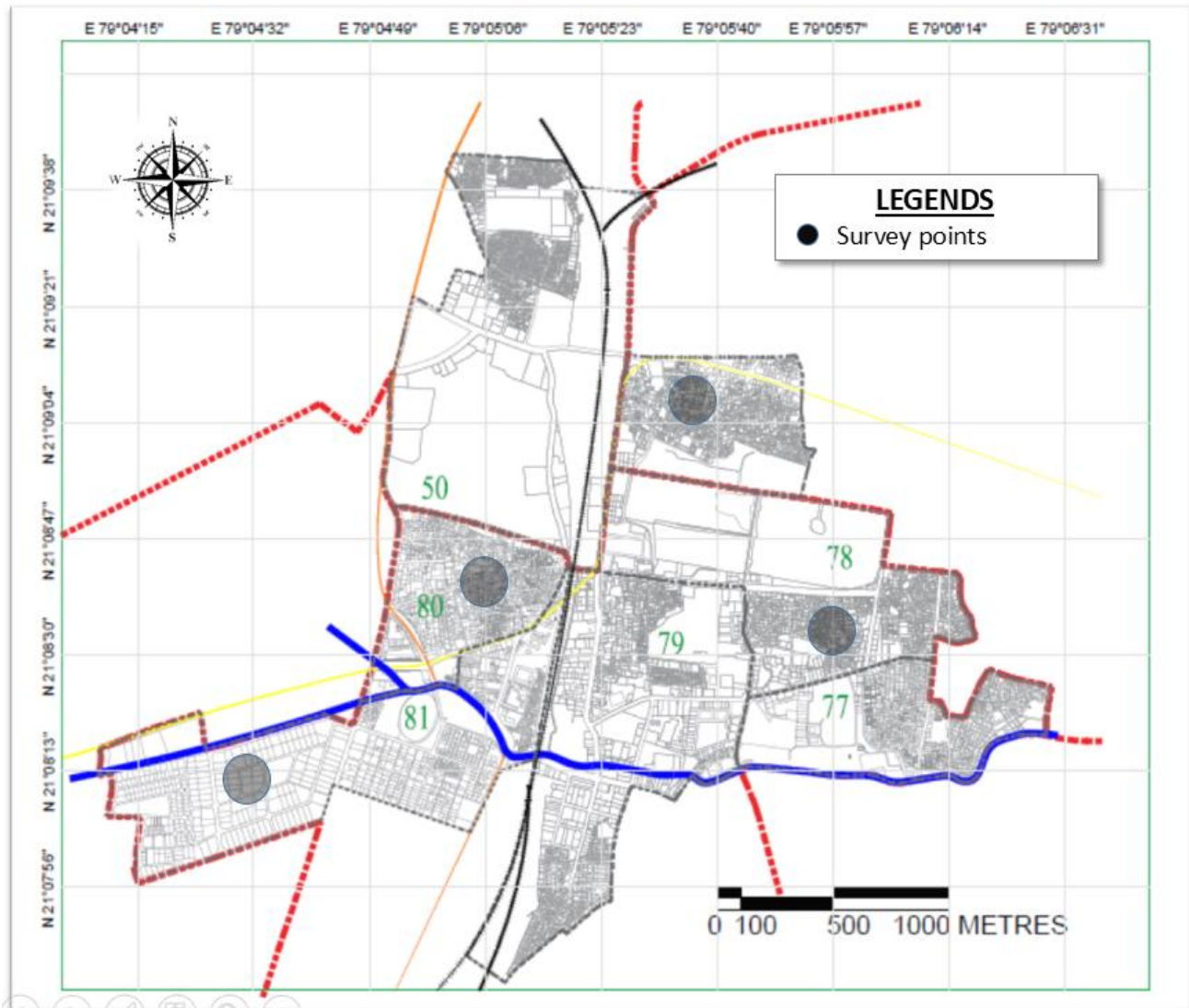


Figure 27 Survey points for permanent residents

From data:

- About 50 household surveys were done in 4 different localities.
- Just 15% households are single member, showing that the households have large sizes leading to high density in the area.

- Just 10% houses have new construction, showing saturation in built up areas.
- Very few people have walking distance access to community spaces or green spaces.

Findings:

- ✓ Physical Infrastructure and services needs to be strengthened due to organic nature of settlement.
- ✓ Social Infrastructure needs to be created to raise standard of living.

7.1.2 Survey data: residential slum/squatters

There are about 25 slums in the site area itself. Apart from these there are 2 squatterers observed location. This means that lots of the areas need redevelopment so as to raise the standard of living.

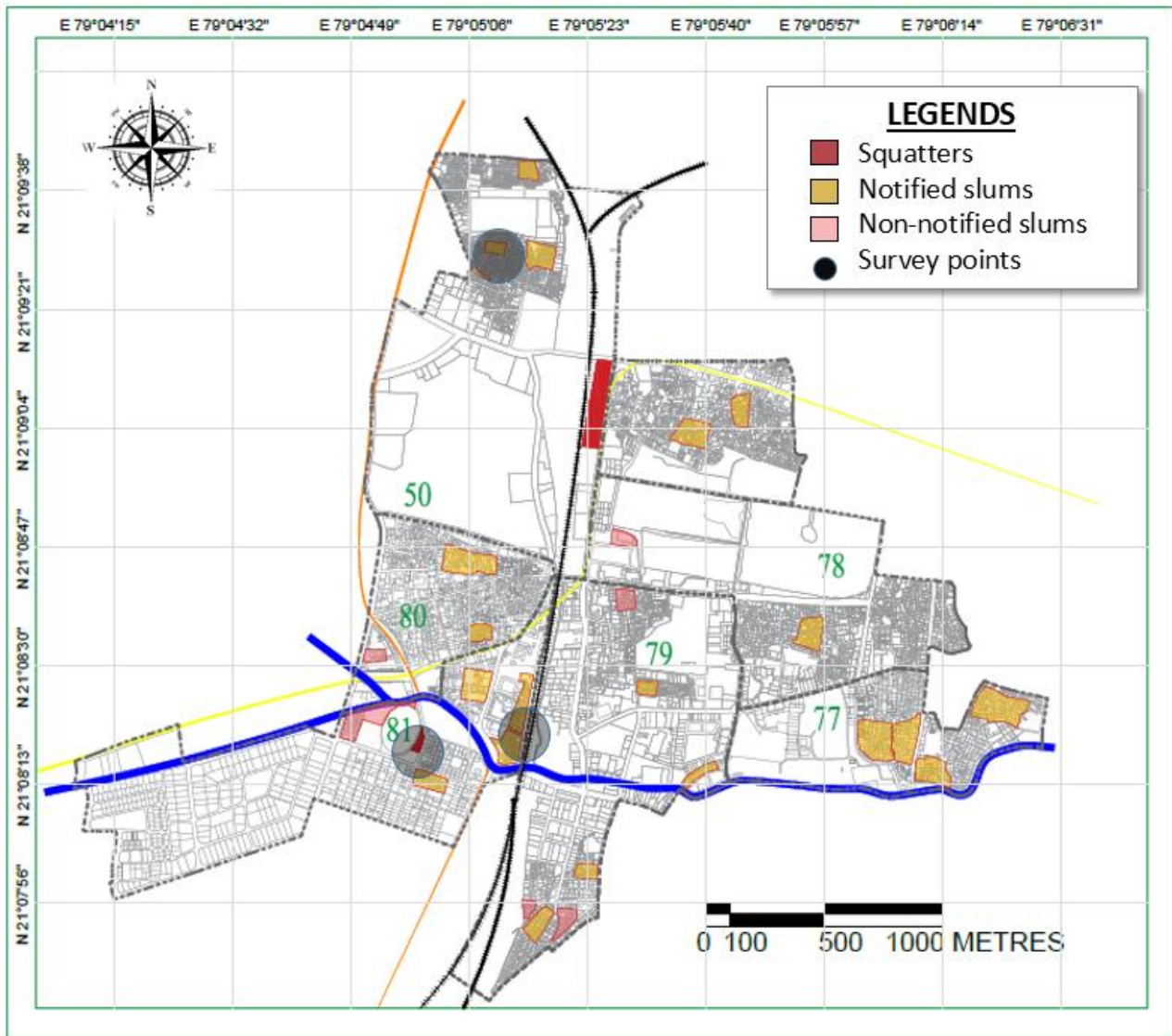


Figure 28 Survey points for temporary residents

From data:

- About 50 household surveys were done from slums and squatters and about 85% have been there for more than 10 years.
- More than 50% of such slums have children living in them.
- More than 60% of the people don't have a pucca house neither a reliable source of income.
- About 80% people don't have personal vehicle and thus depend on other modes for

transportation.

Findings:

- ✓ The slums and squatters residents are ready for rehabilitation and thereby can be taken up under redevelopment.
- ✓ People's livelihood needs attention.
- ✓ Private stakeholders and NGOs can be employed for the operations.

7.1.3 Survey data: Shop owners permanent

Many shop owners have been managing their shops in this area for years. The CBD is famous for shopping and cheap products attracting people from 100 km radius.



Figure 29 Survey points for permanent shop owners

From data:

- About 30 opinion surveys are done for permanent shop owners in the area.

- More than 85% of the shops more than 10 years old.
- Very few shops are single use free standing structures.
- More than 60% shops work full time and run all year long.
- Certain shops are festival or season oriented.
- More than 50% of shops have godowns and their own parking space.

Findings:

- ✓ Shops should have mandatory parking spaces to reduce congestion and on street parking.
- ✓ Old buildings should be conserved and maintained to reduce risk to lives and also promote urban design.

7.1.4 Survey data : Shop owners temporary

There are many hawkers and temporary shopkeepers in these areas, especially in the Sitabuldi ward. They are a prime reason for encroachment and congestion in the area. However, they are also responsible for the local economy and livelihood, thereby needing proper development.

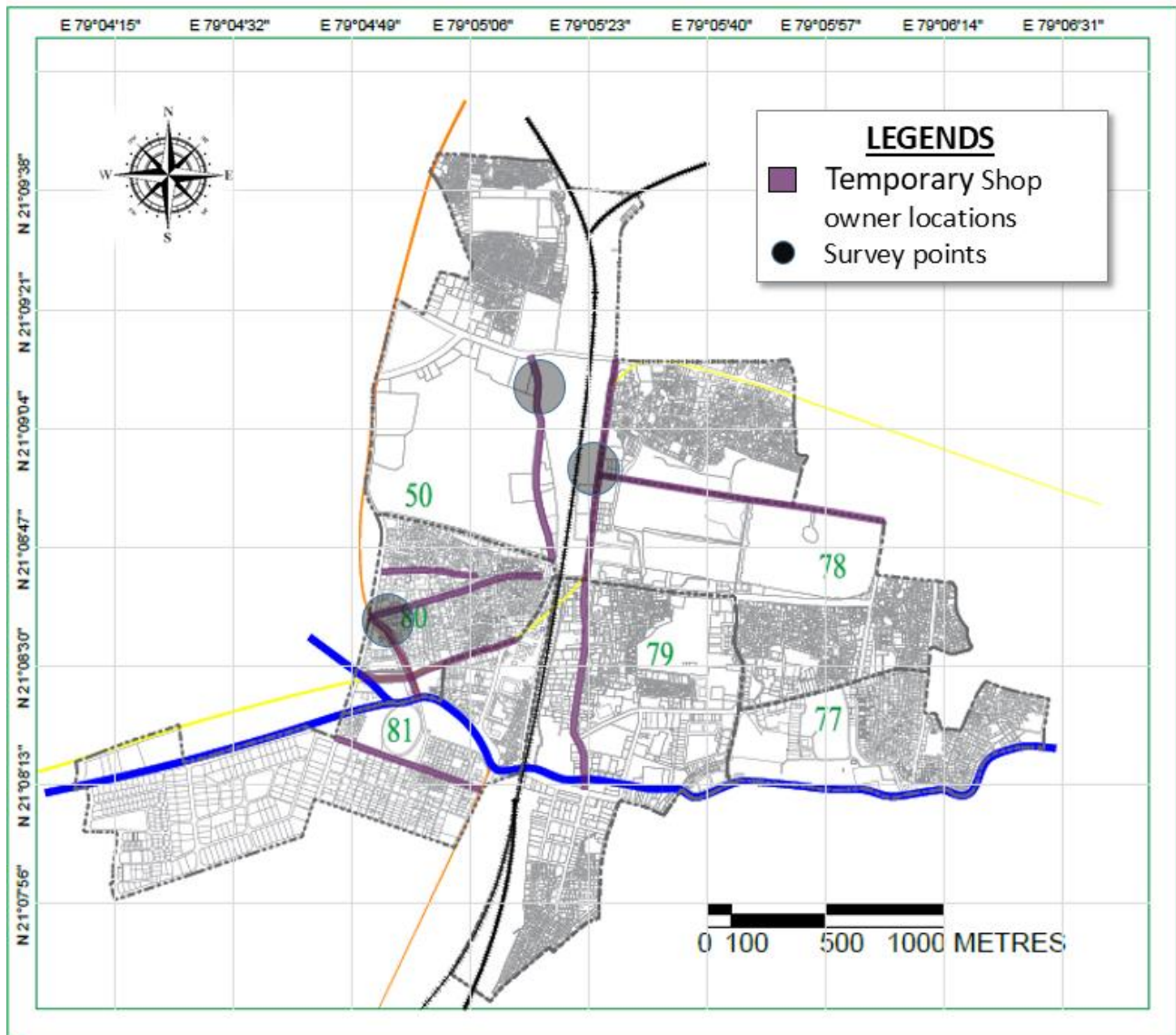


Figure 30 Survey points for temporary shop owners

From data:

- About 30 opinion surveys are done for temporary shop owners in the area.
- They sell a variety of products however they are often removed due to the problem of encroachment.
- Due to their temporary nature most of them often sit in the evenings and specially on weekends.

- They include hawkers and removable shops mostly .

Findings:

- ✓ Registration of temporary shop owners must be done for their betterment as well as society's.
- ✓ Market spaces needs to be created to inculcate the hawker and temporary shops.

7.1.5 Survey data: customers

The site area is the CBD of the city. Thus many of the areas are commercially active and attracts many customers. Main Sitabuldi market which is famous in whole Vidarbha region is situated in the market. Various categorical markets like electronic market, textile market, Orange market, vegetable markets, etc are quite famous here. Apart from it, many street shopping markets are also seen here.

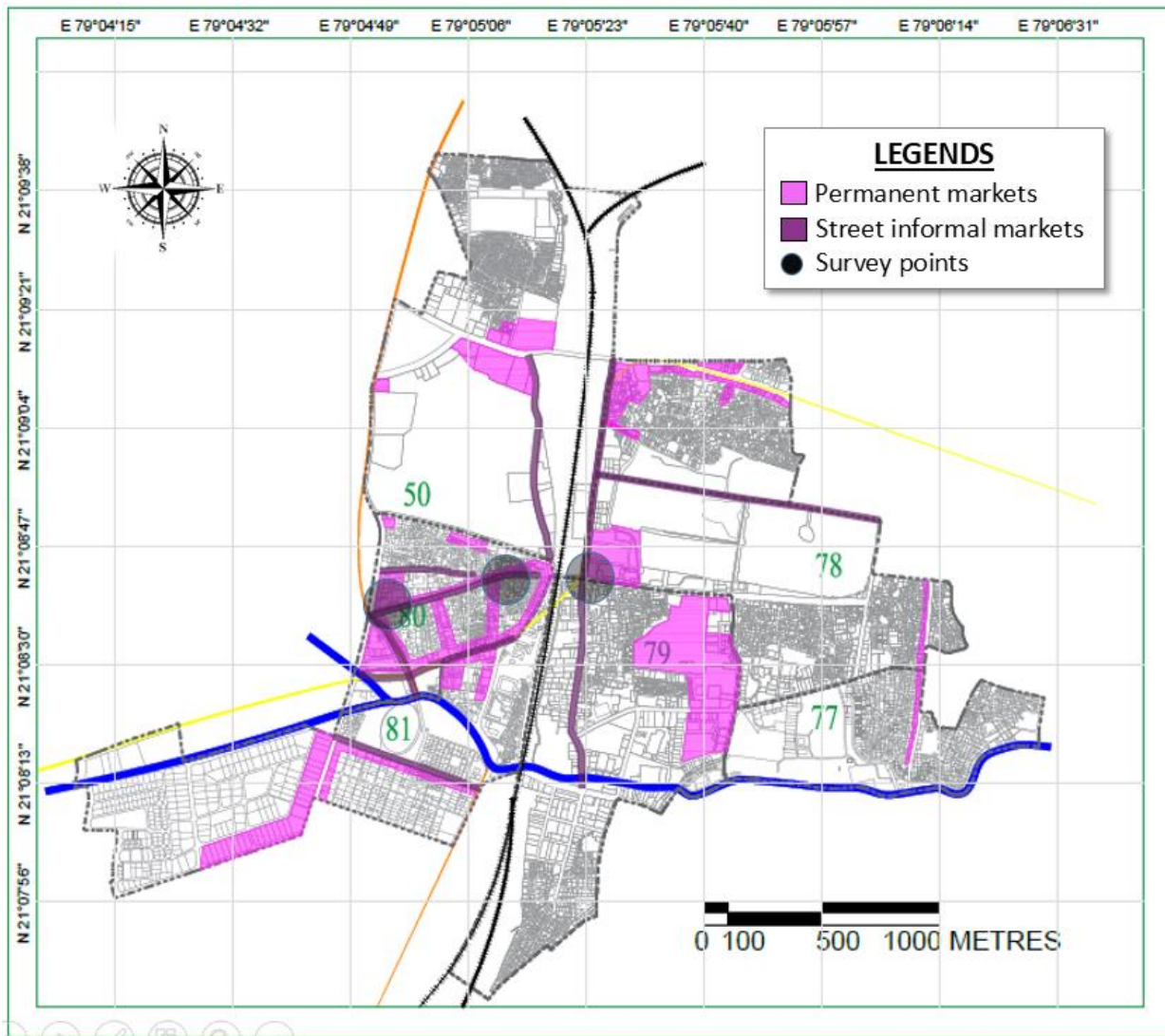


Figure 31 Survey points for customers

From data:

- About 30 opinion surveys are done for the customers in the area.
- People come from different parts of the city to this area to buy mostly textile and electronic items.
- Parking problems is prevalent in all these areas. Also the service status is also poor in terms of drinking water, pedestrian facilities, signages, etc.

Findings:

- ✓ The facilities and services for customers is poor and needs attention.
- ✓ Last mile connectivity and pedestrian activity needs to be promoted.

7.1.6 Survey data: passers-by

The site has Nagpur's main railway station right in the centre along with many bus stands in vicinity. Also being the CBD there is lots of vehicular and pedestrian movements including the most PCUs and pedestrian count roads. Further the metro lines cross through the zones with about 7 metro stations falling in it including the junctional metro station. Thus the already congested area will have increased congestion if not planned properly.

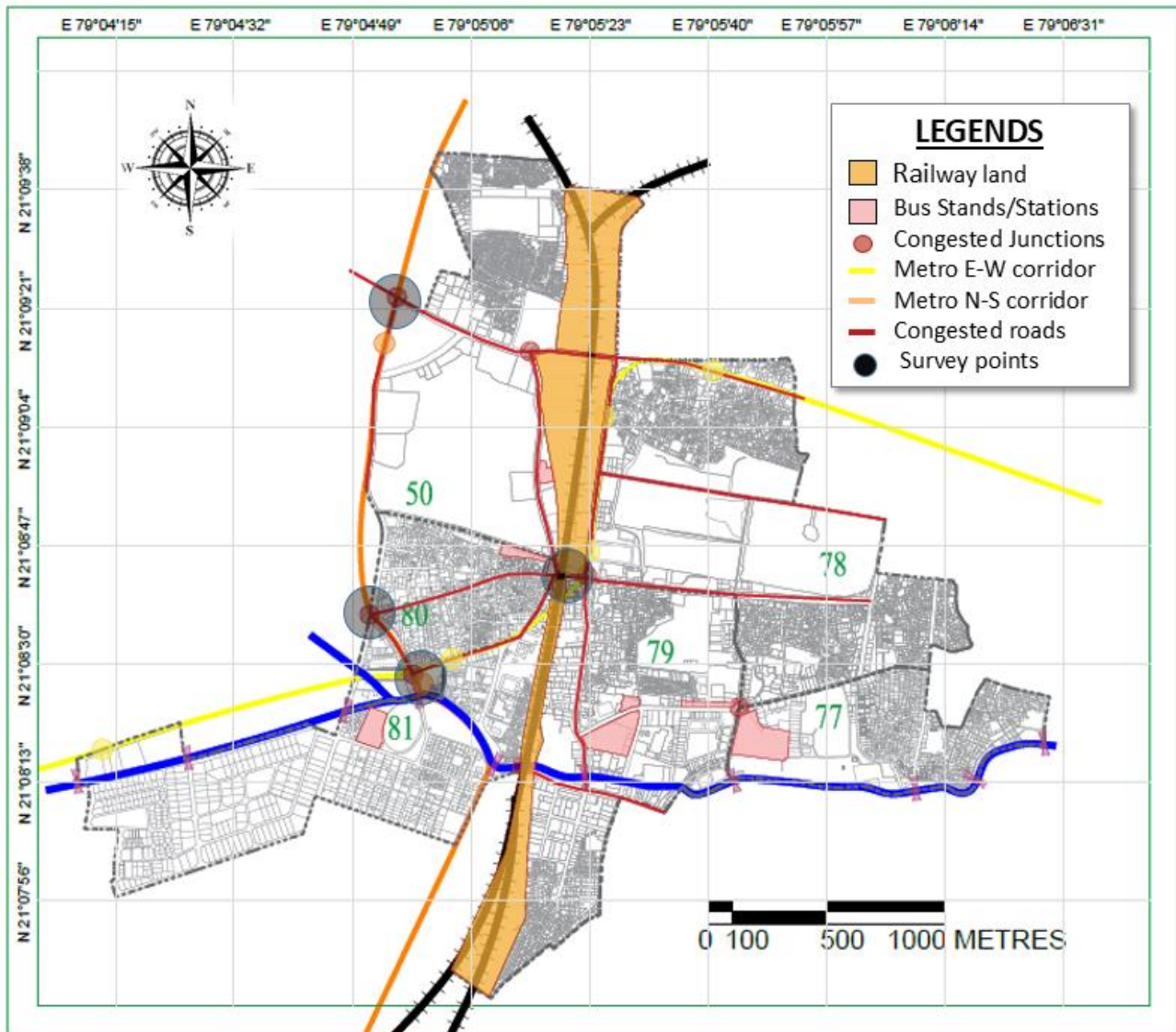


Figure 32 Survey points for passersby

From data:

- From 35 conducted surveys its learned that the traffic is heterogonous in all parts, done for varied reasons.
- Origin and destination varies, however about 50% trips either starts or ends in the CBD.
- About 66% of people take this trip due to unavailability of alternate routes.
- Many of them require parking and find it difficult to get it.

Findings:

- ✓ Redesign of congested squares, over and under bridges for pedestrians and promotion of NMT is required.
- ✓ Alternate routes and multilevel parking is required in the areas.

7.1.7 Survey data: Heritage

There are 23 heritage places in study area.



Figure 33 Survey points for heritage data

From data:

- 15 samples for opinion survey were taken.
- Only 9 out of the 23 heritage places in the site have been visited in majority by the sample people, which include major hotspots of tourist attraction.

- Only 4 places out of the 23 are known to have heritage recognition.
- According to the people, the major way to improve the status of such heritage structures is through Awareness followed by their physical development and then improving its accessibility and signages.

Findings:

- ✓ Heritage conservation and promotion is required to reserve the identity of the city, awareness is prime factor required for this.

7.1.8 Industrial development

Industries are found at large scale in the study area. The CBD area of Nagpur city has lots of industrial area which are either defunct or working ineffectively in different sectors. The Empress mill for textile was the leading employer in Nagpur city, due to which the city rose to fame in the region. Similar is case of model mills. Apart from this there are various saw mills. All of these areas are undergoing transformation in terms of land use. The remainder of areas can be taken up for brownfield development to fulfill the requirements of the area.

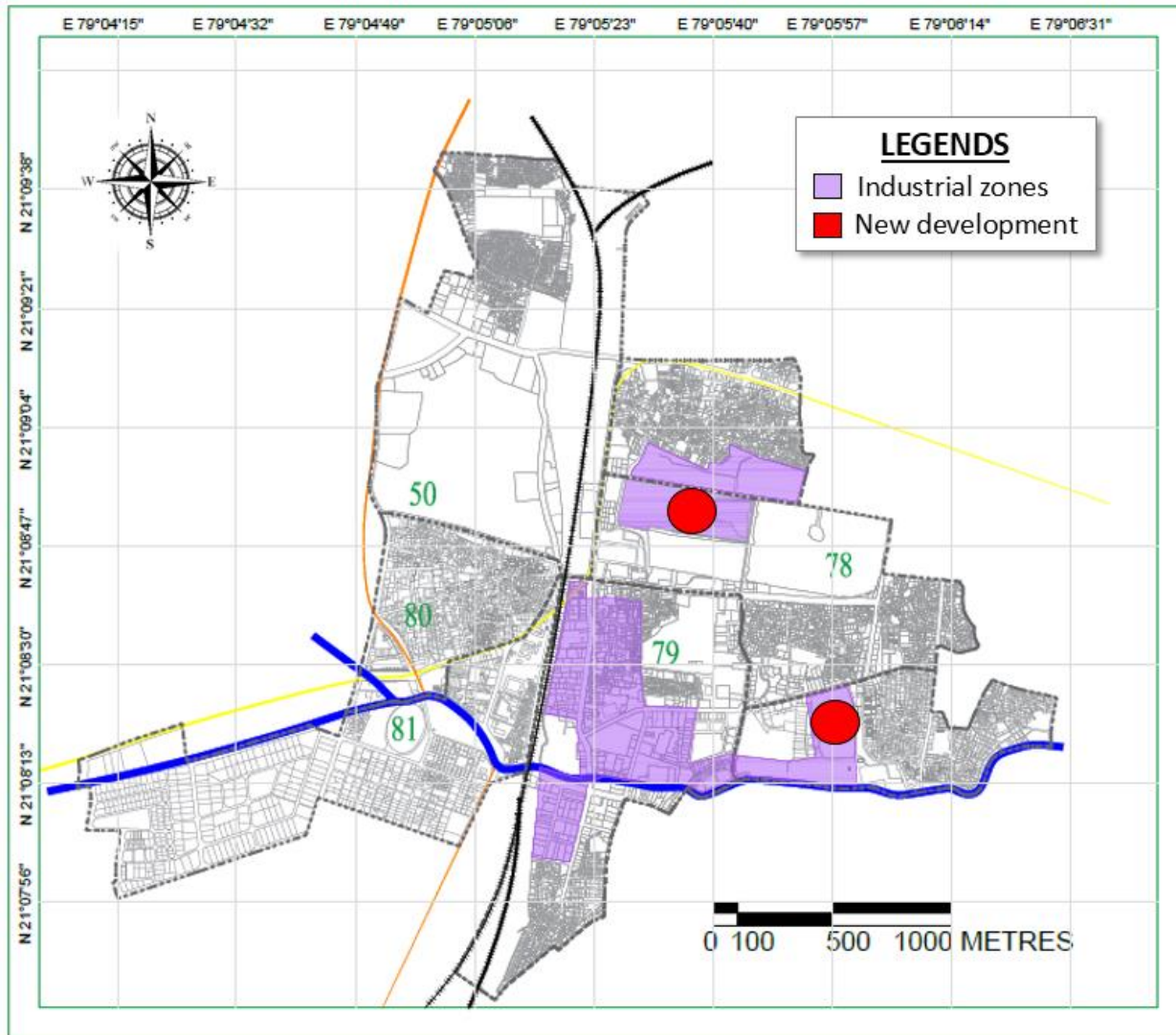


Figure 34 Industrial land use

7.1.9 Land use

There is a mix in land uses in the Core area part. Due to presence of railway line and many bus stand a huge area is under transportation land use. Also due to old mills in the region much of the area is under industrial land-use. The CBD area is organically mixed-use however its marked either commercial or residential in the DP. Many natural land cover like lakes, river and hills are part of the area.

