AREA BASED DEVELOPMENT IN SMART CITY – RELEVANCE FOR URBAN PLANNING AND INCLUSIVITY

A Project Submitted

in Partial Fulfilment of the Requirements

for the Degree of

MASTER

In

Urban and Regional Planning

By

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Under the Guidance of

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BABU BANARASI DAS UNIVERSITY

2022-2023

BABU BANARASI DAS UNIVERSITY, LUCKNOW

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4. Degree for which the thesis is submitted: **Masters in Urban & Regional Planning**

5. School (of the University to which the thesis is submitted)
   School of Architecture and Planning

6. Thesis Preparation Guide was referred to for preparing the thesis. ☐ YES ☐ NO

7. Specifications regarding thesis format have been closely followed. ☐ YES ☐ NO

8. The contents of the thesis have been organized based on the guidelines. ☐ YES ☐ NO

9. The thesis has been prepared without resorting to plagiarism. ☐ YES ☐ NO

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11. The thesis has not been submitted elsewhere for a degree. ☐ YES ☐ NO

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ABSTRACT

Rapid urbanization is a global phenomenon. Current estimates suggest that by 2030, over 60 per cent of global population will be living in cities, increasingly concentrated in Africa, Asia and Latin America (Commission on science and technology for development – United Nations 2016). With the emergence of the latest concept of smart cities, there is a rapid change of lifestyle and a mass migration to cities. At the same time, cities have high demands of infrastructure such as transport and building, and resources such as transport and building, and resources such as food, water, and energy, as well as issues like scarcity of adequate land, unapproachable government. All these are adding to the extreme need to find smarter solutions for cities, that can provide better liveable conditions for the citizens. The Indian government planned 100 smart city project to enter and compete with the new world and growing technologies. Many questions were raised by the citizens, researchers on the proposal point out for justification on appropriateness of proposal time, money, approach and objectives. In this project, I am evaluating the current proposal as an urbanist and using the opportunity to refine the project for a realistic and promising future, rather than creating a label of smartness. I explore the conditional development of smart cities, investigating various examples from different continents and producing an analytical framework towards the approach of making a city smarter. These examples are assisting me to set guidlines, to shape the Indian cities with its own definition of smartness.The focal point of this project is Delhi. Although, due to lack of time , I would emphasis of few sectors of smartness, in selective neighbourhoods of Delhi.

Before the proposal and evaluation, knowing the term smart and its scope in the city system was necessary. The concept of the smart city is elaborated with learnings from the present smart cities around the world. Classic differences are visible towards the approach of smartness from city to city. Thus, the Indian context is more relatable with the cities of developing countries and Asian countries. Through this project I am trying to ingrate the concept of smartness in the government planning and development system of Delhi rather than keeping a separate smart project or proposal. The chosen site for the project are two contrasting areas that require tailormade solutions to address the issues.

ACKNOWLEDEMENTS

It is my pleasure to write this acknowledgment and give thanks to all those who provided me support to do this work and helped me to understand and study this topic, it gives me great pleasure to express my gratitude and thanks to my guide **Ar.Versha Verma**, Assistant Professor, School of Architecture and planning B.B.D. University Lucknow for their valuable   guidance, steady encouragement, and strong support to reach to this stage.

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department.

Last but the least, I am obliged to **my parents and my family** for giving me freedom to explore and grow professionally and for supporting me.

ANSHIKA GOEL

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UNDERTAKING

I, Ms. Anshika Goel, the author of the thesis titled "AREA BASED DEVELOPMENT OF SMART CITY-RELEVANCE FOR URBAN PLANNING AND INCLUSIVITY", hereby declare that this is an independent work of mine, carried out towards fulfilment of the requirements for the award of the Masters in Urban & Regional Planning at the Department of Architecture and Planning, BBDU, Lucknow. The work has not been submitted to any other organization / institution for the award of any Degree/Diploma.

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CHAPTER – 1: INTRODUCTION

1.1 BACKGROUND

In the last decade smart cities have gained valiue in literature, policies, and practices due to rapid urbanization. The strategic components of area based development in the smart cities mission are city improvement, city renewal and city extension plus a pan city initiative in which smart solutions are applied covering large parts of the city.The purpose of the Smart Cities Projects is to drive economic growth and improve the quality of life of people by enabling local area development and harnessing technology, especially technology that leads to Smart outcomes. Area- based development will transform existing areas (retrofit and redevelop), including slums, into better planned ones, thereby improving liveability of the whole City.

1.2 NEED FOR THE STUDY

RAPID URBANIZATION :
By 2030, 60% of worlds population is expected to live in cities results in heavy strain on energy, transportation, water, building and public spaces.
Increasing need is the being felt for smart city which are both efficient, sustainable and can generate economic prosperity and social well being.

1.3 RESEARCH QUESTION

1.   How does understanding of the 'Smart city' concept vary around the world in relation to the conditions of the specific place? How can experiences of adapting technologies around the world be adapted in India?

2.   How operational is the Indian smart cities mission ? What are the strengths and weakness of the proposed smart city plans in selected example cities ?

3.   What are the present policies and strategies in terms of urbanization? How can the urbanization of Indian cities be made smarter by modifying existing planning systems and spatial strategies and policies ?

4.   How can the aspect of citizen engagement in governmental policies and strategies, be included for Indian smart cities ?

5.   How can smart city technology be used to reduce unevenness in infrastructure and service distribution on a city scale ?

1.4 AIM

To curb the growing negative impacts of urbanization smart cities as an urban strategy considered for sustainable development and support innovation , economic development, and inclusion.

1.5 OBJECTIVE

•To give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions.
•To drive economic growth and enhance lifestyle quality.
•To provide better infrastructure, introduce better healthcare facilities and improve safety and security.

1.6 SCOPE AND LIMITATIONS

• A smart city is a technologically modern urban area that uses different types of electronic methods and sensors to collect specific data.
• Smart cities can enhance society through innovation and digital transformation.
• Real estate becomes more expensive, as it is more difficult to build and execute.
• There is a dependance on technology service companies.
• The study area is limited to the Delhi Municipal Corporation(DMC) administrative boundary.
• Designing of the ABD itself and a detailed economic analysis of the proposal is not within the scope of this thesis.

1.7 METHODOLOGY

STAGE – 1 INTRODUCTION	Need of study, Aim, Objective, Scope & limitations
STAGE – 2 LITERATURE REVIEW	•Secondary sources mainly to gain knowledge on definitions & terminology. •Identifying case studies & analyzing it.
STAGE – 3 DATA COLLECTION	•Primary data collection •Secondary data collection
STAGE – 4 DATA ANALYSIS	•Analysis of characteristics of smart city
STAGE – 5 AREA BASED DEVELOPMENT MODELS	•Retrofitting •Redevelopment
STAGE – 6 ISSUES IDENTIFICATION & REVIEW OF THE ISSUES	•Issues in Area based development in Smart Cities •Examining the issues & forecasting future demand
STAGE – 7 FORMULATION OF AREA BASED DEVELOPMENT	Smart city selection process, Strategies, Conclusions & Findings

CHAPTER – 2: LITERATURE

Since the study is based on Smart City development, it is now needed to understand the smart city's contribution in the overall urban planning and to curb the growing negative impacts of urbanization smart cities as an urban strategy considered for sustainable development and support innovation , economic development, and inclusion.
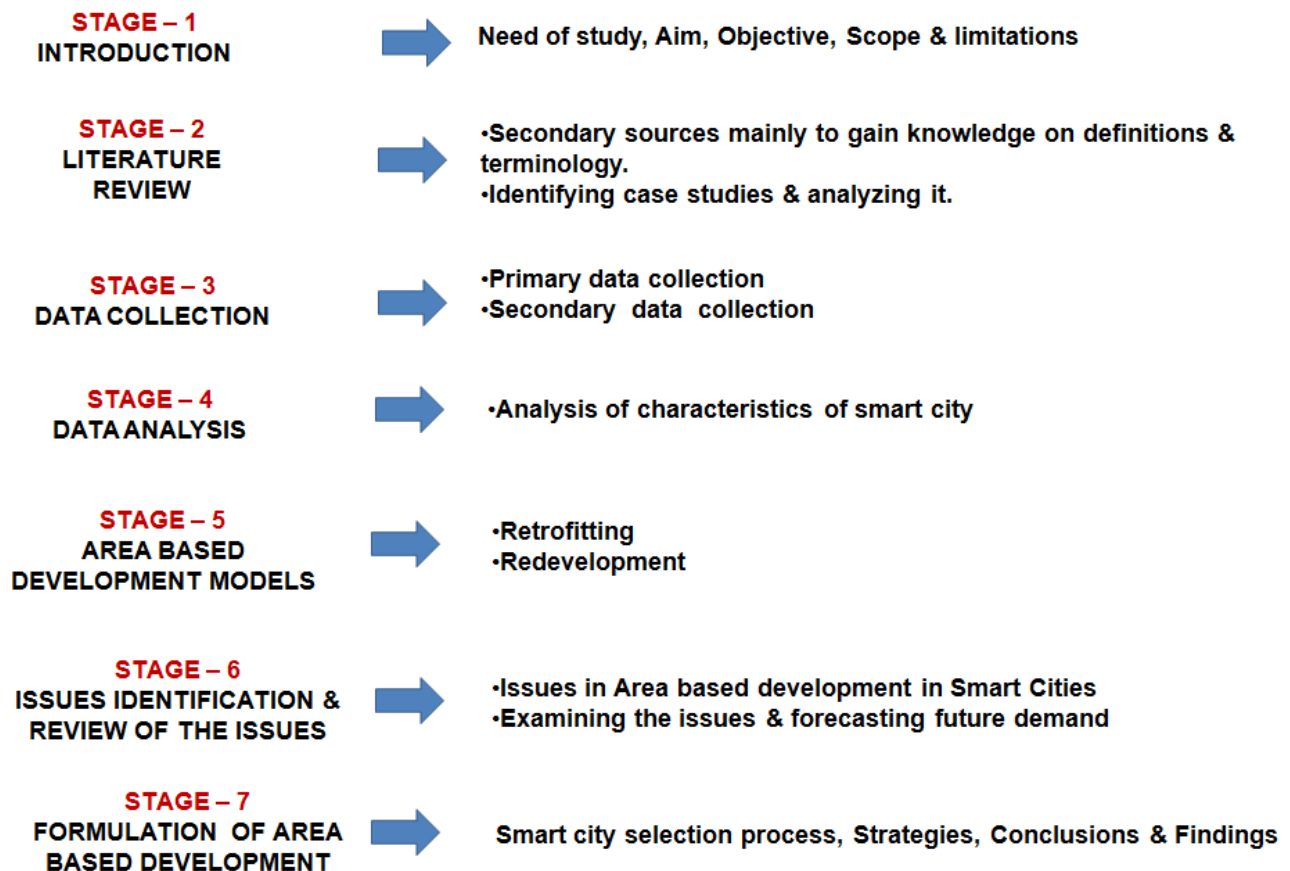
2.1 SMART CITY COMPONENTS

