MINISTRY OF URBAN DEVELOPMENT
GOVERNMENT OF INDIA

PBS CITY SPECIFIC PLAN - GURGAON

CONSULTANCY SERVICES FOR DEVELOPING GUIDANCE DOCUMENTS FOR TRANSIT ORIENTED DEVELOPMENT (TOD), NON-MOTORISED TRANSPORT (NMT) AND PUBLIC BICYCLE SHARING (PBS)

May 2016

PUBLIC BICYCLE SHARING

GURGAON CITY SPECIFIC PLAN

FOREWORD

Prior to the launch of the National Urban Renewal Mission (2005) and the National Urban Transport Policy (2006), investments in public transportation systems to meet the mobility needs of the current and future population were limited in Indian cities. Planning for essential city systems — environmental, land, mobility, economic and social — has largely been attempted in piecemeal manner. The need to induce a paradigm shift, putting people first in planning our regions, cities and neighbourhoods, implies providing for increased mobility choices from dependence on private vehicles to the availability of good public transportation and safe non-motorised transport.

Non-Motorised Transport (NMT) is a foundational mobility concept that prioritizes planning for walking and cycling over automobiles. Public Bicycle Sharing (PBS) is emerging as one of the most sustainable, popular and attractive public transport modes throughout the world. This mode offers the conveniences of both public and personal modes. It enables public access to personal bicycles, offering maximum flexibility with minimum liability. This PBS City Specific Plan presents a compendium of strategies and recommendations for integrating accessibility with land use and infrastructure investment decisions in shaping NMT-friendly streetscapes and intelligent system designs. It follows the five-step planning process as prescribed in the PBS Guidance document for implementing public bicycle sharing projects.

The document includes a comprehensive study on assessing the existing conditions in the context of operational mass transit, encouraging higher share of NMT usage for first and last mile connectivity, reviewing current institutional support, proposing development strategies and funding opportunities to facilitate implementation of innovative public bicycle sharing proposals. The plan also provides its stakeholders in Gurgaon on the city specific planning process for PBS and equip them with essential tools and resources necessary to integrate PBS planning as an extension to city's existing public transit implementation framework.

It is of utmost importance that the local agencies integrate the PBS recommendations presented in this document to mainstream non-motorised transport planning in Gurgaon. This will ensure that strategic investments in Gurgaon lead to mitigating environmental impacts of polluting transportation and reviving cycling as a sustainable and inclusive mode of commuting in India's emerging IT hub.

PREFACE

The Government of India (GoI) has initiated the Sustainable Urban Transport Project (SUTP) with the Ministry of Urban Development (MoUD) as the nodal agency and supported by the Global Environment Facility (GEF), World Bank and UNDP. SUTP consists of capacity building programmes and city demonstration projects, which aim to induce a major change in urban transport planning as currently undertaken in Indian cities.The primary objective of GEF-SUTP is to apply National Urban Transport Policy (2006) principles to achieve a paradigm shift in India's urban transport system for more favourable sustained developments and alternatives.

Under the guidance of MoUD, the project envisaged development of Guidance Documents for three sustainable development concepts: Transit Oriented Development (TOD), Non-Motorised Transport (NMT) and Public Bike Sharing (PBS) as essential steps towards achieving a comprehensive urban transport and land development planning process in the country. To further validate the findings and recommendations of the Guidance Documents, City Specific Plans (CSPs) for two selected demonstration cities each for the above mentioned concepts have been prepared. CSPs have also provided road map to the cities interested in applying these concepts. Lessons learned from these CSPs have helped contextualise the final Guidance Document(s) to Indian conditions.

The two PBS CSPs provide guidance for cities with: a) high modal share for cycling and the penetration of cycling culture in the city's urban form and b) integration of PBS schemes with transit systems to improve the first and last mile connectivity. The ease with which cycling systems are integrated with NMT infrastructure planning will significantly influence the overall feasibility of using PBS schemes as primary modes of transportation for short trips.

The Municipal Corporation Gurgaon (MCG) applied for selection as a demonstration city for preparation of a City-specific PBS Plan. Gurgaon, as part of the National Capital Region, has 5 number of stations along the Delhi Metro rail corridor and an internal circulator Rapid Metro service which is integrated with the existing Delhi Metro to provide increased public transportation alternatives for its citizens. An example of a small city (Tier III) but within a large metropolitan region, Gurgaon depends significantly on public transit alternatives to connect various employment and residential centres. Lack of footpaths and safety of cyclists are some of the major issues plaguing Gurgaon. Accessibility to various activity centres is widely recognized as a challenge by stakeholders and citizens and that needs to be improved through significant investments in walking and cycling infrastructure to provide better last mile connectivity to public transit. Integrating NMT and PBS networks with an existing and highly utilized transit system were some of the positive factors for selecting Gurgaon as a potential demonstration city for implementing PBS. This Plan has been prepared in partnership with the MCG, who also serves as the nodal agency for this PBS planning process.

ACKNOWLEDGEMENT

The successful completion of this project required extensive involvement from the local nodal agency in Gurgaon - the Municipal Corporation of Gurgaon (MCG) under guidance of

1. T.L. Satyaprakash, IAS (Municipal Commissioner, MCG)
2. Shri Rohit Yadav (JE. Commissioner, MCG), and
3. Shri Y S Gupta (JE. Commissioner, MCG)

The consultant team would like to thank the MCG, specifically the staff that helped organize the meetings and guided the study process. In addition, IBI Group would also like to thank all stakeholders who attended the meetings and workshops, including

1. Shri. Vikas Gupta (IAS, Former Commissioner, Municipal Corporation, Gurgaon)
2. Shri Sharat Sharma (Director Operations, Delhi Metro Railway Corporation)
3. Shri Banga (Managing Director, Rapid Metro - IL&FS)
4. Ms. Bharti Arora (IPS, DCP Traffic, Gurgaon Traffic Police)
5. Shri Prabhat Aggarwal (Member of the NASSCOM Regional Council, Haryana)
6. Ms. Sarika Panda (Manager, WRI – Embarq)

The consultant team for the preparation of the Gurgaon PBS CSP was led by the following members from IBI Group:

- Mr. Bankim Kalra
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- Mr. Visweswara Rao
- Ms. Astha Malhotra
- Mr. Sandeep V

EXECUTIVE SUMMARY

Introduction

The Ministry of Urban Development (MoUD), Government of India, under the Sustainable Urban Transport Project (SUTP), has appointed IBI Group, to undertake the task of developing Guidance Documents and City Specific Plans for Transit Oriented Development (TOD), Non-Motorised Transportation (NMT), and Public Bicycle Sharing (PBS) for Indian cities. The Municipal Corporation of Gurgaon (MCG) served as the nodal agency for the project.

Public bicycle sharing (PBS) is a service in which bicycles are made available to multiple users (on a sharing basis) for short duration trips, offering an option of returning them at different destinations. Gurgaon was selected as one of the demonstration cities for preparing a PBS scheme where the five-step planning process (Fig. XX) recommended in the Guidance Document was applied to test its validity.

This Executive Summary highlights the research, analysis and stakeholder involvement activities that have been performed in the development of the PBS scheme; the resulting projects, programmes and policies that comprise the Plan; and the implementation strategy that will guide project and programme activities.

The objectives of the Gurgaon PBS scheme included:

- Providing an understanding of the city characteristic and technical capacity of Gurgaon, with regard to reducing the need for personal vehicle trips.

- Extending the reach of transit and walking trips.

- Promoting greater interest in cycling, and increase cycling ridership in the city.

- Integrating PBS with existing transit and land use to solve first and last mile connectivity issues.

PBS FRAMEWORK

1 ASSESS

PBS FRAMEWORK

2 ENABLE

PBS FRAMEWORK

3 PLAN + DESIGN

PBS FRAMEWORK

4 INVEST

PBS FRAMEWORK

5 IMPLEMENT

Bicycle Station	Sign in	Check Out	Ride	Check in

Illustration on how to use a PBS system

NEED FOR PBS

Gurgaon, a significant urban centre in the National Capital Region, has rapidly emerged as a corporate and commercial destination over the past decade. Various statistics and studies available confirm that trip lengths for majority of the commuters in Gurgaon are around 6 km.

The need for PBS in Gurgaon was based on the following considerations:

- The Yellow line of Delhi Metro connects Gurgaon to Delhi and NCR. This transit system brings a lot of influx of people into Gurgaon for whom last mile connectivity still remains an issue to reach their final destinations in the city.

- It has an operational Rapid Metro System integrated with the Delhi Metro for the Cyber City area, which enhances the opportunity for implementing a PBS.

- To encourage the use of cycling, governmental agencies and civic groups have come together to execute Raahgiri day and Car-free days.

- The city has seen an exponential increase in the motor vehicle ownership resulting in frequent instances of traffic congestion, increased accidents and an overall deteriorating environmental quality.
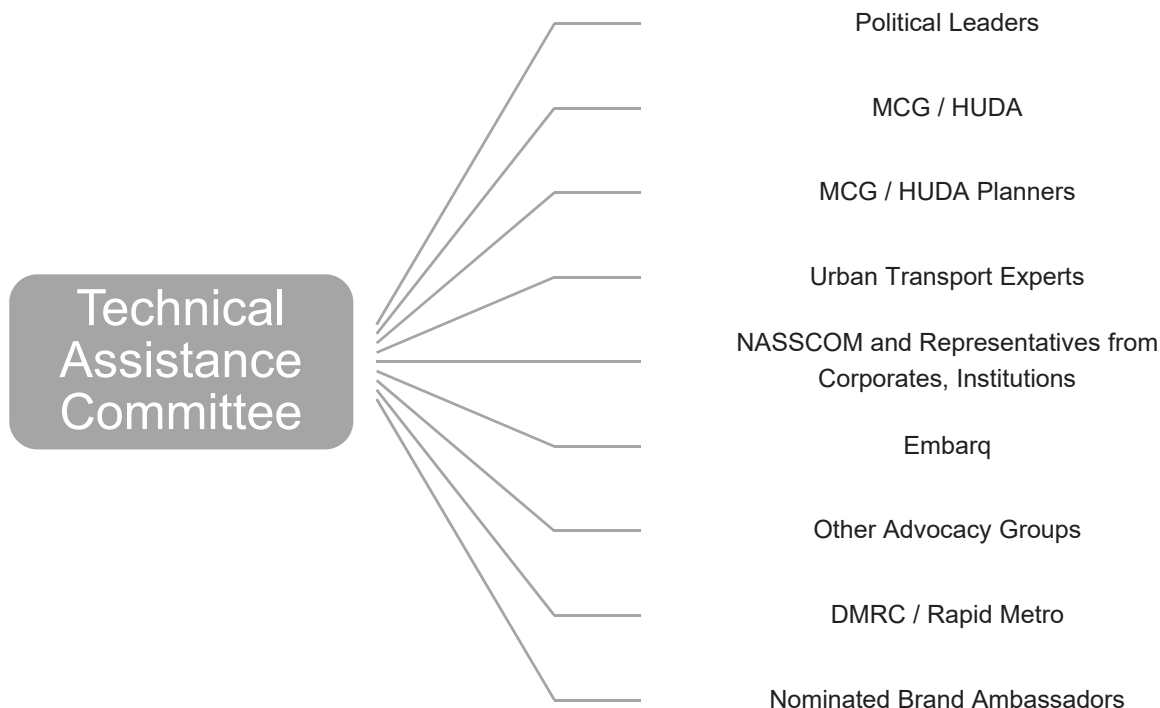
SUPPORT FOR PBS

MCG is identified as the agency that will spearhead the PBS project in Gurgaon. However, in order to be successfully implemented, the PBS program requires political and technical leadership. Key strategies recommended in this plan to gather the necessary support for PBS include:

Key Strategies:

- **Establish a Technical Assistance Committee (TAC):** TAC will consist of political leaders and stakeholders. The committee's responsbilities may include:
  - Acquiring land for PBS stations,
  - Facilitating public outreach,
  - Developing partnership with private entities for funding opportunities, and
  - Reaching out to vendors for discounted products.

- **Building Technical Expertise and Issue Awareness :** This plan recommends that MCG hire a Project Management Consultancy (PMC). The PMC's primary role will be to handhold the municipality through the design, building, operations and transfer (DBOT) of the PBS project.

- **Create Awareness and Enable Public Participation:** The success of events such as Raahgiri in Gurgaon demonstrate people's willingness to adopt bicycling if they are made aware of the usefulness, benefits and most importantly provided a safe environment to cycle.

- **Align PBS with other projects,** specifically the Gurgaon Rapid Metro project and DMRC station area improvements.