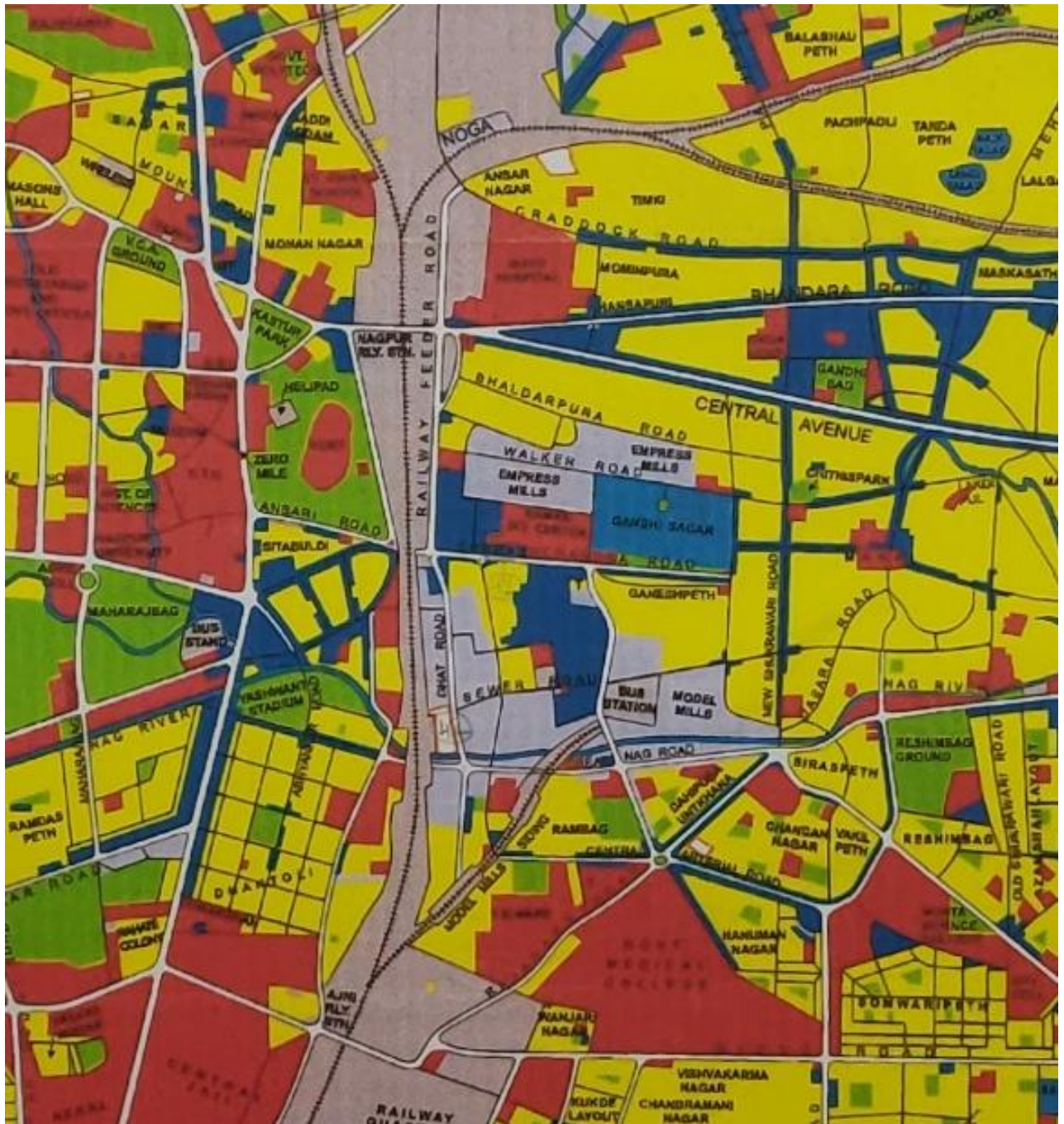


Figure 35 Land use according to DP of Nagpur city 2011

7.1.10 Infrastructure

Infrastructure is important to every place. From study of study area and comparison to guidelines following findings are found :

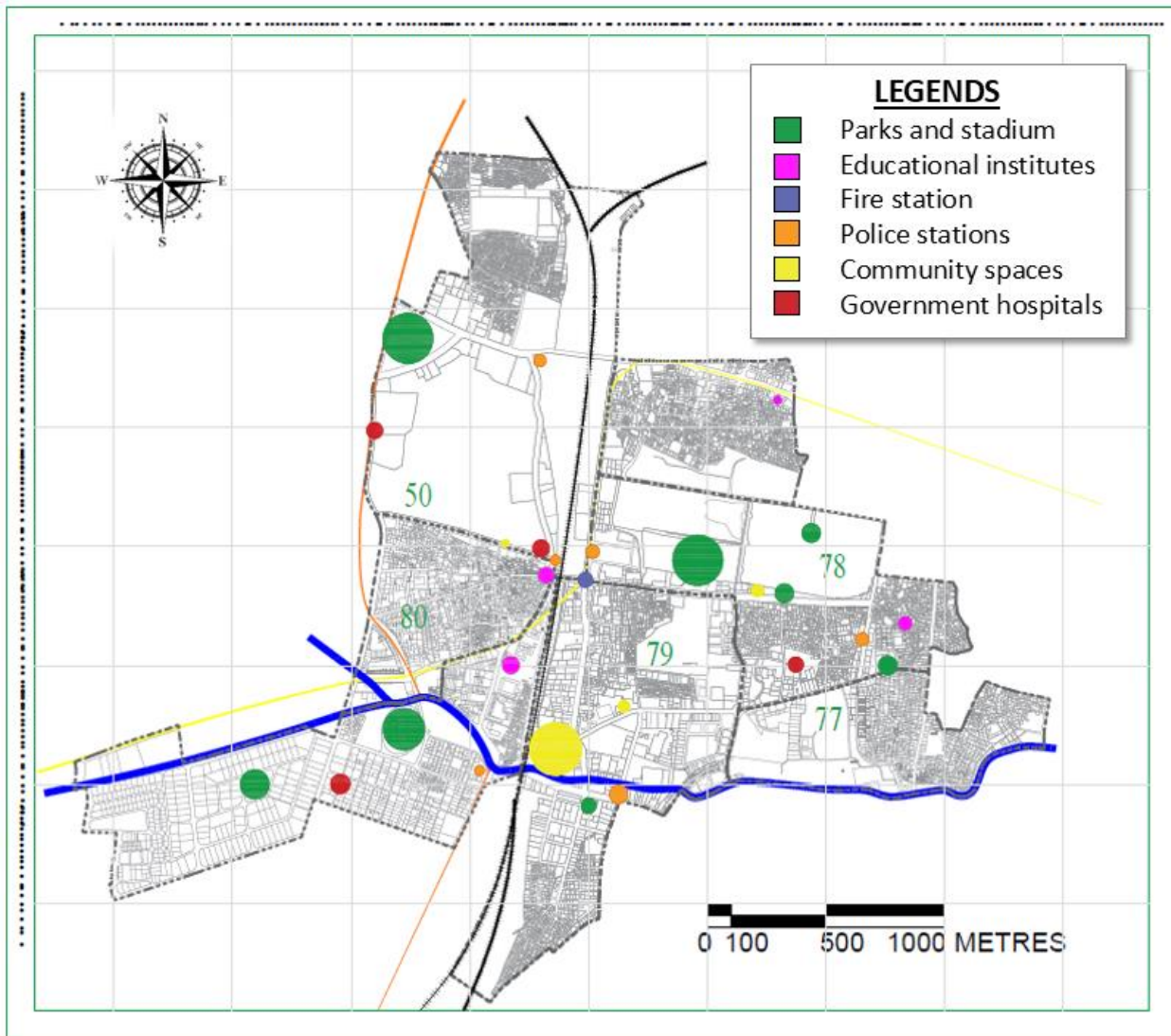


Figure 36 Infrastructure

Findings:

- ✓ Public toilets are way below required level.
- ✓ Educational facilities and its hierarchy is not fulfilled.
- ✓ Multi use hospital for the population is not according to the specification and is dispersed.
- ✓ Most of the socio-cultural facilities are missing.
- ✓ Neighborhood parks are less in numbers.

- ✓ Security and safety measures seem to be okay.
- ✓ Dedicated government shopping center and ration shops are not available.
- ✓ Flood zones are there in the study area and thus its risk management is not proper.

7.2 SWOT analysis

All the parameters have certain positives and negatives. It is necessary to understand these so that a sense of direction can be formulated so as to what parameters needs to be attacked aggressively while what parameters are already in good conditions. The strength, weakness, opportunity and threats for each parameters are explained below. This again is further analyzed to point out specific areas of concern that are source of major problems surrounding these parameters and their core factors of problems. This then gives an overview so as to what directions are to be taken to solve the problems for areas of concern and more specifically the factors creating problems.

7.2.1 Physical Parameter: Physical Infrastructure status

The SWOT analysis along with critical areas of concern, concerning factors and strategical directions to be taken to attack these are as follows:

- **Strength:** Nagpur has the capacity to support physical infrastructure and services due to its strong administration and political value. Most of the new developing areas have good infrastructures and planned areas.
- **Weakness:** The central areas being old and organic, the infrastructure is weak in the areas. Its modification is difficult due to constrained ramification.
- **Opportunity:** Various schemes and development plans allows a chance to take up the betterment of physical infrastructure. Peoples willingness is also helpful.
- **Threat:** The process of developing the physical infrastructure can prove to be negative to the identity of the areas, old structures and culture.
- **Critical areas of concern:** Accessibility into slum areas is highly problematic. Problem of community waste disposal and sanitation is evident.

- Concerning factors:
 - a) Administrative capacity
 - b) Physical constraints
- Strategical direction:
 - a) Capacity development
 - b) Physical planning

7.2.2 Physical Parameter: Land-use effectiveness

The SWOT analysis along with critical areas of concern, concerning factors and strategical directions to be taken to attack these are as follows:

- Strength: Nagpur has defined land use development plan which is followed. The authority is also stringent for buildings to abide by these rules (Atleast for new areas)
- Weakness: Old areas having incompatible land uses are also present. Land uses suitable with future needs are missing like TOD zones and mixed uses.
- Opportunity: With changing scenarios and visions, new progressive ideas can be inculcated at grass roots level for better usage.
- Threat: If land use is not properly managed then land prices, density of people, compatability etc. can become even worse.
- Critical areas of concern: Industrial areas and certain public areas are not compatible. New development like metros require changes in existing setup so as to avoid chaos.
- Concerning factors:
 - a) Regulatory approach
 - b) Changing trends
- Strategical direction:
 - a) Regulatory changes

b) Flexible Land usage "

7.2.3 Physical Parameter: Quality of built form

The SWOT analysis along with critical areas of concern, concerning factors and strategical directions to be taken to attack these are as follows:

- Strength: Nagpur has lots of built form within the core areas housing multitudes of the population. If properly managed it can provide proper shelter to many people close to the CBD.
- Weakness: Due to old age and organic development these built forms in below par conditions and at risk. The quality of living due to this is poor and having many negative impacts.
- Opportunity: The smart city proposal along with other schemes are concentrating on Area based development wherein these blighted areas are to be modified.
- Threat: The high rates of land and prime locations can become a greed factor for involved private sectors leading to dissatisfaction among community.
- Critical areas of concern: Many slums in the areas are most important concerns. Living conditions needs to be improved in organic and old areas and buildings.
- Concerning factors:
 - a) People's approval
 - b) Physical constraints
- Strategical direction:
 - a) People's participation in the process.
 - b) Redevelopment and retrofitting measures

7.2.4 Physical Parameter: Congestion

The SWOT analysis along with critical areas of concern, concerning factors and strategical directions to be taken to attack these are as follows:

- **Strength:** The CBD areas still invites lots of population from the city and nearby regions which is a good sign for the local economy.
- **Weakness:** The floating population and visitors are too much for existing infrastructure causing congestion to pedestrians and traffic.
- **Opportunity:** With development of metro and other smart city proposals there is a chance to improve the level of service and facilities for people, thereby reducing congestion problems.
- **Threat:** Problems of parking, NMV, all weather walkability, walking distances, public amenities if not treated properly can lead anti-magnetic effects of customers.
- **Critical areas of concern:** The CBD area needs to be regulated so as to create positive atmosphere. Various problematic squares and roads also need reprisal.
- **Concerning factors:**
 - a) People's approval
 - b) Physical constraints
- **Strategical direction:**
 - a) De-congestion structures and service proposals
 - b) Community involvement in walkability awareness and proposals.

7.2.5 Economic Parameter: Informality

The SWOT analysis along with critical areas of concern, concerning factors and strategical directions to be taken to attack these are as follows:

- **Strength:** Most important factor in CBD creating informal economy and source of income. Because of this, Nagpur has a regional reach inviting people from as far as 100 km radius.
- **Weakness:** It creates problems for the thoroughfare and people living in the areas. Encroachments and disputes are outcome of this situation which remains out of control mostly.

- **Opportunity:** The area based development can solve this problem as well as improve living conditions of the people.
- **Threat:** If not properly redesigned the character of Sitabuldi, which is central place of attraction can fall and become like any other commercial area. Livelihood of the people can also be lost in the process.
- **Critical areas of concern:** Regulations for such people are missing. Encroachments and Dedicated weekly markets needs to be controlled and managed.
- **Concerning factors:**
 - a) People's approval
 - b) Regulatory approach
- **Strategical direction:**
 - a) People's participation for rehabilitation measures and awareness.
 - b) Redesign market lanes and places.

7.2.6 Economic Parameter: Livelihood

The SWOT analysis along with critical areas of concern, concerning factors and strategical directions to be taken to attack these are as follows:

- **Strength:** Nagpur has become centre for all of the region providing shelter and livelihood and thereby catering to many families.
- **Weakness:** There is uncertainty in such unregulated jobs and livelihoods which puts many families at risk. People often end up in slums or squatters.
- **Opportunity:** Such large number of work force can be trained and involved in different tasks. It helps two-fold to the people as well as the city.
- **Threat:** Certain local arts, crafts and culture can be lost if not preserved properly.
- **Critical areas of concern:** people residing in slums and squatters and working in nearby areas.

- Concerning factors:
 - a) Administrative capacity
 - b) Regulatory approach
- Strategical direction:
 - a) Skill development
 - b) Regular minimum wages

7.2.7 Environmental Parameter: Atmospheric quality

The SWOT analysis along with critical areas of concern, concerning factors and strategical directions to be taken to attack these are as follows:

- Strength: The city doesn't have an extreme source of pollution and the atmospheric quality is quite better than other large metropolitans.
- Weakness: The core areas are most polluted in the city and the resources are not conserved and maintained properly.
- Opportunity: The development can be sustainable whereas natural resources and be conserved and pollution can be reduced in passive and active measures
- Threat: This is an irreversible process. If not done properly, the resources can vanish forever.
- Critical areas of concern: Polluting industries, transportation noises, water pollution, fuel consumption etc. are very high.
- Concerning factors:
 - a) Executional problems
 - b) Regulatory approach
- Strategical direction:
 - a) Alternative proposals

- b) Energy conservation and pollution reduction measures"

7.2.8 Environmental Parameter: Disaster resilience

The SWOT analysis along with critical areas of concern, concerning factors and strategical directions to be taken to attack these are as follows:

- Strength: The city doesn't come under high risk and it has proper response mechanism due to DMP.
- Weakness: Although not major, minor disasters have been occurring over the years causing loss of lives and properties.
- Opportunity: Redevelopment of certain zones and affected areas can involve disaster proofing thereby reducing future risks.
- Threat: The future development will be more intense and man-made disasters would only increase if not covered up now.
- Critical areas of concern: Various trends of life and property loss needs to be covered.
- Concerning factors:
 - a) People's approval
 - b) Physical constraints
- Strategical direction:
 - a) Disaster preparedness and mitigations and proofing

7.2.9 Socio-Cultural Parameter: Place making with community satisfaction

The SWOT analysis along with critical areas of concern, concerning factors and strategical directions to be taken to attack these are as follows:

- Strength: The old core areas have a distinct culture and identity due to vernacular architecture and culture and traditions of the people and needs preservation.
- Weakness: The natural and man-made features are getting neglected or not utilized to it

best thereby leading to its loss and vanishing in the future.

- Opportunity: The development of the area can provide the people and city with rooted identities and tangible wealth.
- Threat: The contextual nature and importance of the place and heritage needs to be preserved or else intangible aspects and people's trust maybe lost forever.
- Critical areas of concern: Natural and man-made heritages along with intangible culture embedded in it. The CBD area and its vanishing identity.
- Concerning factors:
 - a) Funding problems
 - b) Physical constraints
- Strategical direction:
 - a) PPP and NGO involvement and role making
 - b) Physical mapping and planning

7.2.10 Socio-Cultural Parameter: Safety / security with social inclusion

The SWOT analysis along with critical areas of concern, concerning factors and strategical directions to be taken to attack these are as follows:

- Strength: Nagpur is relatively safe city with quite a secular atmosphere
- Weakness: 42% Women however don't feel safe. This is due to the fact that there is poverty and lower quality of living in areas of slums.
- Opportunity: The development can help in improving social cohesion as well as all time safety of the people.
- Threat: There is a thin line between safety and privacy which need not be crossed. The process should be passive so that it doesn't hurt sentiments.
- Critical areas of concern: The slum areas. Abandoned and useless public spaces. Single use zones that become deserted at nights.

- Concerning factors:
 - a) Executional problems
 - b) Regulatory approach
- Strategical direction:
 - a) Design and planning solution proposals
 - b) Regulations for approval

7.2.11 Socio-Cultural Parameter: Social infrastructure status

The SWOT analysis along with critical areas of concern, concerning factors and strategical directions to be taken to attack these are as follows:

- Strength: There are existing infrastructure which are of good quality and maintained.
- Weakness: The existing ones are not properly balanced and spread. These high density areas require more infrastructure whereas land prices are high too.
- Opportunity: Infused and socially progressive social infrastructure can be proposed catering to many needs of the people.
- Threat: It's difficult to project, design, execute and maintain such centres. People's acceptance and needs must be fulfilled or it can incite lots of agitation.
- Critical areas of concern: Social centres placed at proper places. Inclusive nature.
- Concerning factors:
 - a) Funding problems
 - b) Physical constraints
- Strategical direction:
 - a) PPP, NGO and government partnerships
 - b) Physical Planning.

7.3 Zoning and criticality mapping

All the parameters and sub-parameters have different level of problems and coverage in the study area. It becomes difficult to analyze which areas are in worse conditions against areas which are performing quite satisfactorily. At the same time it becomes important to understand, which areas have overlapping problems while which areas not total congregation of problems. To simplify the analysis of such areas the area is divided into different zones.

On the basis of various factors, zone wise criticality mapping is done for all sub-parameters and a scoring system is prepared. This system helps to bring about quantitative calculations to generally qualitative factors. This helps to reach to a summation of criticality factors which help in realizing the zones needing excessive renewal efforts and some zones which doesn't. Criticality mapping for each sub-parameter is shown below which color is coded according to the scores provided. These scores are provided according to various contributing factors which are also mentioned.

7.3.1 Physical Parameter: Physical Infrastructure status

Physical infrastructure is not same everywhere. Certain areas are planned which helps in laying and servicing of infrastructure, while in organic areas the same thing becomes much more difficult.

- Factors: The factors responsible in deciding the criticality of this sub-parameters are
 - a) Population.
 - b) Presence of infrastructure.
 - c) Infrastructure within walking distance.
- Range of criticality: The range and colour coding is decided as
 - a) 4 = Excellent: Multiple centers within walking distance.
 - b) 3 = Good: Present and in walking distance.
 - c) 2 = Satisfactory: Present but far.

d) 1 = Poor: Totally missing.

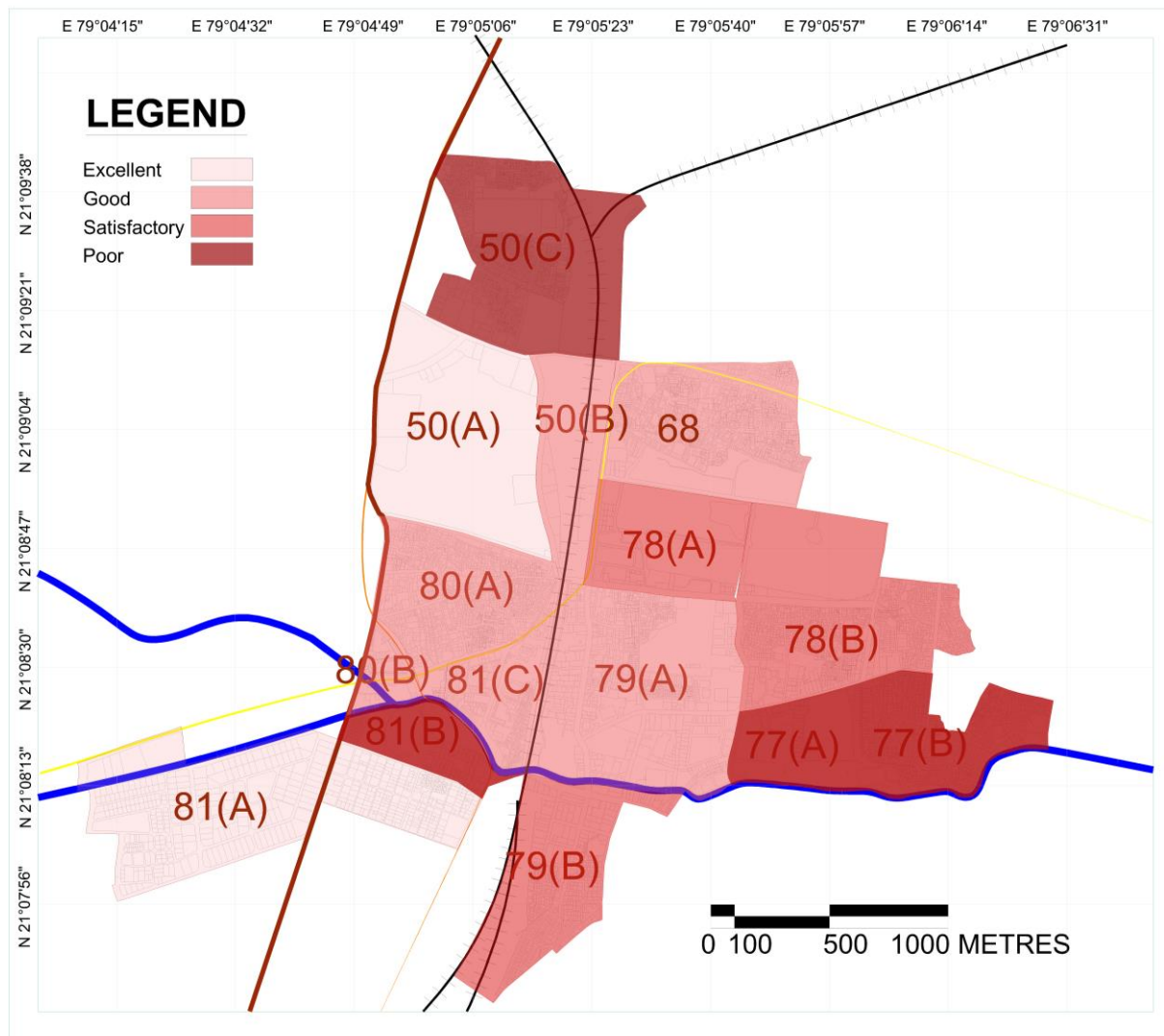


Figure 37 physical parameter: Physical infrastructure

7.3.2 Physical Parameter: Land use effectiveness status

- Factors: The factors responsible in deciding the criticality of this sub-parameters are
 - a) Non-appropriate/Obsolete land use at present.
 - b) Compatible with nearby uses.
- Range of criticality: The range and colour coding is decided as

- a) 4 = Excellent: Feasible and compatible land uses.
- b) 3 = Good: Feasible but non compatible.
- c) 2 = Satisfactory: Non feasible non compatible.
- d) 1 = Poor: Obsolete land use.

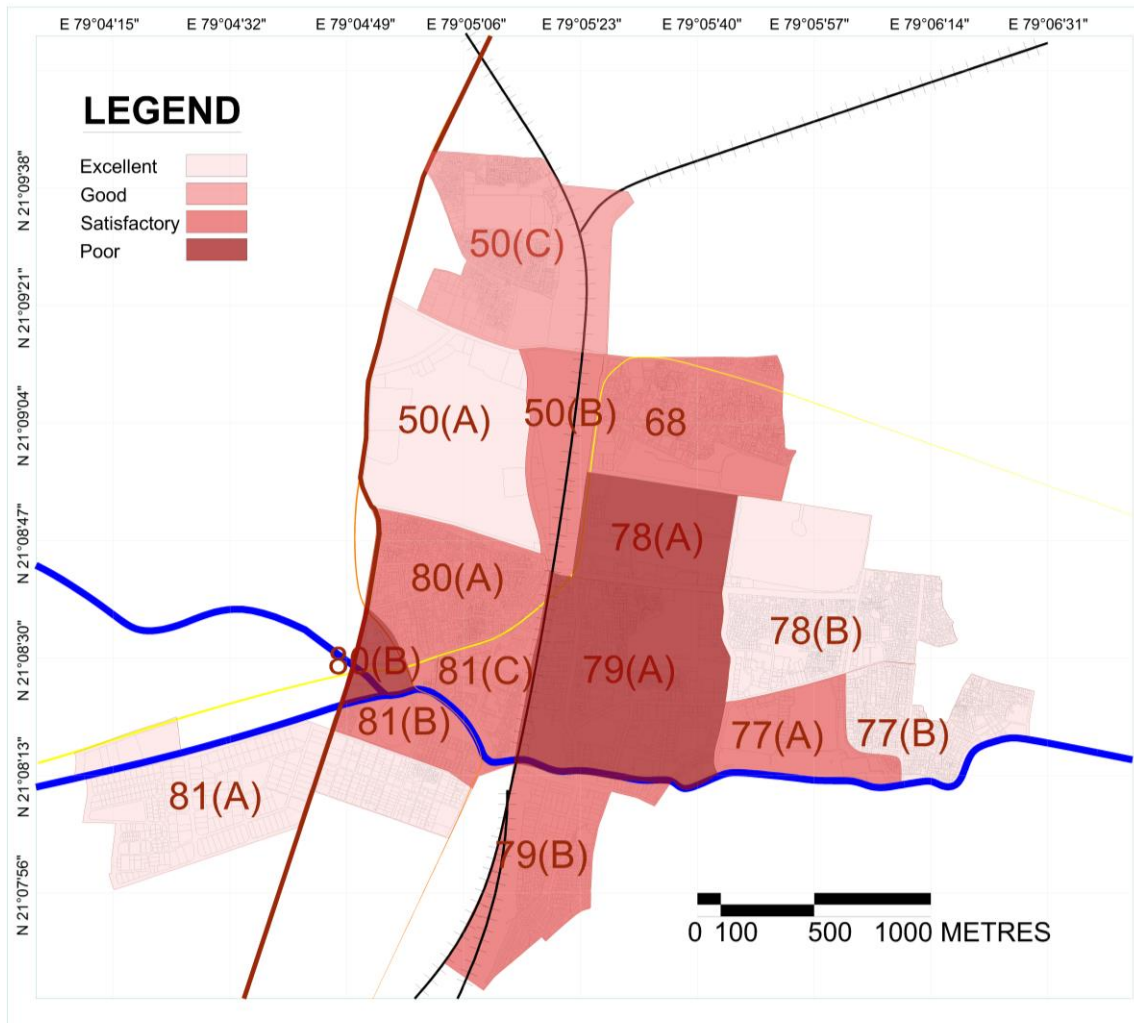


Figure 38 physical infrastructure: Land use effectiveness

7.3.3 Physical Parameter: Quality of Built form

- Factors: The factors responsible in deciding the criticality of this sub-parameters are
 - a) % of population living in slums.

b) Age of buildings.

- Range of criticality: The range and colour coding is decided as

a) 4 = excellent: No slum existing, planned areas.

b) 3 = good: No slum but organic areas.

c) 2 = satisfactory: Small slums and organic areas.

d) 1 = poor: Large slums and organic areas.