A study on smart city component architecture uses GIS operational platform as base for managing infrastructure development components with systems operability for available city infrastructure related systems [2]. This work introduced a smart city development pyramid, Figure 1.1, which consists of four primary stages in building a smart city: smart infrastructure, smart database resources, smart building management system and smart interface. Smart Infrastructure is the base foundation of smart city and its preparation should be considered and discussed during concept of design of all infrastructure networks. The smart infrastructure is represented in transmitting and receiving the data using communication protocols from and to the network devices. The second stage is building up proper database that can reflect existing or proposed infrastructure networks. The database should reflect the completeness of the networks assets as well as consistency and data integrity [2]. After completing the second stage which reflects the physical reality of the assets/network components. The third stage is building the most practical and efficient Building Management System, which has automation work frame that has to be smartly operated. Smart interface provides an easy way to connect and utilize the system component as a whole, e.g. as dashboard or integrated web services [2]. In this work, we see smart city development pyramid which can be applied in other similar smart city development projects. The components of the pyramid suitably match the convention of smart city projects and hence can be suitably applied during development of smart city systems. In relation to our development framework, a number of components discussed in this work [2] have similarities with components used in our development framework. Smart Infrastructure (development pyramid) relates to our data retrieval system. Smart database resource (development framework) relates to our SSC database server and smart interface (development framework) relates to SSC web services platform. In conclusion, this work [2] helps in identifying the building blocks and hierarchy needed in smart city development.
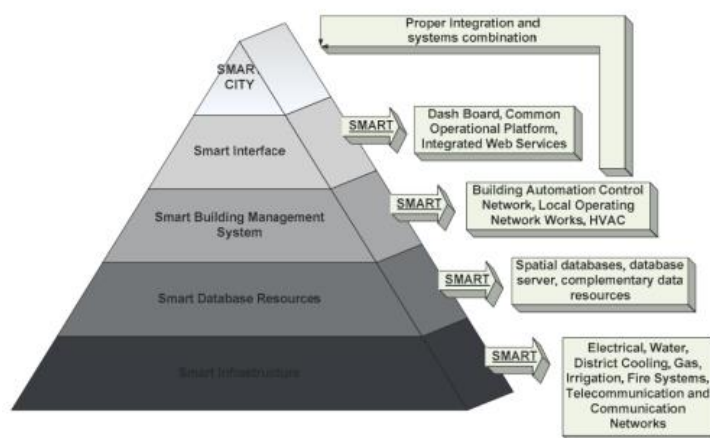

Figure 2.1

2.2 BENEFITS OF SMART CITY

Smart cities that leverage connected technology in all their operations reap a host of benefits. Here are some benefits of Smart Cities that should be considered:

1.- Effectiveness in data-based decision-making
Advances in big data and connected devices have allowed cities to access information that was hitherto unavailable. A well-designed data analysis strategy offers the ability to access and analyse a wealth of information. It also allows us to easily obtain useful knowledge. **Service levels increase rapidly when a city can monitor metrics in real time**.
Effective big data applications and strategies provide cities with information to, among other things, identify trends and citizens' interests, concerns, and needs. The combination of the Internet of Things and Big Data offers endless possibilities for more robust decision-making.

2.- Improving public commitment
The digital services offered by Smart Cities must be high quality and easy to use. Collaboration tools, modern and intuitive websites, mobile applications, self-service portals, and online accounts have become the standard in many facets of life. Citizens expect their city to be ready to use these technologies.
The expansion of digital services in communities makes Smart Cities a more attractive place for residents to live. It also promotes a connected experience in order to create closer relationships with citizens:
Open government data.
Interactive maps.
Government scorecards.
Budgetary transparency.
Local Council meetings broadcast live.
A strong presence on social media.

3.- Creating safer communities
A Smart City is a safer city. Some of the benefits of Smart Cities come from innovative technologies. Such technologies may include:
Vehicle-plate recognition.
Connected law enforcement facilities.
State-of-the-art emergency call services.
Many cities have already begun to invest in smart technologies to promote a safer community. The City of Detroit recently partnered with local businesses to develop a connected cloud-based video platform. This platform gives police the ability to access video from corporate security cameras in real time. Violent crime has decreased by 50% in areas where this system has been implemented.

4.- Improving the environment
The fight to improve the environment is now high on the public agenda. Smart cities are doing all they can to combat negative effects on the environment. Such effects include the increase in greenhouse gases, the waste in our oceans, and litter on our streets.
Energy-efficient buildings, air quality sensors and renewable energy sources provide new tools for cities to reduce their ecological impact.
The deployment of air quality sensors around a city, for example, can provide data to track peaks in low-quality air. These sensors can even improve pollution in densely populated cities. They can also identify the causes of this pollution. This means the data needed to develop action plans can be duly provided.

5.- Improved transport

Investment in smart urban transport is expected to increase by more than 25% annually over the next five years, according to SmartCity. Connected transportation systems are perfect for improving efficiency in cities. An example of this could be improved traffic management, or even the ability for passengers to track bus or train locations.

Smart technologies allow cities to better serve citizens, even despite their rapid growth. Technologies such as smart traffic signals optimise traffic flow. This can relieve congestion at times of heavy traffic.

The benefits of Smart Cities are therefore clear. It is hard to ignore the many benefits that connected cities offer. However, as with any significant citywide technology initiative, implementation requires vision, investment, and careful planning in order to ensure successful take-up.

Figure 2.2

2.3 AREA BASED DEVELOPMENT

The strategic components of area-based development in the Smart Cities Mission are city improvement (retrofitting), city renewal (redevelopment) and city extension (greenfield development) plus a Pan-city initiative in which Smart Solutions are applied covering larger parts of the city. Below are given the deions of the three models of Area-based smart city development:

•**Retrofitting** will introduce planning in an existing built-up area to achieve smart city objectives, along with other objectives, to make the existing area more efficient and liveable. In retrofitting, an area consisting of more than 500 acres will be identified by the city in consultation with citizens. Depending on the existing level of infrastructure services in the identified area and the vision of the residents, the cities will prepare a strategy to become smart. Since existing structures are largely to remain intact in this model, it is expected that more intensive infrastructure service levels and a large number of smart applications will be packed into the retrofitted smart city. This strategy may also be completed in a shorter time frame, leading to its replication in another part of the city.

•**Redevelopment** will effect a replacement of the existing built-up environment and enable co-creation of a new layout with enhanced infrastructure using mixed land use and increased density. Redevelopment envisages an area of more than 50 acres, identified by Urban Local Bodies (ULBs) in consultation with citizens. For instance, a new layout plan of the identified area will be prepared with mixed land-use, higher FSI and high ground coverage. Two examples of the redevelopment model are the Saifee Burhani Upliftment Project in Mumbai (also called the Bhendi Bazaar Project) and the redevelopment of East Kidwai Nagar in New Delhi being undertaken by the National Building Construction Corporation.

•**Greenfield** development will introduce most of the Smart Solutions in a previously vacant area (more than 250 acres) using innovative planning, plan financing and plan implementation tools (e.g. land pooling/ land reconstitution) with provision for affordable housing, especially for the poor. Greenfield developments are required around cities in order to address the needs of the expanding population. One well known example is the GIFT City in Gujarat. Unlike retrofitting and redevelopment, greenfield developments could be located either within the limits of the ULB or within the limits of the local Urban Development Authority (UDA).

•**Pan-city** development envisages application of selected Smart Solutions to the existing city-wide infrastructure. Application of Smart Solutions will involve the use of technology, information and data to make infrastructure and services better. For example, applying Smart Solutions in the transport sector (intelligent traffic management system) and reducing average commute time or cost of citizens will have positive effects on productivity and quality of life of citizens. Another example can be waste water recycling and smart metering which can make a huge contribution to better water management in the city.

The smart city proposal of each shortlisted city is expected to encapsulate either a retrofitting or redevelopment or greenfield development model, or a mix thereof and a Pan-city feature with Smart Solution(s). It is important to note that pan-city is an additional feature to be provided. Since smart city is taking a compact area approach, it is necessary that all the city residents feel there is something in it for them also. Therefore, the additional requirement of some (at least one) city-wide smart solution has been put in the scheme to make it inclusive.

2.4 EVOLUTION OF THE CONCEPT OF SMART CITY

Table 2.1 summarizes how the concept of 'Smart City' has evolved over the years.

Sr. No.	Literature	Year(s)	Concept
1	(Bhattacharya, 2015)	1992	Smart Growth : Alternative paradigm to sprawling urbanization and dependence on automobiles
2			Mixed land use and compact design
3			Walkable urban centres
4			Sense of community living
5	(Townsend, 2013 ;	1990s -	Intelligent cities and Smart City:

	Townsend and Champion, 2014 ; Harrison and Donnelly, 2011 ; Hollands, 2008)	early 2000s	City functioning using data and information technology
6	(Paroutis et al., 2014)	2008-	Reduced urban financing and social welfare post the 2008 global economic crisis led to involvement of private sector for providing public urban services
7	(Steiner and Veel, 2014)		Smart City Model: system of complex flow of information
8		2011	"Smarter Cities" Trademark registered
9	(Chourabi et al., 2012)	2012	Smart City Label : usage non consistent
10	(Batty et al., 2012)	2012	Smart city: A city in which Information and Communications Technology (ICT) is merged with traditional infrastructures, coordinated and integrated using new digital technologies
11	(Song et al., 2017)		A Smart City uses technology to transform its core systems and optimize finite resources. At the highest levels of maturity.
12		2013	A Smarter City is a knowledge based system that provides real time insights to stakeholders, as well as enabling decision makers to proactively manage city's subsystems. Effective Information management is at the core of this capability, and integration and analytics are the key enablers
13	Smart City Council	2014	A smart city as one that has digital technology embedded across all city functions
14	(Bhattacharya et al., 2015)	2015	A Smart City is one which plans judiciously to meet its aspirations and challenges in a sustainable manner while fostering principles of good governance. These are achieved in a Smart City by utilizing the enhanced power of technology, engaging with a more aware and informed citizenry and creating a more competent and capacitated set of people working within an accountable framework