SUPPORT FOR PBS

Technical Assistance Committee

- Political Leaders
- MCG / HUDA
- MCG / HUDA Planners
- Urban Transport Experts
- NASSCOM and Representatives from Corporates, Institutions
- Embarq
- Other Advocacy Groups
- DMRC / Rapid Metro
- Nominated Brand Ambassadors

PBS Technical Assistance Committee (TAC) | Source: Centre for Green Mobility (CGM)

PBS NETWORK PLAN

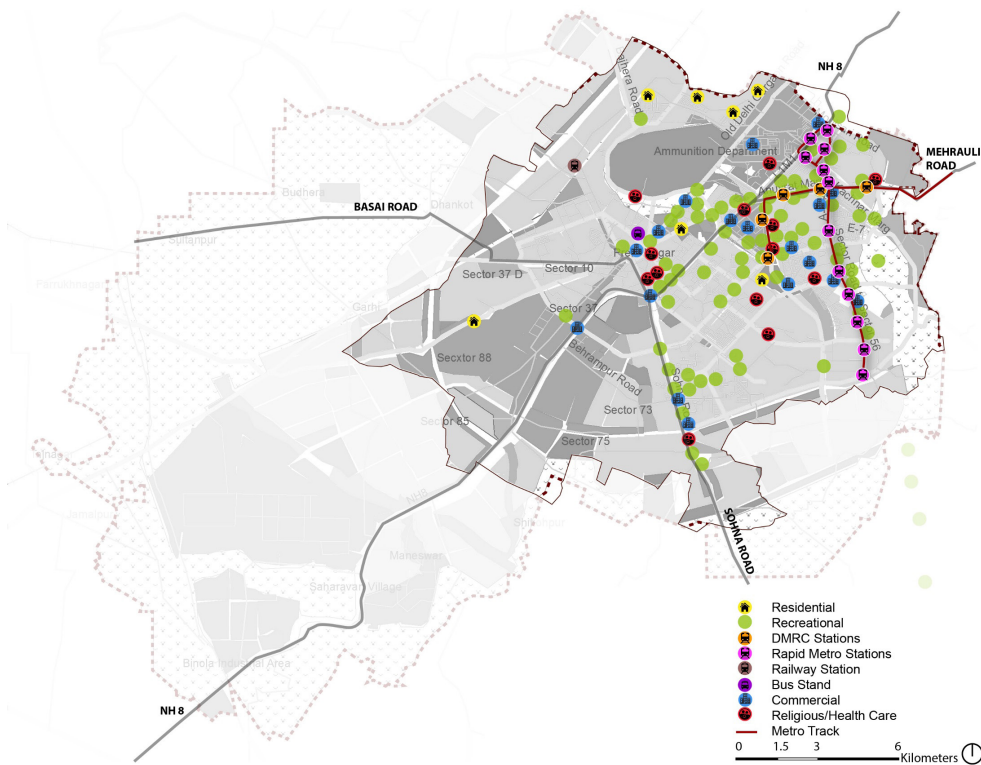Gurgaon's proposed PBS system is divided into three phases.

- **Phase I** (to be implemented within 2 years) is the area where the transit networks are present as the Mass Transport System. Delhi Metro is a major life line passing through the activity generators of the city which also caters to the needs of the adjoining locations along the network.

- **Phase II** (to be implemented within 5 years) includes areas with high potential for growth

- **Phase III** (to be implemented in around 8 years) includes the rest of study area to ensure denser PBS network

The following table shows the phase wise estimation of number of stations and bicycles for proposed PBS system in Gurgaon.
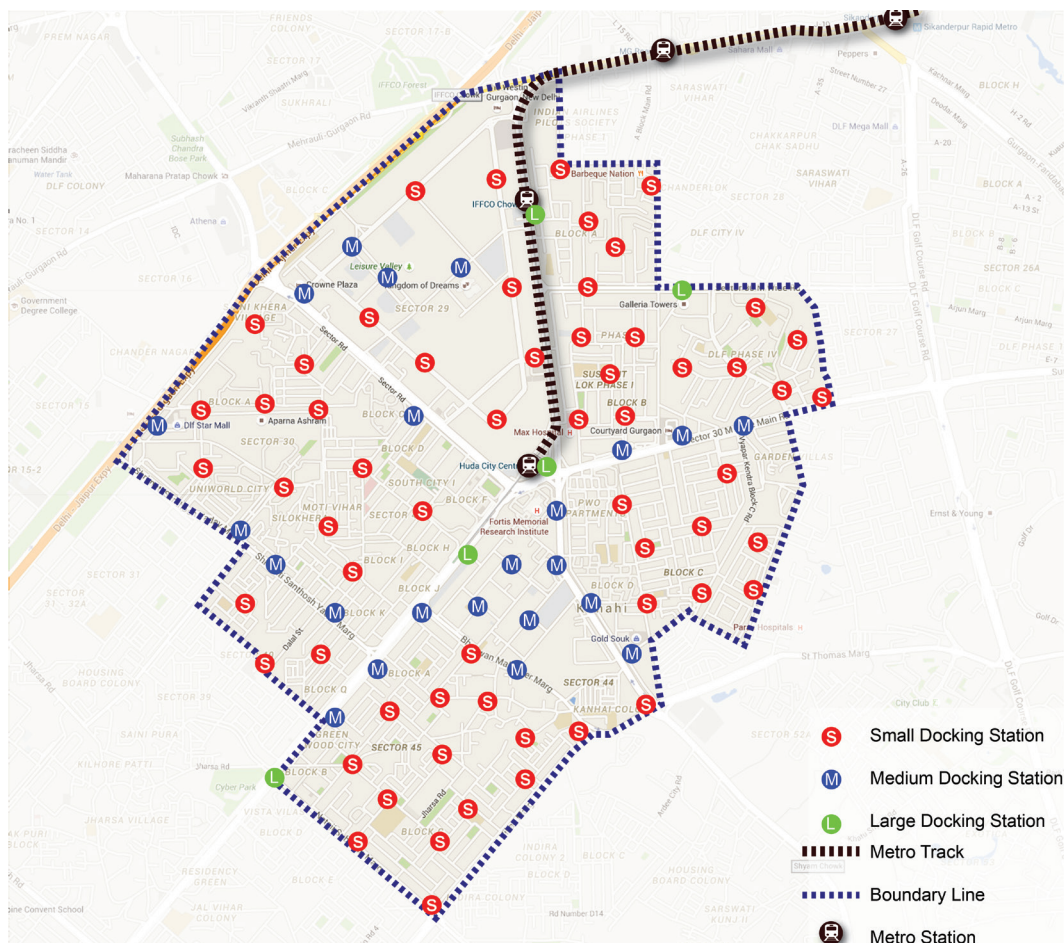
S.No	Phase	Influence Region	Coverage Area (Sq.km)	No of Stations	No of Bicycles	No of Docks
1	Phase I	HUDA City Centre	8.85	88	1260	1890
2	Phase II	Remaining DMRC Metro, Golf Course Rapid Metro & Udyog Vihar	31.29	312	3100	4650
3	Phase III	Residual areas	98.26	982	9800	14700
Total			138.4	1382	14160	21240

PBS NETWORK PLAN

Existing Activity Generators, Gurgaon | Source: IBI Group

Legend:
- Residential
- Recreational
- DMRC Stations
- Rapid Metro Stations
- Railway Station
- Bus Stand
- Commercial
- Religious/Health Care
- Metro Track

PBS Station Location Map for Phase I | Source: IBI Group

Legend:
- S — Small Docking Station
- M — Medium Docking Station
- L — Large Docking Station
- Metro Track
- Boundary Line
- Metro Station

INVEST

The total investment required for implementing and operating the proposed PBS system is classified as CAPEX (capital costs) and OPEX (operation and maintenance costs). For Phase 1, the total capital cost including civil works is **INR 33.09 Cr.** The annual operating cost for the Phase 1 is estimated at **INR 4.7 Cr.**

The project is proposed to be funded through a combination of public funding, fare collection and cross-subsidies.

In order to diversify its funding and revenue sources, MCG could potentially evaluate one or more of the following alternatives to augment the system's financial gap:

- Municipal Budget
- Transit-linked Funding
- Grants
- Funding through Corporate Social Responsibility (CSR) Activities

Direct Revenue: Direct revenue collections from user fees and subscription fees will help in repayment of loans and pay operational costs.

Estimated Annual Revenue = INR 15,00,000 (from subscription) + INR 7,00,000 (from user fees)

= INR 22,00,000

Cross subsidies will form the largest portion of the continual earning. Primary forms of cross subsidies proposed include parking charges and advertisement fees.

IMPLEMENT

Defining the roles and responsibilities of various governmental agencies is a crucial step in implementing the recommendations of the PBS Plan. The plan proposes the following institutional structure for implementing PBS in Gurgaon.

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ABBREVIATIONS

AFCS	:	Automatic Fare Collection Systems
BPO	:	Business Processing Outsourcing
BRT	:	Bus Rapid Transit
BRTS	:	Bus Rapid Transit System
CGM	:	Centre for Green Mobility
CSE	:	Centre for Science and Environment
CSP	:	City Specific Plan
CSR	:	Corporate Social Responsibility
DMRC	:	Delhi Metro Rail Corporation
DP	:	Development Plan
DPR	:	Details Project Report
DTC	:	Delhi Transport Corporation
GD	:	Guidance Document
GEF	:	Global Environment Facility
GIS	:	Geographic Information System
GMUC	:	Gurgaon Manesar Urban Complex
GPS	:	Global Positioning System
HCC	:	HUDA City Centre
HUDA	:	Haryana Urban Development Authority
IMP	:	Integrated Mobility Plan
IPT	:	Intermediate Public Transport
ISBT	:	Inter State Bus Terminus
ITS	:	Intelligent Transport Systems
MCG	:	Municipal Corporation Gurgaon
MIS	:	Management Information Systems
NCR	:	National Capital Region
NCRB	:	National Crime Records Bureau
NFC	:	Near Field Communications
NH	:	National Highway
NMT	:	Non-motorised Transport
NUTP	:	National Urban Transport Policy
NYCBS	:	New York City Bike Sharing
OPEX	:	Operating Expenditure
PBS	:	Public Bicycle Sharing
PIU	:	Project Implementation Unit

PMC	:	Project Management Consultancy
PT	:	Public Transport
RFID	:	Radio Frequency Identification
RMGL	:	Rapid Metro Rail Gurgaon Ltd
RTA	:	Regional Transport Agency
RWA	:	Resident Welfare Associations
SLA	:	Service Level Agreements
SPV	:	Special Purpose Vehicle
SUTP	:	Sustainable Urban Transport Project
TOD	:	Transit Oriented Development
ULB	:	Urban Local Body
UMTA	:	Unified Metropolitan Transport Authority
VAS	:	Value Added Service
WTS	:	Willingness to Shift

CHAPTER I: INTRODUCTION

1. INTRODUCTION

The Ministry of Urban Development (MoUD), Government of India, is the primary agency responsible for development of cities by guiding and developing policies for urban development. MoUD, through its policies and programmes, such as the National Urban Transport Policy (NUTP 2006), continues to strengthen the capacities of urban local bodies and state governments to create conditions that will make Indian cities more liveable and sustainable for its citizens. One such initiative to further the goals of the NUTP 2006 is the Sustainable Urban Transport Project (SUTP). The World Bank and UNDP support SUTP under the Global Environment Facility (GEF) programme.

Under this GEF-SUTP programme, MoUD appointed IBI Group as the lead consultant for developing National-level Guidance documents and city specific plans for (i) Transit Oriented Development (TOD), (ii) Non-motorised Transport (NMT), and (iii) Public Bicycle Sharing System (PBS). The guidance document(s) present a "how-to" manual for each of these three sustainable transportation concepts in detail, by considering the lessons learned from worldwide experience and contextualizing the concepts to better suit India's unique conditions.

To implement the findings and recommendations of the Guidance Documents, City Specific Plans for two cities were prepared for each of the above mentioned concepts. Lessons learned from these City Specific Plans were integrated in refining the Guidance Document(s) and ensuring that they are based on ground realities with a focus on implementation.

PBS is a service in which bicycles are made available to multiple users (on a sharing basis) for short duration trips, offering an option of returning them at different destinations. Often, PBS systems are integrated with public transit stations to provide last mile connectivity or in mixed land use areas to facilitate short duration work and/ or personal trips.

This report contains the Public Bicycle Sharing (PBS) Scheme for the city of Gurgaon (hereinafter referred as the 'Gurgaon PBS Plan') as one of the two City Specific Plans prepared to test the applicability of the PBS Guidance Document in cities. The Municipal Corporation Gurgaon (MCG) was one of the selected demonstration cities out of the total 12 applications received by SUTP. Gurgaon was selected as a demonstration city because of the following reasons:

- The Yellow line of Delhi Metro connects Gurgaon to Delhi and NCR. This transit system brings a lot of influx of people into Gurgaon for whom last mile connectivity still remains an issue to reach their final destinations in the city.
- It has an operational Rapid Metro System integrated with the Delhi Metro for the Cyber City area, which enhances the opportunity for implementing a PBS.
- To encourage the use of cycling, governmental agencies and civic groups have come together to execute Raahgiri day and Car-free days.
- The city has seen an exponential increase in the motor vehicle ownership resulting in frequent instances of traffic congestion, increased accidents and an overall deteriorating environmental quality. In response to this situation, the Honourable High Court of Punjab & Haryana has recently given a directive to local governments to explore NMT options in several districts of the state including Gurgaon.

1.1. Project Objectives

This Gurgaon PBS Plan is intended to provide MCG with the necessary tools and mechanisms in developing and planning a PBS system specifically catering to the needs of the city. The key objectives of the PBS Plan are:

- Providing an understanding of the city characteristic and technical capacity of Gurgaon, with regard to reducing the need for personal vehicle trips.
- Extending the reach of transit and walking trips.
- Promoting greater interest in cycling, and increase cycling ridership in the city.

- Integrating PBS with existing transit and land use to solve first and last mile connectivity issues.