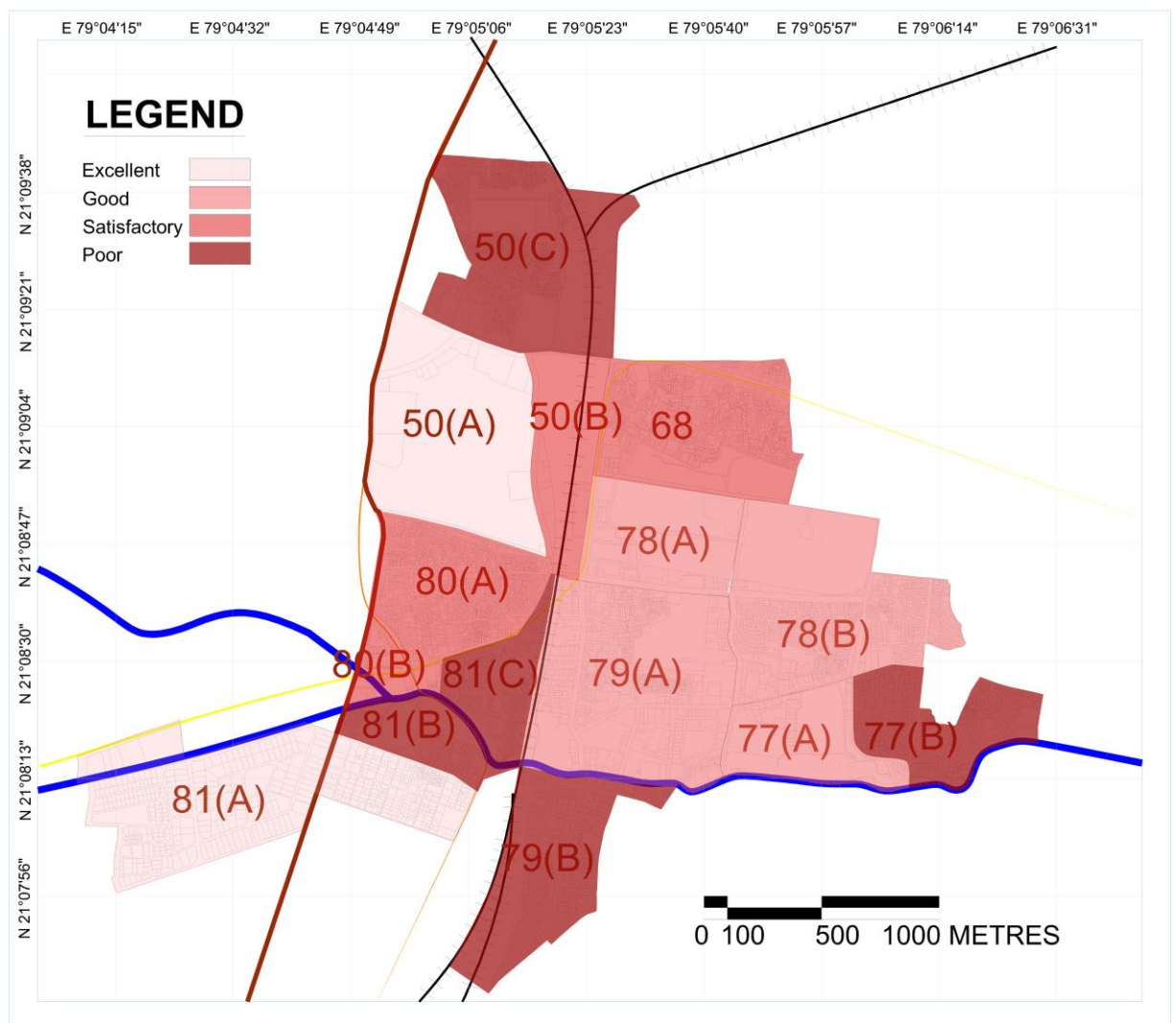


Figure 39 Physical parameters: Quality of built form

7.3.4 Physical Parameter: Congestion

- Factors: The factors responsible in deciding the criticality of this sub-parameters are
 - a) Congested squares.
 - b) Congested roads for vehicles and pedestrians.
 - c) Parking situations.
- Range of criticality: The range and colour coding is decided as
 - a) 4 = Excellent: Free flow traffic and pedestrian conditions, parking available.
 - b) 3 = Good: Satisfactory conditions.
 - c) 2 = Satisfactory: Constrained conditions.
 - d) 1 = Poor: Very congested for vehicles and pedestrians, no parking.

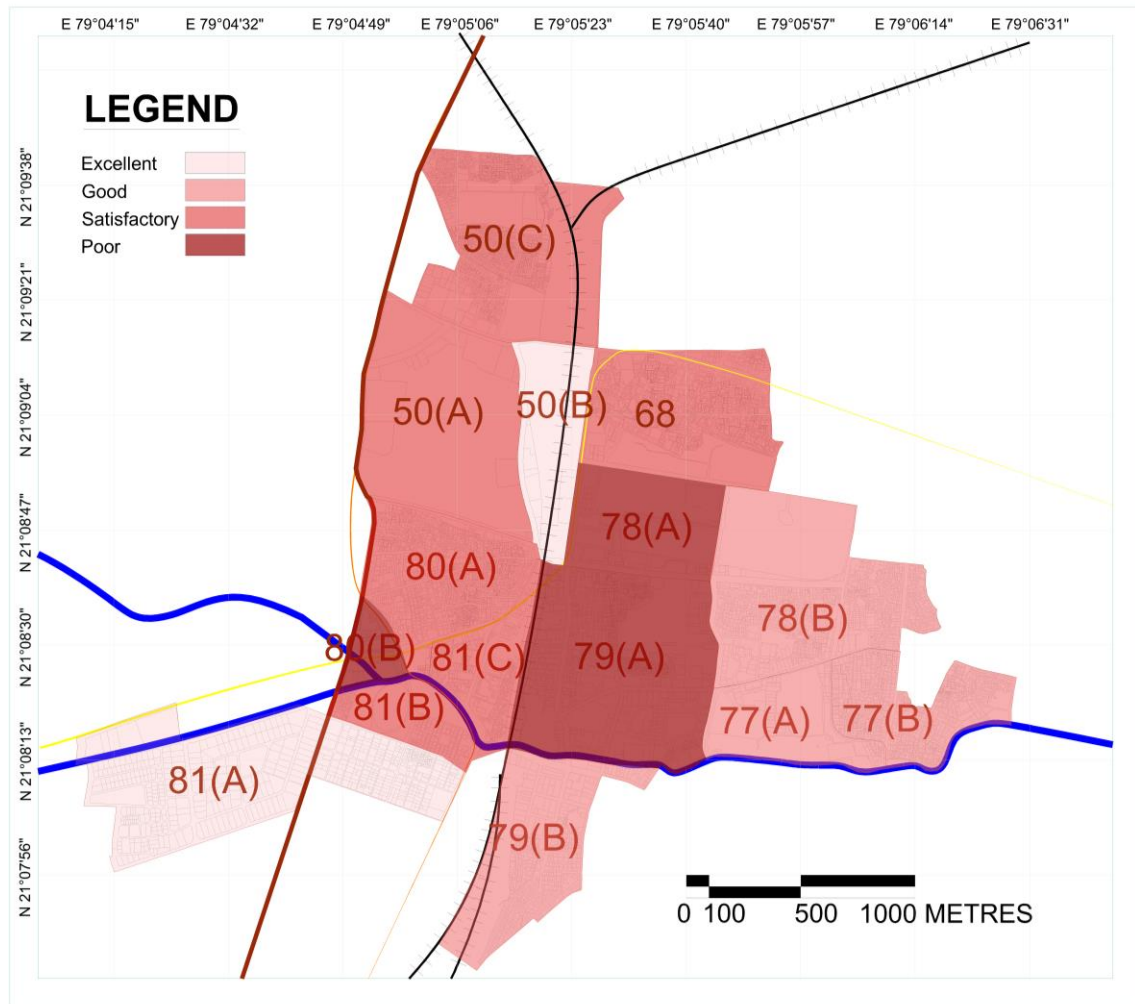


Figure 40 Physical parameters: Congestion

7.3.5 Environmental Parameter: Disaster resilience

- Factors: The factors responsible in deciding the criticality of this sub-parameters are
 - a) Flood prone areas.
 - b) Fire prone areas.
 - c) Accident prone spots.
- Range of criticality: The range and colour coding is decided as
 - a) 4 = Excellent: Resistant with low cases.

- b) 3 = Good: Low risk zones.
- c) 2 = Satisfactory: Moderately risky.
- d) 1 = Poor: Highly risky with many accidents.

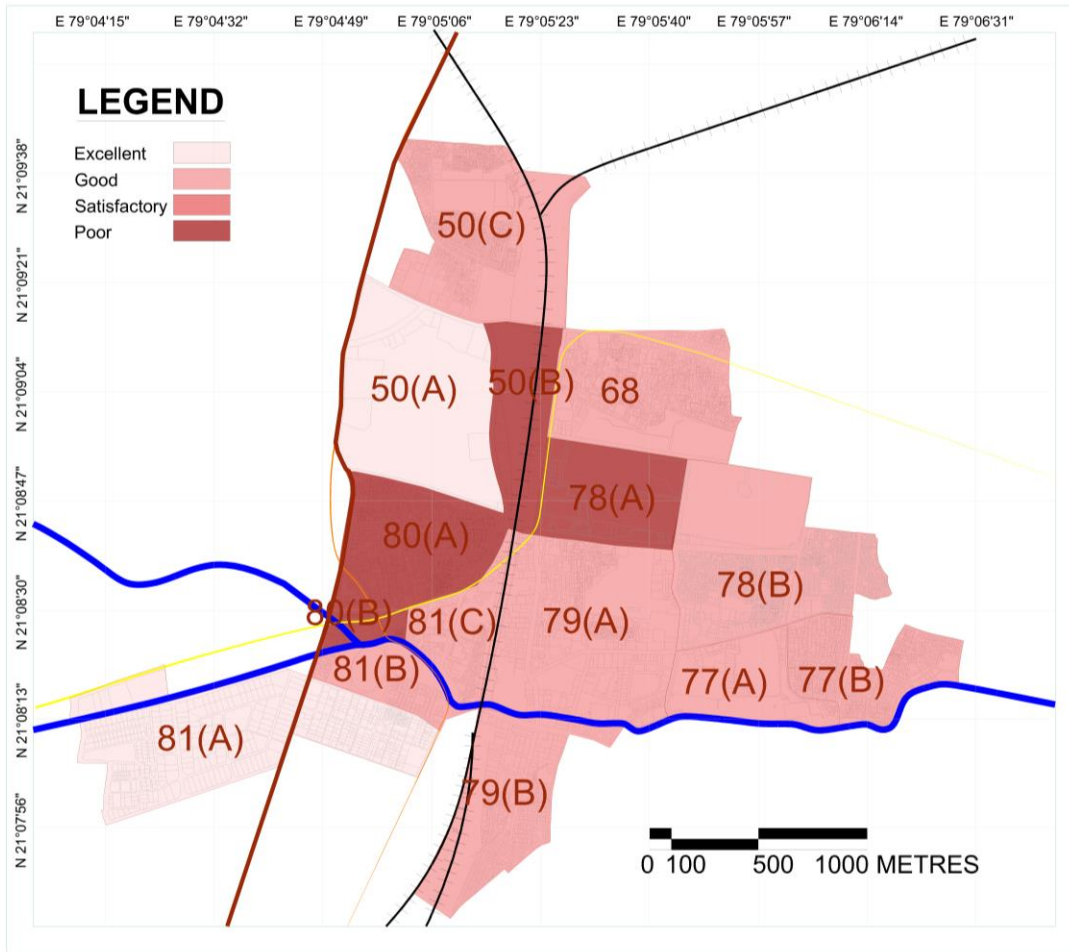


Figure 41 Environmental Parameter: Disaster Resilience

7.3.6 Environmental Parameter: Atmospheric quality

- Factors: The factors responsible in deciding the criticality of this sub-parameters are
 - a) Air, water, soil, noise Polluting activity.
- Range of criticality: The range and colour coding is decided as
 - a) 4 = Excellent: Clean with no pollution.

- b) 3 = Good: At least 1 type of pollution.
- c) 2 = Satisfactory: Some pollution.
- d) 1 = Poor: Many types of pollution.

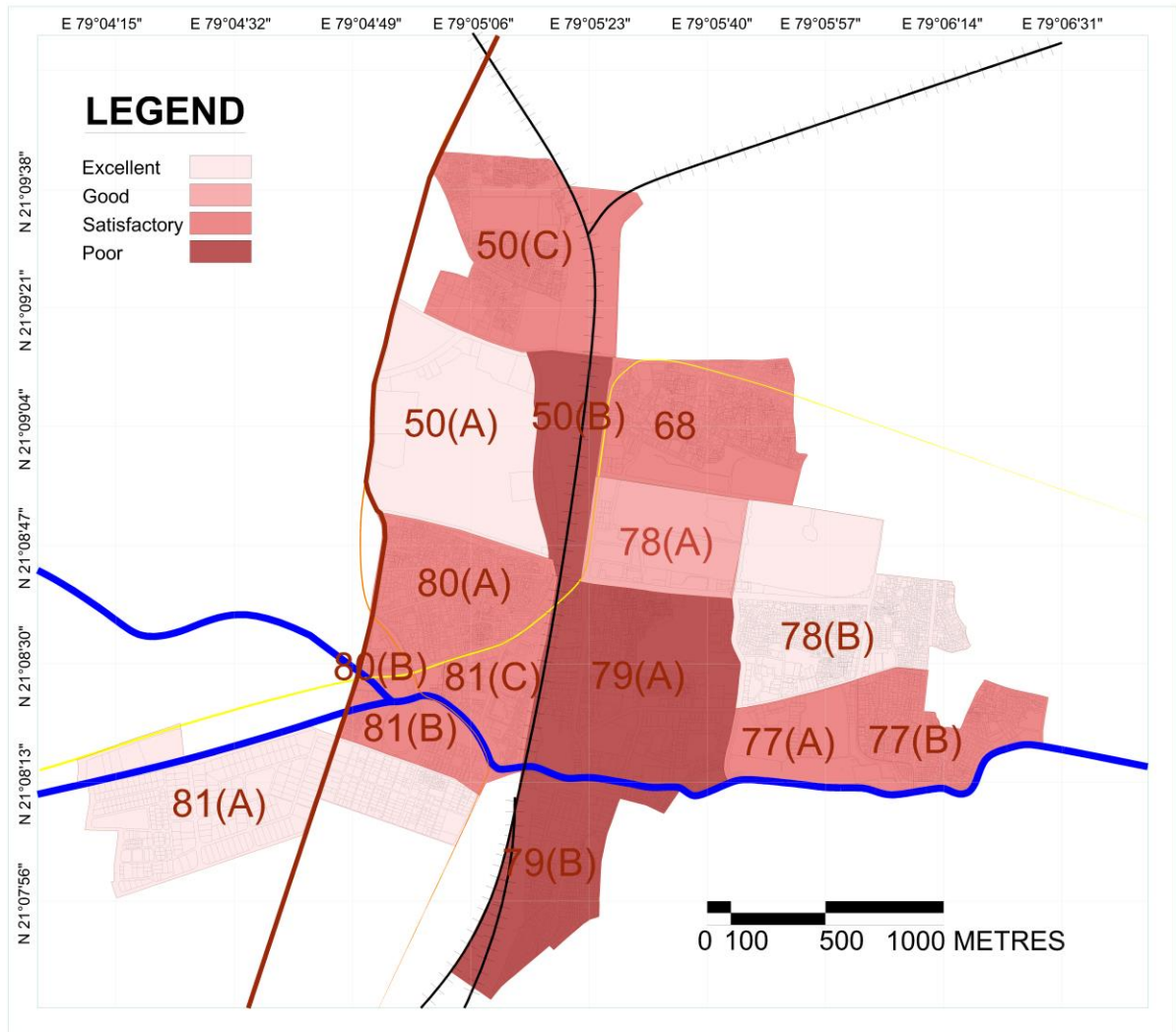


Figure 42 Environmental parameter: Atmospheric Quality

7.3.7 Socio-cultural Parameter: Place making and social cohesion requirement

- Factors: The factors responsible in deciding the criticality of this sub-parameters are
 - a) Community spaces needed.
 - b) Walkability and connectivity missing.

- Range of criticality: The range and colour coding is decided as
 - a) 4 = excellent: Open, interconnected, congregational, and clearly understood.
 - b) 3 = good: Above average.
 - c) 2 = satisfactory: satisfactory.
 - d) 1 = poor: Congested, closed, confusing and chaotic.

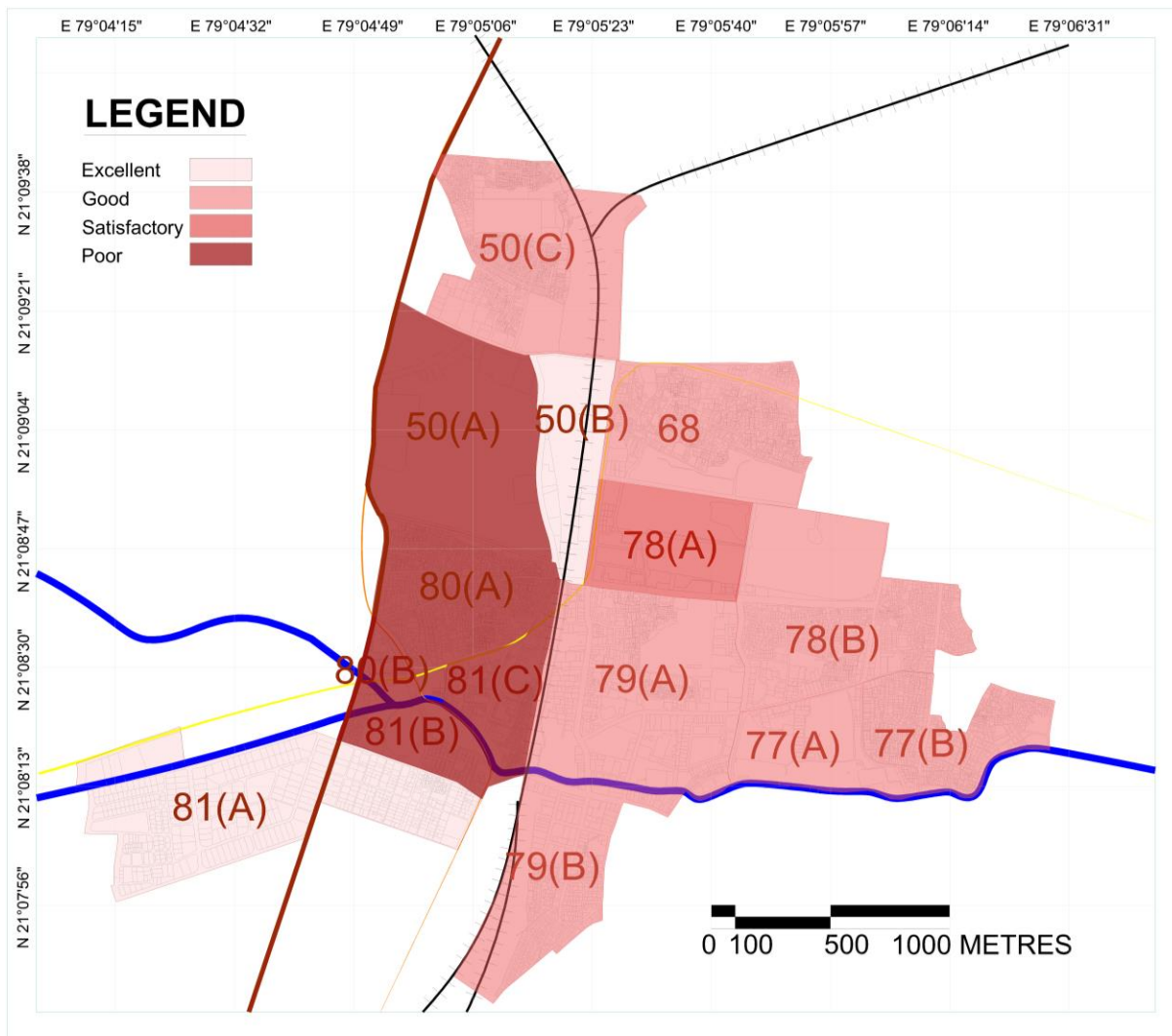


Figure 43 Socio-cultural Parameter: Place making and social cohesion requirement

7.3.8 Socio-cultural Parameter: Safety and security

- Factors: The factors responsible in deciding the criticality of this sub-parameters are
 - a) Pedestrian movements.
 - b) Illumination.
- Range of criticality: The range and colour coding is decided as
 - a) 4 = Excellent: Many.
 - b) 3 = Good: Few.
 - c) 2 = Satisfactory: Some and dying
 - d) 1 = Poor: None and perished.

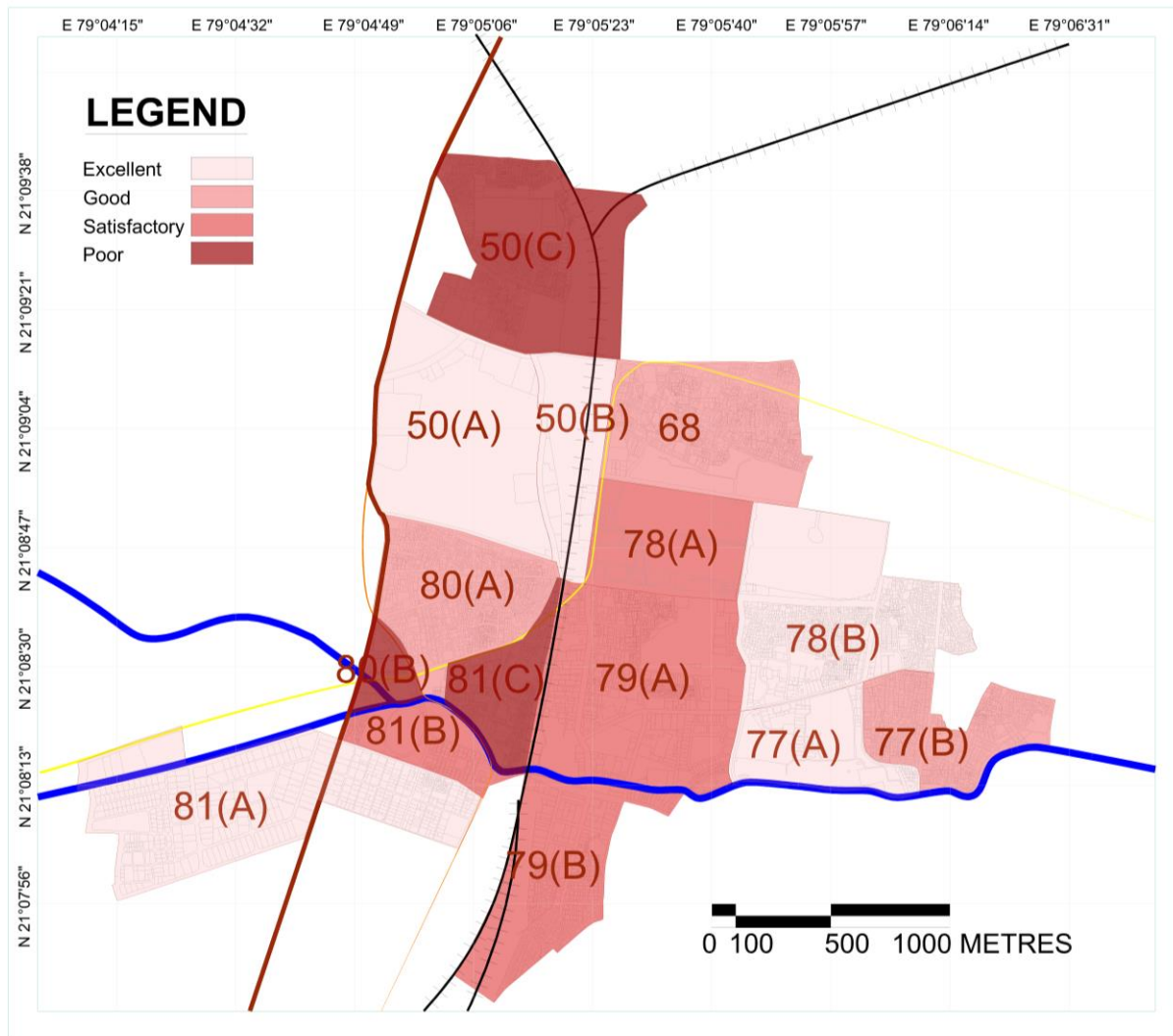


Figure 44 Socio-cultural Parameter: Safety and security

7.3.9 Economic Parameter: Informality

- Factors: The factors responsible in deciding the criticality of this sub-parameters are
 - a) Number of informal shops.
 - b) Number of weekly markets.
- Range of criticality: The range and colour coding is decided as
 - a) 4 = Excellent: Very low informality, permanent shops.

- b) 3 = Good: Low informality with registered shops and inviting atmosphere.
- c) 2 = Satisfactory: Very informal creating hindrances.
- d) 1 = Poor: Extremely informal with almost no pedestrian movement.

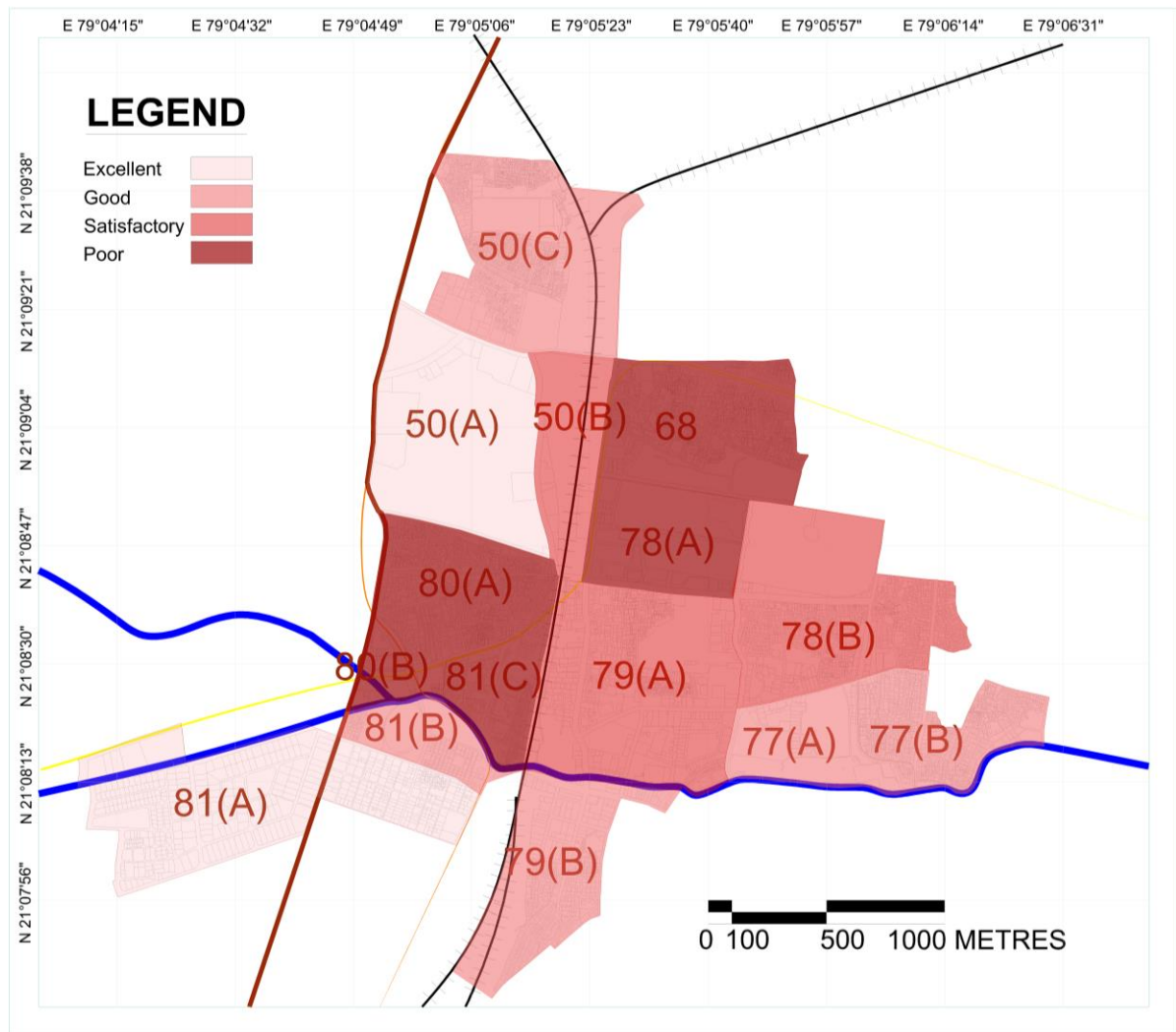


Figure 45 Economic Parameter: Informality

7.3.10 Economic Parameter: Livelihood dependency

- Factors: The factors responsible in deciding the criticality of this sub-parameters are
 - a) Work at home.
 - b) Rooted livelihood.

- Range of criticality: The range and colour coding is decided as
 - a) 4 = Excellent: Few people are affected in terms of livelihood by changes.
 - b) 3 = Good: Considerable people.
 - c) 2 = Satisfactory: High number of people.
 - d) 1 = Poor: Very high number of people.