2.5 SMART CITIES MISSION : KEY RESEARCH GAPS, ISSUES AND ASSOCIATED CHALLENGES

Some of the key issues and challenges identified with respect to the Government of India's Smart cities Mission are outlined in Table 2.2

Sr. No.	Key Issues and challenges (Gaps)	Concerns	Relevant Literature
1	Lack of an appropriate model for smart cities for India	Shall lead to non -inclusive developments	(Bhattacharya et al. , 2015)
2	No consensus on defining the indicators for Indian smart cities	Implementation of fragmented concepts leading to non-inclusive developments	
3	Lack of an overall framework for smart cities	Narrowly focussed on ICT as a means to achieve the objectives of a smart city	
4	Dissuade social acceptability	Privacy and security of sensitive personal data of citizens	
5	Detrimental to sustainability	Negative Environmental impacts due to intense resource(e.g. energy) requirements	
6	Lack of convergence with other programs concerning urban sector	Non-incorporation of spatial aspect of a city and non-alignment with City Development Plans (CDP) JNNURM and Swachch Bharat Mission may lead to ambiguity.	(Kundu, 2014)
7	Requirement of internationally recognized best practices to suit size, scale and context	May lead to environmentally non-sustainable and economically un-viable developments	
8	Lack of urban development policy and urban planning framework for funding strategies	Ad-hoc investments from private sector driven by profit motive and possibility of favouritism to richer states and richer Urban Local Bodies (ULBs)	High Powered Empowered Committee on Urban Infrastructure (HPEC, 2011; Bhagat, 2014)

9	Small cities lack capacity to implement urban development programmes	A big-city bias is likely as seen from JNNURM evaluation studies	(Kundu, 2014)
10	Time delays in release of funds by higher levels of Government such as Central government	Empowerment of local bodies may get affected by the Government of India's control	(Pancholi, 2014)
11	Lack of a participatory approach for scoping based on needs of local community and local solutions	Local needs might not get captured in the mission	(Bhagat, 2014 ; HPEC, 2011
12	Lack of inclusion aspects	Gender concerns of exclusion	Women, 2012
13	Ineffective linkage of city growth plans with spatial aspect	Using template based retrofitting approach may make it less contextual	(Bhattacharya et al. , 2016)
14	Fragmented nature of implementation	Possibility of non-achievement of key agendas of world class cities	(Mahadevia, 2011)
15	Sectoral bias	Possibility of inclination for certain infrastructure such as water supply, drainage and sewerage sectors.	(Bhattacharya et al., 2012)
16	Lack of capacity to adopt technology centric solutions	Shortage of skilled human resource pool, reluctance to use technology enabled platforms and possibility of dual databases(manual and computerised)	(Mohan et al., 2013)
17	Technology being non-neutral	Technology as an enabler of good governance also works as per context, yielding results accordingly	(Torres et al., 2005 ; Mohan , 2014)
18	Lack of clear vision and statutory status	Possibility of being looked upon as short term investment plans City Development Plans under JNNURM	(Thorton, 2011)

2.6 LITERATURE STUDY : VADODARA

2.6.1 INTRODUCTION OF THE CITY

•Vadodara (formerly known as Baroda) is a large city in the Indian state of Gujarat.
•It is located on the banks of the Vishwamitri river, 141 kilometers from the state capital Gandhinagar.
•The railway line and NH 8 that connect Delhi and Mumbai pass through Vadodara.
•It is known as a Sanskari Nagari of India.
•The city is known for the Lakshmi Vilas Palace, the residence of Baroda State's Maratha royal family.
•It is also the home of the Maharaja Sayajirao University of Baroda.
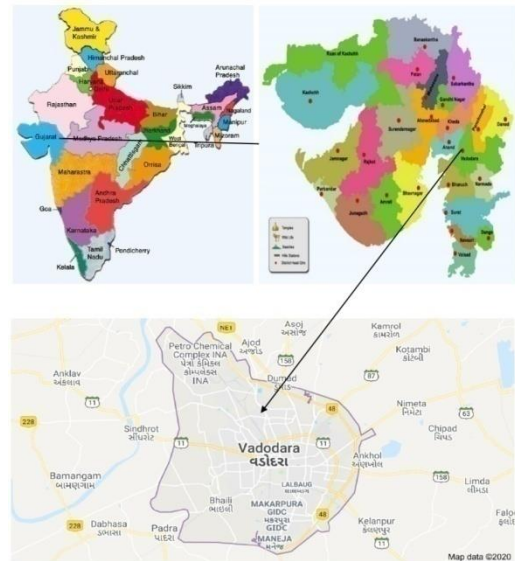
Figure 2.3

2.6.2 AREA BASED DEVELOPMENT

Retrofitting
+
Redevelopment

Re-development
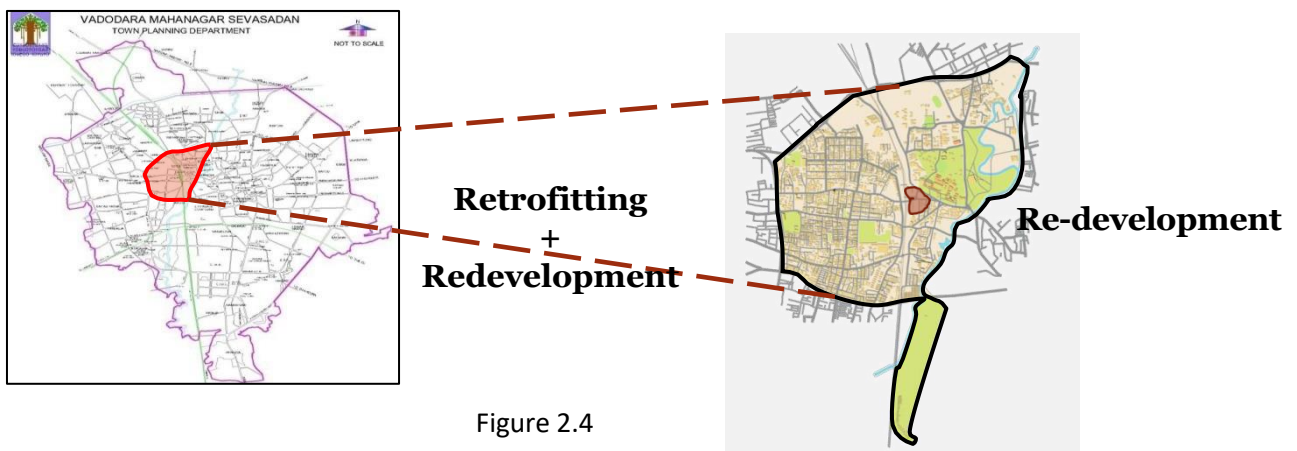
Figure 2.4

Key Features of ABD –

• Approx. 1698 Acres (part of Ward no. 6 , 7 & 10)
• Viswamitri River on East side
• M S University
• Railway Station
• Central Bus Station
• City Bus Depot
• Sayaji Baug(Kamati Baug)
• Town Hall

Key Statistics of ABD –
• Population - 67637
• Household - 23170

SMART CITY's TWIN MODEL
Retrofitting having Redevelopment
=(**1698 acres**)

2.6.3 PROPOSED AREA BASED DEVELOPMENT : VADODARA

IMPROVING QUALITY OF LIFE

(A) Smart Street Lights and Rooftop Solar Panels

• Solar panel project on Akota Dandia Bazar Bridge under implementation.
• The structure erection is completed for installation of 921 kW solar rooftop panels in ABD vicinity.
• 63% of the total 78,000 streetlights in Vadodara city converted to LED.
• Sensor Based LEDs have been planned in the ABD under smart city project.

Figure 2.5

Figure 2.6

Figure 2.7

(B) 24x7 Water Supply and Water ATMs

• The 24x7 Water supply Project, aims to ensure that the households of Vadodara will be entitled to a perpetual supply of water and will be charged for how much water is consumed by that particular household, monitored by a smart water meter.
• The setting up of various water tanks, overhead water tank, pumping station and related equipment, will be included as a part of the scheme.
• The Water ATM Project, will be set up as these units, posing as an interesting alternative to the Stand-post/ Tube-wells.

Figure 2.8

25 Location are identified in ABD area for water ATMs
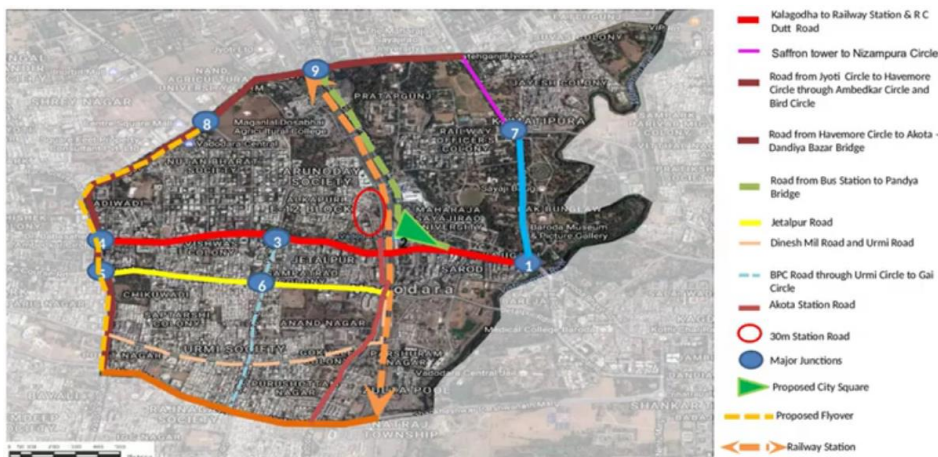Figure 2.9

(C) Visual Improvements of roads

Figure 2.10

(D) Proposed location of Urban Transport hub & Multi level car park

Status
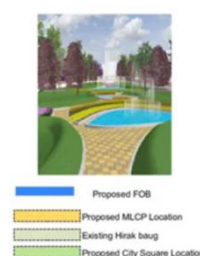• Rfp under preparation for Urban Transport Hub with Multi level car Park

Figure 2.11

CHAPTER – 3 : CASE STUDY

3.1 INTRODUCTION TO THE CITY INDORE

• Indore was founded as a trade market by local landowners from the Narmada River valley route.

• Indore is considered a tier 2 city in India and has a population of more than 2 million people, making it the most populous city in Madhya Pradesh and the 14th most populous city in India.