1.2. Project Methodology

The City Specific Plan (CSP) for Gurgaon follows the steps suggested in the National-level PBS Guidance Document prepared as part of this project. Stakeholder participation has been integral to the city specific plan development process. The refined PBS plan, prepared after feedback and suggestions received from various governmental, non-governmental, private sector and citizen group stakeholders, is presented in this document.

Proposals are based on field visits carried out by the consultants and lessons learned through experiences of other cities in India and across the globe. They are tailored to suit the local requirements in Gurgaon and are enriched with valuable inputs from the stakeholders identified for the project.

The National-level PBS Guidance Document recommends adopting the following five steps to prepare a PBS City Specific Plan:

Exhibit 1.1: Overview of Project Methodology,
Source: IBI Group

1.2.1. Assess

The initial step of preparing a PBS scheme is to "Assess" the preparedness of the city for implementing the system. The assessment includes undertaking a series of tasks to gauge the city's existing strengths and limitations needed to drive the project beyond the planning stage for implementing the system, in terms of:

Physical attributes: examples include factors such as modal share, transit capacity, cycling infrastructure and integration with other modes.

Non-physical factors, such as supportive policy framework, institutional capacity, local commitment, stakeholder ownership, and civic awareness.

Prior to embarking on a detailed study, it is essential to review the current initiatives that can support PBS, understand present technical capacities available locally, identification of possible revenue streams and broad understanding of city's travel patterns. In parallel, it is also important to bring on-board the various stakeholders and administrators who will be involved in the decision making process. Tasks in the "Assess" step include:

1) Create a consolidated database of city-level transportation and land use data
2) Conduct a review of current institutional support for bicycling
3) Develop an understanding of the city's budgetary allocation for transportation
4) Formulate preliminary goals for the city's PBS system
5) Identify stakeholders to create an effective communications strategy
6) Determine initial scale and scope of proposed coverage area
7) Prepare a preliminary feasibility study including potential business models for initial coverage area

1.2.2. Enable

The 'Enable' step highlights the visioning and goal setting process that the city should follow in creating a coherent message for the community. In addition, policy level gaps, financial availability and political support are enabling factors that should ideally be in place to create an implementable plan. Tasks under the 'Enable' step include:

1) Establish leadership support and project champions
2) Conduct capacity building workshops and awareness generation campaigns
3) Define PBS scheme delivery mechanism alternatives
4) Align PBS scheme with planned NMT and transit infrastructure improvement projects
5) Assist with fundraising efforts to undertake detailed planning and implementation

1.2.3. Plan + Design

Building upon the first two steps, the 'Plan + Design' presents the strategy to develop a PBS system for Gurgaon. This stage lays out proposals for determining the coverage area with demand estimation, system specifications including station location, fleet size, station density, technology specifications, rolling stock details, operation details, and a phasing strategy

Tasks under Plan + Design steps include:

1) Conduct a detailed existing conditions inventory and demand analysis for initial PBS coverage area
2) Determine PBS system design including station density, station location, station sizing
3) Refine initial PBS coverage area and determine system phasing strategy
4) Conduct participatory planning workshops to finalise the PBS Network Plan
5) Prepare detailed technical specifications for system hardware and software design

6) Identify NMT infrastructure improvements to support PBS network plan

1.2.4. Invest

Sustainable financing mechanisms are essential for long-term viability of the PBS system and also to ensure that the system is self-financing in the long-term. Funding sources are a key factor in deciding if the city will be able to create a PBS using its own resources or using external funding from central government, private players, investors etc. Chapter 5 (Invest) identifies potential sources of revenue that city receives regularly through public funding, and provides innovative financing alternatives such as approaching sponsors or corporate houses that are willing to support the whole system or parts of it. Diversified sources such as advertising revenues, parking fees, user charges and other sources that may be small in proportion but can cumulatively allow sustained flow of money should also be taken into consideration in creating a financing strategy for the same. The chapter highlights the various types of costs that are incurred, revenue earned and operational model required to run the system proposed for Gurgaon. Tasks under Invest steps are as under:

1) Identify detailed capital and operating costs
2) Determine revenue streams including pricing structure
3) Create operational business model

1.2.5. Implement

Implementation of the PBS system requires increased coordination and meticulous planning of the various tasks identified in the planning phase. The Implement chapter (Chapter 6) identifies the various stakeholders in Gurgaon that will have a crucial role to play in successful implementation of the Plan. It also defines their roles and responsibilities, and gear themselves up for the extensive process of implementation. It is advisable that governance and monitoring structure be created for the purpose of long-term management of PBS. Tasks under implement steps are as under:

1) Establish institutional framework including roles and responsibilities
2) Devise operation & maintenance protocol
3) Build awareness through communication and outreach strategy
4) Undertake operational training and capacity building
5) Develop monitoring system and improvement strategy
6) Expand system

Exhibit 1.2 illustrates the overall project methodology in a flow-chart.
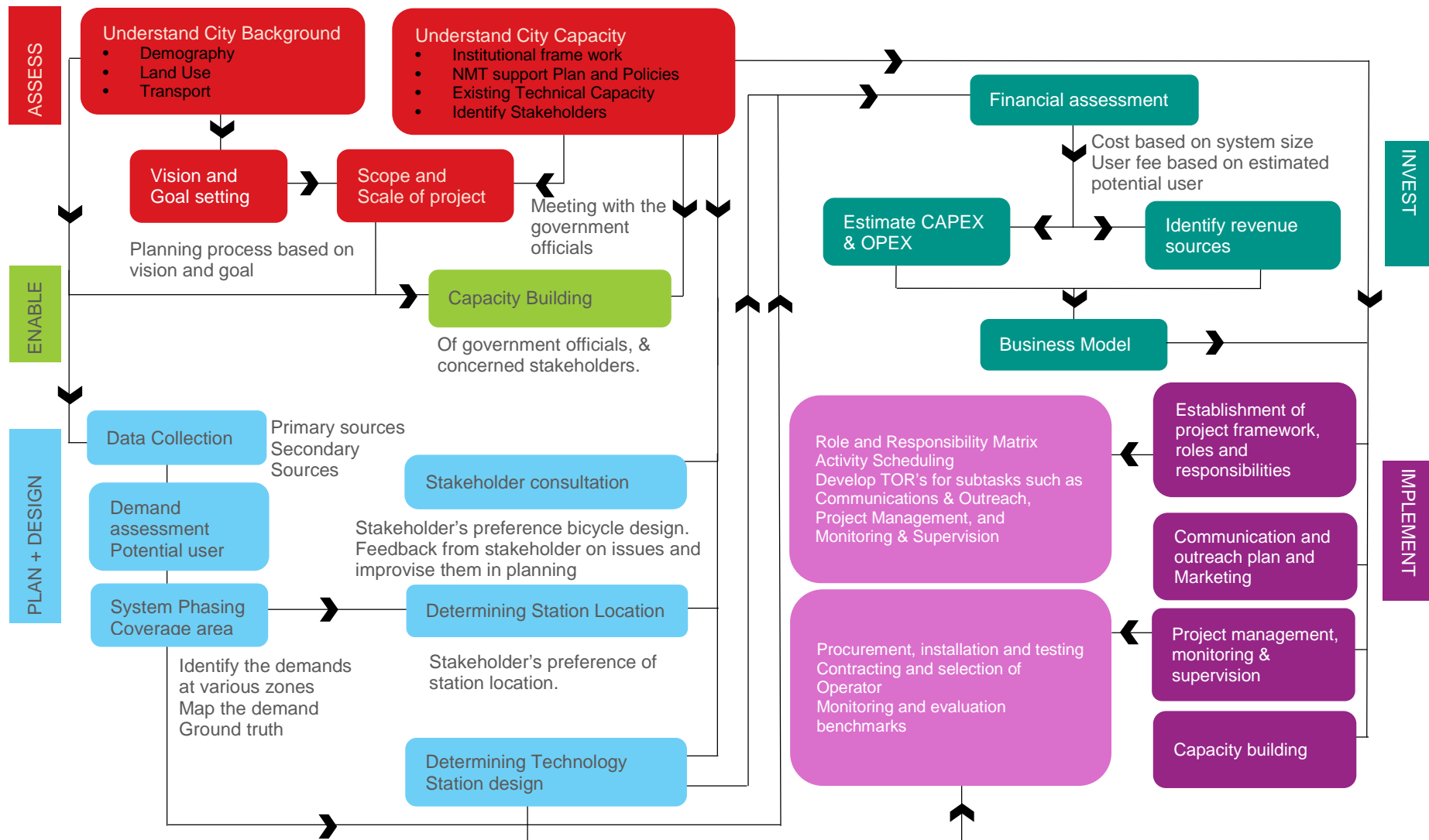
Exhibit 1.2: Flow Chart for Project Methodology

Source: IBI Group

CHAPTER II: ASSESS

2. ASSESS

The Assess chapter provides an overview of the steps needed to examine the city's preparedness for a public bicycle sharing system. In this chapter, the current situation in the city of Gurgaon, with respect to the transportation and land use scenario, is studied in detail based on available literature and data. Various information sources are referred to in this chapter to assess and establish the baseline transport scenario of Gurgaon. Understanding the baseline conditions and transport needs of the city will help evaluate the options available to steer Gurgaon towards a sustainable mobility.

The city of Gurgaon has been at the forefront of NMT-related news in India because of events like Raahgiri Day and Car-Free Day. The young and aspirational demography of Gurgaon has whole-heartedly supported cycling as a viable mode of transport.

Exhibit 2.1: Picture from one of the Car Free Tuesdays in Gurgaon
Source: DNA India, 23 September 2015 (http://www.dnaindia.com/india/report-gurgaon-no-car-day-finds-mixed-response-2127814)

During the Car Free day held on the 22nd of September 2015, it was estimated that over 10,000 cars were kept off the road[1] and people resorted to more sustainable modes of transport such as walking, buses, bicycles, cycle rickshaws, and metro. The willingness of Gurgaon's citizens to shift to sustainable modes of transport such as bicycling is evident based on their patronage of such initiatives. The Municipal Corporation of Gurgaon (MCG) hopes to build on these successes and prepare a long-term vision for the city where cycling becomes a formal mode of transport. The following chart describes how the viability and feasibility of a PBS system in Gurgaon was studied.

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[1] *http://timesofindia.indiatimes.com/city/gurgaon/Its-final-Every-Tuesday-to-be-Car-Free-Day-in-Gurgaon/articleshow/49098504.cms*

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┌─────────────────────┐      ┌─────────────────────┐      ┌─────────────────────┐
│ Study of Baseline   │ ──▶  │ Review of existing  │ ──▶  │ Assess Budget       │
│ Transportation      │      │ Policy              │      │ Availability        │
│ Characteristics     │      │                     │      │                     │
└─────────────────────┘      └─────────────────────┘      └─────────────────────┘
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│ Identifying         │ ◀──  │ Institutional Support│ ◀── │ Vision, Goals and   │
│ Stakeholders        │      │ & Technical         │      │ Objectives of PBS   │
│                     │      │ Capability          │      │                     │
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┌─────────────────────┐      ┌─────────────────────┐
│ Initial Scale and   │ ──▶  │ Feasibility study   │
│ Scope of System     │      │ including potential │
│                     │      │ business models     │
└─────────────────────┘      └─────────────────────┘
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Exhibit 2.2: Gurgaon PBS Planning Process
Source: IBI Group

2.1. Gurgaon City Profile

Gurgaon, a significant urban centre in the National Capital Region, has rapidly emerged as a corporate and commercial destination over the past decade. The city houses more than 250 Fortune 500 companies of the world and this fact in itself is a testament to the growth potential of Gurgaon and its importance as a business destination on the global map. The city currently has the third highest per-capita income in the country. The census statistics of Gurgaon district shows that the city has registered the highest population growth in the state of Haryana at around 74% (decadal population growth).

Location	Year	Population
Gurgaon (District)	2011	1,514,085 (As per Census 2011)
	Total Male Population	817,274
	Total Female Population	696,811
Gurgaon (Urban/ City)	2011	876,824

Exhibit 2.3: Population pattern of Gurgaon

Due to this rapid urbanisation, Gurgaon's planning efforts have not been able to keep up with development pressures and the stress on the civic infrastructure is the worst to be hit. There has been a huge outcry by urban planning and transport experts on the haphazard manner in which the city has developed, at the mercy of private property developers. The media outcry on these issues has been at its peak in the past few years.

Gurgaon is an example of how not to urbanise India

Traffic-congestion-at-Netaji-Subhash-Marg-in-Gurgaon-Parveen-Kumar-HT-Photo

Few Indian cities have witnessed growth the way Gurgaon has.

More than 250 (over half) of the global Fortune 500 companies either have their India headquarters or their important offices in Gurgaon. These include firms such as Walmart, Shell, Microsoft, Samsung, GM, GE, PepsiCo, Coca Cola, Google, Toyota and Facebook.

The outsourcing industry, of which India is one of the biggest backroom offices of the world, hires around a half a million people in Gurgaon, directly and indirectly, and more than 200,000 workers are employed at factories, including Honda's and Maruti's, in and around the city.

From the mid-1980s, when it was still mainly a flatland of green fields, forests and crops, nestled near the ridges of the Aravalli range in Haryana, Gurgaon today is a sprawl of glass, steel and concrete high-rise offices, condominiums and malls, which are the workplaces, homes and shopping destinations for its population of two million and growing.