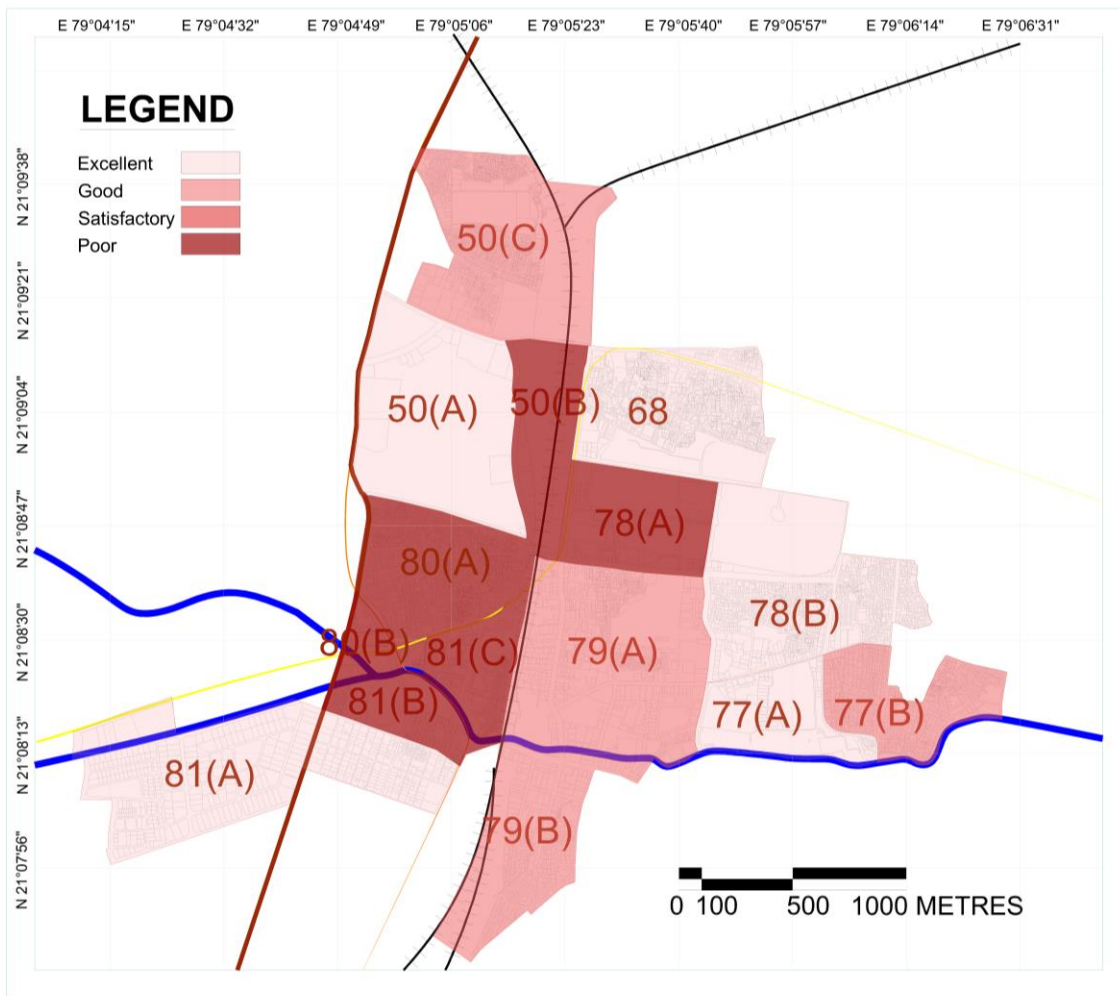


Figure 46 Economic Parameter: Livelihood dependency

7.3.11 Social infrastructure

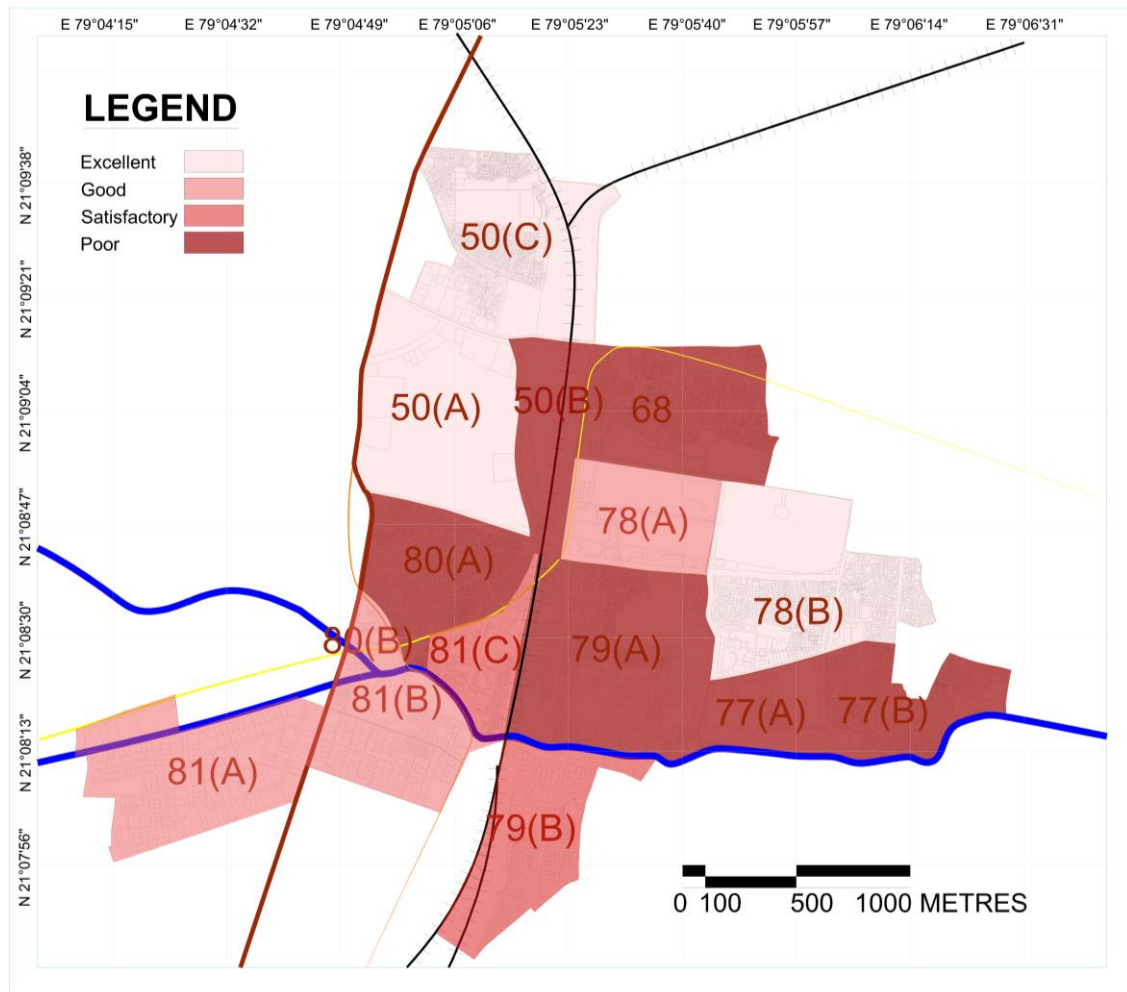


Figure 47 Social infrastructure

7.4 Weighing of Sub-Parameters

In general conditions, an area has multitudes of problems which overlap one over another to lead to a state of decay. These problems differ from one another and some are more critical than the others. It is important to understand that the most critical problems are attacked first while less critical problems are either integrated later or as a sub-set. With the help of literature review and expert opinion, a brief idea is achieved which helps in understanding the most important criteria of urban renewal. From the zoning part above, we can also see what contextual situation has to say. An average of weightage these problems

can be done as they have been compared under similar situations.

Sub-parameter	Zones															Total score	contextual weightage
	50 (A)	50 (B)	50 (C)	68	77 (A)	77 (B)	78 (A)	78 (B)	79 (A)	79 (B)	80 (A)	80 (B)	81 (A)	81 (B)	81 (C)		
Physical infrastructure	1	3	4	2	4	4	3	3	2	3	2	2	1	4	2	40	4
Land-use Effectiveness	1	3	2	3	3	1	4	1	4	3	3	4	1	3	3	39	2
Quality of Built form	1	3	4	3	2	4	2	2	2	4	3	3	1	4	4	42	5
Congestion	3	1	3	3	2	2	4	2	4	2	3	4	1	3	3	40	3
Disaster resilience	1	4	2	2	2	2	4	2	2	2	4	4	1	2	2	36	1
Atmospheric quality	1	4	3	3	3	3	2	1	4	4	3	3	1	3	3	41	4
Placemaking and social cohesion	4	1	2	2	2	2	2	2	4	2	2	4	4	1	4	40	3
Safety and security	1	1	4	2	1	2	3	1	3	3	2	4	1	3	4	35	1
Social Infrastructure	1	4	1	4	4	4	2	1	4	3	4	2	2	2	3	41	4
Informality	1	3	3	4	2	2	4	3	3	2	4	4	1	2	4	42	5
Livelihood dependency	1	4	2	1	1	2	4	1	2	2	4	4	1	4	4	37	2

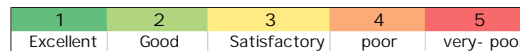


Figure 48 Contextual Weightage

Weightage		Expert opinion						Expert average
Parameter	sub-Parameter							
Physical	Physical infrastructure	1	4	5	5	5	5	4
	Land-use Effectiveness	4	3	4	5	5	5	4.2
	Quality of Built form	2	1	3	5	2	2	2.6
Environmental	Congestion	5	2	5	5	4	4	4.2
	Disaster resilience	1	4	5	4	5	5	3.8
	Atmospheric quality	1	2	5	5	2	2	3
Socio –cultural	Placemaking and social cohesion	1	3	3	5	5	5	3.4
	Safety and security	1	1	3	5	5	5	3
	Social Infrastructure	1	4	5	5	5	5	4
Economic	Informality	5	2	3	3	5	5	3.6
	Livelihood dependency	5	3	3	4	3	3	3.6

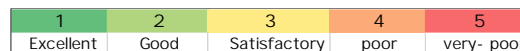


Figure 49 Expert Average

Expert average	Literature review	Contextual weightage	Total average	Weightage points
4	4	4	4	5
4.2	5	2	3.85	5
2.6	3	5	3.3	4
4.2	2	3	3.35	2
3.8	1	1	2.4	1
3	3	4	3.25	2
3.4	4	3	3.45	3
3	1	1	2	1
4	4	4	4	5
3.6	2	5	3.55	4
3.6	5	2	3.55	4

1	2	3	4	5
Excellent	Good	Satisfactory	poor	very- poor

Figure 50 Cumulative Weightage

7.5 Critical zoning mapping and decution

Based on the above table and calculation we have understood which sub-parameters are most critical. With the help weightage method, we can now find which zones are having worst conditions on an overall comprehensive scale.

Parameter	Sub-parameter	Zones															Weightage
		50 (A)	50 (B)	50 (C)	68	77 (A)	77 (B)	78 (A)	78 (B)	79 (A)	79 (B)	80 (A)	80 (B)	81 (A)	81 (B)	81 (C)	
Physical	Physical infrastructure	5	15	20	10	20	20	15	15	10	15	10	10	5	20	10	5
	Land-use Effectiveness	5	15	10	15	15	5	20	5	20	15	15	20	5	15	15	5
	Quality of Built form	4	12	16	12	8	16	8	8	8	16	12	12	4	16	16	4
	Congestion	6	2	6	6	4	4	8	4	8	4	6	8	2	6	6	2
Environmental	Disaster resilience	1	4	2	2	2	2	4	2	2	2	4	4	1	2	2	1
	Atmospheric quality	2	8	6	6	6	6	4	2	8	8	6	6	2	6	6	2
Socio-cultural	Placemaking and social cohesion	12	3	6	6	6	6	6	12	6	6	12	12	3	12	12	3
	Safety and security	1	1	4	2	1	2	3	1	3	3	2	4	1	3	4	1
	Social Infrastructure	5	20	5	20	20	20	10	5	20	15	20	10	10	10	15	5
Economic	Informality	4	12	12	16	8	8	16	12	12	8	16	16	4	8	16	4
	Livelihood dependency	4	16	8	4	4	8	16	4	8	8	16	16	4	16	16	4
Total weighted score		49	108	95	99	94	97	110	70	105	100	119	118	41	114	118	95.8

1	2	3	4	5
Excellent	Good	Satisfactory	poor	very- poor

Figure 51 Critical Zones

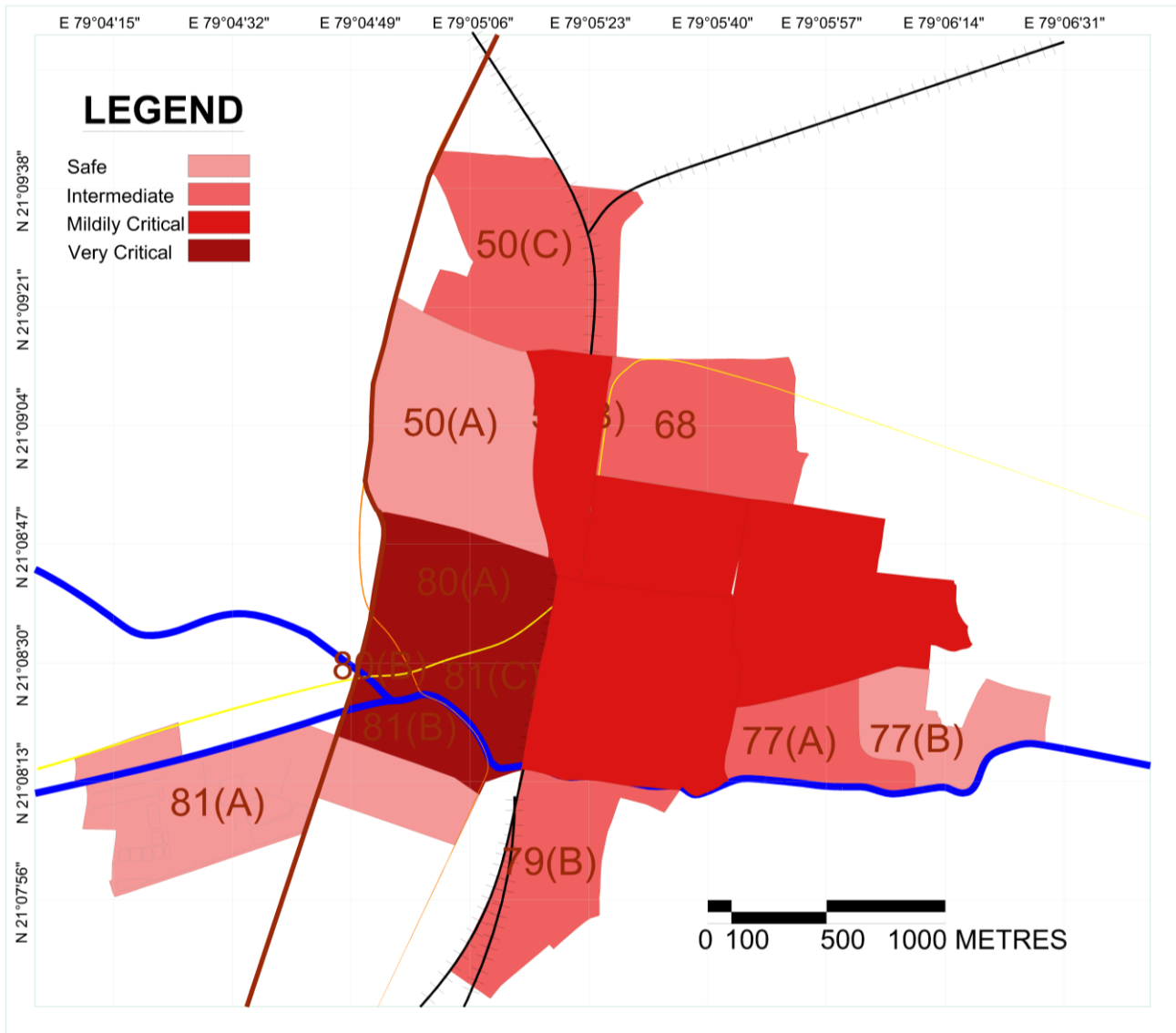


Figure 52 Cumulative Criticality Mapping

8. RECOMMENDATIONS

We have understood how each parameter is performing and what are its areas of concerns along with the factors leading to those concerns. At the same time we have listed how these sub-parameters are weighted to bring about a cumulative situation for each zones. Now we know which the sub-parameters are requiring most attention while which areas spatially needs most attention as well. However it's worth noting that none of the sub-parameters can be treated individually as seen in literature review. Thereby it is to be understood how each sub-parameter interacts with other one and how they are inter-related. This helps in making a more comprehensive effort while suggesting the recommendations. The inter-relationship of sub-parameters are as follows:

8.1 Integrated approach

From literatures, personal experience and case studies a basic idea of relationship between sub-parameters is documented. These relations should be exploited so that the causal-effect relationship can be foreseen and recommendations become considerate and comprehensive. Various relations and their understanding are as follows:

1. Physical infrastructure - Built form

The old built form should be retrofitted with missing physical infrastructure while the new ones should be designed with consideration of sustainability and future needs so that it doesn't become obsolete in the future.

2. Physical Infrastructure - Land use effectiveness

The land use effectiveness is directly related to status of physical infrastructure as it caters to the need of land use.

3. Physical Infrastructure - Congestion

Increased congestion puts excessive load on Infrastructure, therefore congestion level must be maintained according to the infrastructure status.

4. Physical Infrastructure - Informality

Increased informality above a certain level can choke physical infrastructure and lead to chaotic situation. Either the informality should be regulated or physical infrastructure be updated according to it.

5. Physical Infrastructure - Livelihood

Livelihood often leads to floating population which the physical infrastructure has to cater and thus are inter-related and must be maintained.

6. Physical Infrastructure - Atmospheric quality

Proper functioning and maintenance of physical infrastructure within the acceptable load ensures proper atmospheric quality.

7. Physical Infrastructure - Disaster resilience

The coping power of the city or area to disasters largely depend on factored load and condition of physical infrastructure and thus it has to be taken into consideration through standards and design.

8. Physical Infrastructure - Identity and Place making along with community involvement and public satisfaction

Identity and place making can only come into effect once the basic physical infrastructure are covered and people are healthy and have proper access to basic services.

9. Physical Infrastructure - Safety/ Security and Social inclusion

Sound infrastructure creates the first line of defence for safety of the citizens.

10. Physical Infrastructure - Social infrastructure

Social and physical infrastructure complement each other with happiness and ease.

11. Built form - Land use Effectiveness

Proper land use zoning and regulations along with its execution defines the status of built

form and compatibility.

12. Built form - Congestion

Better the status of Built form, easier to regulate congestion conditions.

13. Built form - Informality

Informality puts direct stress on the built form of the area and is often the driving factor for its identity as well as depreciation.

14. Built form - Livelihood

Status of livelihood affects the built form conditions of the area. Poorer the livelihood, more chances of inferior and unmaintained built form and slum development.

15. Built form - Atmospheric quality

As the built form deteriorates, the atmospheric quality reduces and becomes unhealthy for the occupants.

16. Built form - Disaster resilience

Poorer the built form, more chances of disaster to occur like fire, collapse, etc. leading to loss of life and assets.

17. Built form - Identity and Place making along with community involvement and public satisfaction

Although built form can be deciding factor for the identity of place, the living satisfaction is reduces with its deterioration.

18. Built form - Safety/ Security and Social inclusion

Congested, poor built form gives an aura of risk and social anxiety.

19. Built form - Social infrastructure

Social infrastructure can only be efficient when the built form is in good conditions, or it becomes a refuge.

20. Land use effectiveness - congestion

Compatible land use and regulations helps in reduction of congestion arising due to improper activity mixing.

21. Land use effectiveness - Informality

Informality leads to disruption of land use effectiveness and regulations above a certain point, unless thought of.

22. Land use effectiveness - Livelihood

Land use effectiveness helps spurting the growth of livelihood when properly planned.

23. Land use effectiveness - Atmospheric quality

Only of the guiding factors in a city for atmospheric quality is the land use effectiveness as it represents compatible uses and placements of activities.

24. Land use effectiveness - Disaster resilience

Land use effectiveness is a passive factor for reducing disasters by avoiding incompatible land uses.

25. Land use effectiveness - Identity and Place making along with community involvement and public satisfaction

Properly planned and executed land use helps in creating a identity by avoiding intermingling of unwanted factors.

26. Land use effectiveness - Safety/ Security and Social inclusion

Proper zoning and land use helps differ non-conforming land uses together and thereby automatically increasing security passively.

27. Land use effectiveness - Social infrastructure

Proper delineation of land uses help in cost reduction as well as placement of social infrastructure to cater to most people and bring social cohesion.

28. Congestion - Informality

Informality is one of the root causes of congestion from aspects of customers and the shopkeepers.

29. Congestion - Livelihood

Livelihood can prosper in congested areas, but in the end it helps in increasing it and thereby creating ruckus.

30. Congestion - Atmospheric quality

More the congestion, poorer the atmospheric quality. To improve atmospheric quality, congestion reduction plays one of the passive roles.

31. Congestion - Disaster resilience

Congested areas become highly prone to disaster and at the same time reduce the capability of disaster response.

32. Congestion - Identity and Place making along with community involvement and public satisfaction

Congestion leads to public dissatisfaction and also leads to negative impacts on factors of identity and place making.

33. Congestion - Safety/ Security and Social inclusion

Congestion becomes a prime factor for the encroachment of safety and security as it becomes difficult to regulate and surveillance.

34. Congestion - Social infrastructure

Social infrastructure takes a toll due to congestion and becomes inadequate and inaccessible if congestion is increased.

35. Informality - Livelihood

Informality is a disguised livelihood due to its fluctuating nature and unstable dependency.

36. Informality - Atmospheric quality

Informality leads to reduction in atmospheric quality and thus physical and mental conditions.

37. Informality - Disaster resilience

Informal sector cannot be considered in disaster preparedness and response as it's never accounted for.

38. Informality - Identity and Place making along with community involvement and public satisfaction

Informality forms identity factor for many places and thus has to be regulated if not uprooted to maintain the identity.

39. Informality - Safety/ Security and Social inclusion

Although it gives social inclusion to almost anybody, it is also therefore cause of reduced safety and increased crimes and disputes.

40. Informality - Social infrastructure

Social infrastructure is often encroached by informality or at least is attracted by it due to higher people's footfall.

41. Livelihood - Atmospheric quality

Livelihood ensures advancements and thereby reduces pollution and atmospheric quality degradation by traditional backward techniques like open defecation and fuel wood usage.

42. Livelihood - Disaster resilience

People with no livelihood are more prone to disaster due to poor living conditions.

43. Livelihood - Identity and Place making along with community involvement and public satisfaction

Livelihood of people can be determining factor in identity of a place and for public's internal satisfaction.

44. Livelihood - Safety/ Security and Social inclusion

People feel secure and socially included only when they have livelihood and their families are provided for.

45. Livelihood - Social infrastructure

Properly maintained and used social infrastructure hints at proper livelihood and at the same time it should positively reinforce it.

46. Atmospheric quality - Disaster resilience

Disasters, especially man-made have poor and neglected atmospheric quality as one of the root causes.

47. Atmospheric quality - Identity and Place making along with community involvement and public satisfaction

Identity of a place can remain only when it has good atmosphere for people to enjoy and be satisfied.

48. Atmospheric quality - Safety/ Security and Social inclusion

Sense of security is higher in atmospherically sound areas.

49. Atmospheric quality - Social infrastructure

Social infrastructure's existence and maintenance should be a complimentary factor helping to improve and maintain atmospheric quality.

50. Disaster resilience - Identity and Place making along with community involvement and public satisfaction

Identity of a place and its people is worth keeping only when it's safe and doesn't get lost due to disasters over the years.

51. Disaster resilience - Safety/ Security and Social inclusion

Safety and security above the individual level is often dependent of the disaster resilience

and leads to peace of mind among the society.

52. Disaster resilience - Social infrastructure

Social infrastructure should cater at the time of disaster.

53. Identity and Place making along with community involvement and public satisfaction - Safety/ Security and Social inclusion

Positive identity at the minimum needs safe and secure environment which can ultimately lead to public satisfaction in rooted context.

54. Identity and Place making along with community involvement and public satisfaction - Social infrastructure

Social infrastructure can define the place by its design and usage and greatly affects the satisfaction of people in the neighbourhood.

55. Safety/ Security and Social inclusion - Social infrastructure

Social infrastructure's design and location greatly defines the sense of security and safety among the users.

Overall integration is as follows:

Table 1 Parameter integration

Parameter	Sub-parameter	Physical	Environmental	Socio-cultural	Economic
Physical	Physical infrastructure status	<ul style="list-style-type: none"> All sub-parameters should compliment each other. Concurrent efforts must be taken due to the concrete consequences. 	<ul style="list-style-type: none"> Sustainable, disaster resilient, Low-carbon footprint and energy consuming built form and infrastructure Land use should be compact and mixed to reduce trips and lesser congestion leading to less energy consumption and pollution 	<ul style="list-style-type: none"> All physical parameters should be through and for the society and changes should lead to better quality of living. Social inclusion must be achieved by creating a sense of place safe for everybody. 	<ul style="list-style-type: none"> The changes should involve and even improve the job opportunities for local population. The character of informality must be preserved in physical manifestations as it is integral part of Indian economy.
	Land-use effectiveness				
	Quality of Built form				
	Congestion				
Environmental	Disaster resilience		<ul style="list-style-type: none"> Two-faceted approach must be taken where the negative impacts are reduced as well as positive modifications are done for safeguarding of rapidly deteriorating environmental conditions. 	<ul style="list-style-type: none"> People are the most important part of the city and their well being should be kept on first priority. 	<ul style="list-style-type: none"> Economic investments should dominate outputs as environmental impacts are irreversible.
	Atmospheric quality				
Socio-cultural	Placemaking and Sense of community			<ul style="list-style-type: none"> All sub-parameters must be enacted through community led decision making. 	<ul style="list-style-type: none"> Economic stability has direct socio-cultural impacts and helps in improving overall standard of life.
	Safety/security and social inclusion				
	Social Infrastructure status				
Economic	Informality				<ul style="list-style-type: none"> The informality and livelihood must be safeguarded so that people can utilise all other factors carefree.
	Livelihood dependency				

8.2 Projects

A variety of projects are taken under different parameters which follow the integration as explained above. The projects are phasing based so that minimum negative impact occurs over the area. A general outline of all projects are given. The spatial manifestation are also illustrated where needed. The projects are mentioned sub-parameter wise.

8.2.1 Physical parameter: Physical Infrastructure status

Projects to improve the physical infrastructure status are as follows:

I. Major collector roads redesign

- PHASE I – Roads with BRT facility for 7 roads ~8.85 kms
- PHASE II – Other roads and pedestrian only bridges of critical zones
- PHASE III – Internal roads with high traffic volumes roads in remaining areas

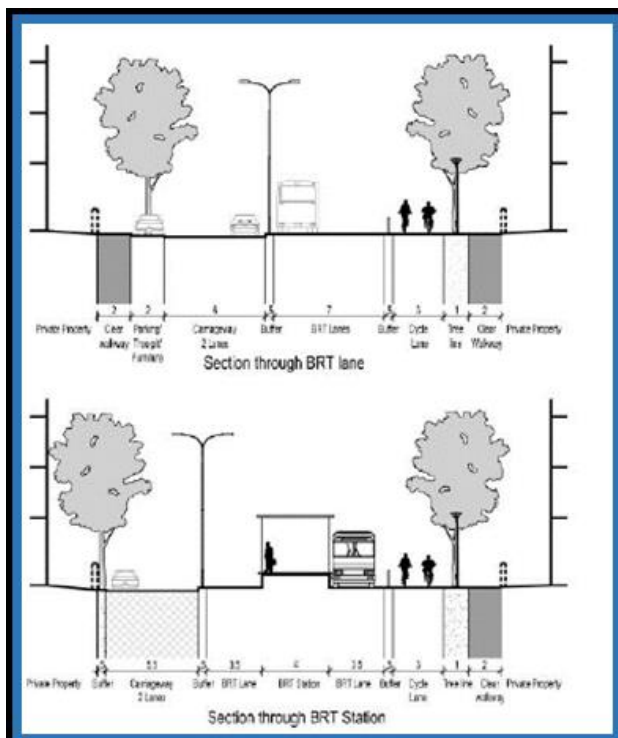


Figure 53 Road design guidelines (Source : Pune smart city and NJ Bicycle and Pedestrian Resource Center)



Figure 54 Sitabuldi main road redesign principles

In this case, a redesign is required that will change the dynamics of the area. The pink parts are the built environment. It is necessary to have local areas bylaws to be strictly followed by building owners. No encroachment or extensions will be allowed. The green areas would be typical hawker and temporary shop zones. This would have informal walking space and shopping space in it. The orange part will be NMT vehicle zone only. This would be run by local government with rented vehicles. No parking will be allowed anywhere on the street between 9 am to 9 pm. Same will be the case for loading and unloading.



Figure 55 Internal road considerations

In internal road cases which are totally encroached a minimum road width of 6m would be left as shown by orange colour. An offset from building line would be allowed for informal shops as shown in green colour. These boundaries will not be crossed.