• Indore is the largest and most populous city in the Indian state of Madhya Pradesh.

• The city is distributed over a land area of just 530 square kilometres, making Indore the most densely populated major city in the central province.

Figure 3.1

3.2 REDEVELOPMENT AREA

Indore's Area Based Development (ABD), known as "Rajwada Rejuvenation" will cover 742 acres in the downtown/ Central Business District (CBD) area of the city out of 70,000 acres of total municipal land. The project aims to retrofit the existing area along with redeveloping certain parts of the land.

- ABD will include projects in:
- Transport and walkability
- Redevelopment of public land
- Water supply, wastewater management & sanitation
- Solid waste management
- Power supply & efficiency
- Underground electrification & shifting/laying of other utilities
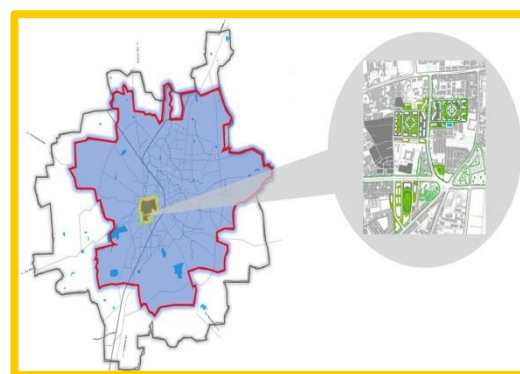- IT connectivity & IT enabled government services

Figure 3.2

Improvement of roads from Mhow Naka to Tori corner have been completed

Figure 3.3

Houses demolished for road widening in Jairampur Indore

A house partially demolished in Indore

Figure 3.4

RIVERFRONT DEVELOPMENT

Once the construction works are completed,

following are benefits are expected:

• Restoration/ visual improvement of the riverfront

• Preventing entry of sewerage into the river

• Creation of a city-level recreational area

Figure 3.5

Figure 3.6

CHAPTER – 4 : DETAILED ANALYSIS OF DELHI

4.1 INTRODUCTION TO THE CITY DELHI

- **Delhi**, officially the **National Capital Territory** (**NCT**) **of Delhi**, is a city and a union territory of India containing New Delhi, the capital of India.
- Straddling the Yamuna river, primarily its western or right bank, Delhi shares borders with the state of Uttar Pradesh in the east and with the state of Haryana in the remaining directions.
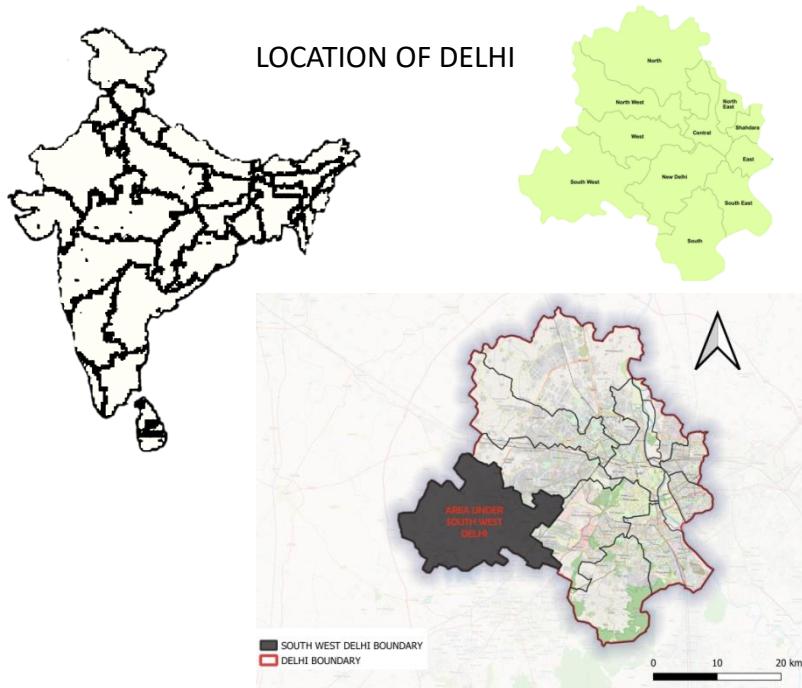- The NCT covers an area of 1,484 square kilometres (573 sq mi).

LOCATION OF DELHI

Figure 4.1

4.2 GENERAL SITE CONTEXT

- Here we will go through the hard facts to come up with possible smart solutions in city level.
- Population: 16,788,000
- Area: 1,484.0 kmsq.
- Density : 11,312/km sq. (29,298/sq. mi)
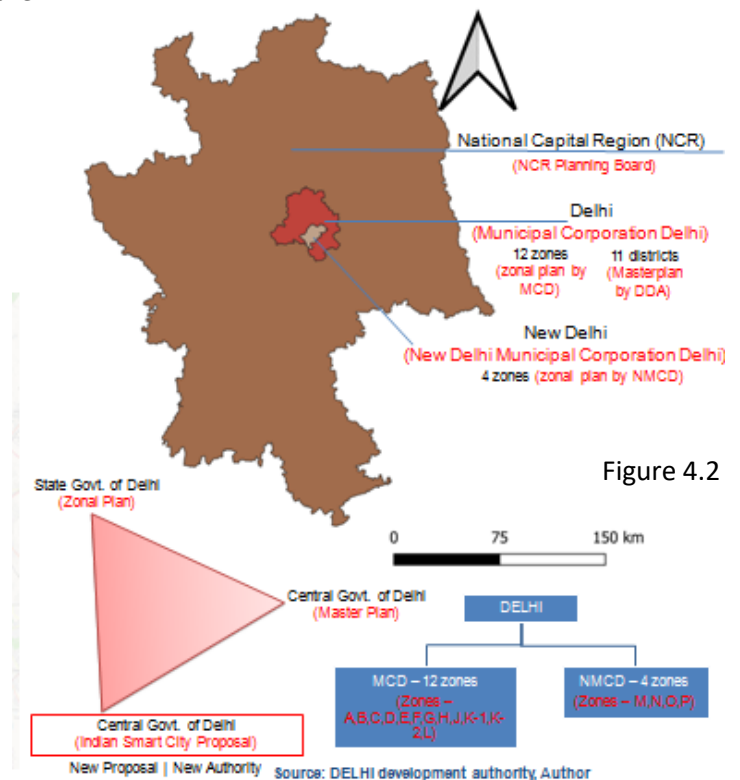- Municipality : Municipal corporation of Delhi (MCD) + New Delhi Municipal Corporation (NDMC)

Figure 4.2

4.3 THE SELECTED SITES

- Two neighbourhoods at a distance of one and half kms are having different issues, portrays a lot of difference in their characters.

- Not just that but also the government is treating them differently one is a planned sub city. And the other is an urban village.

- The sites are separated by a huge drain, which was previously a river this became the physical barrier that separated those two sites.

- The second site is excluded by the citizens as well as the government as it doesn't come under authorized areas in the master plan. We will see the issues and difference they have further.

DWARKA BOUNDARY
NAJAFGARH BOUNDARY
SOUTH WEST DELHI BOUNDARY
DELHI BOUNDARY

0   10   20 km

Figure 4.3

NAJAFGARH

DWARKA

site area
DWARKA
NAJAFGARH
DWARKA BOUNDARY
NAJAFGARH BOUNDARY

ROADS
MAJOR ROADS
NATIONAL HIGHWAY
WATERWAYS
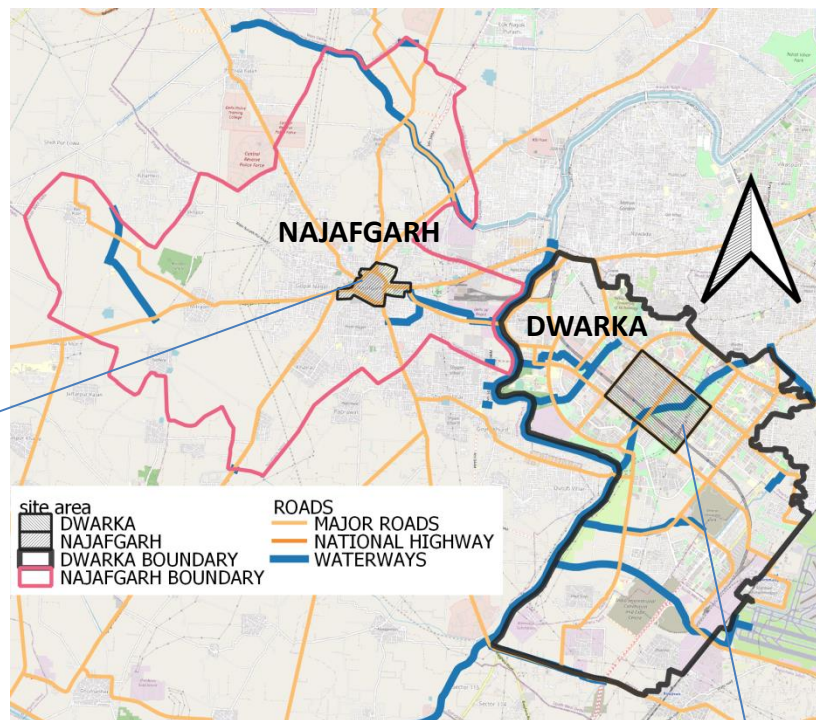
Figure 4.4

Redevelopment

- Census town of India
- Redevelopment as smart city strategy
- Rural environment with a lot of development scope

Figure 4.5

Retrofitting

- Newly build residential suburb.
- Retrofitting as smart city strategy.
- Self sufficient neighborhoods.

Figure 4.6

4.4 DETAILED ANALYSIS OF DWARKA

- The demonstration project will take place in two sectors of Dwarka, namely sector 11 and sector 12.
- As Dwarka sub city is still under construction, most of the sectors are not completely built.
- These are most populated and maximum built sectors and can be represented as the face of Dwarka.
- The comparison between landuse plan done by MCD and the local development plans by DDA.
- The two authorities are working separately and producing different landuse plans for the same area.
- This creates the sense of confusion and make the understanding of rules and regulations more complex.