Yet, few Indian cities are on the brink as Gurgaon is for there is also a grim and depressing flipside to this city's story of boom. Three decades after the first real estate developer dug into what was still largely a sleepy verdant village, the Millennium City (a nickname that now reeks of black humour) is on the verge of spiralling into a deep and precipitous fall from where it may never recover.

Look a bit closely and you'll see why.

Gurgaon's streets are unplanned, unnamed and, in many instances, unnavigable; electricity for most hours of the day has to be generated by residents, offices and malls (there are 35 of those in the city) using their own captive generator sets that burn diesel for fuel; there is no public transport system worth mentioning that functions within the city; air pollution levels rival neighbouring Delhi's (which is the worst in the world) in a city that has just a tenth of the population; policing standards are akin to those of a village thana; and, as residents and commuters realise every year during monsoon, the city's drainage and

Exhibit 2.4: Opinion Coverage in Media on Gurgaon Urbanisation as a Problem (Hindustan Times, Dt.10 August 2015)

Urban transport is one of the most pressing challenges that the civic, planning and enforcement agencies are trying to address. The city's arterials are stressed with a daily influx of vehicular traffic from Delhi and other NCR, while on the other hand; its local roads have become unsafe for daily commute for its residents. Statistics reveal that over 400 people are killed on Gurgaon roads each year[2]. The traffic police have identified several locations as accident black spots in the city that need urgent attention. HUDA City Centre Metro station, Signature Tower, Rajiv Chowk, Gurgaon-Faridabad Road and Bilaspur are some of these highly accident prone areas.

Some projections indicate that the city's population would cross 5 million in the next 15 years[3]. Given the projected population, one can imagine the severity of the transport problem that would be with the projected population if the vehicular traffic chaos is not addressed immediately. As expressed by business groups such as NASSCOM[4], which have a strong foot-hold in the Cyber city region of Gurgaon, problems such as economic disparity, lack of civic infrastructure, high crime rate, unpredictable governance, and lack of citizen participation are some of the critical issues related to the growth potential of Gurgaon. In fact, several experts have time and again stressed the importance of strong Public Transportation for the connectivity within Gurgaon and outside as well. The Delhi Metro Rail and Rapid Metro Rail partially serve the purpose of easing the external influx of people movement from outside Gurgaon.

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[2] http://www.hindustantimes.com/gurgaon/gurgaon-traffic-police-identify-five-accident-prone-areas/story-26Zc0yLJ109f789E9u9yjO.html

[3] As per the population projections presented in "Integrated Mobility Plan for Gurgaon Manesar Urban Complex,2010"

[4] http://www.iamin.in/en/gurgaon/news/development-patches-won%E2%80%99t-help-gurgaon-requires-paradigm-shift-65366

Exhibit 2.5: Media Coverage on Gurgaon Urban Problems
Sources: Clockwise from top left 09 July 2015, 18 June 2015, 30 June 2015, 13 August 2015)

Gurgaon offers many opportunities to plan and implement PBS system as an alternative mode of transport for its people. Every Sunday for Raahgiri, the city closes a section of roads for motor vehicles so it can be used by people for walking, jogging, running, cycling, skating and other leisure activities. The resource utilization and positive response of the user at events such as Raahgiri day has also been one of the reasons that can pave way to plan bicycle sharing system in Gurgaon.

Exhibit 2.6: Events coverage during Raahgiri, Gurgaon
Source: Raahgiri Facebook Page

2.1.1. Geographic Characteristics

Gurgaon is located in the state of Haryana and comes under National Capital Region (NCR). Gurgaon is one of Delhi's four major satellite cities that emerged as one of the leading financial and industrials hubs in India. Municipal Corporation is the governing body of Gurgaon since 2008. The city has witnessed tremendous growth in the last decade with development in various sectors such as IT, BPO, Commerce and Industries. Due to its proximity to Delhi, Gurgaon witnessed major changes as industry and housing found a cheaper alternative.

Gurgaon district (1,253 sq.km. area), traditionally engaged in agriculture saw rapid development in the north-eastern part of the district in the early 1990s. Significant migrant population has come from different parts of India to work in the city and are employed in various sectors from construction to information technology across multiple profiles. Municipal Corporation of Gurgaon includes the Gurgaon village, newly developing urban satellite city and Industrial Model Township in Manesar (Exhibit 2.7).

Exhibit 2.7: Gurgaon District and Municipal Limits
Source: Google Maps and IBI Group

Although the district has isolated hills of Aravali, city of Gurgaon has a fairly flat topography making it ideal for bicycling. The average elevation of Gurgaon is 712 ft. above mean sea level. The city experiences a monsoon-influenced humid subtropical climate. Summers are typically hot and humid, with an average temperature ranging between 21°C to 40°C in the months of April to June. Onset of monsoon is from June and lasts till September. Average 7 days of rainfall is received during the rainy months. Winters are very cold and foggy with few sunny days; temperature can go down up to 3°C. The average annual rainfall is around 71.4 cm in Gurgaon.

2.1.2. Demography and Socio- Economic Characteristics

PBS ridership is typically influenced by population density and mix of land use. Gurgaon is the second most populated city in Haryana with a population of 8.7 lakh being accommodated within 36 wards spread across 732 sq.km area (Census of India, 2011). The population distribution of the district shows an annual growth rate of

Exhibit 2.8: Population Distribution in Cities, Haryana 2011

20.8% from 2001 to 2011 (Refer Exhibit 2.9). The growth of population is exponential, both in the case of city and district.
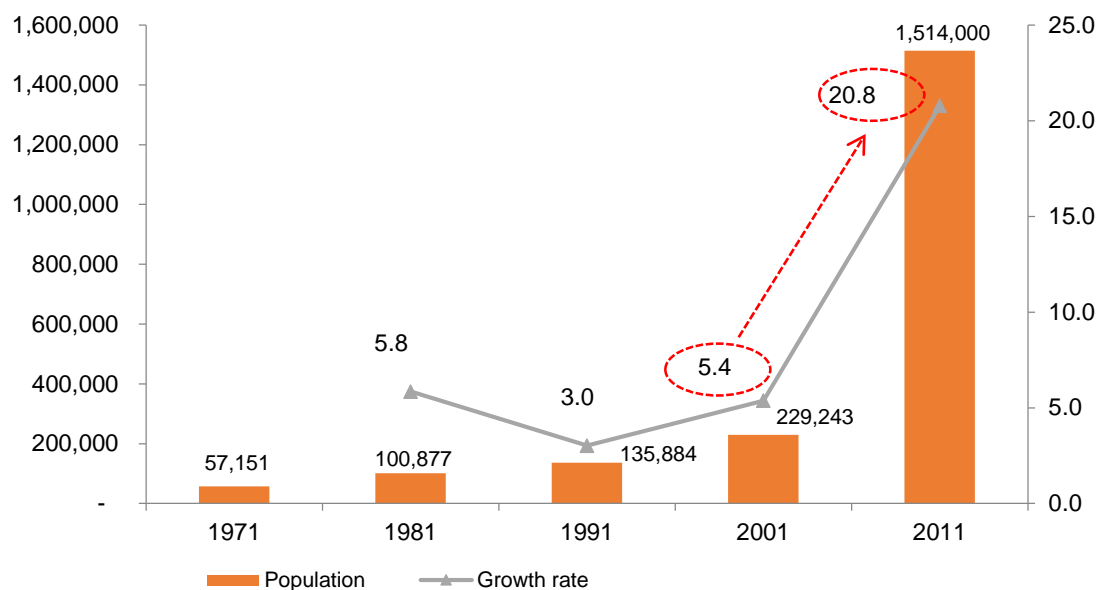
Exhibit 2.9: Population Distribution and Growth Rate, Gurgaon District

Source: Census of India
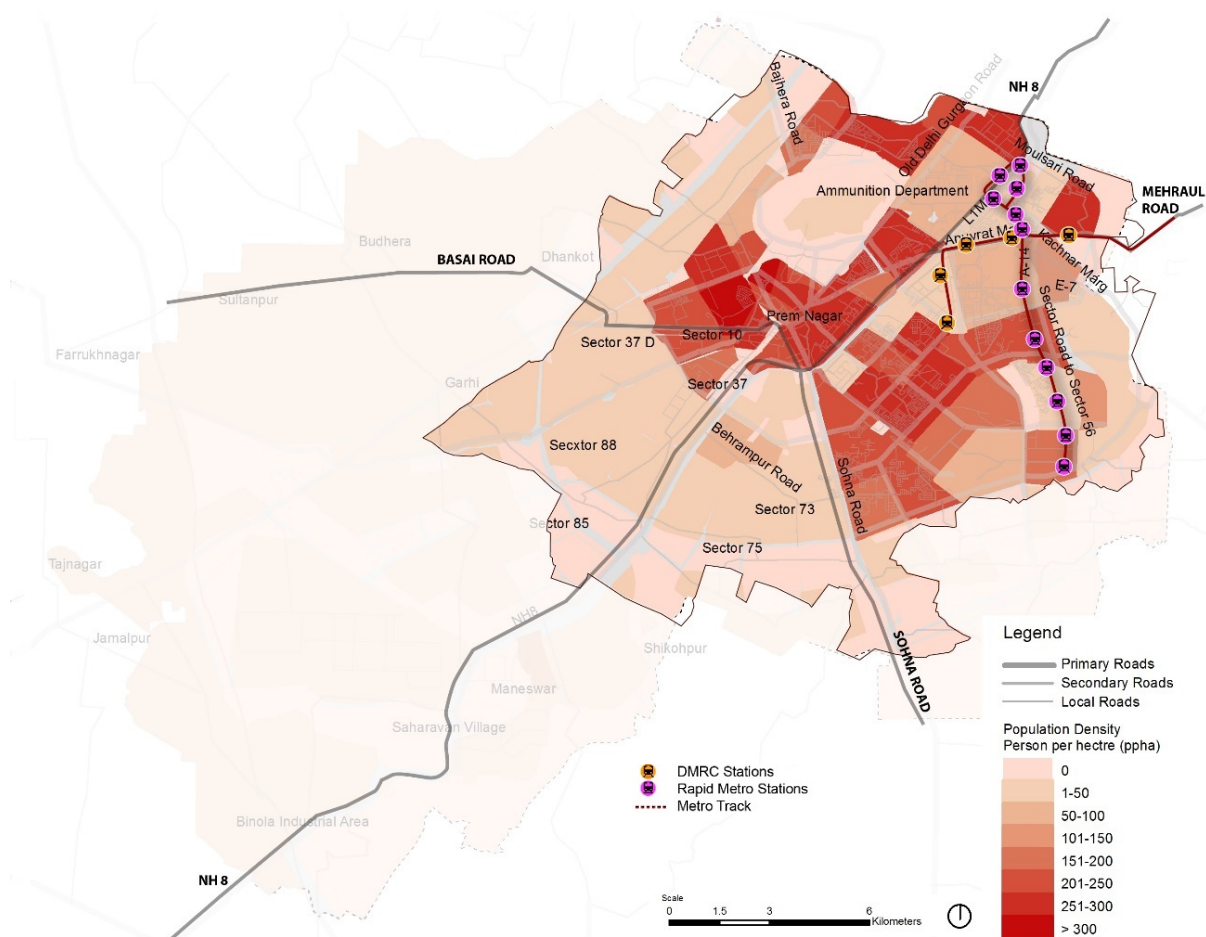
Map 2.1: Population density of Gurgaon (2008)

Source IMP GMUC, 2010

Majority of population resides in the north-eastern part of the municipal limits in MCG. In the south-east lies the Manesar complex which is an upcoming industrial area.

The north-eastern parts of Gurgaon is physically divided due to the presence of NH8 (Delhi - Jaipur Expressway). The northern half of NH8 is the old Gurgaon, comprising the original Gurgaon village. Population density around the railway station area and bus depot ranges from 200 persons per hectare (ppha) to over 300 ppha.

The southern half of NH8 is the new urban Gurgaon developed by private investors since 1990's, comprising of mostly migrated population. Population density here ranges from 100 ppha to over 300 ppha. Construction of roads and extension of metro has contributed to the deteriorating development character and movement of people and goods within the city. Around the Metro corridor, the average population density ranges from 50- 200ppha; while the residential neighbourhood of South City-II has a population density of more than 300 ppha. The density of Manesar complex ranges between 50-100ppha. (Refer Map 2.1). The population distribution is also skewed within the MCG limits. The average population density is around 11 ppha while it ranges from 100ppha to 300ppha in north-eastern Gurgaon.