II. Community garbage collection and segregation centres

- PHASE I – Community segregation centres
- PHASE II – Household segregation



Figure 56 before and after pictures (Source: India water portal)

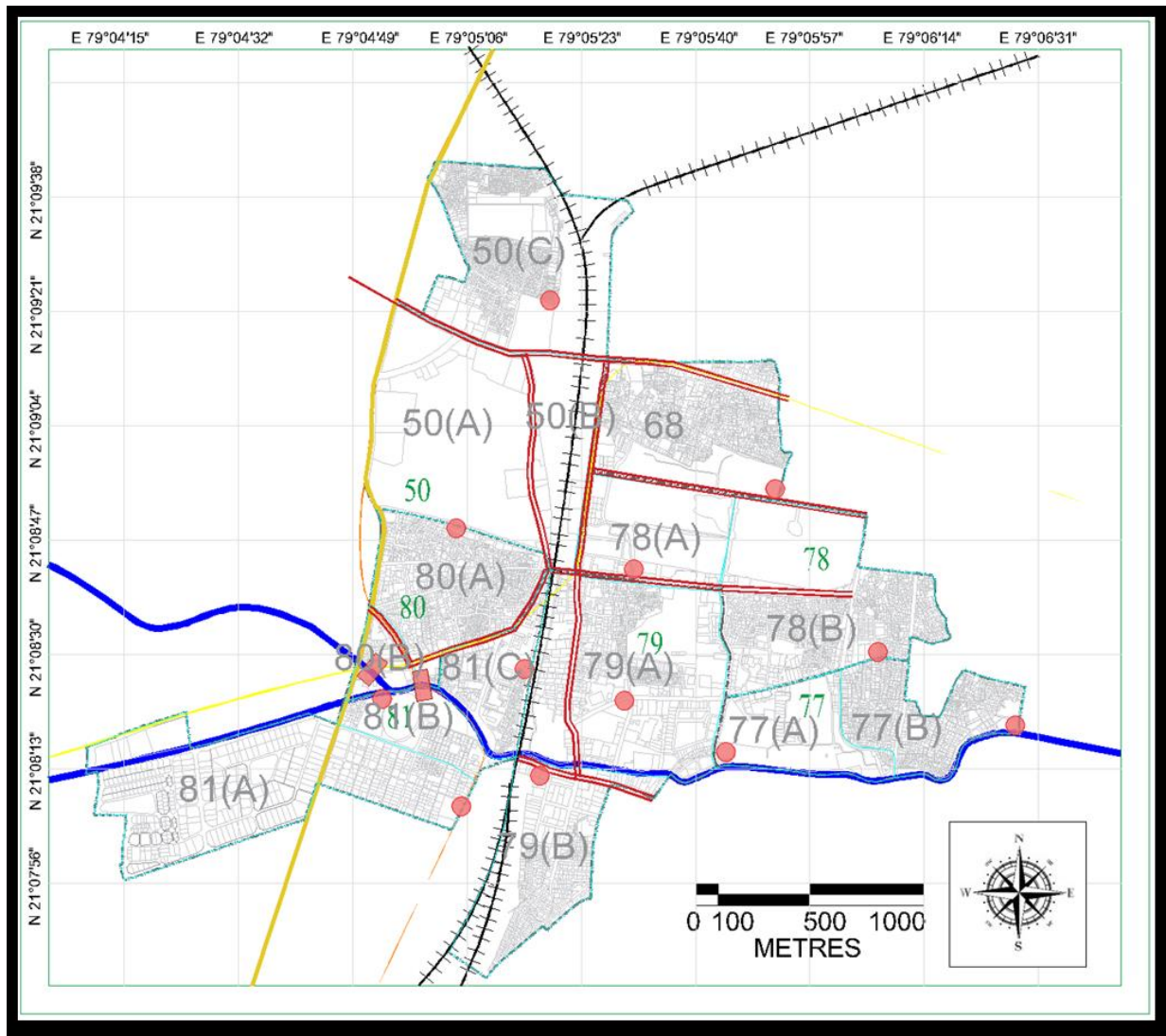


Figure 57 Physical infrastructure project mapping

Note: The construction will occur on Government lands especially ones with existing community bins or dumping sites

8.2.2 Physical parameter: Quality of built form

Projects to improve the Quality of built form are as follows:

I. In-situ and redevelopment of slum

- PHASE I – pop > 3000 + very critical zones
- PHASE II – pop 1000-3000 + very critical zones

- PHASE III – pop <1000 very critical zones + remaining

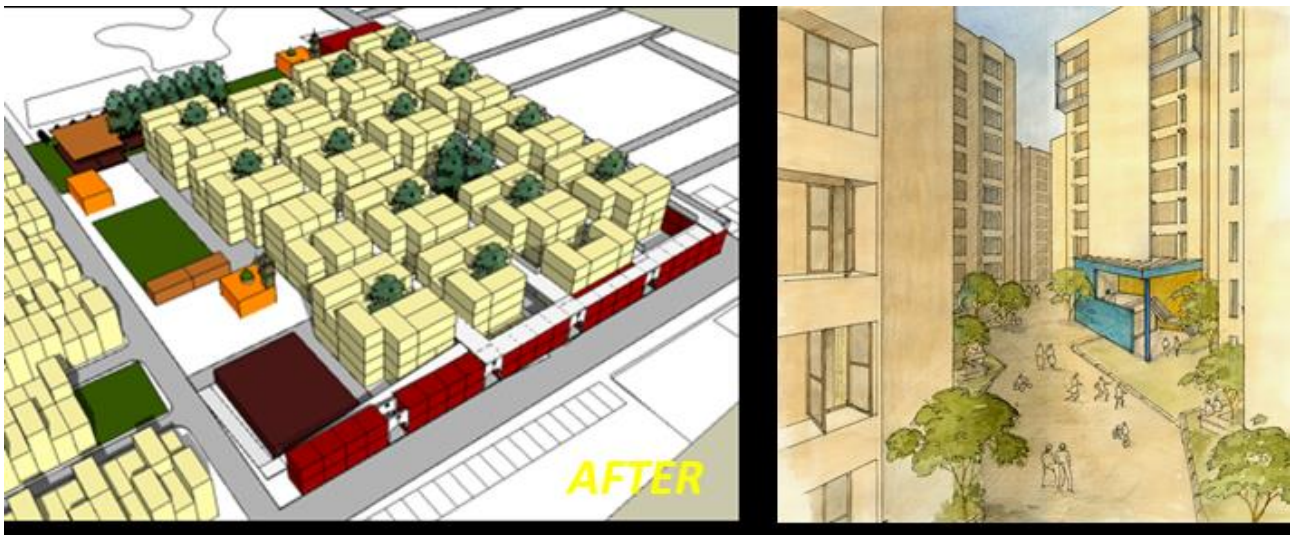


Figure 58 Before and after pictures (Source: Harvard.edu and PK das associates)

Note:

- *MHADA land to have temporary refuge apartments*
- *Daily up-down for people at temporary shelters*
- *Redevelopment with their required needs of social infrastructure*

II. Retrofitting for infrastructure

- I. PHASE I – Very Critical zones
- II. PHASE II – Mildly critical zones

III. PHASE III – Intermediate and safe zones



Figure 59 Before and after pictures (Source: Singapore guide)

Note:

- *Physical Infrastructure*
- *Energy consumption reduction*

III. **Old building reinforcement and conservation**

- PHASE I - Condition assessment of buildings for Repair and upgrading
- PHASE II - Phasing depending on the criticality



Figure 60 Before and after pictures (Source: Dreamstime.com)

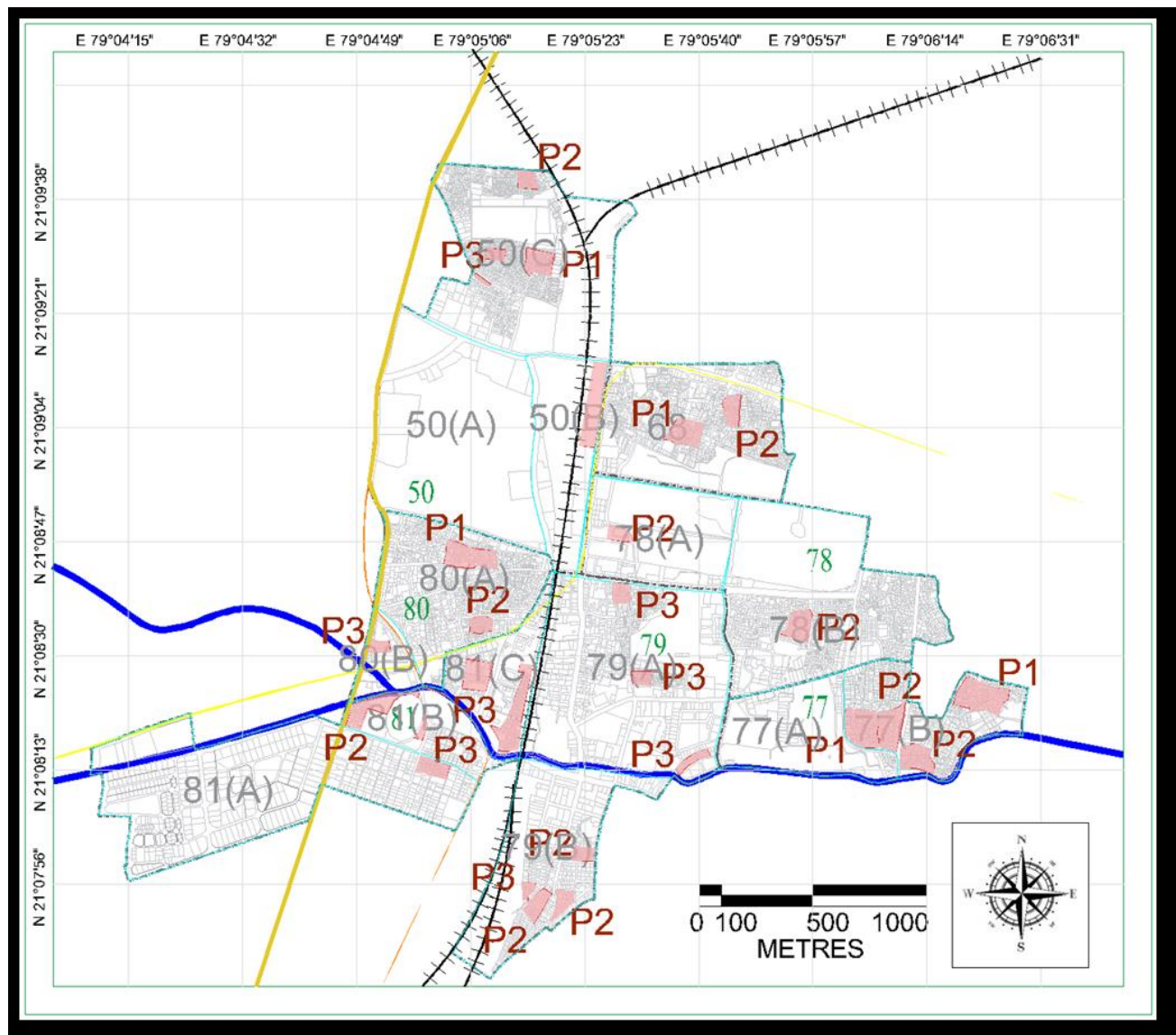


Figure 61 Quality of built form project mapping

8.2.3 Physical parameter: Land-use effectiveness

Projects to improve the Land-use effectiveness are as follows:

I. Land-use change

- PHASE I – Redundant industrial land use change
- PHASE II – Mixed land use provision with regulations



Figure 62 Before and after pictures (Source: Washington Post)

Note:

- *Need and form based changing to other land-use.*
- *Vacant plots inventory and future plans.*

II. TOD zoning and defining

- PHASE I – TOD zoning for under-construction metro stations – 6 zones
- PHASE II – TOD zoning for bus stand and railway station – 5 zones



Figure 63 Before and after pictures (Source: DTAH)

Note:

- *All zones are of 100 m radius except the Sitabuldi metro station which is 500m in accordance with CBD zoning*
- *All these zones have epicentres accompanied with multi-level parking facility, feeder zones and multi -activity 24hrs usage.*

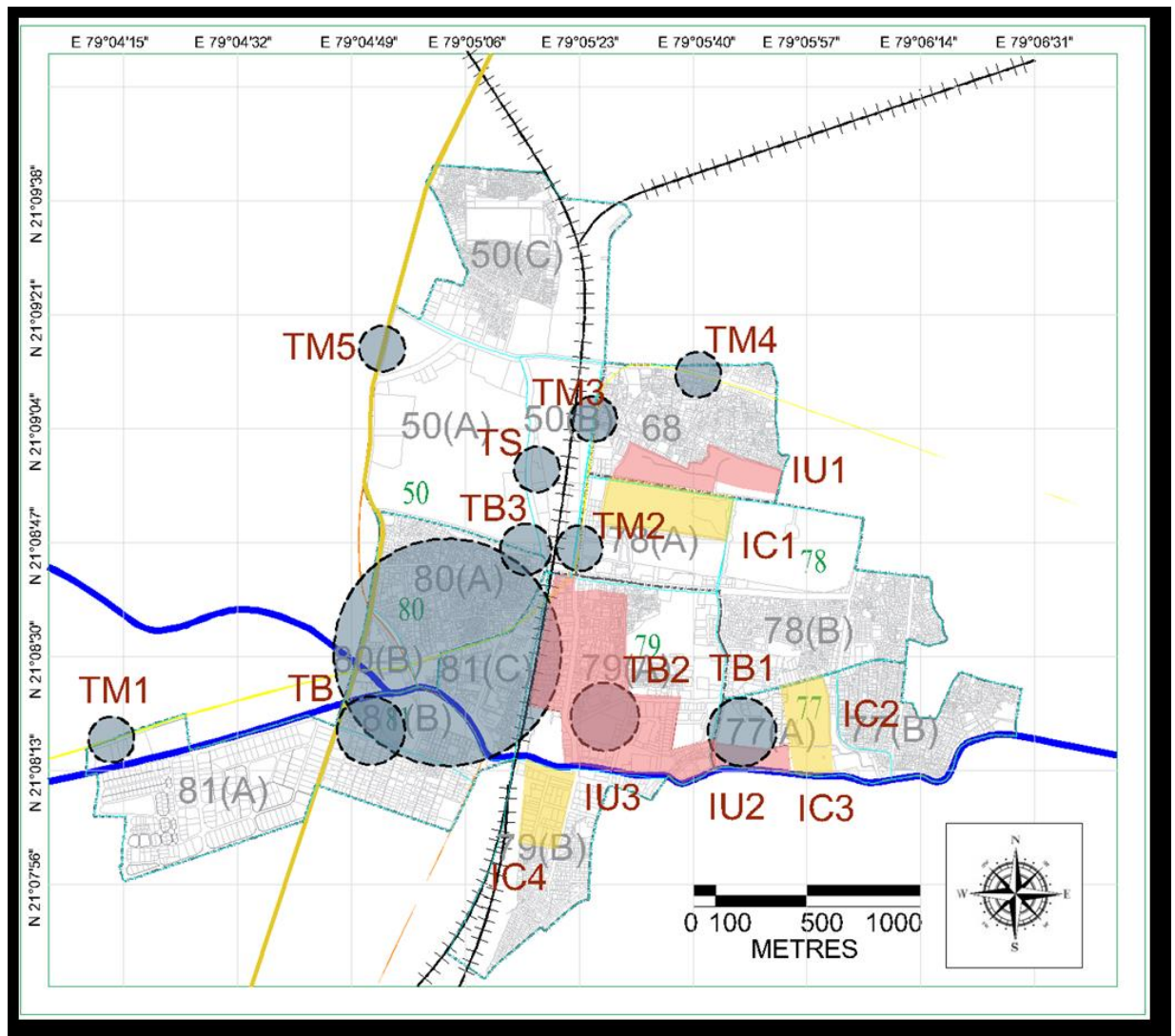


Figure 64 Land-use project mapping

8.2.4 Physical parameter: Congestion

Projects to improve the Congestion are as follows:

- I. **Redesign of squares**
 - I. PHASE I – square redesign with traffic calming and managing techniques for all squares – 7 squares
 - II. PHASE II – sub-ways and over-bridges at critical junctions as in CMP
 - III. PHASE III – sub-ways and over-bridges at all major junctions



Figure 65 Before and after pictures (Source: Dubai metro)

Note:

- Removal of encroachment
- Informal inclusive and safety designs.

II. Street regulations

- I. PHASE I – Segregation of lanes for heterogeneous traffic
- II. PHASE II – one-way road networking



Figure 66 Before and after pictures (Source: Cycling weekly)

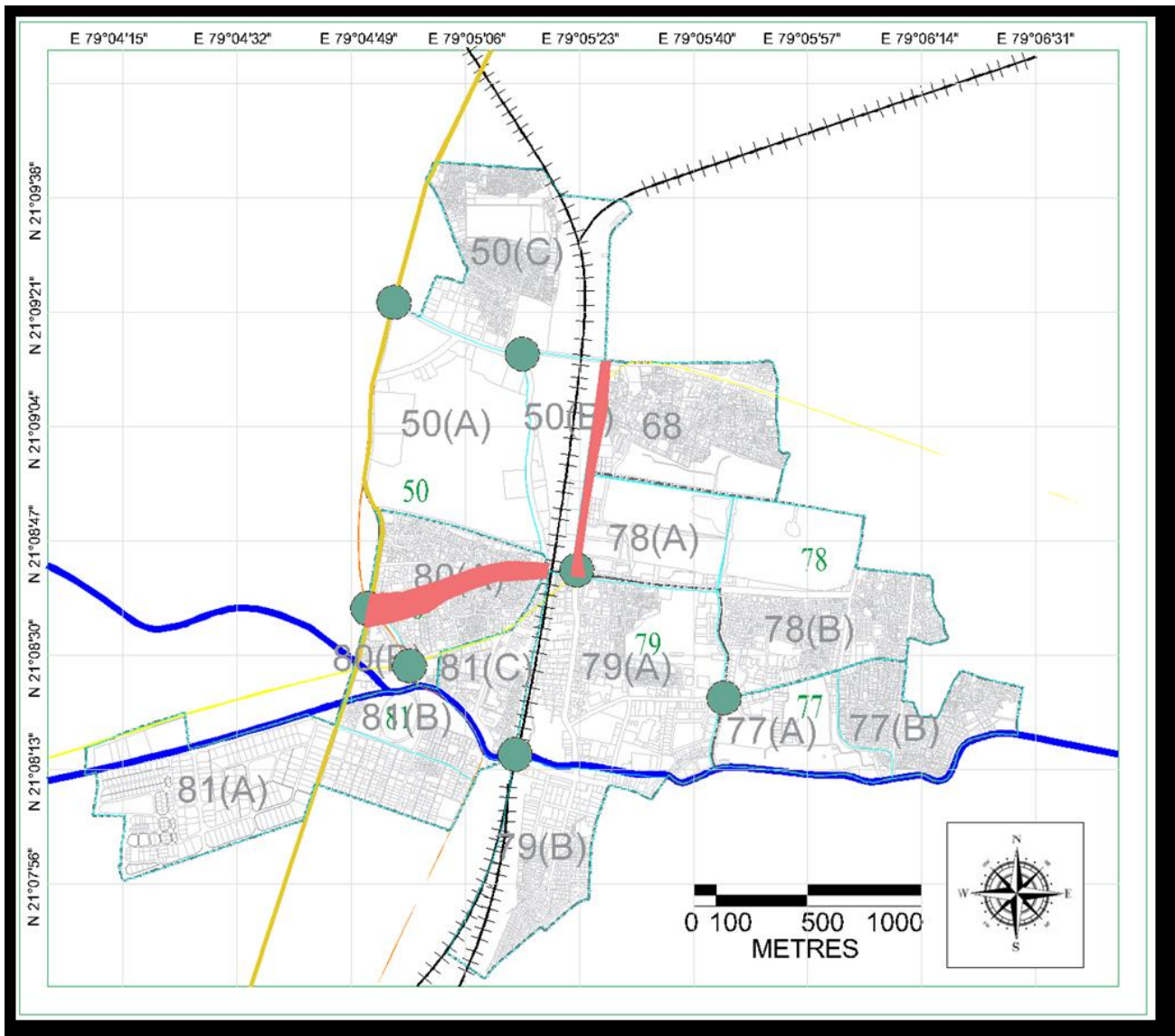


Figure 67 Congestion improvement project mapping

8.2.5 Economic parameter: Livelihood

Projects to improve the Livelihood condition are as follows:

I. Skill development

- PHASE I – Collaboration with NMC for skill development centre in middle of the site
- PHASE II – Vocational training programmes especially for commercial promotion.

Note:

- *Infusion with Fortune foundation and **Employment skill training placement** office in Nagpur*
- *The site chosen is adjacent to Government Industrial Training Institute.*

II. Job creation

- PHASE I – Formal and informal job data collection and journal keeping
- PHASE II – Involvement in Local area plan projects

Note:

Projects needing workforce: Local inclusion for all the workers seeking livelihood in projects of Infrastructure development, construction work, services, etc.

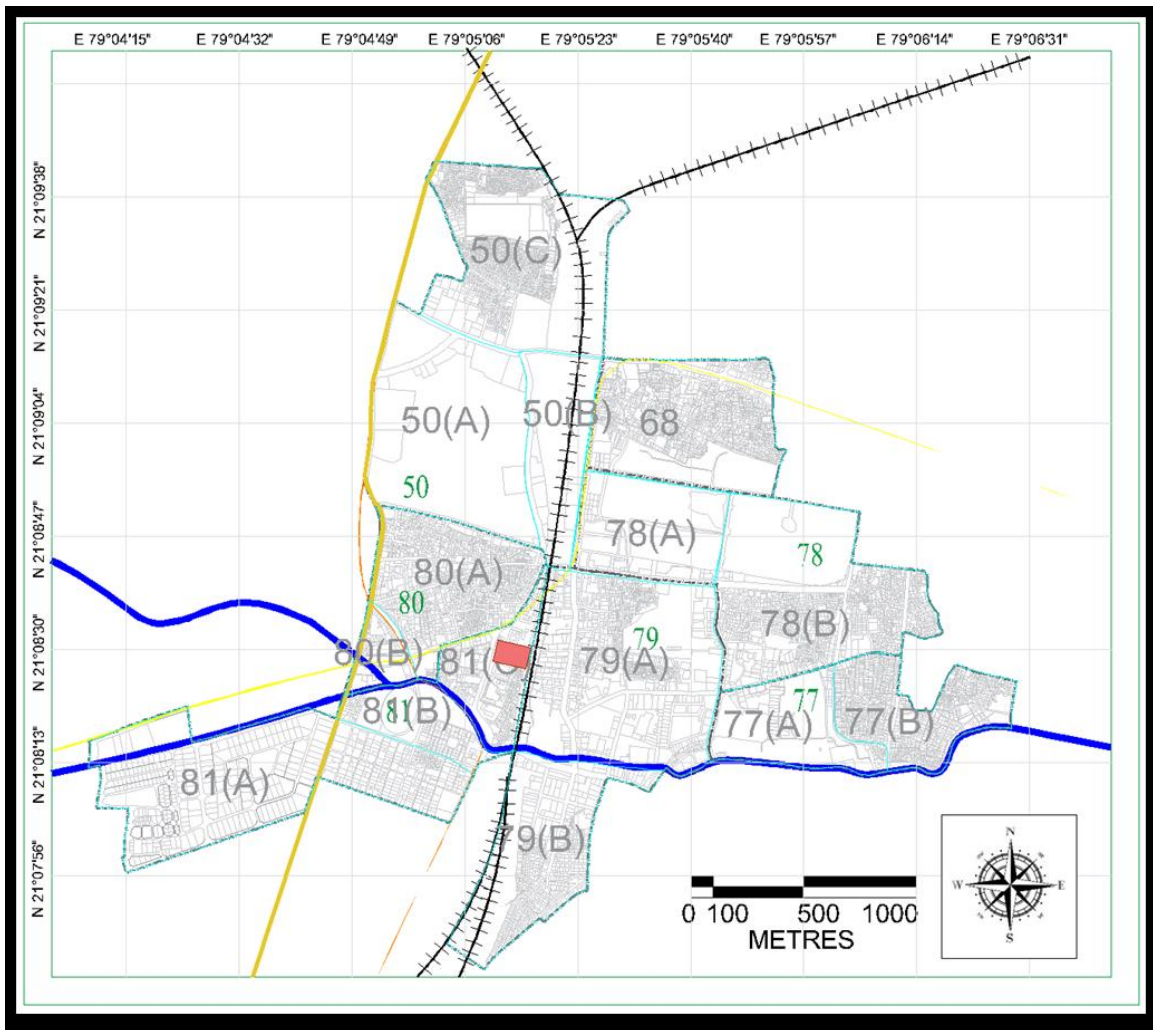


Figure 68 Livelihood project mapping

8.2.6 Economic parameter: Informality

Projects to improve the informality are as follows:

I. Reinforcement of existing markets

- I. PHASE I – Major markets with distinctive characters - 4
- II. PHASE II – All other local markets



Figure 69 Before and after pictures (Source: Pinterest)

Note:

- *Plinth formation for all shops against water logging*
- *Internal networking and docking areas to avoid on street parking and chaos.*

II. Informality removal and rehabilitation of weekly markets

- I. PHASE I – Development of hawker zones at same street
- II. PHASE II – Removal of encroachment and informality



Figure 70 before and after pictures (Source: Times of India)

Note:

- *Registration of hawkers*
- *Attractive measure for customer inflow*

III. Redesign of CBD informal streets

- PHASE I – Formulation of pedestrian and hawker zones
- PHASE II – Banning of private vehicle with provision for NMT and vicinity parking

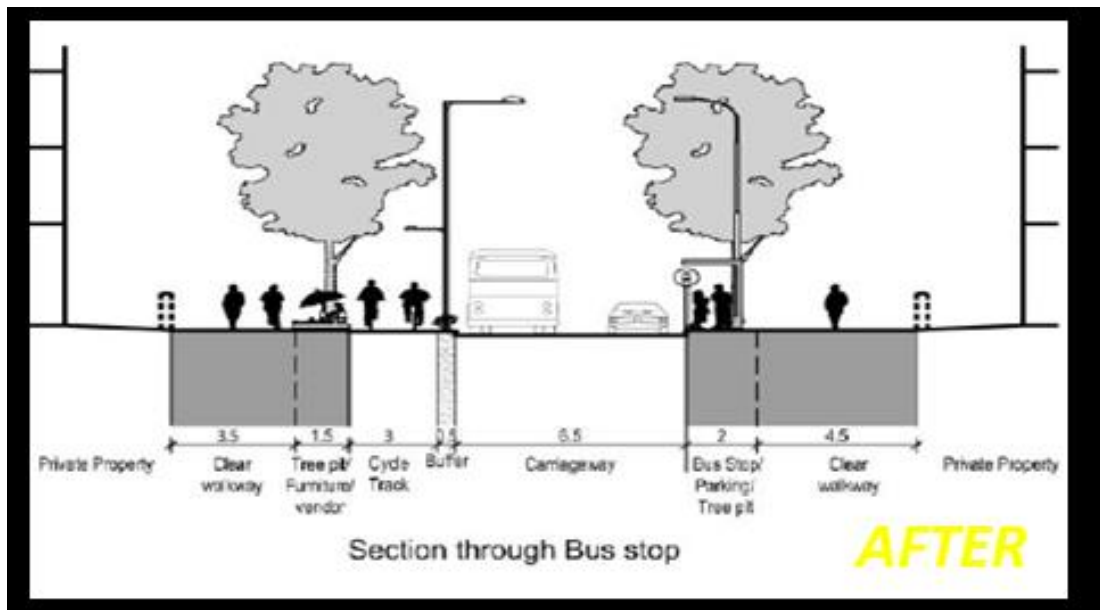


Figure 71 Before and after pictures (Source: Pune smart city road design)

Note:

- Plaza type development for various activities like many successful international case studies.

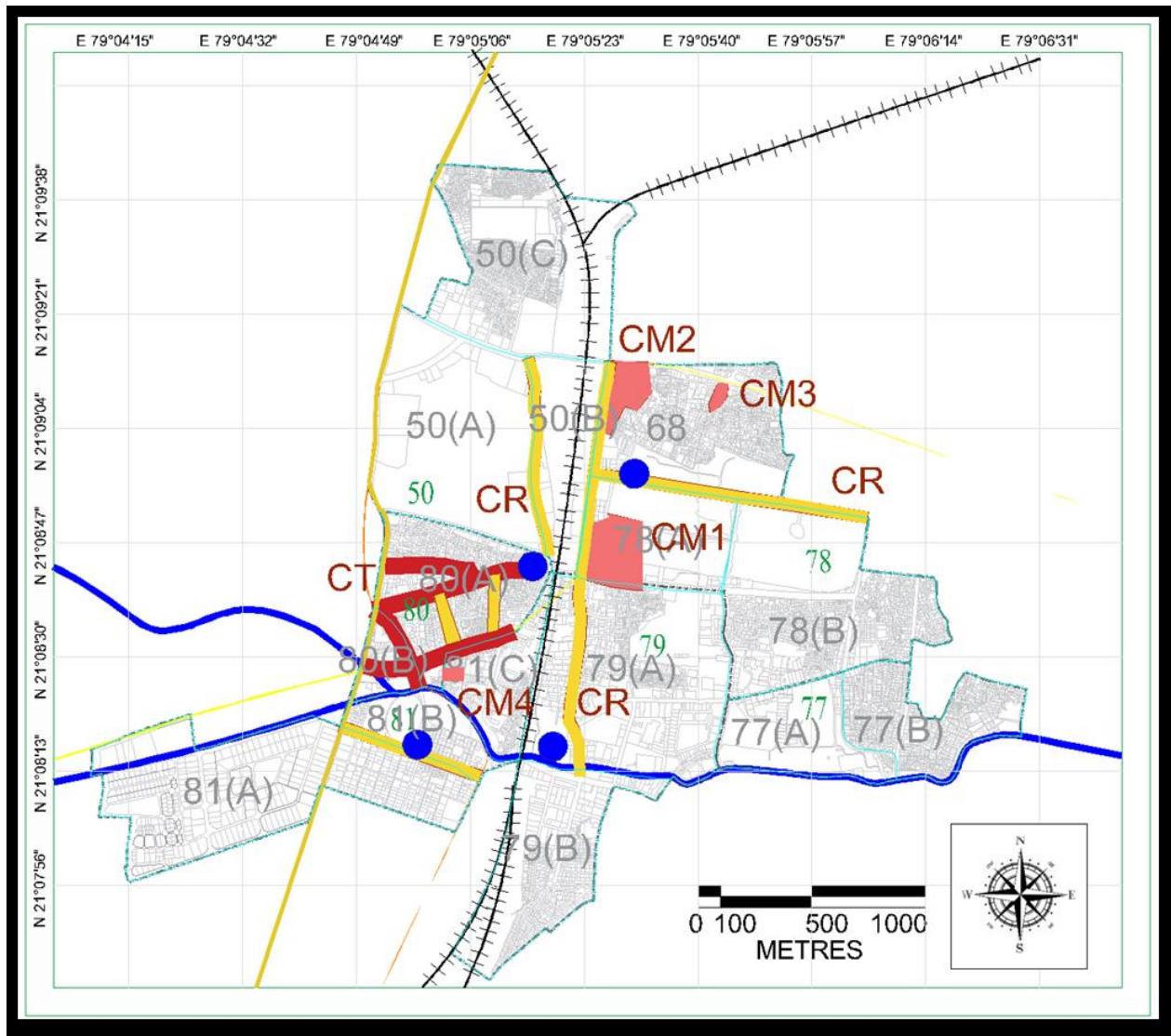


Figure 72 informality project mapping

8.2.7 Socio-cultural parameter: Placemaking with community satisfaction

Projects to improve the Placemaking with community satisfaction are as follows:

I. Lake and river front development

1. PHASE I – Development of already existing Gandhisagar lake for recreation
2. PHASE II – Development of gardens and multi-activity parks at river front areas – 3



Figure 73 Before and after pictures (Source: Whiting Lakefront Department)

Note:

- Existing open lands with government ownership.