4.5 PRESENT LANDUSE MAP

- This is the real landuse map that is actually been modified illegally by the residents.
- This clearly shows the violations of rigid planning structure.
- Though Dwarka is the only planned area where mixed use is proposed by the govt., but still the rigidity forces the citizens to break the rules.
- From this analysis, one of the main question rises for this study that : how much rigidity and rules actually needed or followed in the master plan and landuse plan?
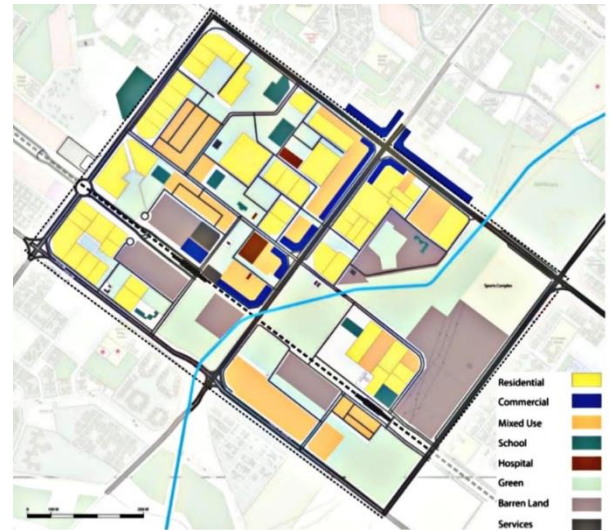

Figure 4.7   **Current land use map**

Masterplan Dwarka sector 11 and 12

Figure 4.8

Local development plans | Dwarka Sector 11 and 12

Figure 4.9

4.6 DETAILED ANALYSIS OF NAJAFGARH

- I selected the central market area of Najafgarh for detailed study and demonstration project.
- This area represent the character of the space very well.
- The character of the zone can be seen clearly in the images.

Figure 4.10

Figure 4.11

- Najafgarh area is one of the most densed place in the city, where there are a lot of illegal landuses are residing.
- Najafgarh is primarily know for being an economic and transport hub in rural Delhi.
- Najafgarh market is well famous for different varieties of shops including textile, hardware, ornament, sports, sweets.
- The strategy of redevelopment will be the chosen one in this case to uplift the condition of the place and adding futuristic sustainability.
- Najafgarh town and built up area around this town has been considered as special area for which Redevelopment Plan & Special Area Plan shall be prepared.
- Along the important main movement corridor i.e. MRTS corridor, major roads, new urban development is being done/ planned recently
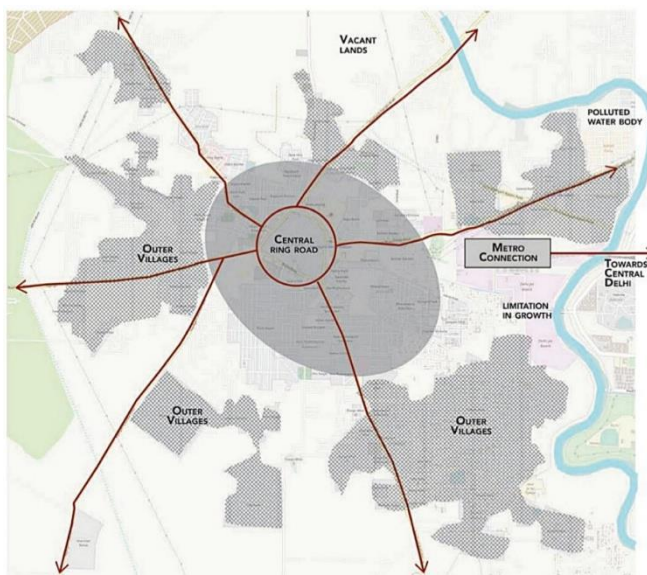
4.7 PRESENT LANDUSE MAP
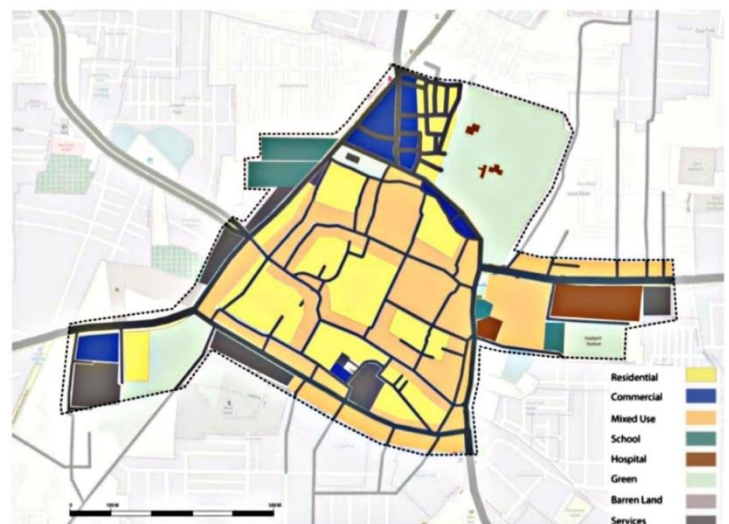

Figure 4.12   **Najafgarh Analysis Map**

Figure 4.13

CHAPTER 5 - DEMOGRAPHIC PROFILE OF THE SELECTED STUDY AREA

- The population of Dwarka sector 11 and 12 as per 2011 census is 47,362 out of which male and female are 25,304 and 22,058
- The population of Najafgarh as per 2011 census is 1,16,237 .
- The selected area is composed of 6 wards- 4 in Najafgarh and 2 in Dwarka which had a population of 163599 in 2011.
- Considering the population growth rate of 31% fior the past decade, the current population in the selected study area would be 218882.

5.1 SEX RATIO AND LITERACY RATE

- The sex ratio of the selected area is 876 female per 1000 male.
- Child sex ratio of girls is 871 per 1000 boys.
- In education section, the total literacy rate in Najafgarh is 88% out of which the female literacy rate is 72% & the male literacy rate is 82%.
- Same as in Dwarka male literacy rate is around 83% while female literacy rate is 68%.

DWARKA WORK PROFILE
- Out of total population, 12690 were engaged in work or business activity. Of total 12690 working population, 94% were engaged in main work while 5.8% of total workers were engaged in marginal work.

NAJAFGARH WORK PROFILE
- Out of the total population, 94% of workers describe their work as main work while 5% were involved in marginal activity **.**

Ward no.	Name	Population	Projected Population
		2011	2023
041-s	Gopal Nagar	3051	4117
044-s	Roshanpura	17061	23020
042-s	Dichaon Kalan	44150	59572
043-s	Najafgarh	51975	70130
038-s	Dwarka sec11	18590	24352
036-s	Dwarka sec12	28772	37691
	TOTAL	163599	218882

POPULATION IN 2011

47362 116237

■ DWARKA ■ NAJAFGARH

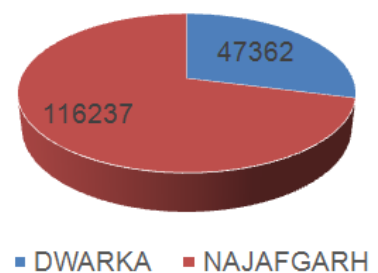Figure 5.1   Population of Wards in selected area   Figure 5.2
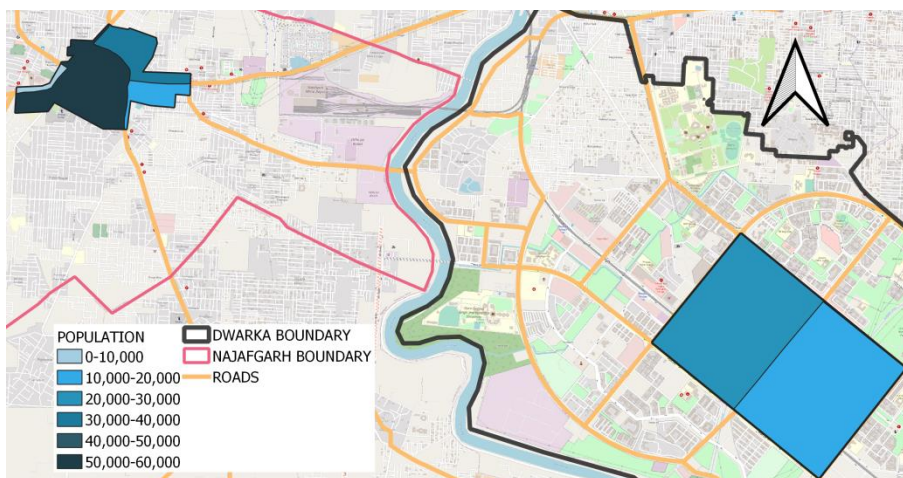
Figure 5.3 Ward wise share of population in selected study area

CHAPTER 6 – CONNECTIVITY OF THE SELECTED STUDY

6.1 MCD TRANSPORT

• Road and Transport constitute the main entities of efficiency working of any urban area.
• Delhi has significant reliance on its transport infrastructure.
• The city has developed a highly efficient public transport system with the introduction of the Delhi Metro.
• Delhi has one of the largest bus transport systems.