2.1.3. Transportation Characteristics

2.1.3.1. ROAD NETWORK

As per the Development Plan (DP) 2021, Gurgaon has around 11% of its area under road network. NH8 forms the major road connecting Delhi with Jaipur. The southern urban stretch or new Gurgaon has a grid pattern road network with straight roads intersecting each other at right angle. The major roads in Gurgaon, besides NH8, include: MG Road, Atul Kataria Road, Sohna Road. Map 2 shows the existing road network in Gurgaon.
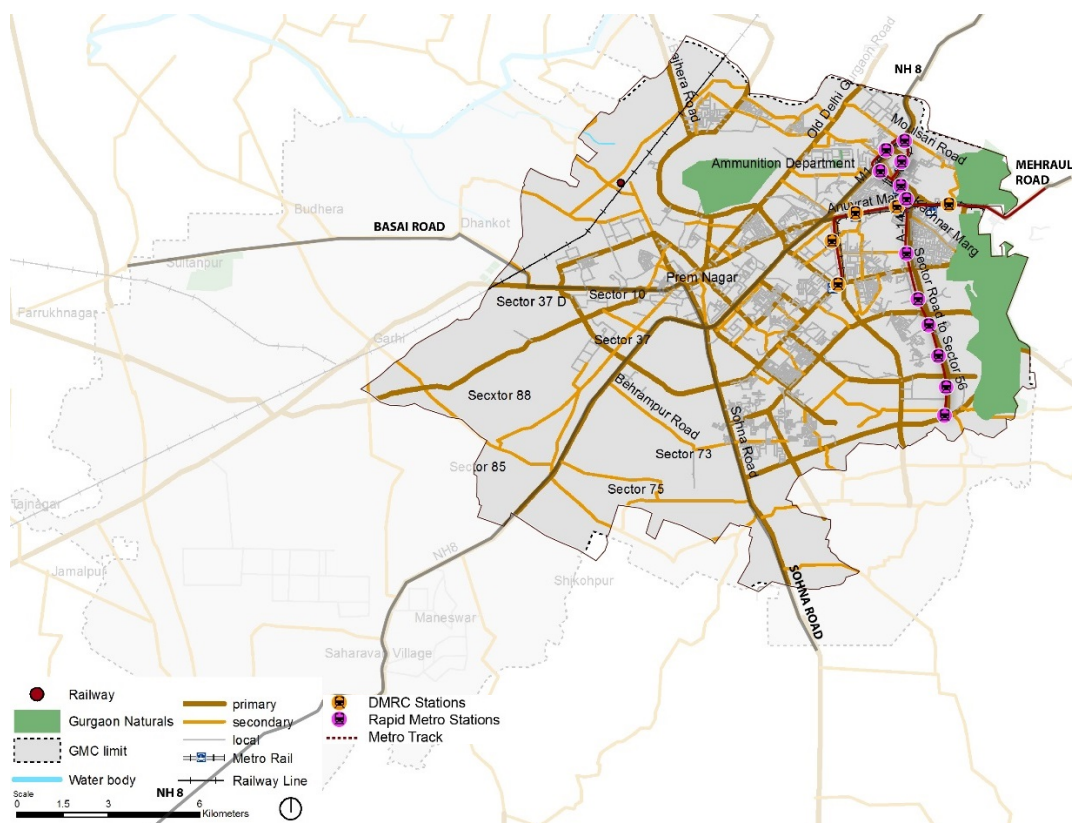
Map 2.2: Road network map of Gurgaon
Source: IMP GMUC 2010

The connectivity between Gurgaon and Manesar is one of the critical aspects that will impact the city's future growth as both the areas are expected to grow in tandem. There are three roads which are connecting Gurgaon with Manesar- NH8, Khandsa Road and Pataudi Road. NH8 is currently the prominent connection, while the road condition of the two other roads is poor. Presently, mini buses

are operating between Gurgaon and Manesar to meet the public transport need of the people. The truck traffic also uses these roads to access Manesar. The local roads within the sector are well connected. (Refer Map 2.2)

2.1.3.2. TRAFFIC GENERATING ACTIVITY

Gurgaon has grown as the hub of BPO, IT and other new-age businesses. Activities surrounding both the metro corridors (Delhi Metro and Rapid Metro) are substantial. There are numerous commercial and recreational activity centres such as amusement parks, malls, shopping complex, office building, food joints etc. in the vicinity of the metro corridor, NH8 and Sohna Road. Map 4 shows concentration of educational institutes on the same corridors, some extending towards Northern Sectors 23 and 22, which attract a lot of educational trips. Majority of the traffic generating activity centres in Gurgaon are concentrated on the eastern part, causing severe traffic congestion during peak hours (Refer Map 5). These areas include important landmarks on the M.G. Road such as Sikanderpur, Guru Dronacharya and areas in core Gurgaon such as HUDA City Centre, Gold Souk, Rajiv Chowk, Prem Nagar and Hero Honda Chowk. On the other side of the NH8 (i.e. old Gurgaon) - Palem Vihar, Railway station, Bus depot and stretch along Sheetlamata Mandir witnesses high traffic patterns.
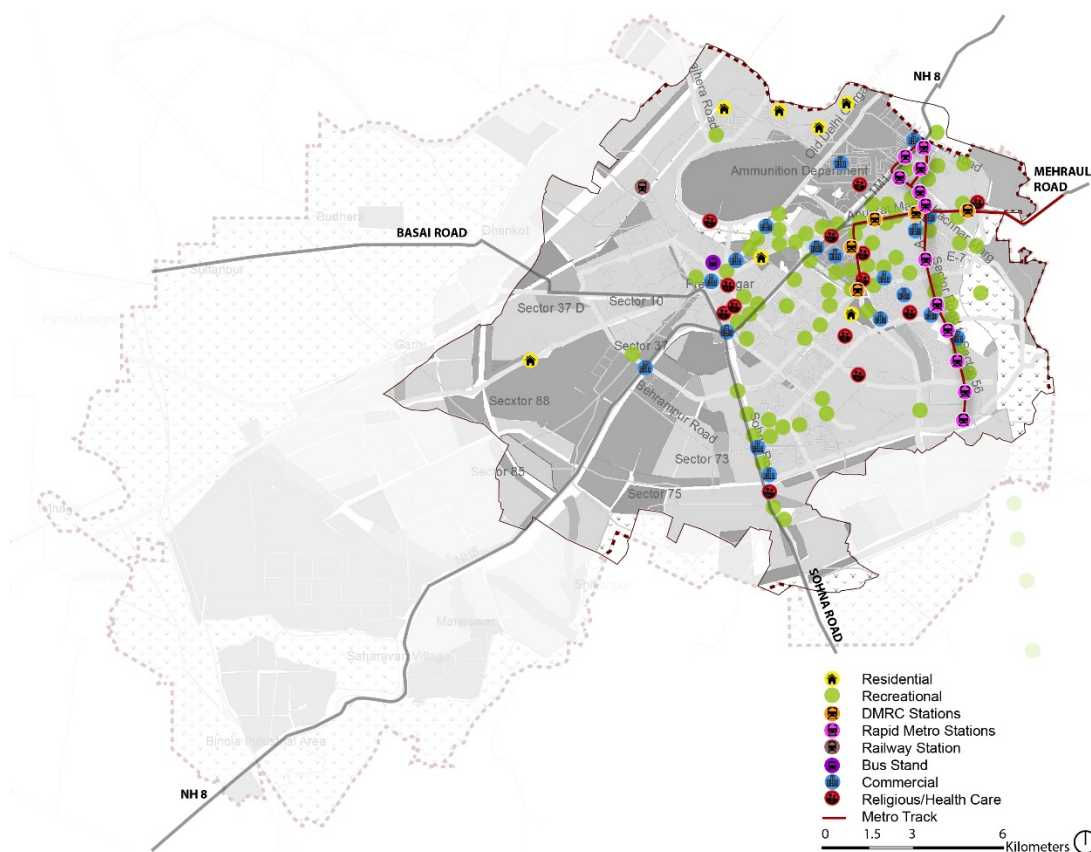
Map 2.3: Existing activity generators in Gurgaon
Source CGM 2015
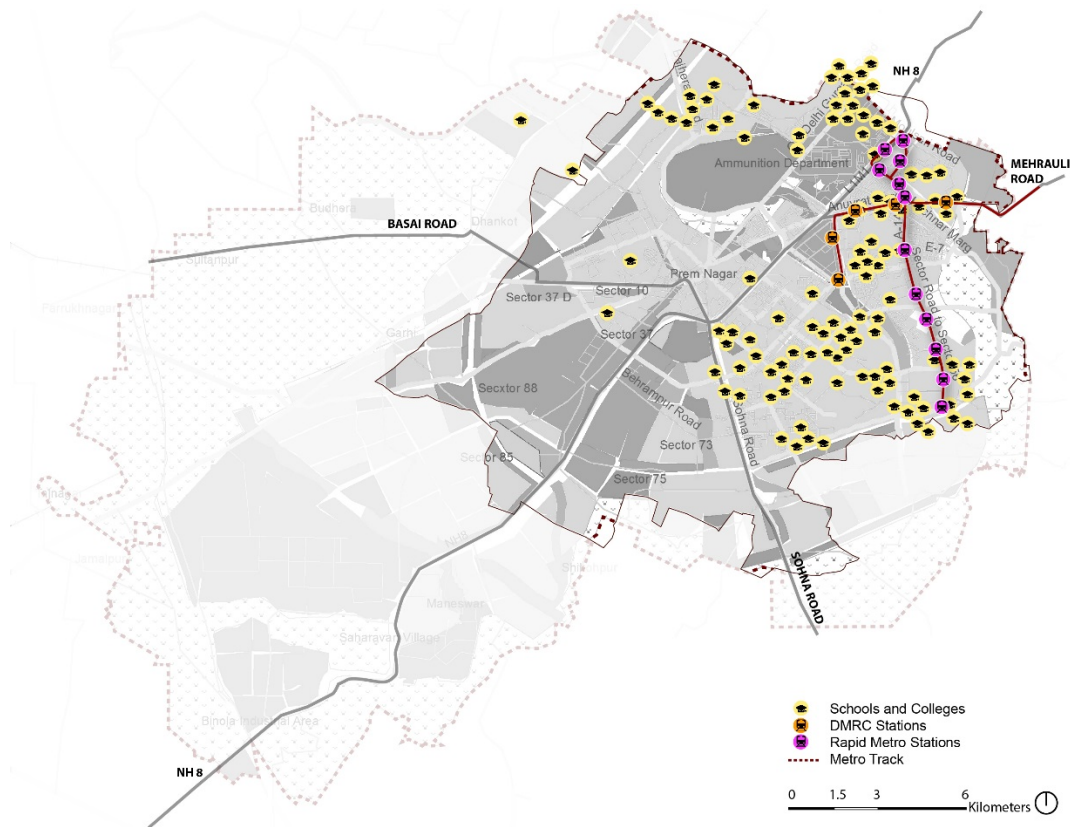
Map 2.4: Existing schools and colleges in Gurgaon
Source CGM 2015
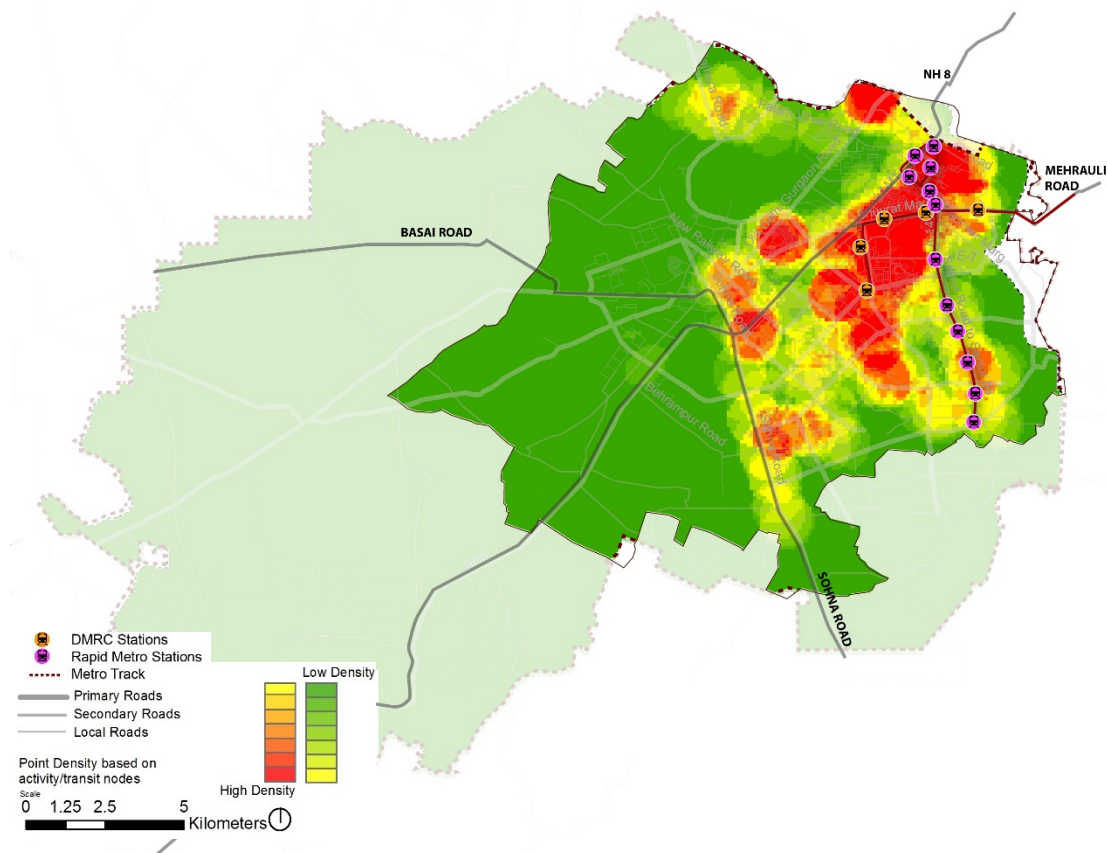
Map 2.5: Heat map based on activity/transit nodes of Gurgaon
Source CGM 2015