II. Heritage conservation and promotion

- I. PHASE I – Conservation of Heritage buildings in HZ1 and HZ2
- II. PHASE II – Vicinity development along with awareness drives and conservation of remaining sites.

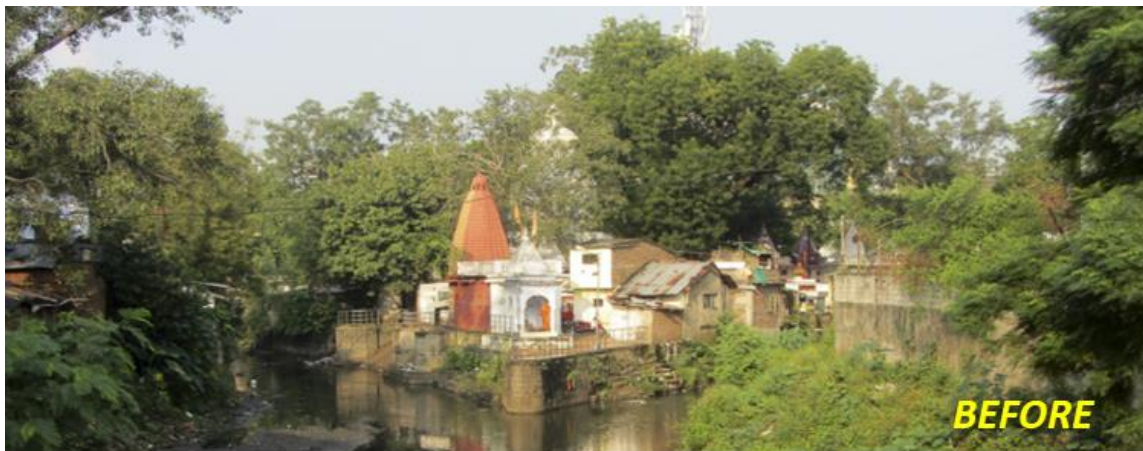


Figure 74 Before and after pictures (Source: Pinterest)

Note:

- *13 heritage sites in phase 1 and remaining 11 in phase 2*

III. Existing public places modification

- PHASE I – Modification of all public spaces criticality zones wise.

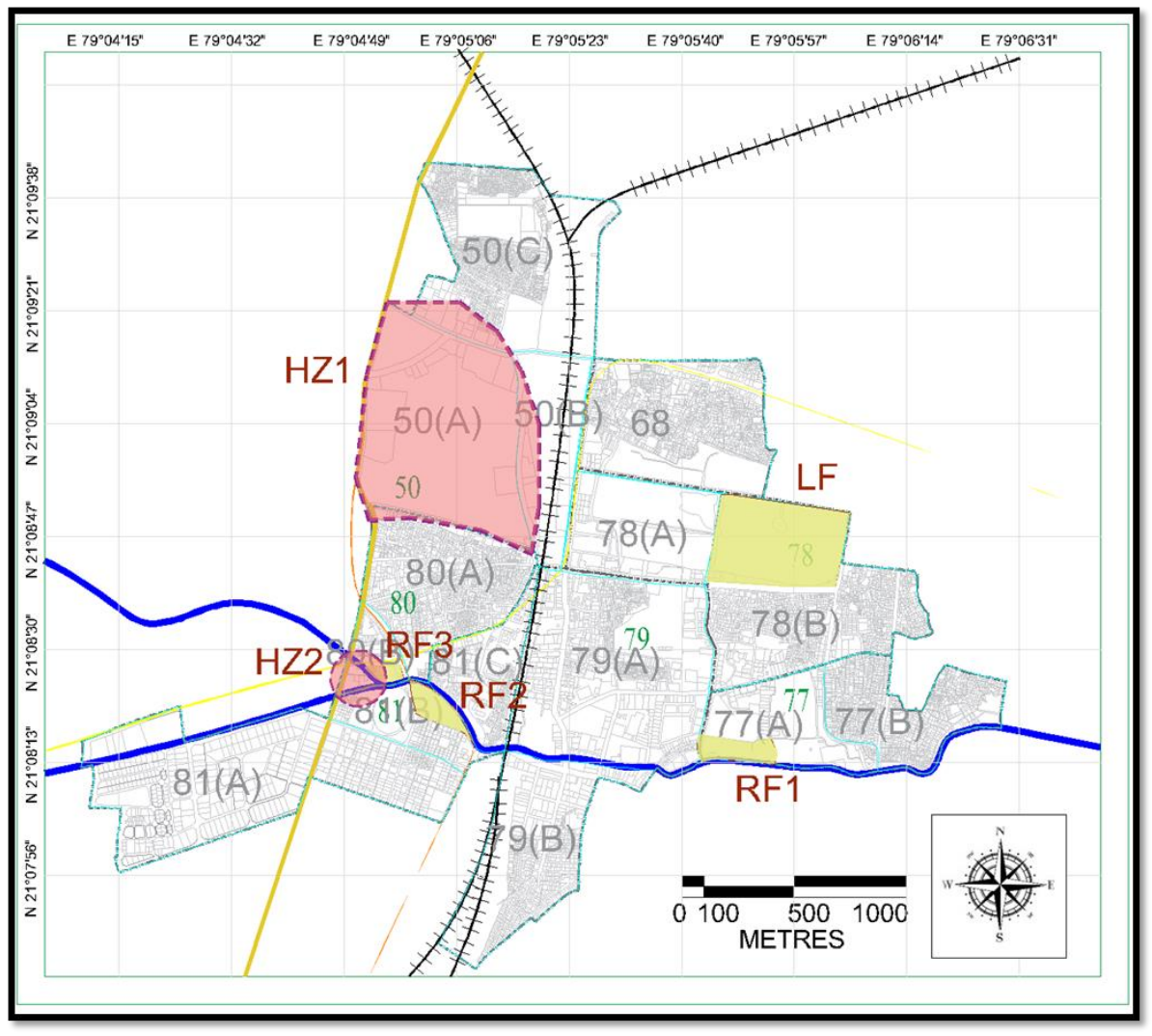


Figure 75 Place making with community satisfaction project mapping

8.2.8 Socio-cultural parameter: Security/safety with social inclusion

Projects to improve the Security/safety with social inclusion are as follows:

I. **CPTED inculcation**

- PHASE I – All slum redesign to follow CPTED principles
- PHASE II – All streets to be modified with this in effect
- PHASE III – All new buildings and spaces through by-laws modification

II. Multi-use 24hrs activites

- PHASE I – Metro stations to have 24 hrs shops.
- PHASE II – Special government buildings with facility of night schools, night shelters, etc. at strategic locations

III. Social redesign of community spaces

- PHASE I – New proposed design of social and community spaces to involve PPS recommendations.
- PHASE II – Retrofitting and up-gradation of old spaces

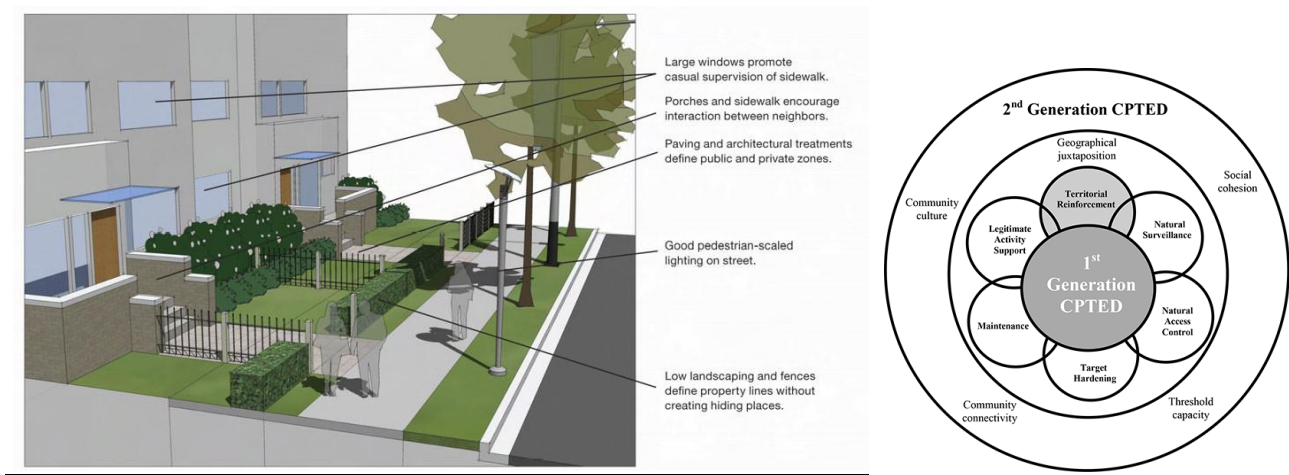


Figure 76 CPTED Principles (Source: International Foundation for Protection Officers)

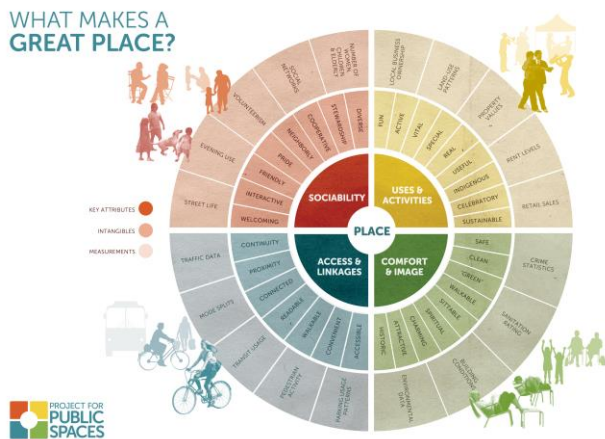


Figure 77 Place making (Source: PPS.org)

8.2.9 Socio-cultural parameter: Social infrastructure status

Projects to improve the Social infrastructure status are as follows:

I. Social Infrastructure Provision

- PHASE I – Social infrastructure of school and green space combined in critical void zones
- PHASE II – Need based community led social infrastructure provision of in large slum redesign.
- PHASE III – redesign of existing social infrastructure with and remaining slums



Figure 78 Before and after pictures (Source: Colorado springs)

Note: Community led social infrastructure will include community halls, congregational centres for festivals, etc.

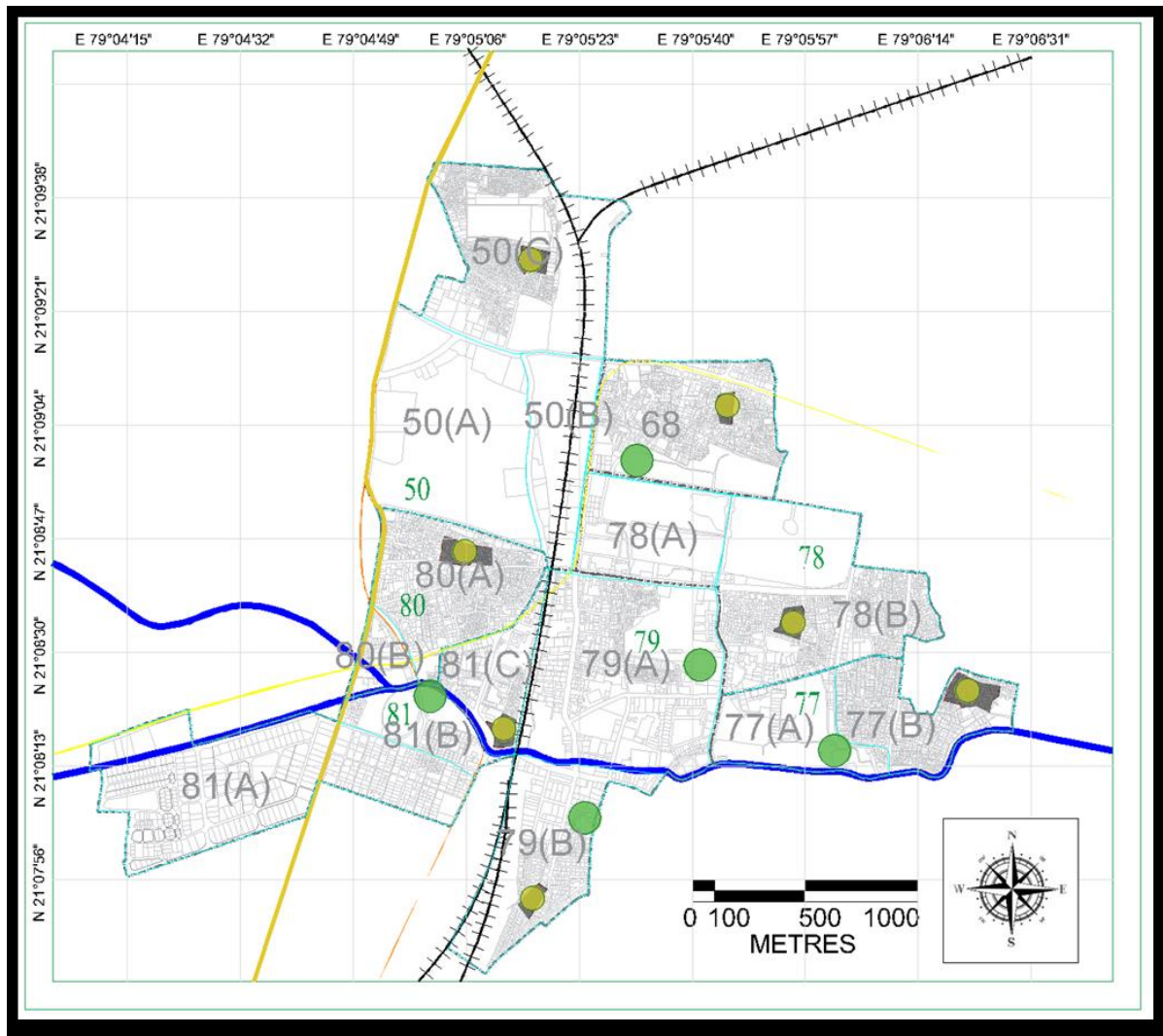


Figure 79 Social infrastructure projects

8.2.10 Environmental parameter: Atmospheric quality

Projects to improve the Atmospheric quality are as follows:

- **Pollution reduction measures**
- PHASE I – Soil testing and purification in parcels of textile mills.
- PHASE II – Removal of Cremation ground from middle of the city to the outskirts.
- PHASE III – Water treatment plants installation (3) and industry and residential waste outlet stopping.



Figure 80 before and after pictures (Source: Cheonggyecheon-Site Plan)

Note:

- Continuous testing further leading to regulation of present industries in the area.
- Coverage of 3 facets of air, water and soil to be considered.
- **Energy consumption reduction**
- PHASE I – Regulatory measures for concessions for installations of devices at individual buildings.
- PHASE II – Retrofitting and traffic infrastructures for reduced carbon footprint and energy consumption.

Note:

- Devices including solar panels, solar heaters, electric charging, etc.

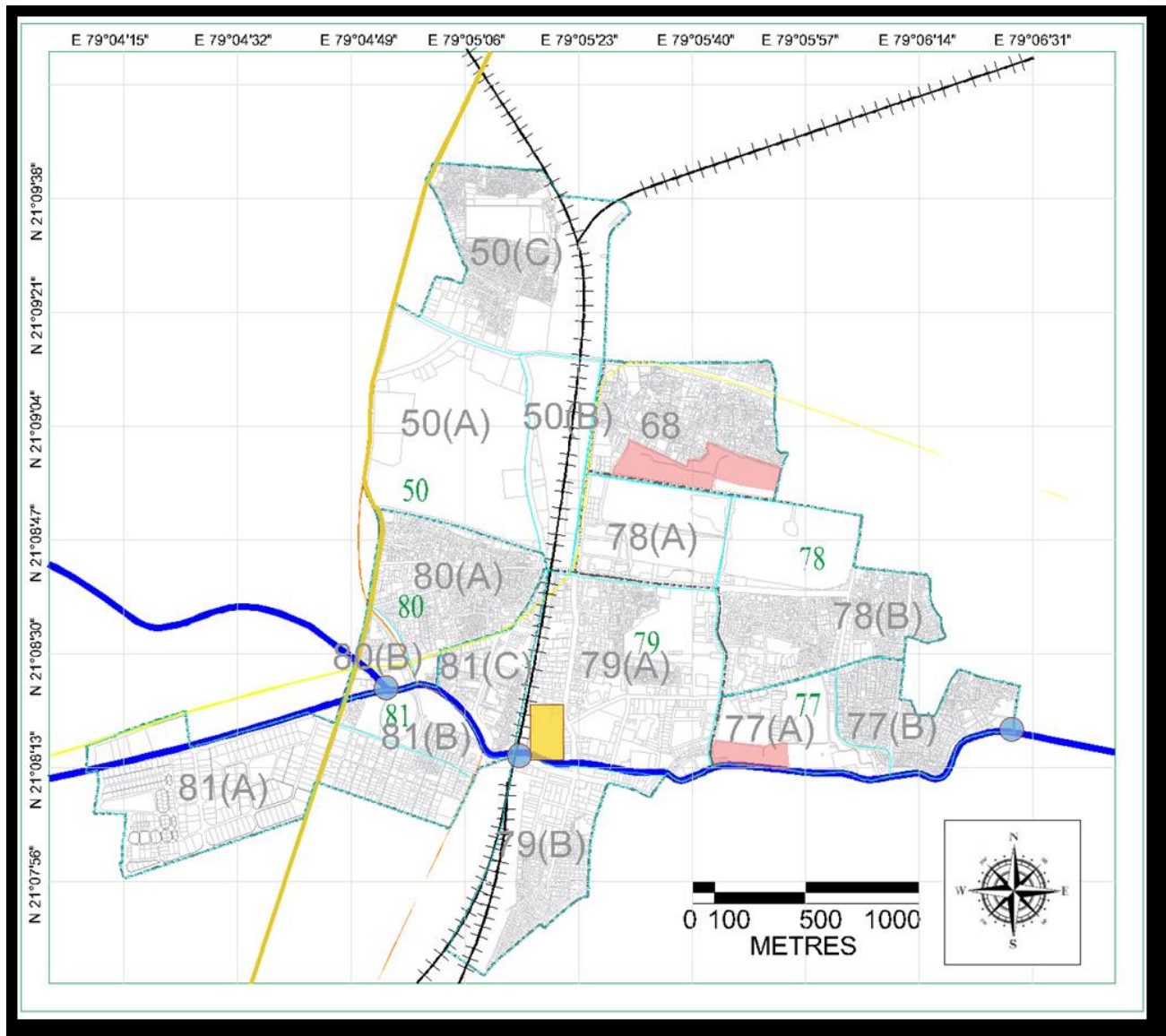


Figure 81 Atmospheric quality improvement project mapping

8.2.11 Environmental parameter: Disaster resilience

Projects to improve Disaster resilience as follows:

- **Accident/Fire/Flood proofing**
- PHASE I – Accident proofing by at-grade or under-grade crossings
- PHASE II – Flood prone zones treatment and upgradation by canal and bunds creation.

- PHASE III – Critical fire zones treatment by wire removal

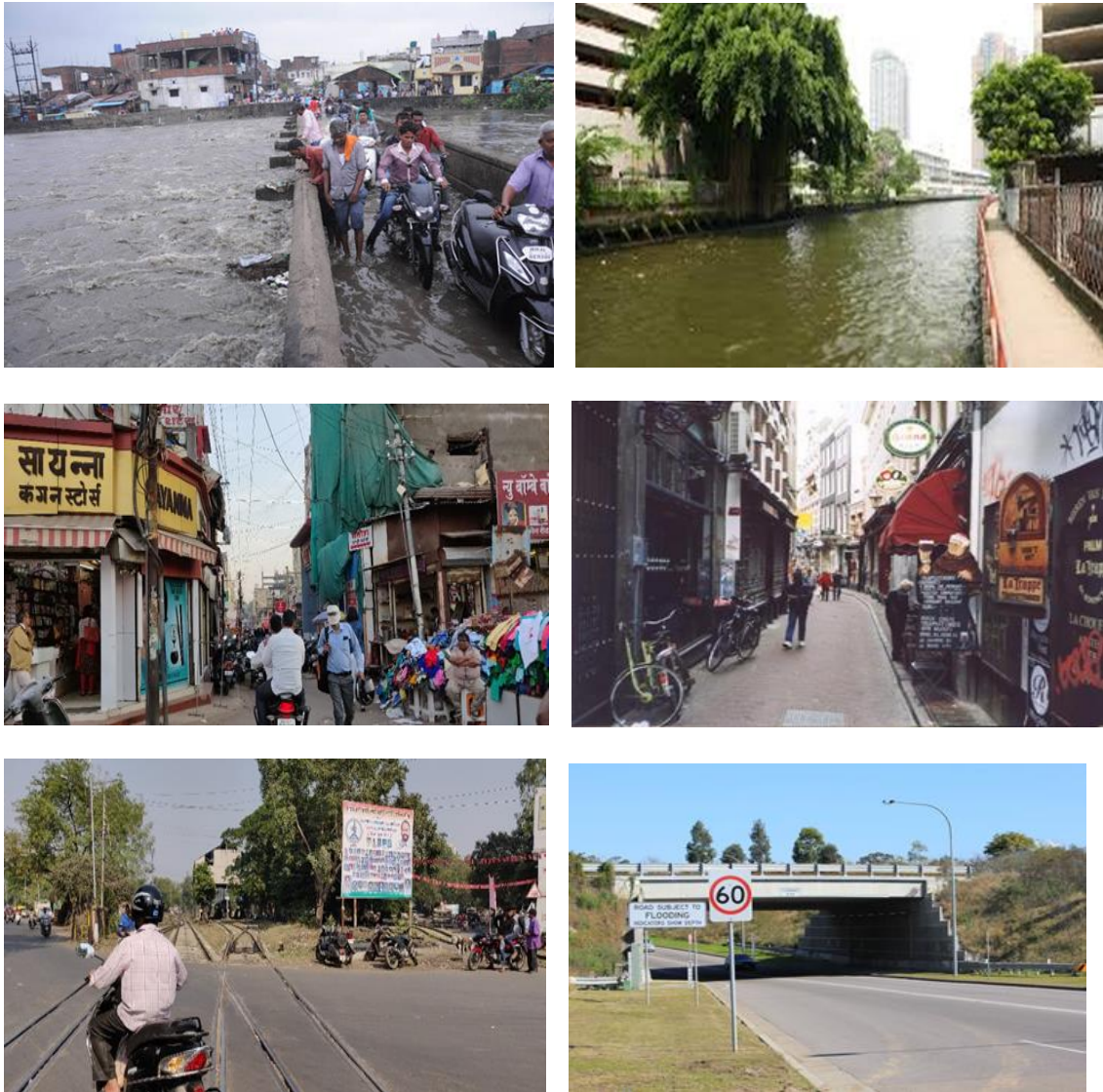


Figure 82 Before and after pictures (Source: Haloweeb)

Note:

- *Subsequent measures for next to critical zones.*

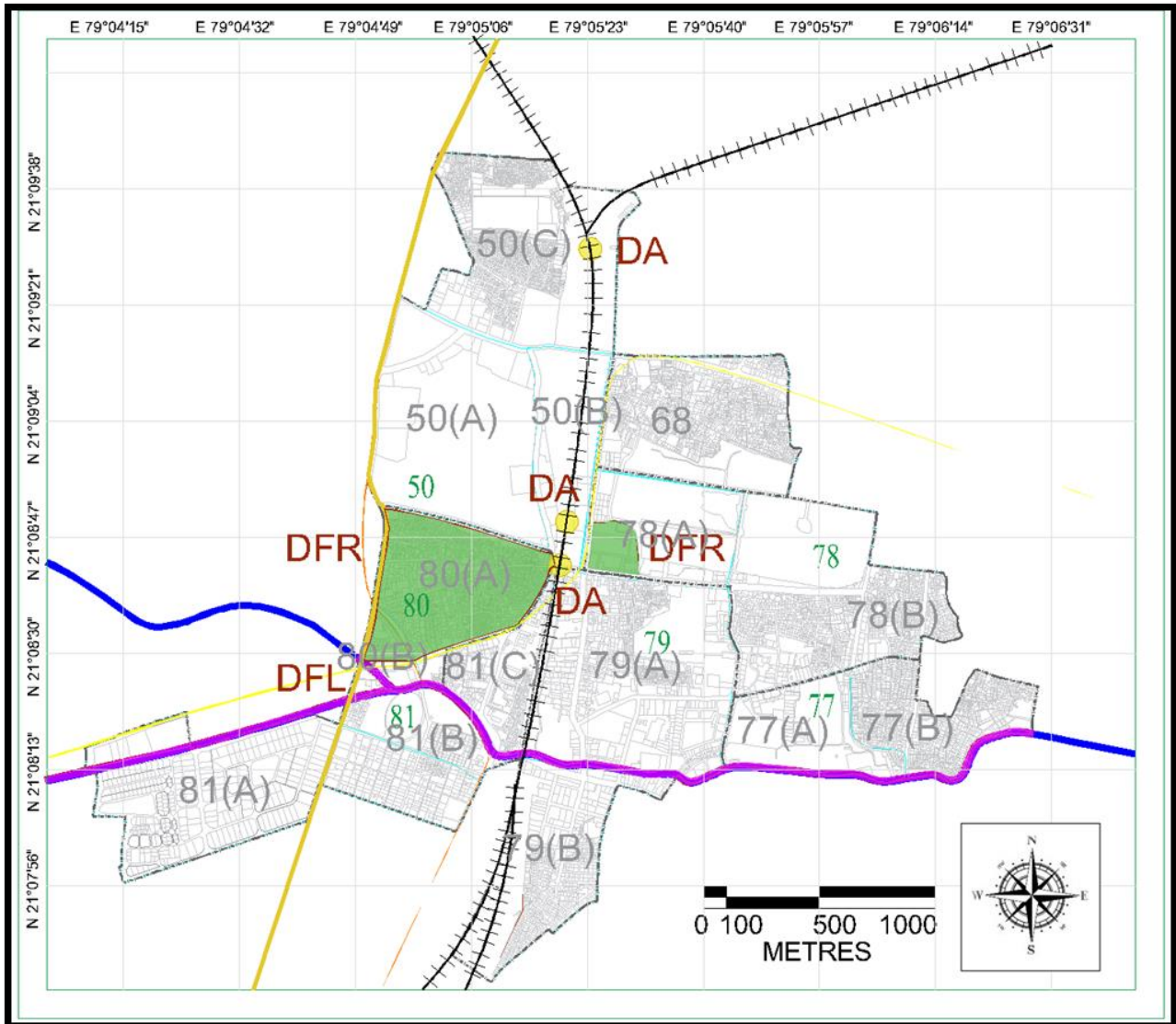


Figure 83 Disaster resilience improvement project mapping

8.3 Phasing

The phasing always needs to be backed up by feedbacks and appraisals so that the process can become comprehensive and we can learn from own mistakes. The phasing of the projects are as follows:

Planning strategies for Urban Renewal of core area of Nagpur city

Table 2 Phase 1 projects

PHASE 1 PROJECTS			
Sr no.	Project name	Sub-parameter Parameters	Expanse
1	Major collector roads redesign	Physical infrastructure status	7 road with BRT facility
2	Community segregation centres		11
3	In-situ and redevelopment of slum		pop > 3000 + very critical zones
4	Retrofitting for infrastructure	Quality of Built form	Critical zones
5	Old building reinforcement and conservation		Condition assessment of buildings for Repair and upgrading
6	Land-use change	Land-use effectiveness	Redundant industrial land use change
7	TOD zoning and defining		TOD zoning for under-construction metro stations for 6 station
8	Redesign of squares	Congestion	square redesign with traffic calming and managing techniques for all squares – 7 squares
9	Street regulations		Segregation of lanes for heterogeneous traffic
10	Skill development	Livelihood	Collaboration with NMC for skill development centre in middle of the site
11	Job creation		Formal and informal job data collection and journal keeping
12	Reinforcement of existing markets	Informality	Major markets with distinctive characters - 4
13	Informality removal and rehabilitation of weekly markets		Development of hawker zones at same street
14	Redesign of CBD informal streets		Formulation of pedestrian and hawker zones
15	Lake and river front development	Placemaking with community satisfaction	Development of already existing Gandhisagar lake for recreation
16	Heritage conservation and promotion		Conservation of Heritage buildings in HZ1 and HZ2
17	Existing public places modification		Modification of all public spaces criticality zones wise.
18	CPTED inculcation	Security/Safety with social inclusion	All slum redesign to follow CPTED principles
19	Multi-use 24hrs activites		Metro stations to have 24 hrs shops.
20	Social redesign of community spaces		New proposed design of social and community spaces to involve PPS recommendations
21	Redesign of squares	Social infrastructure status	Social infrastructure of school and green space combined in critical void zones
22	Pollution reduction measures	Atmospheric quality	Soil testing and purification in parcels of textile mills.
23	Energy consumption reduction		Regulatory measures for concessions for installations of devices at individual buildings.
24	Accident/Fire/Flood proofing	Disaster resilience	Accident proofing by at-grade or under-grade crossings

Table 3 Phase 2 projects

PHASE 2 PROJECTS			
Sr no.	Project name	Sub-parameter Parameters	Expanse
1	Major collector roads redesign	Physical infrastructure status	Other roads and pedestrian only bridges of critical zones
2	Community segregation centres		Household segregation
3	In-situ and redevelopment of slum	Quality of Built form	pop 1000-3000 + very critical zones
4	Retrofitting for infrastructure		Mildly critical zones
5	Old building reinforcement and conservation		Phasing depending on the criticality
6	Land-use change	Land-use effectiveness	Mixed land use provision with regulations
7	TOD zoning and defining		TOD zoning for bus stand and railway station – 5 zones
8	Redesign of squares	Congestion	sub-ways and over-bridges at critical junctions as in CMP
9	Street regulations		One-way road networking
10	Skill development	Livelihood	Vocational training programmes especially for commercial promotion.
11	Job creation		Involvement in Local area plan projects
12	Reinforcement of existing markets	Informality	All other local markets
13	Informality removal and rehabilitation of weekly markets		Removal of encroachment and informality
14	Redesign of CBD informal streets		Banning of private vehicle with provision for NMT and vicinity parking
15	Lake and river front development	Placemaking with community satisfaction	Development of gardens and multi-activity parks at river front areas - 3
16	Heritage conservation and promotion		Vicinity development along with awareness drives and conservation of remaining sites.
17	CPTED inculcation	Security/Safety with social inclusion	All streets to be modified with this in effect
18	Multi-use 24hrs activites		Special government buildings with facility of night schools, night shelters, etc. at strategic locations
19	Social redesign of community spaces		Retrofitting and up-gradation of old spaces
20	Redesign of squares	Social infrastructure status	Need based community led social infrastructure provision of in large slum redesign.
21	Pollution reduction measures	Atmospheric quality	Removal of Cremation ground from middle of the city to the outskirts.
22	Energy consumption reduction		Retrofitting and traffic infrastructures for reduced carbon footprint and energy consumption
23	Accident/Fire/Flood proofing	Disaster resilience	Flood prone zones treatment and upgradation by canal and bunds creation.