6.2 ROAD CHARACTERISTICS

• Delhi is connected by NH 1, NH 2, NH 8, NH 10 and NH 24.
• National Highway 1 or (NH 1) is a National Highway in Northern India that links the National capital New Delhi to the town of Attari in Punjab near the Indo-Pakistani border.
• National Highway 2 (NH 2), commonly referred as Delhi-Kolkata Road is a busy Indian National Highway that runs through the states of Delhi, Haryana, Uttar Pradesh, Bihar, Jharkhand, and West Bengal.
• National Highway 8 (NH 8), is a National Highway in India that connects the Indian capital city of New Delhi with the Indian Financial capital city of Mumbai.
• National Highway 10 (NH 10) is a National Highway in northern India that originates at Delhi and ends at the town of Fazilka in Punjab near the Indo-Pakistani border.
• National Highway 24 or NH 24 is a National Highway in India that connects the National capital Delhi to Uttar Pradesh state capital Lucknow running 438 kilometers in length.
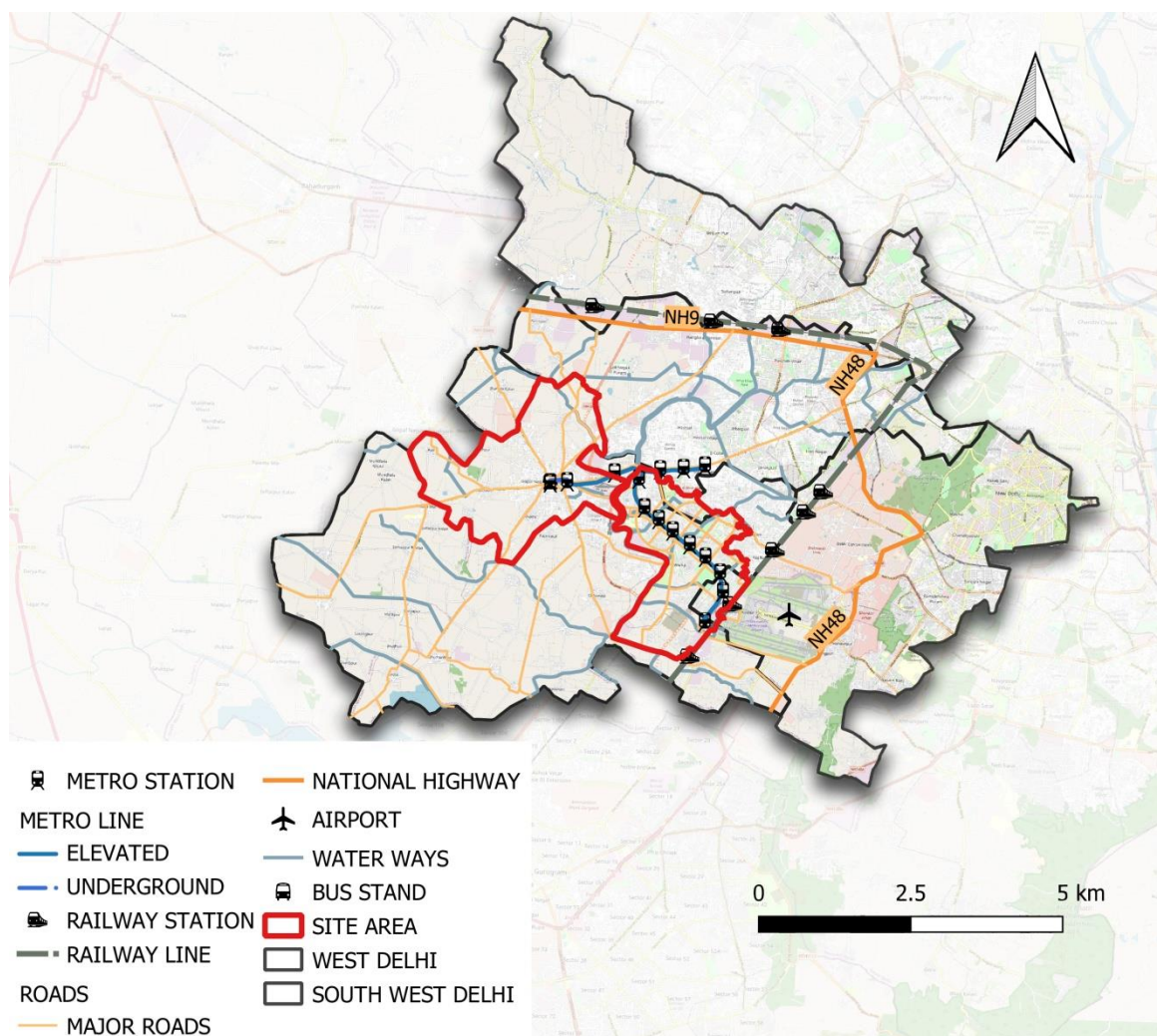

Figure 6.1

CHAPTER 7 – DEVELOPMENT AROUND THE SELECTED STUDY AREA

- Personal investigation was carried out to understand the existing land uses and type of development around the study area.
- This was done through photographic documentation.

7.1 OBSERVATIONS

- The land ownership varies around the selected area.
- The land is owned by Central Govt., State Govt. or private parties.
- The development around the area has taken place in a very haphazard manner.
- There are many small and big settlements around the selected area which have already come up.
- In spite of this there are significant patches of vacant land around the selected site
- It is therefore important to take all these aspects into consideration before planning any development around the selected area.

The extra waste space between the road and the buildings can be used in a better manner

A lot of spaces under the metro way is empty and not used to its potential

Cooperative housing socities are an opportunity that can influence people to engage in sustainable development.

METRO STATION
METRO LINE
— ELEVATED
— UNDERGROUND
site area
☐ DWARKA
▨ NAJAFGARH

☐ DWARKA BOUNDARY
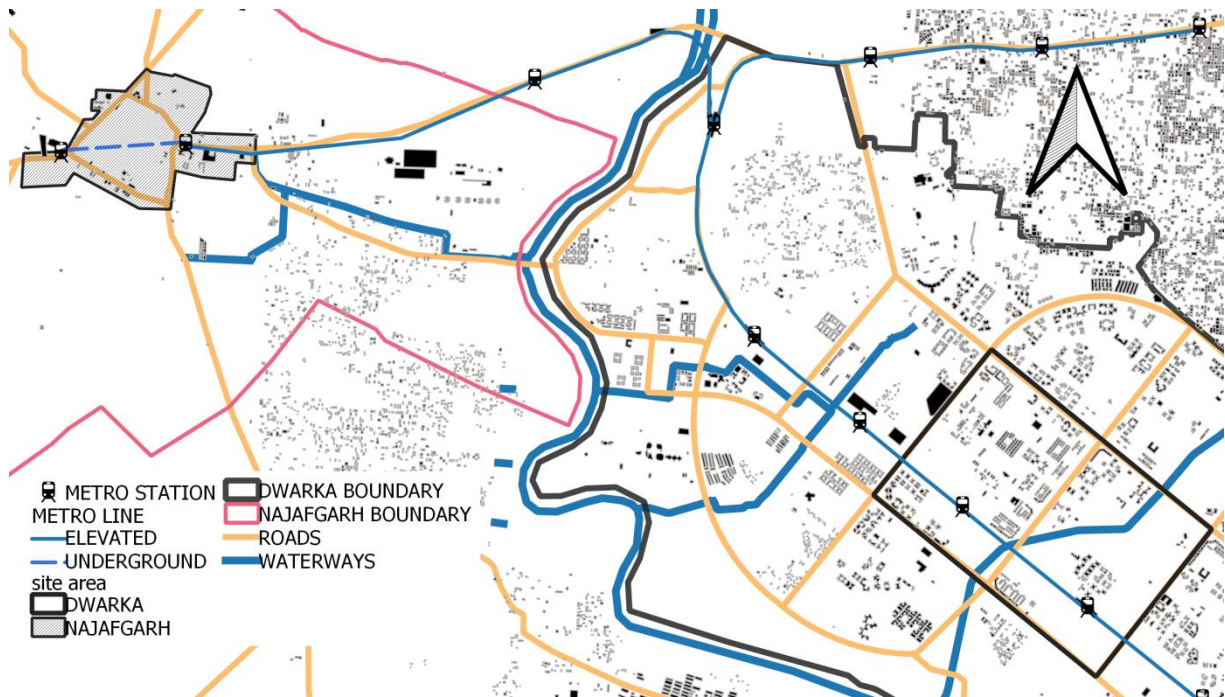☐ NAJAFGARH BOUNDARY
— ROADS
— WATERWAYS

Figure 7.1

No proper bus stop constructed fir this area

Internal narrow streets with commercial and residential development.

On street parking of public transport

CHAPTER 8 – SWOT ANALYSIS OF SELECTED STUDY AREA

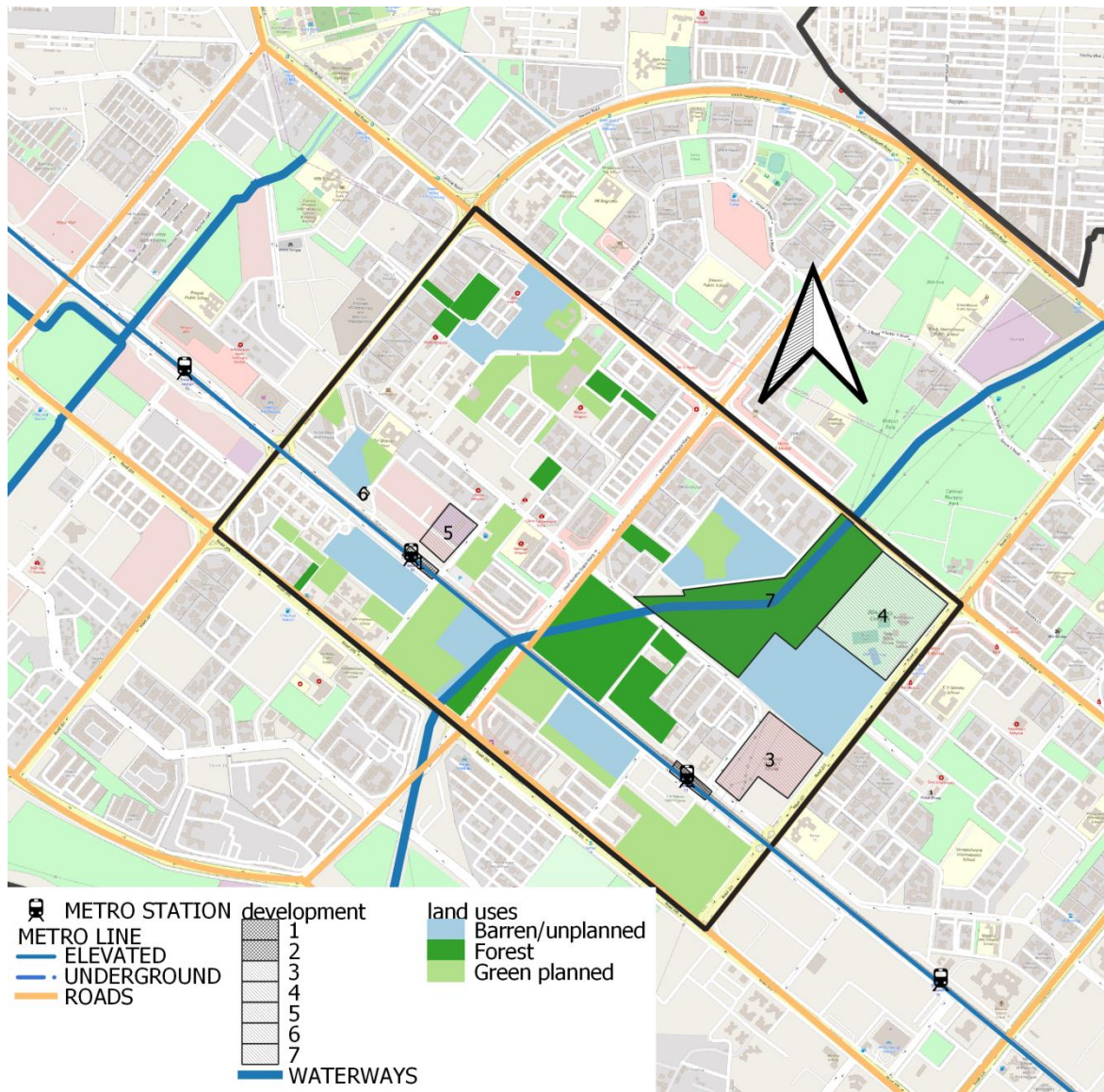## 8.1 Swot Analysis : Dwarka sec 11 and 12

Figure 8.1

STRENGTHS :
- The infrastructure (road network and metro connectivity).
- The Grid planning
- Mix of different landuse.