2.1.3.3. VEHICLE GROWTH PATTERN
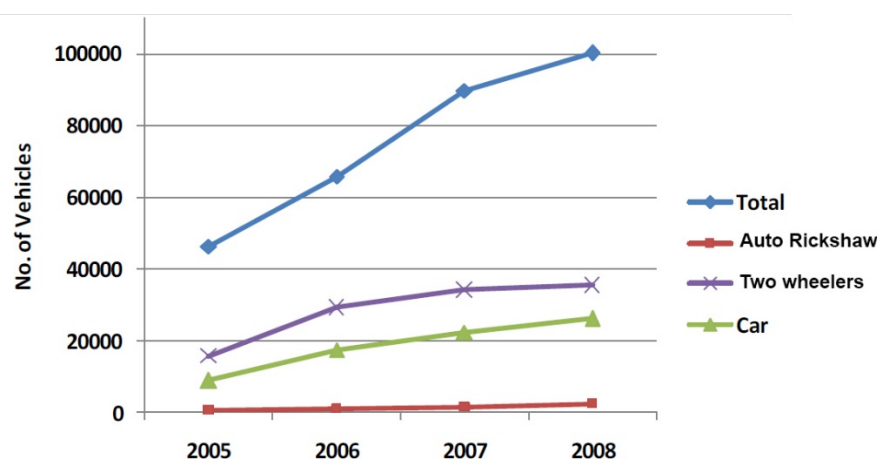
Exhibit 2.10: Vehicle growth in Gurgaon, 2010
Source: IMP of GMUC 2009

The vehicle population from 2005-08, as stated in the IMP GMUC 2009, marked a growth rate of more than 20% per annum. Particularly, personal modes have registered a very high growth rate. Cars grew at a 30% rate, while two wheelers at 22%. IPT modes are also adding substantially to the city's vehicle population. It is vital to note that in Gurgaon, on an average 250 vehicles are getting registered daily, in which two wheelers and cars constitute about two- thirds of the total registrations.

Also the floating population of vehicles from neighbouring places, especially from Delhi are enormous. The existence of old vehicles along with high growth rates in the recent past also had a impacts on the traffic levels in Gurgaon.

Cities	No. of cars and 2 wheelers per 1000 people
Gurgaon	232
Chandigarh	172
Delhi	120
In Gurgaon, 43% of households own two-wheelers, 33% own cars.	

Exhibit 2.11: Number of Private Vehicle per 1000 people, Cities; India, 2014 (India, 2014)

2.1.3.4. AIR QUALITY

A study in Gurgaon conducted in December 2014 by the Centre for Science and Environment (CSE), reported that the 24-hour average of PM2.5 (fine, respirable particulate matter) levels in the air is about 13 times the national safe standard. PM2.5 levels are considered to be a serious health threat as these ultra-fine pollution particles can get lodged in the lungs and reduce its capacity over time. They are linked to cardiac conditions like strokes and heart rhythm disorders. The study also stated that the deteriorating condition of Gurgaon's air quality is eventually contributing to the national capital's pollution level. The most severe cases of low air quality were found at IFFCO Chowk-Cyber Green Office area- Sohna Road-Artemis hospital- Amity International School- Medanta-Rajiv Chowk-Civil Hospital-Sadar Bazar-Udyog Vihar. (Refer Map 2.6)
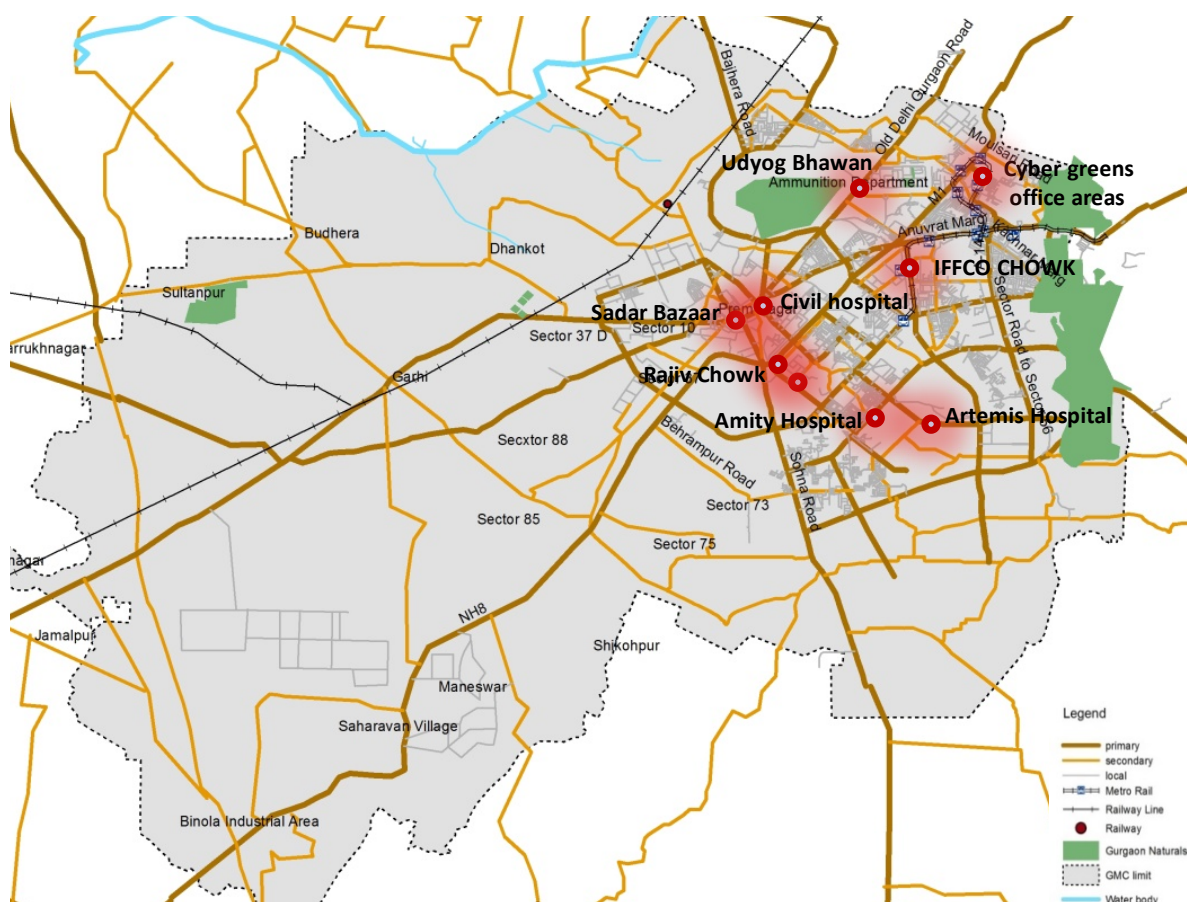
Map 2.6: Places with low air quality in Gurgaon
Source: IMP GMUC 2009

2.1.3.5. ROAD ACCIDENTS

While the study shows a decrease in the overall accident rate, the percentage share of fatal accidents is very high in Gurgaon. According to the statistics from Gurgaon Police webpage, out of 356 fatal road accidents, 48% of the road accidents occurred during daytime and 52% occurred at night in the year 2013 (Refer Exhibit 2.12). The maximum number of fatal accidents took place on National Highway-8 (106) followed by Sohna Road (29), Kulana-Pataudi-Tauru Road (25), Pataudi Road (16), Farrukhnagar (12), Faridabad Road (12), Tauru-Palwal Road (8) and Sohna-Ballabgarh Road (8). The NMT users happen to be the most vulnerable to road accidents (Refer Exhibit 2.13).
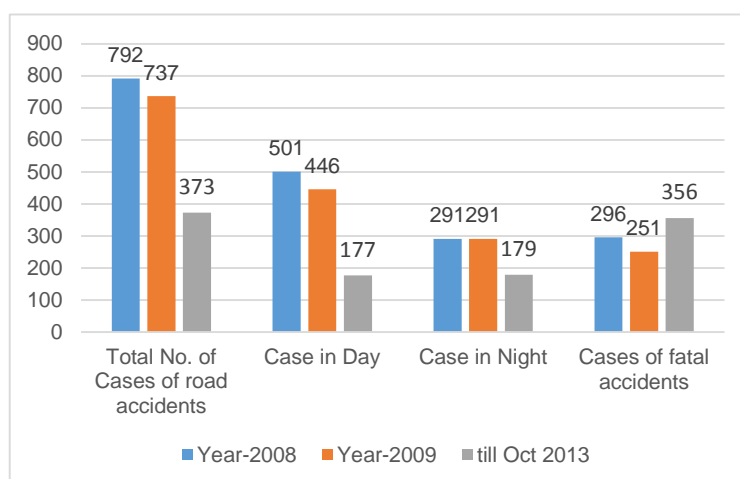
Exhibit 2.12: Accident statistics in Gurgaon
Source: www.gurgaon.haryanapolice.gov.in

Affected mode	2008	2009	2013
Two Wheelers	38%	34%	33%
Pedestrians	27%	20%	37%
Cyclist	-	-	5%
Auto Rickshaw	-	-	5%

Exhibit 2.13: Affected mode in road accident, Gurgaon[5]

2.1.4. Trip Characteristics

According to the Integrated Mobility Plan (IMP) for Gurgaon-Manesar Urban Complex (GMUC), around 51% of the total trips in 2010 in Gurgaon were made by personal modes (Refer Exhibit 2.14), as compared to 39% in 2004. Mode share of NMT- bicycle, pedal rickshaw and walk was over 33% and that of bus was 7%. The share of sustainable transport modes (PT+ Rickshaw+ Walk +Bicycle) which was 58% in the year 2004 deteriorated to 40% in the year 2010. Auto rickshaws and Pedal rickshaws are the city's Intermediate Public Transport (IPT) service contributing to around 11% modal share.
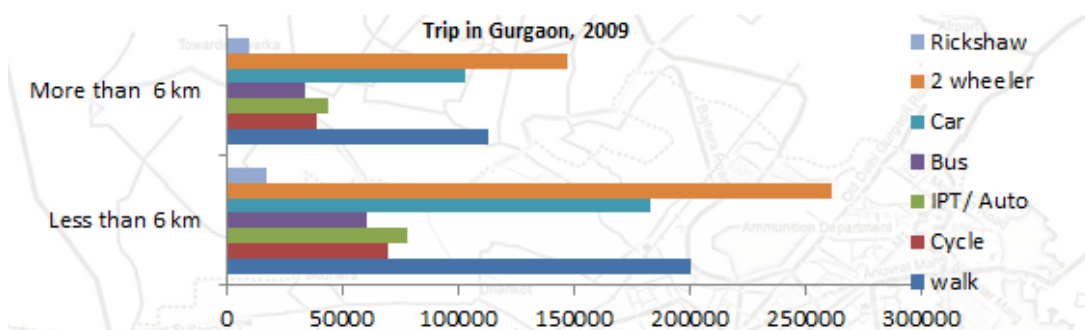
Exhibit 2.14: Distribution of trips by length
Source: IMP GMUC 2010
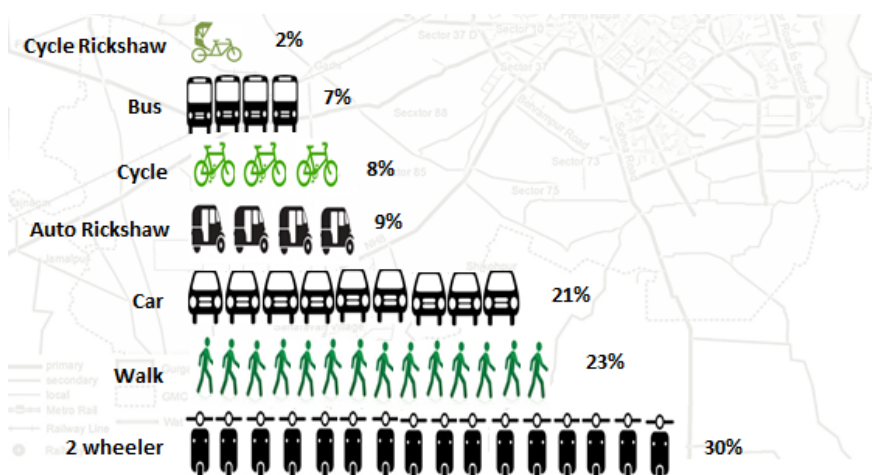
Exhibit 2.15: Distribution of trips by Modal share
Source IMP GMUC 2010

In 2010, the average trip length in the city was 7km and average trip-rate of the city was around 1.55 per person[6]. According to the IMP, in 2010, 45% trips were between 0-2 km, 8% of trips are between 2-6 km and 8 % between 6 to10 km. In addition to this, the trip length of commuters using public transport was 16 km, which is significantly high and indicates that commuters use PT mainly for intercity transfers. Also, majority of the daily trips were within 5 km which makes a potential case for

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[5] *Statistics from Gurgaon Police webpage: www.gugaon.haryanapolice.gov.in*

[6] *IMP GMUC 2010*

developing Gurgaon as a bicycle oriented city through proper planning.