Table 4 Phase 3 projects

PHASE 3 PROJECTS			
Sr no.	Project name	Sub-parameter Parameters	Expanse
1	Major collector roads redesign	Physical infrastructure status	Internal roads with high traffic volumes roads in remaining areas
2	In-situ and redevelopment of slum	Quality of Built form	pop <1000 very critical zones + remaining
3	Retrofitting for infrastructure		Intermediate and safe zones
4	Redesign of squares	Congestion	sub-ways and over-bridges at all major junctions
5	CPTED inculcation	Security/Safety with social inclusion	All new buildings and spaces through by-laws modification
6	Redesign of squares	Social infrastructure status	redesign of existing social infrastructure with and remaining slums
7	Pollution reduction measures	Atmospheric quality	Water treatment plants installation (3) and industry and residential waste outlet stopping.
8	Accident/Fire/Flood proofing	Disaster resilience	1.Critical fire zones treatment by wire removal

8.4 Project validation

Of all the projects chosen it is necessary to see if the critical factors and areas are being services by the projects. Therefore a comparison is done for all the factors.

Table 5 Weightage wise project for sub-parameters

Weightage	Sub-parameter	Number of projects	Average projects
5	Physical infrastructure status	21	19.66
	Social infrastructure status	22	
	Land use effectiveness	16	
4	Quality of built form	19	16.33
	Informality	15	
	Livelihood dependency	15	
3	placemaking with sense of community	13	13
2	congestion	10	8.5
	atmospheric quality	7	
1	disaster resilience	6	6
	Safety/ security and social inclusion	6	

Table 6 Zone wise projects

Criticality score	Legend	Zones	Projects	Average projects
≤ 82	Safe zones	50 A	7	7
		78 B	8	
		81 A	6	
83 TO 95	Intermediate	50 C	9	9
		77 A	9	
96 TO 107	Mildly critical zones	68	11	9.75
		77 B	8	
		79 A	10	
		79 B	10	
≥ 108	Very critical zones	50 B	11	12
		78 A	12	
		80 A	13	
		80 B	11	
		81 B	13	
		81 C	12	

As seen above, the results are satisfactory as the critical zones and sub-parameters are getting maximum projects.

9. CONCLUSION

An overall effort has been taken to cover all of the important sectors of urban parameter as mentioned in various literatures. A logic wise process is followed wherein various criticalities are attacked with different sorts of projects. Phasing are also done. An integration among various factors is also tried to be achieved. Hence, it is worth to say that the effort is tried to become comprehensive and fulfilling the objectives. There is further scope for the work to be detailed out. However at this stage the proposal would be limited to the above achieved work. It is to note that the process of Urban renewal is always evolving and continuous. Thereby once in motion it should be made in such a way that it becomes a feedback process.

10. BIBLIOGRAPHY

- Delisle, James R, and Terry V Grissom. 2011. “An Empirical Study of the Efficacy of Mixed-Use Development: The Seattle Experience by: James R. DeLisle, Terry V. Grissom Presented at ARES 2011 and Submitted for a Best Paper Award,” 1–31.
- Vorontsova, A V, V L Vorontsova, and D V Salimgareev. 2016. “The Development of Urban Areas and Spaces with the Mixed Functional Use.” *Procedia Engineering* 150: 1996–2000. <https://doi.org/10.1016/j.proeng.2016.07.277>.
- Zheng, Helen Wei, Geoffrey Qiping Shen, and Hao Wang. 2014. “A Review of Recent Studies on Sustainable Urban Renewal.” *Habitat International* 41: 272–79. <https://doi.org/10.1016/j.habitatint.2013.08.006>.
- Kong, Hui, Daniel Z Sui, Xin Tong, and Xun Wang. 2015. “Paths to Mixed-Use Development: A Case Study of Southern Changping in Beijing , China.” *Cities* 44: 94–103. <https://doi.org/10.1016/j.cities.2015.01.003>.
- Greene, Margarita, Rodrigo Ivan, Cristhian Figueroa, Natan Waintrub, and J De D Ortúzar. 2017. “Towards a Sustainable City : Applying Urban Renewal Incentives According to the Social and Urban Characteristics of the Area.” *Habitat International* 68: 15–23. <https://doi.org/10.1016/j.habitatint.2017.03.004>.
- Delisle, James R, and Terry V Grissom. 2011. “An Empirical Study of the Efficacy of Mixed-Use Development: The Seattle Experience by: James R. DeLisle, Terry V. Grissom Presented at ARES 2011 and Submitted for a Best Paper Award,” 1–31.
- Vorontsova, A V, V L Vorontsova, and D V Salimgareev. 2016. “The Development of Urban Areas and Spaces with the Mixed Functional Use.” *Procedia Engineering* 150: 1996–2000. <https://doi.org/10.1016/j.proeng.2016.07.277>.
- Zheng, Helen Wei, Geoffrey Qiping Shen, and Hao Wang. 2014. “A Review of Recent Studies on Sustainable Urban Renewal.” *Habitat International* 41: 272–79. <https://doi.org/10.1016/j.habitatint.2013.08.006>.
- Kong, Hui, Daniel Z Sui, Xin Tong, and Xun Wang. 2015. “Paths to Mixed-Use

Development : A Case Study of Southern Changping in Beijing , China.” *Cities* 44: 94–103. <https://doi.org/10.1016/j.cities.2015.01.003>.

- Greene, Margarita, Rodrigo Ivan, Cristhian Figueroa, Natan Waintrub, and J De D Ortúzar. 2017. “Towards a Sustainable City : Applying Urban Renewal Incentives According to the Social and Urban Characteristics of the Area.” *Habitat International* 68: 15–23. <https://doi.org/10.1016/j.habitatint.2017.03.004>.
- Delisle, James R, and Terry V Grissom. 2011. “An Empirical Study of the Efficacy of Mixed-Use Development: The Seattle Experience by: James R. DeLisle, Terry V. Grissom Presented at ARES 2011 and Submitted for a Best Paper Award,” 1–31.
- Vorontsova, A V, V L Vorontsova, and D V Salimgareev. 2016. “The Development of Urban Areas and Spaces with the Mixed Functional Use.” *Procedia Engineering* 150: 1996–2000. <https://doi.org/10.1016/j.proeng.2016.07.277>.
- Zheng, Helen Wei, Geoffrey Qiping Shen, and Hao Wang. 2014. “A Review of Recent Studies on Sustainable Urban Renewal.” *Habitat International* 41: 272–79. <https://doi.org/10.1016/j.habitatint.2013.08.006>.
- Kong, Hui, Daniel Z Sui, Xin Tong, and Xun Wang. 2015. “Paths to Mixed-Use Development : A Case Study of Southern Changping in Beijing , China.” *Cities* 44: 94–103. <https://doi.org/10.1016/j.cities.2015.01.003>.
- Greene, Margarita, Rodrigo Ivan, Cristhian Figueroa, Natan Waintrub, and J De D Ortúzar. 2017. “Towards a Sustainable City : Applying Urban Renewal Incentives According to the Social and Urban Characteristics of the Area.” *Habitat International* 68: 15–23. <https://doi.org/10.1016/j.habitatint.2017.03.004>.
- Delisle, James R, and Terry V Grissom. 2011. “An Empirical Study of the Efficacy of Mixed-Use Development: The Seattle Experience by: James R. DeLisle, Terry V. Grissom Presented at ARES 2011 and Submitted for a Best Paper Award,” 1–31.
- Vorontsova, A V, V L Vorontsova, and D V Salimgareev. 2016. “The Development of Urban Areas and Spaces with the Mixed Functional Use.” *Procedia Engineering* 150:

1996–2000. <https://doi.org/10.1016/j.proeng.2016.07.277>.

- Zheng, Helen Wei, Geoffrey Qiping Shen, and Hao Wang. 2014. “A Review of Recent Studies on Sustainable Urban Renewal.” *Habitat International* 41: 272–79. <https://doi.org/10.1016/j.habitatint.2013.08.006>.
- Kong, Hui, Daniel Z Sui, Xin Tong, and Xun Wang. 2015. “Paths to Mixed-Use Development : A Case Study of Southern Changping in Beijing , China.” *Cities* 44: 94–103. <https://doi.org/10.1016/j.cities.2015.01.003>.
- Greene, Margarita, Rodrigo Ivan, Cristhian Figueroa, Natan Waintrub, and J De D Ortúzar. 2017. “Towards a Sustainable City : Applying Urban Renewal Incentives According to the Social and Urban Characteristics of the Area.” *Habitat International* 68: 15–23. <https://doi.org/10.1016/j.habitatint.2017.03.004>.
- Delisle, James R, and Terry V Grissom. 2011. “An Empirical Study of the Efficacy of Mixed-Use Development: The Seattle Experience by: James R. DeLisle, Terry V. Grissom Presented at ARES 2011 and Submitted for a Best Paper Award,” 1–31.
- Vorontsova, A V, V L Vorontsova, and D V Salimgareev. 2016. “The Development of Urban Areas and Spaces with the Mixed Functional Use.” *Procedia Engineering* 150: 1996–2000. <https://doi.org/10.1016/j.proeng.2016.07.277>.
- Zheng, Helen Wei, Geoffrey Qiping Shen, and Hao Wang. 2014. “A Review of Recent Studies on Sustainable Urban Renewal.” *Habitat International* 41: 272–79. <https://doi.org/10.1016/j.habitatint.2013.08.006>.
- Kong, Hui, Daniel Z Sui, Xin Tong, and Xun Wang. 2015. “Paths to Mixed-Use Development : A Case Study of Southern Changping in Beijing , China.” *Cities* 44: 94–103. <https://doi.org/10.1016/j.cities.2015.01.003>.
- Greene, Margarita, Rodrigo Ivan, Cristhian Figueroa, Natan Waintrub, and J De D Ortúzar. 2017. “Towards a Sustainable City : Applying Urban Renewal Incentives According to the Social and Urban Characteristics of the Area.” *Habitat International* 68: 15–23. <https://doi.org/10.1016/j.habitatint.2017.03.004>.

- Delisle, James R, and Terry V Grissom. 2011. “An Empirical Study of the Efficacy of Mixed-Use Development: The Seattle Experience by: James R. DeLisle, Terry V. Grissom Presented at ARES 2011 and Submitted for a Best Paper Award,” 1–31.
- Vorontsova, A V, V L Vorontsova, and D V Salimgareev. 2016. “The Development of Urban Areas and Spaces with the Mixed Functional Use.” *Procedia Engineering* 150: 1996–2000. <https://doi.org/10.1016/j.proeng.2016.07.277>.
- Zheng, Helen Wei, Geoffrey Qiping Shen, and Hao Wang. 2014. “A Review of Recent Studies on Sustainable Urban Renewal.” *Habitat International* 41: 272–79. <https://doi.org/10.1016/j.habitatint.2013.08.006>.
- Kong, Hui, Daniel Z Sui, Xin Tong, and Xun Wang. 2015. “Paths to Mixed-Use Development : A Case Study of Southern Changping in Beijing , China.” *Cities* 44: 94–103. <https://doi.org/10.1016/j.cities.2015.01.003>.
- Greene, Margarita, Rodrigo Ivan, Cristhian Figueroa, Natan Waintrub, and J De D Ortúzar. 2017. “Towards a Sustainable City : Applying Urban Renewal Incentives According to the Social and Urban Characteristics of the Area.” *Habitat International* 68: 15–23. <https://doi.org/10.1016/j.habitatint.2017.03.004>.
- Watson, S. (2006). *Urban Renewal. Ruins in Process Vancouver Art in the Sixties*. Retrieved from <http://usir.salford.ac.uk/7073/>
- Simone, A. M. (2006). *The Right to the City. Interventions: International Journal of Postcolonial Studies*, 7(3), 321–325. <http://doi.org/10.1080/13698010500268189>
- Buissink, A. (2000). *Transformation is the single most consistent factor in the life of a city What is Urban renewal ?*
- Levenston, M. (2009). *An overview of Urban Farming. City Farmer*, 1–6. Retrieved from <http://www.cityfarmer.info/2009/11/24/overview-of-urban-farming-by-green-for-all/>
- Renewal, U., Ordinance, A., Region, S. A., Kong, H., Bureau, D., Strategy, U. R., ... *When, U. R. S. (n.d.). No Title.*

- Harris, M., City, H., & Yards, B. N. (2015). *Urbecon*, 2, 1–8.
- Preeti Onkar, K. K. D. and A. S. (2008). Exploring the Concept of Urban Renewal in the Indian Context. *Institute of Town Planners India*, 5(2), 42–46.
- Lang, T. (2005). Insights in the British Debate about Urban Decline and Urban Regeneration *. *IRS Institut for Regionalentwicklung Und Struktuplanung*, (December), 25.
- Franz, Y. (2013). Between Urban Decay and Rejuvenation . Deliberate Employment of Gentrification in Neighbourhood Development, 1–297.
- Rui, L. (2003). Urban Renewal at Neighborhood Level.
- Dhote, K. K., Silakri, R. K., & Onkar, P. (2013). Urban Renewal and Redevelopment : Identification of Appropriate Planning Intervention for Indian Cities, 2(7), 42–48.
- Au, E. S. (2014). Urban Renewal – A case study in Hong Kong. *FIG Congress 2014 Engaging the Challenges – Enhancing the Relevance*, (June 2014).
- Book: *New towns for old: The technique of Urban renewal* (Burns. W.)
- Book: *Urban renewal: The record and the controversy* (James Wilson)

11. ANNEXURE

11.1 Annexure -1: Questionnaire/schedules prepared for survey

Different questionnaire prepared for household/ opinion/ OD survey are given below. For passerby

Survey Schedule form, Dissertation, MURP, Architecture and Planning Department, IIT ROORKEE

PASSERBY

Location (Wardwise): 50 68 77 78
79 80 81

Type of vehicle: bicycle 2-wheeler 3-wheeler 4-wheeler
Passenger bus others if yes then specify _____

Number of travelers: 1 2 3-5 >5

Cargo carrier: Yes No

Purpose of trip: Work related Leisure/Recreation Emergency

Origin: North South East West

Destination: North South East West

Alternative routes availability: Yes No

Number of trips in a week: Occasionally Once 2-6 Daily

Parking/Stoppages required: Yes No

Problems faced on route:

Note: The survey is conducted for Master's dissertation of Core city area of Nagpur city and will be used for academic purpose only

Figure 84 Passerby opinion survey questionnaire

11.1.1 For customers

Survey Schedule form, Dissertation, MURP, Architecture and Planning Department, IIT ROORKEE

CUSTOMER

Location (Wardwise): 50 68 77 78
79 80 81

Mode of vehicle: Private Public Intermediate Walking Other

Parking: On-street Off-street Drop and go N.A.

Number of shops visited: 1 2 >2

Product of interest: Textile Electronics Utensils Multiple Others

Distance from home: <1km 1-5 km 5-15km >15km

Walking distance in area: <1km 1-5 km >5km

Status of services:

- a) Drinking water: Not available Poor Good Excellent
- b) Public Toilets: Not available Poor Good Excellent
- c) Sitting facilities: Not available Poor Good Excellent
- d) Weather protection: Not available Poor Good Excellent
- e) Signages: Not available Poor Good Excellent
- f) Footpaths: Not available Poor Good Excellent

Problems faced:

Note: The survey is conducted for Master's dissertation of Core city area of Nagpur city and will be used for academic purpose only

Figure 85 Customer opinion survey questionnaire

11.1.2 For permanent shopowners

Survey Schedule form, Dissertation, MURP, Architecture and Planning Department, IIT ROORKEE

Shop owner (Permanent)

Location of shop (Wardwise): 50 68 77 78
79 80 81

Shop Name: _____

Product: Textile Electronics Food other

Age of building in years: <10 10-50 50-100 100-300 >300

Status of building: Good condition Dilapidated Unstable and Risky

Type: Single Use Dual use Multiple use

Ownership: Self Rented Co-operative

Annual Income: <1,00,000 1,00,000-10,00,000 >10,00,000

Timings: Only Morning Only evening Full day

Peak season: Yearly Summer Winter Rainy Festival oriented

Number of employees: 1 2-5 5-20 >20

Godown and its distance: N.A Adjacent Neighbourhood Ward
outside ward Outside city

Vehicle for transportation: Walking 2-wheeler 4-wheeler other

Parking: In building on-street dedicated distant

Supply's mode of transport: Local lmt Local hmt outside lmt outside hmt

Note: The survey is conducted for Master's dissertation of Core city area of Nagpur city and will be used for academic purpose only

Figure 86 Permanent shopowner opinion survey questionnaire

11.1.3 For temporary shop owners/ hawkers

Survey Schedule form, Dissertation, MURP, Architecture and Planning Department, IIT ROORKEE

Shop owner (Temporary)

Location of shop (Wardwise): 50 68 77 78
79 80 81

Shop Name: _____

Product: Textile Parts Food other

Type: Hawker moving Temporary Moving Hawker static Temporary static

Registration: Yes No

Days in week: weekly Daily only Weeekends only weekdays

Timings: Only Morning Only evening Full day

Place of operation: On-street In market

Note: The survey is conducted for Master's dissertation of Core city area of Nagpur city and will be used for academic purpose only

Figure 87 Temporaryt shopowner opinion survey questionnaire

11.1.4 For legal residential dwellers

Survey Schedule form, Dissertation, MURP, Architecture and Planning Department, IIT ROORKEE

Residential unit (Legal)

Name: _____

Location: 50 68 77 78
79 80 81

Number of family members: 1 2-4 4-8 >8

Area of House: <20 sq.m 20-50 sq.m 50-200 sq.m >200 sq.m

Building age: <10 10-50 50-100 100-300 >300

Status of building: Good condition Dilapidated Unstable and Risky

Type: Single Use Dual use Multiple use

Ownership: Self Rented Co-operative

Occupation: Business Government service private sector other None

Place of Occupation: Same building same neighbourhood city outside city

Transportation: Walking 2-wheeler 4-wheeler other

Parking: inside plotline on-street distant

Service QOS:

a) Water supply	Not available	<input type="checkbox"/>	Poor	<input type="checkbox"/>	Good	<input type="checkbox"/>	Excellent	<input type="checkbox"/>
b) Garbage collection	Not available	<input type="checkbox"/>	Poor	<input type="checkbox"/>	Good	<input type="checkbox"/>	Excellent	<input type="checkbox"/>
c) Sanitation	Not available	<input type="checkbox"/>	Poor	<input type="checkbox"/>	Good	<input type="checkbox"/>	Excellent	<input type="checkbox"/>
d) Electric supply	Not available	<input type="checkbox"/>	Poor	<input type="checkbox"/>	Good	<input type="checkbox"/>	Excellent	<input type="checkbox"/>

Nearest facility in m:

a) Government hospital	< 300	<input type="checkbox"/>	300-1000	<input type="checkbox"/>	1000-5000	<input type="checkbox"/>	>5000	<input type="checkbox"/>
b) Open area	< 300	<input type="checkbox"/>	300-1000	<input type="checkbox"/>	1000-5000	<input type="checkbox"/>	>5000	<input type="checkbox"/>
c) Police station	< 300	<input type="checkbox"/>	300-1000	<input type="checkbox"/>	1000-5000	<input type="checkbox"/>	>5000	<input type="checkbox"/>
d) Community hall	< 300	<input type="checkbox"/>	300-1000	<input type="checkbox"/>	1000-5000	<input type="checkbox"/>	>5000	<input type="checkbox"/>

Note: The survey is conducted for Master's dissertation of Core city area of Nagpur city and will be used for academic purpose only

Figure 88 Permanent house dwellers household survey questionnaire

11.1.5 For illegal housing & slums/ squatters

Survey Schedule form, Dissertation, MURP, Architecture and Planning Department, IIT ROORKEE

Residential unit (Illegal)

Name: _____

Location (wardwise): 50 68 77 78
79 80 81

Type: Slum squatter

Members of family living together: 1 2-4 >4

Children living together: Yes No

Years of residing: <5 years 5-10 years 10-50 years >50 years

Type of structure: Pucca semi-pucca kutcha no structure

Occupation: Private job self run business Government job other

Annual income: <10,000 10,000-50,000 >50,000

Willingness to rehabilitation: Yes No

Job attached with place of residing: Yes No

Belongings and facilities:

- | | | | | |
|-------------------------------|-----|--------------------------|----|--------------------------|
| a) House registration | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| b) Water connection | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| c) Private toilet | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| d) Cooking Gas | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |
| e) Vehicle for transportation | Yes | <input type="checkbox"/> | No | <input type="checkbox"/> |

Note: The survey is conducted for Master's dissertation of Core city area of Nagpur city and will be used for academic purpose only

Figure 89 Temporary/illegal house dwellers household survey questionnaire

Survey Schedule form, Dissertation, MURP, Architecture and Planning Department, IIT ROORKEE

Weightage assessment for parameters of urban renewal for Core city area, Nagpur

Starting from 1 to 5, rate the parameter that affects the renewal process for CBD core city area of Nagpur city. (1 being the least effective and 5 being the most. Two factors for each number)

Physical Parameters:

- Infrastructure coverage _____
- Land-use Effectiveness _____
- Quality of Built form _____
- Congestion _____

Environmental Parameters:

- Disaster resilience _____
- Atmospheric quality _____

Socio – Cultural Parameters:

- Placemaking and social cohesion requirement _____
- Safety and security _____

Economic Parameters:

- Informality _____
- Livelihood dependency _____

Note: The survey is conducted for Master's dissertation of Core city area of Nagpur city and will be used for academic purpose only

Figure 90 questionnaire Weightage ranking from experts

11.2 Annexure 2 t Data/ meta data collected

Zone number	Zone Name	Ward number	Ward Name	Slum Code	Slum name	Population	Households	Non notified		
10	Mangalwari	50	Khalasi Line	314	Khalasi line-1	3200	676			
				315	Khalashi lane	250	55			
				323	Lala garden	660	120			
				324	Harijan Basti	1000	175			
4	Dhantoli	77	kamalbagh	15	tulshibagh	3249	615			
				16	rahetaker wadi	1852	380			
				257	Kamalbagh	4500	800			
				279	kamalbagh 2	2100	350			
		78	Gandhisagar	8	habib ka akhada	1600	300			
						263	sindhkhana, mangpura	2500	470	
		79	Shaniwari	274	Borkar nagar	2500	426			
						275	zopadpatti near new st stand	550	107	
						277	gujarwadi	500	110	
						348	Indira nagar	2500	525	
						349	jat tarodi behind kundanlal lib.	300	69	
						396	timber market sweeper colony	500	105	
						977	NW of borkar nagar	1500	342	
		80	Sitabuldi	250	gavalipura tekadi	3500	852			
						252	anand nagar	2000	420	
						950	sangam	450	103	
81	Lendra park	249	kumbhartoli	600	126					
				260	choti dhantoli	700	147			
				266	netaji market	550	121			
				286	zhopadpatti near yashwant stadi	1200	274			
				938	north of kumbhartoli	870	184			
6	Gandhibagh	68	Bajeria	297	sautra market nagar	2700	550			
				326	Lodhipura	3500	700			

Figure 91 Slum Data

Planning strategies for Urban Renewal of core area of Nagpur city

Sr no	Name of Heritage site	Have you visited the place?															
1	Poddareshwar Ram Mandir, CA road	1	1	1	2	1	2	2	2	1	1	2	1	2	1	1	
2	Tekdi Ganesh Temple, Sitabuldi	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	
3	Sitabuldi Fort and hill	1	2	1	1	2	2	1	2	1	1	2	2	1	1	2	
4	Zero Mile stone	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
5	Jumma Talav/Gandhisagar lake	1	1	1	1	1	1	1	1	2	1	1	1	2	1	1	
6	Provincial Automobile Building, kingsway	2	2	2	1	2	2	2	2	1	2	1	1	2	2	2	
7	St. Joseph Convent, kasturchand park	2	2	2	1	2	2	1	2	2	2	1	1	2	2	2	
8	Chhatri in Memory of Rao Bahadur mukherji	1	2	1	1	1	2	2	1	1	2	1	1	1	2	1	
9	Kasturchand park, sadar	2	1	1	1	1	1	1	1	1	1	2	2	1	1	1	
10	Chatri at Kasturchand park	2	1	1	1	1	1	1	1	1	1	2	2	1	1	1	
11	St. John School	2	2	2	2	2	2	2	1	2	2	1	2	2	2	2	
12	Samadhi to Mahant Nikku Das	2	2	2	2	2	2	2	2	1	2	2	2	2	1	2	
13	Gateway Regal Theatre	1	2	2	1	2	1	2	1	2	2	1	2	2	1	1	
14	Subraminanium Devasthanam, Sangam	1	2	2	2	2	2	2	2	1	2	2	2	2	1	2	
15	Gopal Krishna Mandir, Sangam	2	2	2	2	2	2	2	2	1	2	2	2	2	1	2	
16	Mahadev Mandir, Sangam	2	2	2	2	1	2	2	2	2	1	2	1	2	2	2	
17	Hanuman Mandir, Sangam	2	2	2	2	2	2	2	2	1	2	2	1	2	2	1	
18	Dattatreya Mandir, Sangam	2	2	2	2	2	2	1	1	2	2	2	1	2	2	2	
19	Sangameshwar Mahadev Mandir, Sangam	2	2	2	2	1	1	2	2	2	2	2	1	2	1	1	
20	Railway Station	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
21	Mahadev Mandir	1	1	1	1	1	2	2	2	2	1	2	2	1	2	2	
22	Sitabuldi Ganesh Hills	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	
23	Buty Baoli, Regal	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	
24	Nag nadi and canal*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	