WEAKNESS :
- Location (Distance from the center of the city).
- The big drain.

OPPORTUNITIES :
- Barren/open lands

THREAT :
- The visible separation in planning structure compared to the other part of the city.
- This can also be an opportunity to grow as a demonstration project that can be followed in other parts.

8.2 Swot Analysis : Najafgarh Central Market area

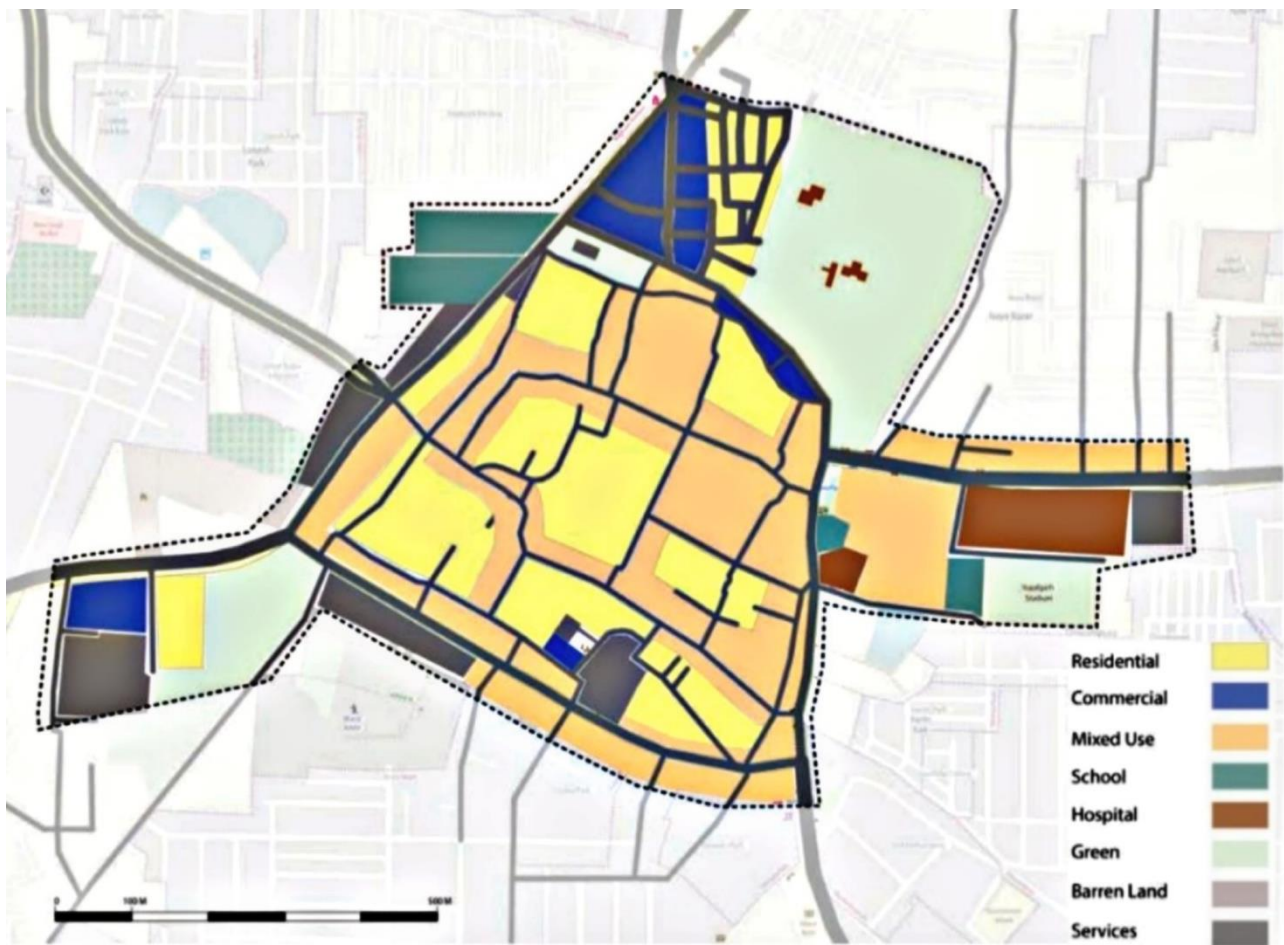|		
Residential		
Commercial		
Mixed Use		
School		
Hospital		
Green		
Barren Land		
Services		

Figure 8.2

- The map above explains the unattended focus of govt. in this area.
- Citizens are not following any regulations for development. This may prove a positive point for a sustainable growth as the development will be from the scratch. Or might need more concentration.

STRENGTHS :
- Main transport corridors.
- Economic situations.

WEAKNESS :
- Building density.
- Population density.
- Illegal growth.
- Unplanned development.

OPPORTUNITIES :
- Mixed use buildings.
- Possibility of growth.

THREAT :
- Unapproachable citizens.
- Safety and security issues.

- Through the questionnaires, I tried to understand perspective of Indian Citizens, the professionals related to the Indian Smart City Project.
- It was needed to know how the citizens feel about the project.
- Are they even aware of the facts and figures ?This questionnaire was circulated in order to get some inputs before proposing new strategies.
- The main emphasis was the inclusion of the citizens in the process to planning & development of a city, it was helpful to know their requirements and day to day problems.
- Following are few strong statements from the reviewed interviews.
- The common issue indicated by most of the citizens were insufficient provision of basic needs and exclusion from the process of making smart city.
- The citizens are criticizing without having the wholesome idea.

RANA SARKAR, Govt, employee

- Smart development should be inclusive of all Stakeholders.
- Sustainable on the long run.
- Local accessible govt.

VIKAS KUMAR, 34yrs

- Unhealthy and unhygienic slums in the city.
- Traffic congestion.
- Better connectivity and efficient public transport is needed.

S.K. BANERJEE, 65yrs

- Pollution is a major problem.
- Women security issues.
- Lack of awareness for smartness.
- Improve quality of life.

PRAFUL, 39yrs

- Potable water crises.
- Air and noise pollution.
- Well informed smart city proposal through breaking news.

RAKESH KUMAR, 28yrs

- Citizen safety and security.
- Air and noise pollution.
- Synergy b/w traditional approach and smart solutions should be included.

AMIT KUMAR, 34yrs

- Lack of awareness among citizens.
- Planning and programming should be followed with efficient and transparent implementation.

CHAPTER 10 - PROPOSALS

10.1 RAIN WATER HARVESTING FOR COMMUNITY FARMING

DWARKA : RETROFITTING

(i) Issue :

- Residents of private housing societies paying the water bill to maintain the open green spaces of the society space.
- They use the same treated water provided for domestic use by the municipality.
- A lot of water is being wasted that way.

Green areas in society housing
Figure 10.1

(ii) Principle :

- The rainwater can be collected in the rooftop & can be collected through gutter pipeline & filtered in a simply constructed filter at the backyard.

Figure 10.2 Project Drawing

Figure 10.3 Principle of rain water harvesting

- The filters is constructed by brick masonry & filtered by pebbles, gravel & sand as shown in figure.
- Each layer should be separated by wire mesh.

(iii) Project Description :

- The collected water on the rooftop can be filtered & used for maintaining the greenery & also for community farming.
- This way the residents will be engaged in a productive way, where they can grow their own farm vegetables in the open spaces.
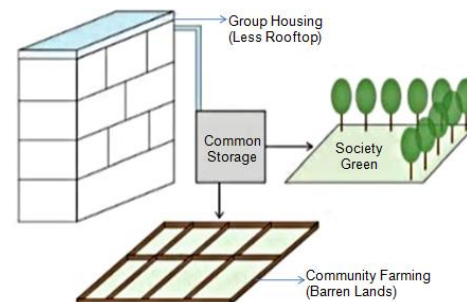

Figure 10.4   Project Drawing

Legends
- Government Housing
- Private/ Cooperative Houses
- Individual Houses
- Buildings for rain harvesting
- Demonstration Site Boundary

Figure 10.5

Project Drawing
Source : Drawn by author

Figure 10.6

Project Drawing
Source : Drawn by author

	Government Housing
	Private/Cooperative Houses
	Individual Houses
	Buildings for Rain harvesting
	Open Green Spaces

- The detailed plan shows how the private housing societies have more green space & the harvested water can be used for maintenance.
- While the government housing societies can use some percentage of stored water for domestic use.
- Individual houses can use Project 02 details.

10.2 RAIN WATER HARVESTING FOR INDIVIDUAL HOUSES

NAJAFGARH : REDEVELOPMENT

(i) Issue :

- Scarcity of fresh water in the urban village.
- Informal settlements depend on community level sources for water supply.
- The average duration of water supply in informal settlements is one to two hours a day.
- Households dependent on tankers for water supply have no fixed timing or duration for supply.