2.1.5. NMT Issues

Location	Peak Hour	count
IFFCO Chowk	18.00-19.00	1706
Rajiv Chowk	18.00-19.00	1115
Sethi Chowk	18.45-19.45	1115
Near Bus Stand	18.00-19.00	1002
Sukhrali Chowk	18.15-19.15	999
Prakash Puri Chowk	8.15-9.15	988
MG road	8.00-9.00	856
Shankar Chowk	10.15-11.15	695
Fountain Chowk	8.00-9.00	693
Vishwakarma road	9.00-10.00	590
Sheetla Mata Mandir chowk	9.15-10.15	294
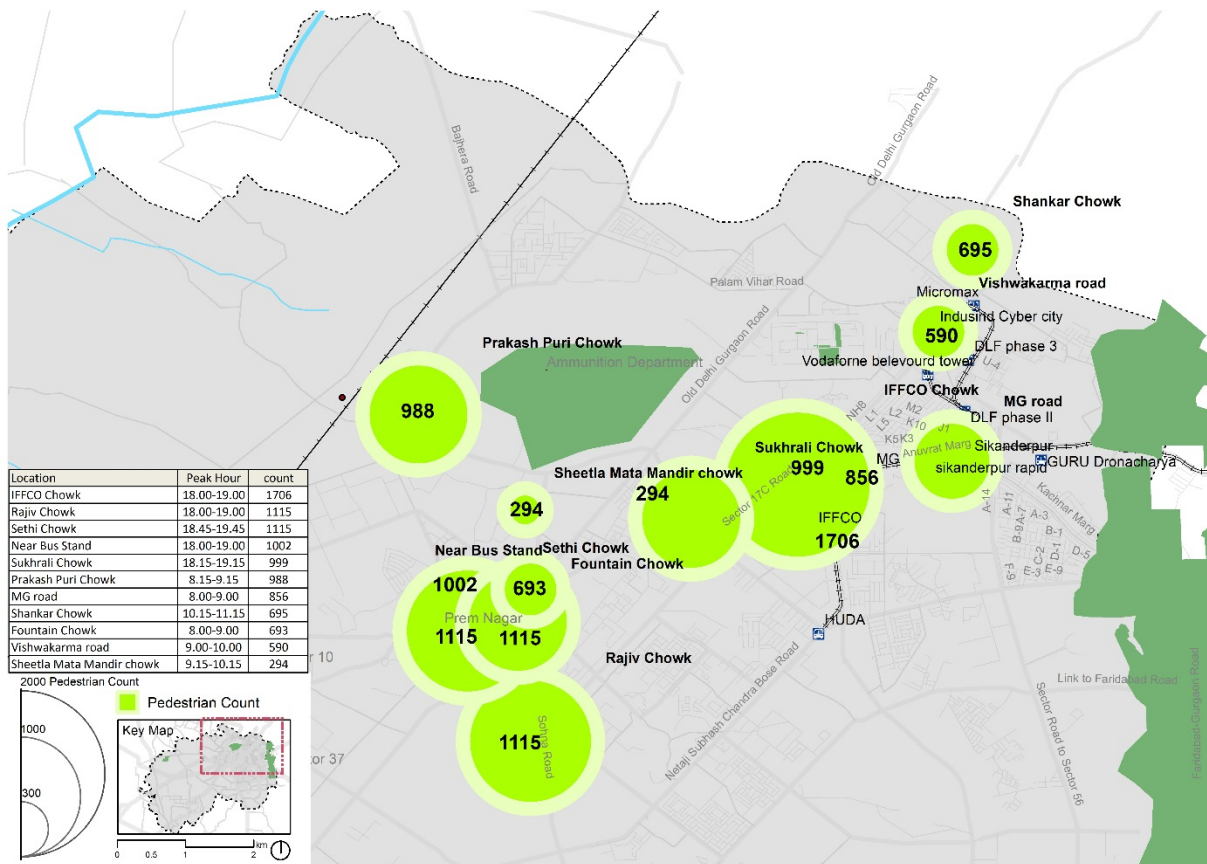
Map 2.7: Pedestrian (peak hour) count of Gurgaon
Source: IMP GMUC 2010

Modal share of the city for walk, bicycle and pedal rickshaw, as reported in the IMP, was 23%, 8% and 2% respectively. Average trip length for walk trips is 2km against 3km on cycle. In the survey documented in the IMP report for GMUC, 2010, it is observed that peak hour pedestrian crossing (both directions) across the roads are high at IFFCO Chowk, Rajeev Chowk, Sethi Chowk and near bus stand in old Gurgaon. (Refer Map 2.7)

Exhibit 2.16: Hundreds of pedestrians risk their lives daily while crossing busy roads such as the one near Huda City Centre Metro Station in Gurgaon

Source: Hindustan times 06 June 2013 (http://www.hindustantimes.com/india/road-design-flaws-traffic-bottlenecks-choke-crossings/story-ucCH4KAO6dgrJuTWGPrnNL.html)

The safety concerns related to pedestrians and NMT users are also critical and need immediate attention. Most roads in Gurgaon do not have lanes demarcated for NMT use leading to unsafe traffic conditions on the roads. Most of the higher order roads do have footpaths for pedestrians but the number of pedestrian crossings available in MCG area are limited. Roads having usable footpaths are significantly lower than 23% which forces the pedestrians to walk on the carriageway along such roads. Condition of footpaths are unusable on several roads with obstructions, design flaws, encroachments by vendors and often, illegally parked vehicles. At various places obstructions like utility boxes and uneven tree bases are also present. Moreover, lack of street lights on several roads of Gurgaon increases vulnerability to accidents, especially for NMT users.

The Raahgiri program[7], being organised since 2014 in Gurgaon, has highlighted NMT issues prominently bringing them to the common man's attention. Encouraged by the response to Raahgiri, the MCG has demarcated a few streets with a 1 m wide bicycle lane. However, the lack of a physical barrier between the cycling lane and high speed traffic lanes continues to create an impaired sense of safety.

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[7] *Raahgiri day is a weekly event, organised every Sunday morning from 6-10am. The event is an adaption of Ciclovia, originally developed in Bogotá, Colombia in 1976 where sections of roads are closed for motor vehicles and are opened to people for walking, jogging, running, cycling, skating, and other leisure activities. In India, Gurgaon became the first city to hold this event launched in November 2013. The program has created lot of buzz and several other Indian cities have also adopted the concept.*

Exhibit 2.17: Bicycling lanes in Gurgaon
Source: Centre for Green Mobility

2.1.6. Public Transport System Characteristics

The Integrated Mobility Plan (2010) envisioned a bus service, rail and shared autos to constitute a seamless public transport network for the city. In 2010, the DMRC Metro Rail extension and an intra-city Rapid Metro loop were also introduced in Gurgaon. Besides the bus and metro rail services, several private mini-buses also ply in the city. Private vans, auto rickshaws and pedal rickshaws provide Intermediate Public Transport (IPT) services in the city.
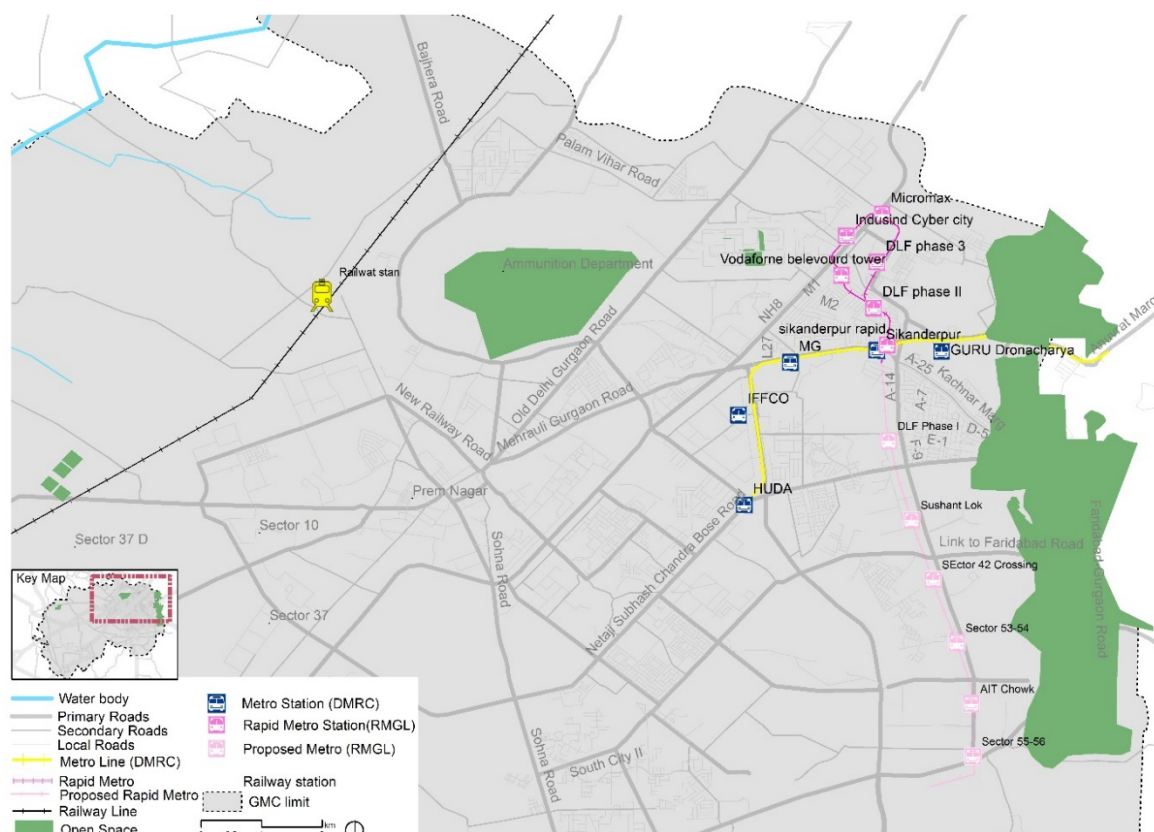
Map 2.8: Existing and proposed metro route of Gurgaon
Source CGM – Please refer Appendices for Large size Maps

Metro service: Delhi Metro manages five metro stations in Gurgaon namely - HUDA City Centre, IFFCO Chowk, MG Road, Sikanderpur and Guru Dronacharya. The Yellow Line connects HUDA City Centre to Central Secretariat.

Rapid Metro: The rapid metro is owned by Rapid Metro Rail Gurgaon Ltd. (RMGL) and is privately financed. It connects 6 stations (Sikanderpur, DLF Phase II, Belvedere Towers, Cyber City, Moulsari Avenue and DLF Phase III) in Gurgaon with the Yellow line of Delhi Metro at Sikanderpur station forming a loop of 5.1 km length. It has a daily ridership of 32,000[8]. The rapid metro line is proposed to extend towards the south up to Sushant Lok (Refer Map 2.8).

Bus Service: The Delhi Transport Corporation (DTC) buses travel to Gurgaon via Badarpur, Dhaula Kuan, Karol Bagh, Anand Vihar and the ISBT routes. Media reports observed that DTC buses travelling to Gurgaon generate more revenues in comparison with those going to different parts of the National Capital Region. It was also observed that revenue collections along bus routes travelling to Gurgaon have received a boost since the expressway toll was removed in 2015, as buses had to pay only the commercial toll collected by the Delhi civic body.[9]

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[8] *http://www.dnaindia.com/india/report-reliance-s-versova-andheri-mumbai-metro-won-t-come-under-rti-1991211*

[9] *http://timesofindia.indiatimes.com/city/gurgaon/More-DTC-buses-between-Gurgaon-Delhi/articleshow/32814936.cms*