Figure 92 Heritage visited Data

Sr no	Name of Heritage site	Do you know it is a heritage place?															
1	Poddareshwar Ram Mandir, CA road	1	2	2	2	2	2	2	1	2	2	2	2	2	2	1	
2	Tekdi Ganesh Temple, Sitabuldi	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	
3	Sitabuldi Fort and hill	1	1	2	1	1	1	1	2	1	1	1	2	1	2	1	
4	Zero Mile stone	1	2	1	1	1	1	2	1	1	1	2	2	1	1	2	
5	Jumma Talav/Gandhisagar lake	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	
6	Provincial Automobile Building, kingsway	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
7	St. Joseph Convent, kasturchand park	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	
8	Chhatri in Memory of Rao Bahadur mukherji	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	
9	Kasturchand park, sadar	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
10	Chatri at Kasturchand park	2	1	2	2	2	2	2	1	2	2	2	2	2	1	2	
11	St. John School	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
12	Samadhi to Mahant Nikku Das	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
13	Gateway Regal Theatre	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
14	Subraminanium Devasthanam, Sangam	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
15	Gopal Krishna Mandir, Sangam	2	2	2	1	2	2	2	2	2	1	2	2	2	2	2	
16	Mahadev Mandir, Sangam	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
17	Hanuman Mandir, Sangam	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
18	Dattatreya Mandir, Sangam	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
19	Sangameshwar Mahadev Mandir, Sangam	2	1	2	2	2	2	2	1	2	2	2	2	2	1	1	
20	Railway Station	1	1	1	1	2	1	2	2	1	1	1	2	2	2	1	
21	Mahadev Mandir	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
22	Sitabuldi Ganesh Hills	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
23	Buty Baoli, Regal	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
24	Nag nadi and canal*	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	

Figure 93 Heritage Knowledge Data

Sr no	Name of Heritage site	Efforts that can be taken														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Poddareshwar Ram Mandir, CA road	1	1	1	1	1	1	1	3	1	1	1	1	1	1	1
2	Tekdi Ganesh Temple, Sitabuldi	3	1	1	3	1	3	1	3	1	1	3	1	3	1	3
3	Sitabuldi Fort and hill	2	1	1	2	2	1	1	2	1	3	3	2	1	3	1
4	Zero Mile stone	3	1	3	3	1	3	3	3	1	1	3	3	3	3	3
5	Jumma Talav/Gandhisagar lake	3	3	1	3	3	1	3	3	1	1	3	3	3	1	3
6	Provincial Automobile Building, kingsway	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	St. Joseph Convent, kasturchand park	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	Chhatri in Memory of Rao Bahadur mukherji	1	2	1	1	3	2	1	1	1	2	3	1	2	1	3
9	Kasturchand park, sadar	1	1	3	1	1	3	1	1	1	3	1	3	3	1	1
10	Chatri at Kasturchand park	1	3	1	3	1	3	1	1	3	1	1	3	1	1	3
11	St. John School	1	2	1	1	1	2	1	1	1	1	2	1	1	1	1
12	Samadhi to Mahant Nikku Das	1	1	2	2	1	3	1	1	2	1	3	1	2	1	1
13	Gateway Regal Theatre	1	3	1	1	3	1	2	1	1	1	3	1	1	1	2
14	Subraminanium Devasthanam, Sangam	1	1	2	1	3	2	2	2	1	1	2	1	1	2	1
15	Gopal Krishna Mandir, Sangam	1	2	1	1	3	2	2	2	3	1	3	3	2	2	1
16	Mahadev Mandir, Sangam	1	1	1	3	1	1	2	1	3	1	3	2	2	3	1
17	Hanuman Mandir, Sangam	1	1	2	1	1	1	2	1	3	1	1	3	1	2	1
18	Dattatreya Mandir, Sangam	1	2	1	1	1	3	1	1	3	1	2	1	1	2	1
19	Sangameshwar Mahadev Mandir, Sangam	2	1	1	1	3	1	1	1	1	3	1	1	2	1	1
20	Railway Station	1	1	3	1	1	1	3	1	1	3	1	1	3	1	1
21	Mahadev Mandir	1	1	2	1	3	2	1	1	1	3	3	1	3	1	1
22	Sitabuldi Ganesh Hills	2	1	1	1	2	1	1	1	1	2	1	1	2	1	1
23	Buty Baoli, Regal	1	1	1	3	1	1	1	1	3	1	1	1	2	1	1
24	Nag nadi and canal*	1	1	3	1	3	1	1	3	1	1	3	1	3	1	3

Figure 94 Heritage Improvement Opinion Data

Have you visited the place?	Do you know it is	What can be done for the
		awareness -1
Yes -1	Yes -1	accessibility - 2
No -2	No -2	physical development -3

Figure 95 Heritage Metadata

Planning strategies for Urban Renewal of core area of Nagpur city

P_Ward_no	P_Type_v eh	P_No_tra v	P_Cargo_carrier	P_Purp_tr ip	P_Origin	P_Destina tion	P_Alt_rou te	P_No_we ekly_trip	P_Park_r eq
1	1	1	1	1	1	5	2	4	1
1	2	2	1	1	2	4	2	2	2
1	4	1	2	1	4	5	1	4	1
1	3	2	1	1	3	5	2	3	1
1	6	3	2	3	5	2	2	1	2
1	2	2	2	2	2	1	1	1	1
1	5	4	2	1	1	3	2	4	2
1	5	4	2	1	2	5	2	2	2
2	2	1	1	1	2	5	2	3	1
2	3	3	1	1	4	3	1	2	2
2	4	3	2	1	3	5	2	4	1
2	6	2	2	2	2	1	1	2	2
3	1	2	1	2	3	4	2	1	1
3	2	1	2	2	4	3	1	1	2
3	4	3	1	1	3	5	2	3	1
4	3	1	1	1	4	3	2	4	2
4	4	2	2	1	3	5	1	4	1
4	6	1	2	1	4	5	1	3	1
4	2	2	2	2	5	2	2	2	2
4	1	1	2	1	1	2	1	3	2
5	3	3	1	1	3	5	2	4	1
5	2	1	1	2	1	2	2	2	2
5	4	1	2	2	1	2	1	2	2
6	1	1	1	1	3	5	2	4	2
6	6	1	2	1	5	4	2	4	1
6	5	4	2	2	3	4	1	3	2
6	2	2	1	1	1	5	2	3	1
6	4	2	1	2	2	5	2	2	1
6	3	2	2	1	2	5	2	3	2
7	2	2	2	2	5	1	1	1	1
7	4	1	1	1	2	5	2	4	1
7	5	4	2	2	2	3	1	2	2
7	6	1	2	1	3	5	1	3	1
7	1	1	2	1	1	5	2	4	2
7	2	1	2	2	5	2	1	3	1

Figure 96 Passerby Info Data

Passerby's info = P									
Ward number	Type of vehicle	Number of travellers	Cargo carrier?	Purpose of trip	Origin	Destination	Alternative routes availability	Numbers of weekly trips	Parking / stoppages required
P_Ward_no	P_Type_veh	P_No_trav	P_Cargo_carrier	P_Purp_trip	P_Origin	P_Destination	P_Alt_route	P_No_weekly_trip	P_Park_req
50 - 1	Bicycle - 1	one - 1	Yes - 1	Work - 1	North nagpur - 1	North nagpur - 1	Yes - 1	ocassionally - 1	Yes - 1
68 - 2	2-wheeler - 2	two - 2	No - 2	Leisure/recreation - 2	South Nagpur - 2	South Nagpur - 2	No - 2	once - 2	No - 2
77 - 3	3-wheeler - 3	3 to 5 - 3		Emergency - 3	East Nagpur - 3	East Nagpur - 3		2 to 6 - 3	
78 - 4	4-wheeler - 4	>5 - 4			West nagpur - 4	West nagpur - 4		daily - 4	
79 - 5	Passenger bus - 5				central nagpur - 5	central nagpur - 5			
80 - 6	others - 6								
81 - 7									

Figure 97 Passerby Info Metadata

C_Ward_no	C_Mode_veh	C_Park	C_No_shops_vis	C_Prod_interest	C_Dist_home	C_Walking_length	C_Drinking	C_Public_toilets	C_Sitting_facilities	C_Weather_preferences	C_Signages	C_Footpaths
1	1	1	1	1	2	1	1	2	2	2	2	1
1	3	3	2	2	1	1	2	1	1	1	3	2
1	2	4	1	3	1	2	3	2	2	1	4	3
2	1	1	1	1	2	2	3	3	3	2	2	2
2	1	1	2	2	1	1	2	2	2	2	3	2
2	3	3	1	1	2	1	1	1	1	3	3	3
2	1	1	3	3	2	1	3	1	1	3	2	3
2	4	4	1	1	3	2	1	4	2	2	2	2
3	1	1	1	1	1	1	2	3	1	1	3	2
3	1	1	2	2	1	1	1	4	3	2	3	4
4	3	3	3	1	2	2	2	2	3	1	4	3
4	1	2	1	1	4	1	3	3	2	1	2	2
4	2	4	1	1	3	1	1	1	1	3	1	1
4	1	2	1	3	2	2	2	3	2	1	3	4
4	1	1	3	3	1	1	1	2	1	1	4	3
4	3	3	3	2	4	1	3	2	3	1	2	2
4	1	1	3	3	2	2	2	3	2	2	3	2
5	1	1	1	2	2	1	1	1	4	2	2	3
5	1	1	1	3	1	1	3	2	2	2	2	4
6	3	3	2	1	3	2	1	1	1	3	3	4
6	2	4	3	2	4	2	3	3	4	1	2	3
6	1	2	3	3	4	1	2	4	3	2	3	2
6	1	1	1	3	2	2	3	2	2	2	3	1
6	2	4	3	1	4	2	1	1	2	1	3	3
6	3	3	3	2	1	1	1	1	1	2	4	2
7	1	2	1	1	3	2	4	3	3	1	2	2
7	3	3	2	3	4	1	2	4	1	2	2	1
7	1	1	3	1	1	2	1	2	2	3	1	3
7	2	4	1	3	4	1	3	3	1	1	3	2
7	1	2	3	1	2	1	1	3	3	1	4	3

Figure 98 Customer Info Data

Planning strategies for Urban Renewal of core area of Nagpur city

Customer's info = C												
Ward number	Mode of vehicle	Parking	Number of shops visited	Product of interest	Distance from home	walking length in area	Status of service					
C_Ward_no	C_Mode_veh	C_Park	C_No_shops_vis	C_Prod_interest	C_Dist_home	C_Walking_length	C_Status_service					
50 - 1	Private - 1	On-street - 1	one-1	Textile - 1	<1 km - 1	< 2km - 1	C Drinking water	C Public toilet	C Sitting facilities	C Weather procted	C Signages	C Footpaths
68 - 2	Public - 2	Off - street - 2	two-2	Electronics - 2	1- 5 km - 2	>2km - 2	Not available - 1	Not available - 1	Not available - 1	Not available - 1	Not available	Not available - 1
77 - 3	Intermediate - 3	Drop and go - 3	More than 2 - 3	Utensils - 3	5- 15 km - 3		Poor - 2	Poor - 2	Poor - 2	Poor - 2	Poor - 2	Poor - 2
78 - 4	Walking - 4	N.A. - 4		Other - 4	>15 km - 4		Good - 3	Good - 3	Good - 3	Good - 3	Good - 3	Good - 3
79 - 5				Multiple - 5			Excellent - 4	Excellent - 4	Excellent - 4	Excellent - 4	Excellent - 4	Excellent - 4
80 - 6												
81 - 7												

Figure 99 Customer Info Metadata

Ps_Ward_no	Ps_Product_offer	Ps_Age_build	Ps_Status_build	Ps_type	Ps_owner	Ps_annual_inc	Ps_timing	Ps_peak_season	Ps_no_employ	Ps_godown	Ps_godown_dist	Ps_veh_trans	Ps_park	Ps_Sup_mod_trans	
1	1	1	1	1	2	1	1	3	1	2	1	3	2	1	3
1	2	2	2	3	2	2	2	3	5	1	2	1	4	2	2
1	1	2	1	1	1	1	1	1	3	1	2	3	1	1	1
1	2	2	1	2	1	1	1	3	1	1	3	1	1	1	1
1	3	3	2	3	3	3	1	3	1	2	1	4	2	3	3
1	1	2	1	2	2	2	2	3	1	2	1	2	1	1	2
2	4	5	2	1	1	1	1	3	3	1	3	2	1	3	3
2	4	3	2	2	2	2	3	1	1	2	1	4	1	3	3
2	2	4	3	2	1	1	3	3	1	2	1	4	2	1	1
3	1	2	1	1	2	2	2	1	2	1	2	1	1	1	1
3	2	3	2	3	2	1	3	5	3	2	1	4	2	4	4
4	4	3	2	2	3	1	3	1	3	1	4	3	3	1	1
4	2	2	1	1	2	2	3	1	2	1	2	2	1	1	1
4	3	4	2	1	1	1	1	3	1	2	2	1	4	1	3
4	1	3	1	2	2	1	3	2	4	2	1	4	3	1	1
4	4	2	1	3	2	1	1	1	2	1	3	2	2	1	1
5	3	3	3	2	3	2	3	1	3	2	1	4	1	2	2
5	2	1	1	3	2	1	3	5	4	2	1	4	2	1	1
5	2	3	2	1	1	3	1	1	1	1	5	3	1	1	1
6	1	2	1	2	1	2	3	1	2	2	1	4	3	3	3
6	4	3	2	3	2	1	3	2	4	1	2	1	3	4	4
6	3	4	3	2	3	3	3	1	3	1	3	2	1	1	1
6	2	3	2	1	2	2	3	1	2	1	2	1	3	1	1
6	1	1	1	2	2	2	2	5	1	2	1	4	1	2	2
6	4	3	2	1	3	1	3	1	4	2	1	4	1	3	3
7	4	1	1	1	2	1	3	1	2	1	2	2	3	3	3
7	2	2	3	2	3	1	3	1	1	2	1	4	2	1	1
7	1	2	1	1	2	2	3	5	4	1	4	3	3	2	2
7	1	3	2	2	1	1	2	1	2	1	1	4	1	1	1
7	3	1	1	2	2	1	3	1	1	2	1	4	3	3	3

Figure 100 Permanent Shop owner Data

Permanent shopowners = PS														
Shop location	Product sold	buildings in years	Status of building	type	Ownership	Annual income	Timings	Peak season	Number of employees	Godown available	godown distance from shop	Vehicle for transportation	Parking	supply's mode of transportation
Ps_Ward_no	Ps_Product_offer	Ps_Age_build	Ps_Status_build	Ps_type	Ps_owner	Ps_annual_inc	Ps_timing	Ps_peak_season	Ps_no_employ	Ps_godown	Ps_godown_dist	Ps_veh_trans	Ps_park	Ps_Sup_mod_trans
50 - 1	Textile - 1	<10 - 1	Good - 1	Single use - 1	Self - 1	<1,00,000 - 1	only morning - 1	Yearly - 1	one - 1	Yes - 1	N.A - 1	Walking - 1	in building - 1	Local / hmt - 1
68 - 2	Electronics - 2	10-50 - 2	Dilapidated - 2	Double use - 2	Rented - 2	1 lakh to 10 lakh - 2	Only evening - 2	Summer - 2	two to five - 2	No - 2	Adjacent - 2	2 - wheeler - 2	on - street - 2	Local / hmt - 2
77 - 3	Food - 3	50-100 - 3	Unstable and risky - 3	Multiple uses - 3	Co-operative 3	> 10 lakhs - 3	Full day - 3	Winter - 3	five to 20 - 3		Neighbourhood - 3	3/4 - wheeler - 3	dedicated at distance - 3	outside/hmt - 3
78 - 4	Other - 4	100-300 - 4						Rainy - 4	>20 - 4		Ward - 4	N.A. - 4		outside/hmt - 4
79 - 5		>300 - 5						Festival oriented - 5			Outside ward - 5			
80 - 6											Outside city - 6			
81 - 7														

Figure 101 Permanent Shop owner Metadata

Ts_Ward_no	Ts_produ ct_sold	Ts_type	Ts_regis	Ts_days_ week	Ts_timing s	Ts_plc_o per
1	3	1	2	4	2	2
1	2	2	2	2	3	1
1	4	1	2	4	1	1
2	1	4	1	3	2	2
2	2	3	1	1	1	2
2	2	1	2	2	2	1
2	1	2	2	4	1	1
3	1	1	1	2	2	2
3	3	4	2	1	3	1
3	2	2	2	4	2	1
4	4	1	1	4	2	2
4	4	4	1	2	1	1
4	2	3	2	3	2	2
4	4	1	2	2	3	1
4	3	2	2	2	2	1
5	4	2	1	1	1	1
5	2	4	2	4	2	2
6	1	3	2	1	3	1
6	1	1	1	2	2	2
6	4	4	1	4	2	1
6	3	3	2	4	1	1
6	1	4	2	4	1	1
6	4	3	1	3	3	2
6	2	3	2	2	2	1
6	1	4	2	4	1	1
6	3	3	1	1	2	2
7	3	1	2	1	1	1
7	3	2	2	4	3	1
7	3	4	1	2	2	2
7	2	3	2	4	1	1

Figure 102 Temporary Shop owner Data

Temporary shopowners = TS						
Shop location	Product sold	type	Registered	Days in week	Timings	Place of operation
Ts_Ward_no	Ts_product_sold	Ts_type	Ts_regis	Ts_days_week	Ts_timings	Ts_plc_oper
50 - 1	Textile -1	Hawker moving -1	Yes -1	weekly -1	Only morning -1	on-street - 1
68 - 2	Parts- 2	Temporary moving-2	No -2	only weekends -2	Only evening -2	In market -2
77 - 3	Food -3	Hawker static -3		only weekdays -3	Full day -3	
78 - 4	Others - 4	Temporary static -4		Daily -4		
79 - 5						
80 - 6						
81 - 7						

Figure 103 Temporary Shop owner Metadata

Rishikesh Dixit, Masters in Urban and Rural Planning, 2017-19

RI_Area_house	RI_build_age	RI_Status_build	RI_type	RI_owner	RI_occu	RI_place_occu	RI_trans	ri_parking	RI_water	RI_garbage	RI_sanitat	RI_electric	RI_govt_h	RI_open_a	RI_police	RI_comm
3	2	2	1	2	1	3	2	1	3	3	3	3	2	4	1	3
1	4	2	1	1	2	3	2	2	3	4	2	4	2	3	2	3
3	3	2	2	3	3	2	1	2	4	4	4	3	2	4	2	3
4	2	1	1	2	2	3	3	1	3	4	2	3	1	3	3	2
4	3	2	1	1	2	2	1	1	4	3	3	3	1	3	3	2
2	3	2	2	1	1	2	3	1	2	3	3	3	2	4	2	3
2	1	1	2	2	1	4	3	2	3	3	2	3	1	3	1	3
3	3	2	1	2	2	2	1	2	4	3	3	4	2	3	1	3
4	2	2	3	1	3	3	3	1	3	4	3	2	1	4	3	3
2	2	1	1	1	1	2	1	2	4	3	2	3	1	3	3	3
2	3	1	2	1	3	3	2	1	4	4	3	3	1	4	2	2
3	3	1	2	2	2	2	2	1	4	4	3	4	1	3	2	2
3	4	3	1	2	1	3	3	1	3	2	2	3	1	4	2	2
2	3	2	1	2	1	1	1	2	2	3	4	3	1	4	3	3
2	5	3	1	2	1	2	2	1	3	3	3	3	1	3	3	3
4	4	3	2	3	3	2	3	1	3	3	3	3	1	3	3	2
3	3	1	3	1	2	4	4	3	4	4	2	3	1	1	1	3
3	2	1	2	2	1	1	1	1	3	4	3	2	2	3	1	3
4	2	1	1	1	1	3	3	1	2	3	4	3	2	1	2	3
2	3	2	2	3	4	2	2	2	3	4	3	3	1	2	2	2
2	3	1	2	2	5	2	3	3	3	4	3	4	1	2	2	2
4	2	1	1	1	2	3	3	1	4	3	2	3	2	1	2	3
2	2	1	3	2	1	1	1	2	4	3	3	2	2	2	1	1
4	4	3	1	3	2	2	2	1	4	2	3	3	3	1	1	1
1	3	2	1	2	2	3	2	1	3	4	4	3	2	2	1	1
3	1	1	2	1	4	3	2	2	3	3	3	3	2	1	1	1
2	2	1	2	2	3	3	2	1	2	4	3	3	2	2	1	1
1	3	1	1	2	1	3	3	2	4	4	2	4	3	2	1	1
2	3	1	1	1	1	2	3	2	3	4	4	3	2	2	3	3
3	3	2	3	3	2	2	1	1	4	3	3	3	2	1	3	3
2	2	1	1	2	3	3	2	2	4	3	3	3	3	2	3	3
2	2	1	1	1	2	4	2	1	2	4	2	4	2	2	3	3
3	3	1	2	2	3	3	3	2	4	4	4	2	3	1	2	3
2	4	3	2	3	1	2	2	1	3	3	2	2	2	2	2	3
4	2	1	1	2	3	2	2	1	2	3	3	4	2	2	2	3
1	3	1	1	1	1	1	1	3	3	4	2	3	1	3	2	2
3	2	1	2	1	1	1	1	1	3	3	3	3	1	4	2	2
4	5	3	3	2	1	2	2	1	4	2	3	3	2	3	1	3
2	3	2	2	1	4	1	1	2	2	4	2	3	1	3	1	3
3	2	1	1	1	1	1	1	3	3	4	4	1	3	1	2	
2	3	1	1	2	1	1	1	3	3	3	2	3	2	3	1	3
3	4	3	2	3	2	2	3	1	4	4	3	2	1	4	1	2
3	1	1	2	1	3	3	3	1	4	4	3	3	1	1	2	3
2	1	1	1	2	2	1	1	2	3	4	4	3	2	1	2	3
3	2	2	1	1	1	3	3	1	4	4	4	4	2	1	1	3
4	3	2	1	1	3	3	2	1	3	4	4	4	3	1	1	3
2	1	1	2	2	2	4	4	2	3	4	4	3	2	1	1	3
3	3	2	2	1	1	3	3	1	4	4	3	4	2	1	2	3
3	2	2	1	2	3	3	3	1	4	4	4	3	3	1	2	3
3	1	1	3	1	2	2	1	1	3	3	4	3	2	1	3	3

Figure 104 Residential Legal Data

Residential Legal = RI																		
residence location	family members	Area of house	building age	Status of building	type	Ownership	Occupation	Place of occupation	transportation	Parking	Status of service				Nearest facility in m			
RI_Ward no	RI_no_fam_m	RI_Area_house	RI_build_age	RI_Status_build	RI_type	RI_owner	RI_occu	RI_place_occu	RI_trans	ri_parking	RI_water_sup	RI_garbage_coll	RI_sanitation	RI_electric_supp	RI_govt_hosp	RI_open_area	RI_police_stat	RI_comm_hall
50-1	one-1	<20 sq m-1	<10-1	Good-1	Single use-1	Self-1	Business-1	Same building-1	walking-1	inside plotline-1	Not available-1	Not available-1	Not available-1	Not available-1	<300-1	<300-1	<300-1	<300-1
60-2	two to four-2	20-50 sq m-2	10-50-2	Degraded-2	Double use-2	Rented-2	government service-2	Same neighbourhood-2	2-wheeler-2	on-street-2	Not available-1	Not available-1	Poor-2	Poor-2	300-1000-2	300-1000-2	300-1000-2	300-1000-2
77-3	Four to 8-3	50-200 sq m-3	50-100-3	Unsuitable and risky-3	Multiple uses-3	Co-operative-3	Private sector-3	city-3	4-wheeler-3	distant-3	Poor-2	Poor-2	Poor-2	Poor-2	1000-5000-3	1000-5000-3	1000-5000-3	1000-5000-3
78-4	n6-4	>200 sq m-4	100-300-4				other-4	outside city-4	other-4		Good-3	Good-3	Good-3	Good-3	5000-10000-4	5000-10000-4	5000-10000-4	5000-10000-4
79-5			>300-5				None-5				Excellent-4	Excellent-4	Excellent-4	Excellent-4				
80-6																		
81-7																		

Figure 105 Residential Legal Metadata

Planning strategies for Urban Renewal of core area of Nagpur city

Ri_Ward_no	Ri_type	Ri_member	Ri_child	Ri_years	Ri_type_struct	Ri_occup	Ri_ann_in	Ri_willing_rehab	Ri_job_at_tach_res	Ri_ration	Ri_water	Ri_Private	Ri_cooking	Ri_veh_tra
1	1	2	1	3	2	1	3	1	2	2	1	1	1	2
1	1	2	1	3	3	2	3	1	2	2	1	2	1	2
1	1	3	1	2	1	2	3	2	1	1	1	1	1	1
1	1	2	2	3	3	1	2	1	2	2	2	1	1	2
1	2	1	2	1	4	4	1	1	2	2	2	2	1	2
1	1	2	1	3	2	2	3	1	2	1	1	1	1	2
1	1	3	1	4	3	1	3	1	1	2	1	2	2	2
1	1	2	2	2	1	2	3	2	2	1	1	2	1	2
2	1	2	2	3	1	3	3	1	2	1	1	1	1	2
2	1	3	1	3	2	2	2	1	2	1	1	1	1	1
2	1	2	1	2	3	1	3	1	1	1	2	2	1	2
2	1	2	2	4	2	2	2	1	2	1	1	1	1	2
2	1	3	1	3	2	4	3	2	1	1	1	1	2	2
2	1	1	2	2	3	1	2	1	2	1	1	1	1	2
3	1	2	1	3	2	1	2	1	2	1	1	1	1	1
3	1	3	1	3	2	2	3	1	2	1	1	1	1	2
3	1	2	2	4	1	1	3	1	1	1	1	1	1	1
3	1	3	1	2	3	2	2	1	2	1	1	1	1	2
3	1	3	1	3	2	4	3	1	2	1	1	1	1	2
4	1	2	1	3	1	1	3	1	2	1	1	1	1	2
4	1	3	1	3	2	1	3	2	1	1	1	1	1	1
4	1	1	2	2	2	2	3	1	2	1	1	1	1	1
4	1	2	1	3	3	1	3	1	1	2	2	2	1	2
4	1	3	2	3	2	3	3	1	1	1	1	1	1	2
4	1	3	1	2	2	2	2	1	2	1	1	1	1	2
4	2	1	2	1	4	4	1	1	1	2	2	2	2	2
4	2	2	2	1	4	4	1	1	1	2	2	2	2	2
5	1	2	1	2	1	1	3	1	2	1	1	1	1	2
5	1	3	1	3	2	1	2	2	1	1	1	1	1	2
5	1	3	2	1	1	2	2	1	2	1	1	2	2	2
5	1	2	1	3	3	3	3	1	2	2	1	1	1	2
5	1	1	2	2	1	4	1	1	1	1	1	1	1	1
5	1	2	2	2	2	2	3	1	2	2	2	1		1
5	1	3	2	3	1	2	3	1	2	1	1	1	1	2
5	1	2	1	1	3	1	3	1	2	1	1	1	1	2
5	1	1	2	2	3	4	1	1	1	1	1	1	1	1
5	1	2	1	1	2	2	3	1	2	1	1	1	1	2
6	1	2	2	3	3	2	2	1	2	2	1	1	1	2
6	1	3	1	3	2	1	1	1	2	1	1	2	2	2
6	1	3	2	2	1	2	3	2	1	1	1	1	1	1
6	1	3	2	2	1	2	3	1	2	1	1	1	1	2
7	2	1	2	2	4	4	1	1	2	2	2	2	2	2
7	2	2	1	2	4	4	1	1	2	2	2	2	2	2
7	2	1	2	1	3	4	1	1	1	2	2	2	2	2
7	2	3	1	3	4	4	1	1	2	2	2	2	2	2
7	1	2	2	2	2	2	3	1	2	1	1	2	1	2
7	1	3	1	2	2	1	3	1	2	1	1	1	1	1
7	1	3	1	3	1	3	2	1	1	2	1	1	1	2
7	1	2	2	1	2	2	3	2	1	1	1	1	1	1

Figure 106 Residential Illegal Data

Residential Illegal = Ri														
residence location	Type	Members	Children living	Years of residing	type of structure	Occupation	Annual income	s to rehabilita	to residence	Belonging and facilities				
Ri_Ward_no	Ri_type	Ri_member	Ri_child	Ri_years	Ri_type_struct	ri_occu	Ri_ann_inc	Ri_willing_rehab	Ri_job_attach_res	Ri_belong_fac				
										Ri_ration	Ri_water	Ri_Private	Ri_cooking	Ri_veh_trans
50 - 1	Slum -1	one -1	Yes - 1	<5 - 1	Pucca - 1	Private job - 1	<1k - 1	Yes - 1	Yes - 1	Yes - 1	Yes - 1	Yes - 1	Yes - 1	Yes - 1
68 - 2	Squatter - 2	two to four - 2	No - 2	5 to 10 - 2	Semi-pucca - 2	Business - 2	1k to 5k - 2	No - 2	No - 2	Yes - 1	Yes - 1	Yes - 1	Yes - 1	Yes - 1
77 - 3		>4 - 3		10 to 50 - 3	Kutcha - 3	Govt. employee - 3	>5k - 3			No - 2	No - 2	No - 2	No - 2	No - 2
78 - 4				>50 - 4	No structure - 4	Other - 4								
79 - 5														
80 - 6														
81 - 7														

Figure 107 Residential Illegal Metadata