Drinking water tank provided by the municipality
Figure 10.7

(ii) Strategy :

- This can release a little pressure on ground water extraction, which is the primary source of water in that area.
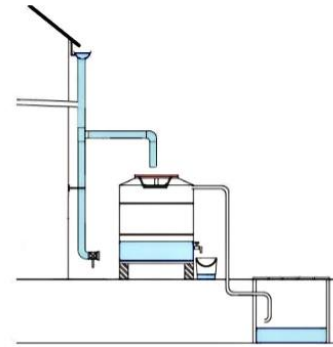
Figure 10.8   Project illustration

(iii) Project Description :

- Assembling individual houses for combined investment for rain water harvesting project.
- Most of the houses share common walls with adjacent houses & have a common shaft space for ventilation & pipelines.
- Such houses can be combined together & can invest for water harvesting as a common venture.
- The shaft can be used as water storage space & that water can be used for domestic purposes like house cleaning/ car washing/ watering plants etc.
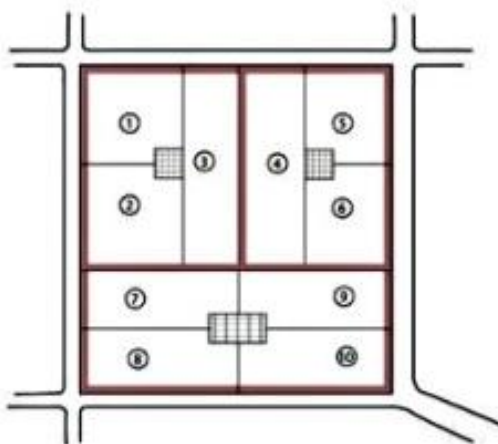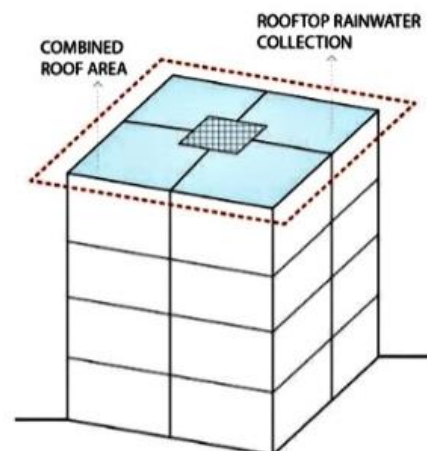

Figure 10.9   Project illustration

24

Figure 10.10   Location Mapping   Source : Drawn by Author

Figure 10.11   Detailed mapping of building assembling   Source : Drawn by Author

- It is pointless to mark and combine the houses on map, as the residents will self organize themselves according to their social bonding.
- This map is just to give an idea how the concept work.

25

10.3 GREYWATER SEPARATION

DWARKA : RETROFITTING

(i) Issue :

- The sewage system directly connects to the Najafgarh drain polluting to its extent.
- Because of lack of fresh water, if, the greywater is separated, it can be treated and used for domestic purposes.

Figure 10.11   Sewer connection to the drain

(ii) Strategy :

- The strategy is simple & smarter way to direct the sanitation system by using separatepipes for greywater & stormwater.
- In this simple filtration device, greywater is distributed by gravity flow into a tank containing the filter material.
- The filter consists of bark, a separating filter-cloth & a sand layer.
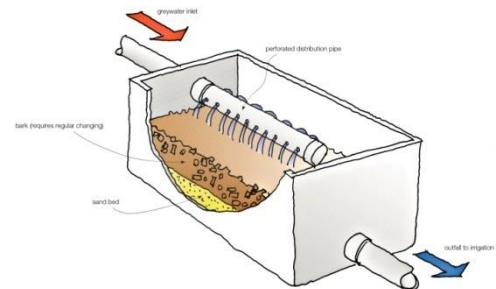- The water flows continuously through the filter & directly for further use.

Figure 10.12   Greywater separation & Filter

(iii) Project Description :

- The project will be possible in Dwarka because of its grid planning.
- The pipelines can be separated & treated for domestic purpose.
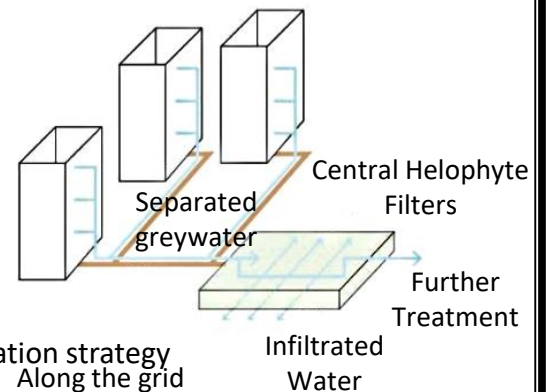- Following diagram shows how the strategy will work.

Figure 10.13

Greywater separation strategy
Along the grid

Figure 10.14

10.4 CENTRAL HELOPHYTE SYSTEM

DWARKA : RETROFITTING

(i) Issue :

- This is an opportunity rather than issue.
- The barren lands can be used for as open green public spaces with this project.

Figure 10.15   Open unused land

(ii) Strategy :

- The The helophyte filters are vertical flowing reed fields where grey water can be treated.
- These reed fields can be easily integrated in the urban fabric as they bring (green) quality.
- Nevertheless, there is many space needed for the filters (2 m^2 per inhabitant)
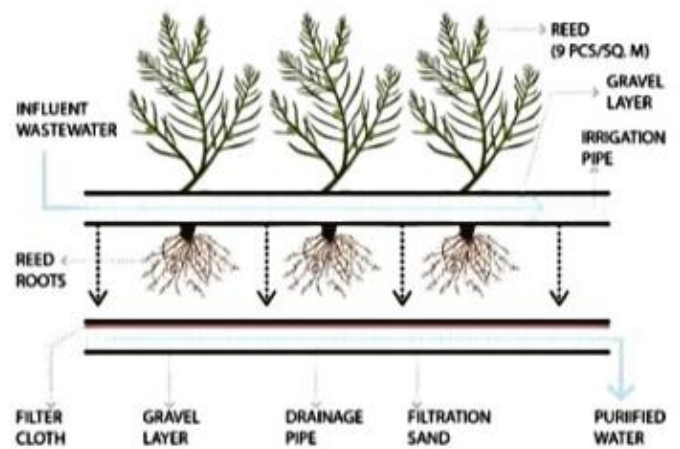- The helophyte filters should be implemented on street or block scale to make integration possible.

Figure 10.16   Water treatment by helophyte filters

(iii) Project Description :

- The helophyte filters can be implemented along streets, in courtyards as a larger field or in existing waterways.
- A connection to the separate grey water system of the block or street & the surface water is necessary as well.
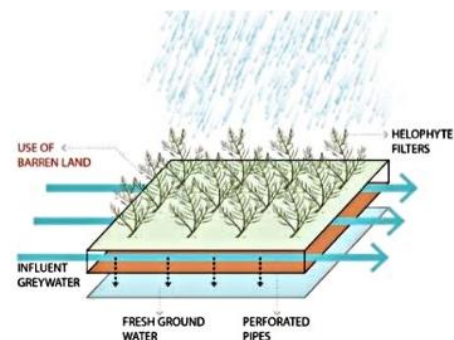

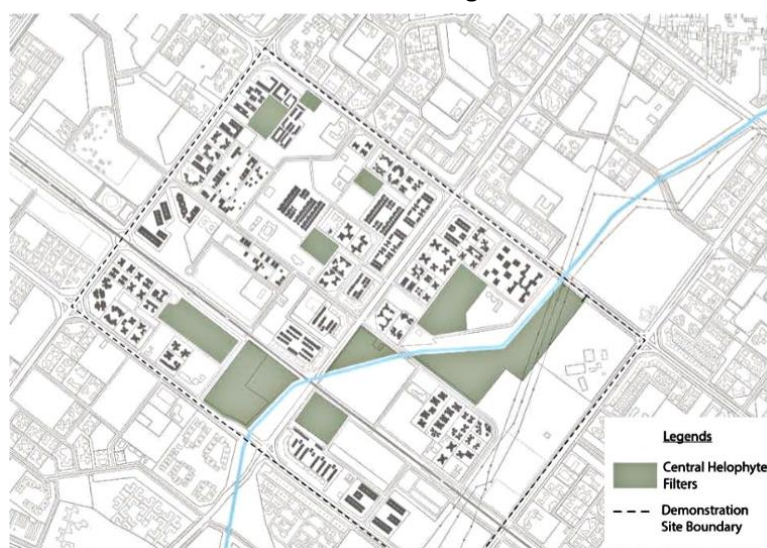Figure 10.17   Water treatment by helophytes filters

Figure 10.18

Water treatment by helophytes filters

10.5 GROUND WATER PURIFICATION

NAJAFGARH : REDEVELOPMENT

(i) Issue :

- Due to shortage of fresh water supply in this area, the residents use bore well to extract ground water.
- And due to immense building density gradually the water level is decreasing.
- Additionally the drain passing bt is creating a lot of ground water pollution, & the same water is being used by the residents.
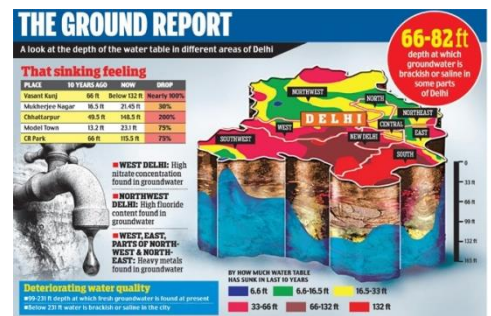

Figure 10.19   Water condition in Delhi

(ii) Strategy :

(a)   Same as central Helophyte system in Dwarka.

(b)   Smart City Reference

Orica's Botany Groundwater Cleanup Project

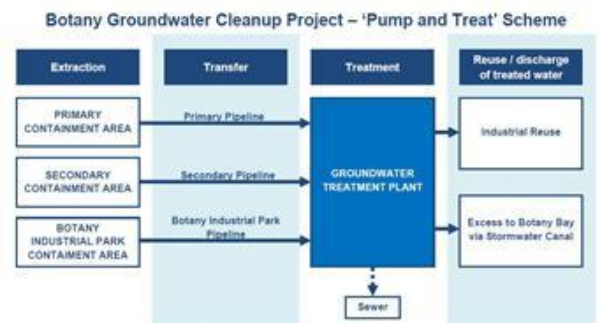This is a mechanical solution, but local solutions will be used for this project in India.

Figure 10.20   Groundwater treatment plan

(iii) Project Description :

- There are very less open spaces in Najafgarh, but those spaces can be used to percolate locally filtered water to add in the ground water level.
- This is similar to project on Dwarka

Figure 10.21   Possible open spaces for ground water purification

(iv) Reflection :

- If the project become successful, then Delhi as a city will move a step ahead towards sustainability of natural resources.

CHAPTER 11 : CONCLUSION

Thus, concluding this project I would say smart cities should not be seen as technically advanced urban space but as space intelligently managed with optimal resource used with least resource footprints. By having such localized solutions smart cities can overcome many problems that municipalities face in providing the common services such as water supply, sewers and central sewage treatment plants. In the beginning a lot questions were in my mind, as well as lots of questions were asked regarding smart India. How smart cities in india are possible ? What scenarios can make it possible ? How much can be extended on a general level for other cities ? With this general note I would like to conclude this project with few specific statements after the detailed research that I am completing.

1) Smart cities in India are possible and should be developed
2) Smart patchwork can be one of the successful theories for development.
3) Smart Urbanism concept is more useful than smart city concept in India.
4) Act on small areas, rather planning the whole city.

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