Gurgaon's local bus service consists of 7 routes. It connects the busy parts of Mahavir Chowk, Sheetlamata Mandir, Palem Vihar, Maruti Udyog, Atul Kataria Chowk, Railway Station, Hero Honda Chowk, Huda City Centre, Golf Course, South City, Cyber City, Sushant Lok - Paras Hospital and DLF Phase IV. (Refer Map 2.9, Exhibit 2.18,)
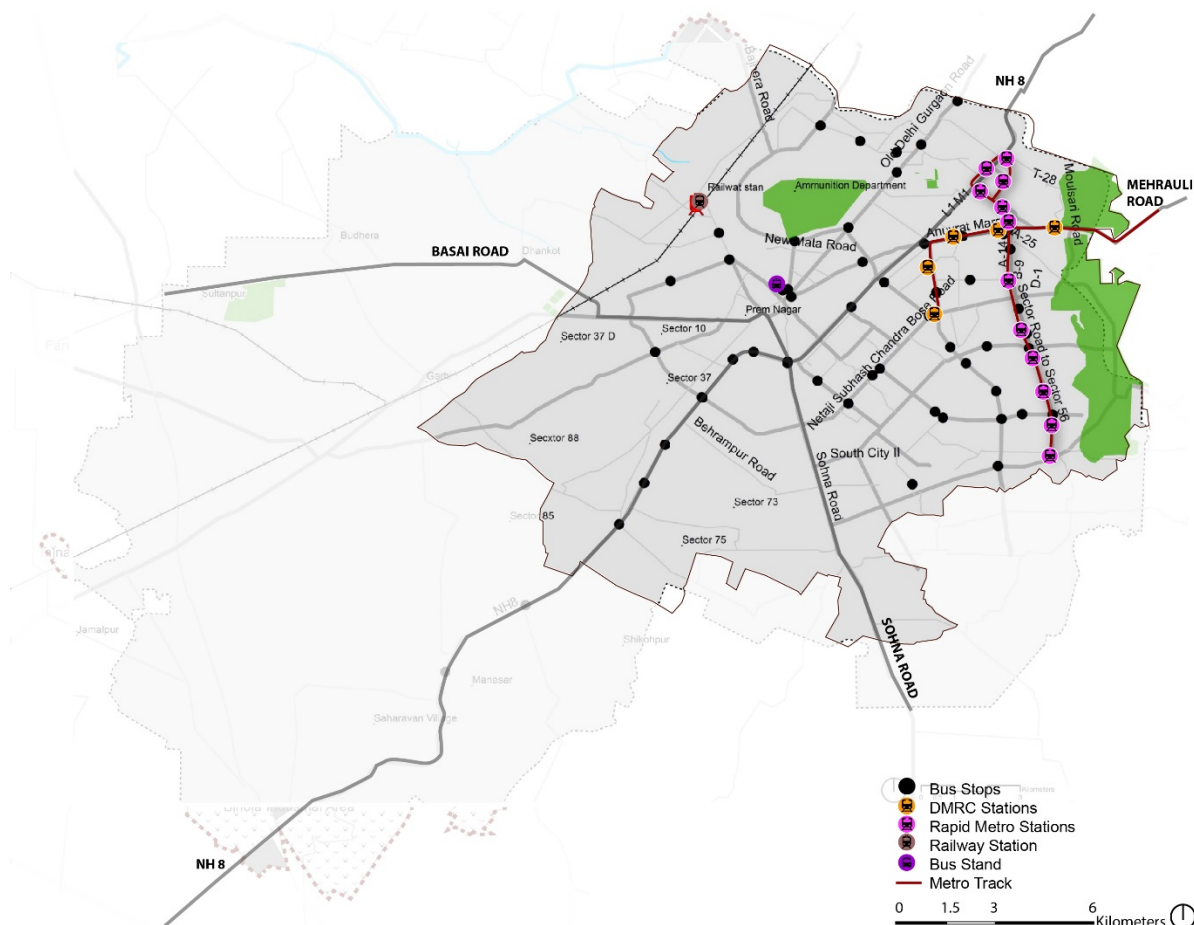
Map 2.9: Major bus stops of Gurgaon
Source: Haryana Transport Department, www.hartrans.gov.in

Exhibit 2.18: Mini bus catering to intra city trips at M.G Road metro station, Gurgaon
Source: IBI Group

IPT service: Gurgaon has auto rickshaws, pedal rickshaws and vans plying in the city to cater to the IPT trips. Auto rickshaws are of two kinds- shared and hired. Shared auto rickshaws runs on fixed routes and fixed prices. Hired rickshaws travel across the city with no control on fares. Gurgaon has also introduced Pink Auto only for ladies. (Refer Exhibit 2.19).

Exhibit 2.19: Shared auto rickshaw (black and yellow), Hire auto rickshaw (green and yellow) and pedal cycle rickshaw, near M.G Road metro station, Gurgaon

Source: IBI Group

2.1.7.   Land Use Characteristics

The land use of old and new Gurgaon is very different and quite distinct in nature. Old Gurgaon has mixed land use of residential houses and shops around the Railway Station and Sheetlamata Mandir area. This area also houses several administrative offices, including the office of MCG. Land use of new Gurgaon is planned with low-density residential sectors having pockets of high-rise commercial, residential apartments and shopping malls. The Metro Rail triggered many land use changes along its corridor, and now has several commercial offices along its route especially around Huda City Centre, M.G. Road, and IFFCO Chowk metro stations. The Rapid Metro which is operating in the Cyber City area is an established employment and entertainment destination with several corporate offices and restaurants. The corridor attracts several trips throughout the day, making it a highly attractive activity centre.

The proposed land use of Gurgaon as per DP 2021 (Refer Map 2.10) shows residential land use of 40% interspersed with 4% commercial areas and 15% industrial areas along NH-8 (Exhibit 2.20). Research has shown that the agriculture lands located in the surrounding region of the city have shown a declining trend due to growth in population and economic activities. The city has grown towards Delhi and Faridabad along the main roads. (Lohani, 2014).

Exhibit 2.20: Proposed distribution of land use, Gurgaon DP 2021

Sl. no.	Land Use	Area sq. km.	Percentage share
1	Residential	149.3	40%
2	Commercial	14.04	4%
3	Industrial	54.4	15%
4	Traffic and communication	42.31	11%
5	Public Utility	5.6	2%

Sl. no.	Land Use	Area sq. km.	Percentage share
6	Public, Semi public	16.3	4%
7	Agriculture/Open space	26.7	7%
8	Defence land	6	2%
9	Others[10]	54.2	15%
	Grand Total	**368.85**	**100**

Source IMP GMUC 2010
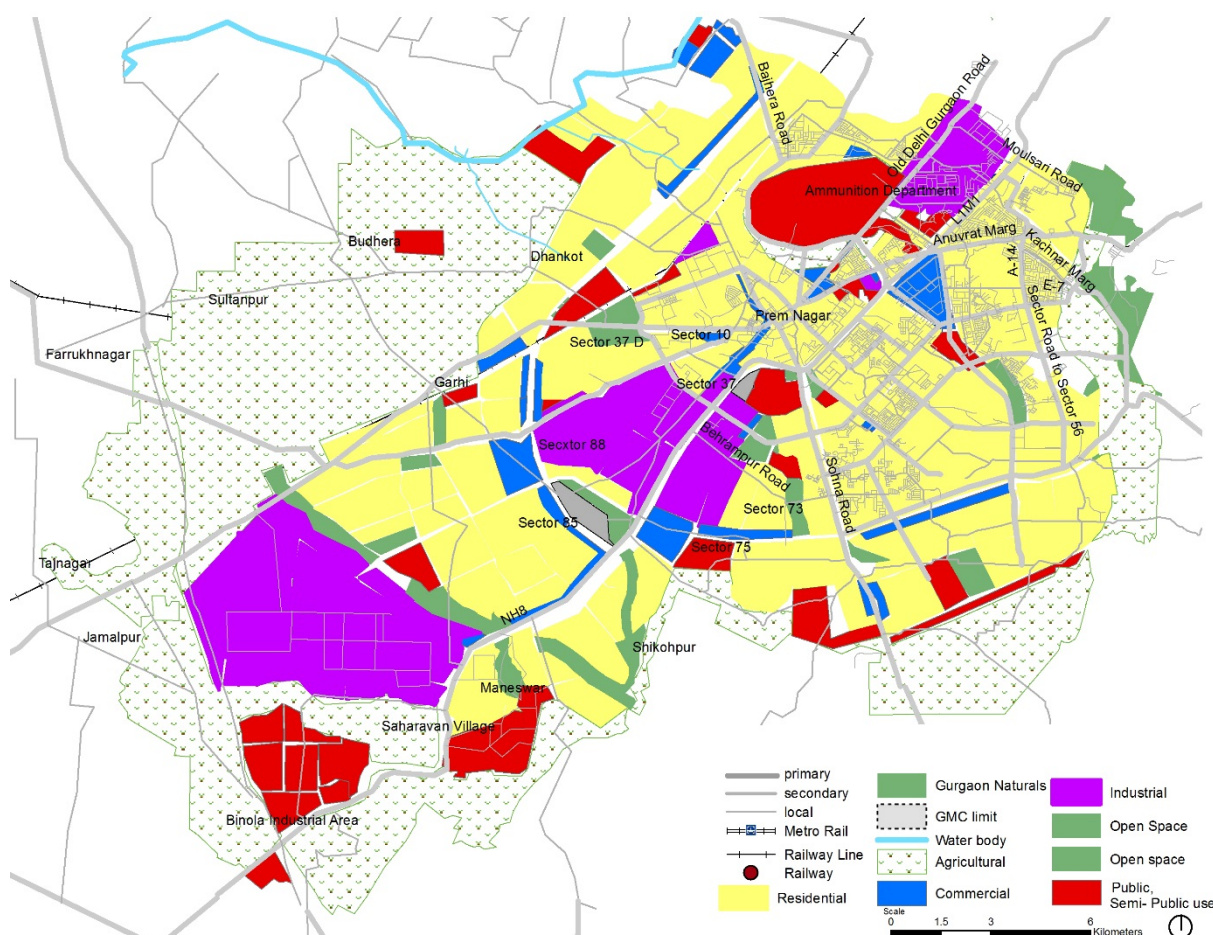
Map 2.10: Proposed land use map, Gurgaon Development Plan (DP) 2021
Source IMP GMUC 2010

2.2. Making a Case for Gurgaon PBS

This section of the Chapter focuses on why providing a PBS can be a better alternative for Gurgaon.

2.2.1. Critical Issues in Gurgaon

After studying the baseline city travel characteristics of Gurgaon in detail, it was evident that Gurgaon has to deal with three basic issues related to urban transportation. These issues must be addressed on a priority while planning any new transportation system in the city, and are expected to be duly addressed by a PBS system.

ISSUE 1 – Lack of efficient public transportation within city limits: Though Gurgaon has good public transport connectivity with Delhi via the Metro Rail, the situation completely changes once the

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[10] *Includes SEZ, Village| Source: IMP GMUC 2010, Pg. A-46*

commuter reaches Gurgaon. There is no public transport available for the commuter to complete its first and last mile journey to and from the transit stations within Gurgaon. Various statistics and studies available confirm that trip lengths for majority of the commuters in Gurgaon are around 6 km[11]. It is a generally established fact that a 5 km distance is equivalent to around 20 minutes of comfortable bicycling distance[12]. Therefore, if an efficient PBS system is planned there would be an enormous potential of it being a success.

ISSUE 2 – High accident rates: As per the National Crime Records Bureau (NCRB) reports for the State of Haryana and the Gurgaon traffic Police reports, 400 deaths occur on Gurgaon roads every year due to accidents of various types. Also, statistics reveal that over 90% of the accidents involve some motorised vehicle and majority of those are due to over speeding. Traffic calming is a critical need in the city. The experience in many cities globally has shown that as more people cycle and walk, vehicle drivers learn to be conscious of their environments and drive slower and safer. A large scale PBS system in combination with traffic calming and NMT infrastructure could potentially play an important role in prioritizing pedestrians and cyclists and in turn forcing motorists to drive slower and safer through design interventions.

ISSUE 3 – Critical pollution levels: As elaborated in the previous sections, PM2.5 was found to be around 13 times more than the safe acceptable limits at several locations in Gurgaon. As bicycling is an eco-friendly mode of transportation, a well-planned PBS system can provide non-polluting transport alternatives that could contribute in reducing the city's overall greenhouse gas (GHG) emissions, if implemented in conjunction with other pollution control measures.

2.2.2. Opportunities in Gurgaon

There are several reasons why a safe, efficient and cost-effective transportation system would be successful in Gurgaon. Two main opportunities for the potential success of a PBS system are as follows:

OPPORTUNITY 1 – Metro Connectivity: A large floating population of commuters reaches Gurgaon daily via the Delhi Metro rail. It is also an established fact that Gurgaon suffers from a lack of proper first and last mile connectivity and even if it exists, it is unaffordable in the long-term. Often the cost for last-mile connectivity through IPT modes in a majority of cases is more than the actual trip cost (by Delhi Metro) itself. Therefore, if a PBS system is planned along the Metro corridor it will make a win-win case for the commuters, transit agency and the civic authorities. This makes the PBS system a well-placed value proposition.

OPPORTUNITY 2 – Compact node of activity generators: A close inspection of existing land uses reveals that most employment or activity generators are within a 5 km distance from the metro stations. Moreover, a large number of schools and colleges lie within close distance to residential land uses and metro stations. This offers the biggest opportunity for a PBS system to emerge as the origins and destinations are within comfortable bicycling distances, especially for the younger demographic who are most likely to use this mode.

2.2.3. Benefits of a PBS System over Bicycle Renting

While the viability of the bicycle as a last mile connection mode is established through the discussion above, the benefits of a PBS system over a bicycle rental system are provided below:

BENEFIT 1: Serves short trips: The high concentration of employment, institutional, and service-oriented uses within a 5km distance suggests a high number of short trips for errands and other purposes. This is supported by the trip length distribution discussed earlier and can be well served by a PBS system.

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[11] *Trip Length Frequency Distribution from the report "Integrated Mobility Plan for Gurgaon Manesar Urban Complex, 2010"*

[12] *Using bicycling speed as 12 kmph as per "Guidelines and Development Control Norms for MRTS* Influence Zone for Transit Oriented Development", UTTIPEC, 2012*

BENEFIT 2: More trips can be served: Map 5 shows that most traffic is concentrated on roads surrounding the Delhi Metro corridor. A PBS system will allow a higher concentration of bicycle stations within a constrained geographic boundary. Since a PBS system will allow users to use cycles for short durations on a sharing basis, it will also allow more potential users per bicycle and more trips can be converted to bicycle trips as opposed to rental services that generally operate on a daily basis with the same pick-up and drop-off location.

BENEFIT 3: Bicycle Security: The lack of safe bicycle parking is a deterrent to regular bicycle use. Since PBS will do away with the need for bicycle parking, more people will be encouraged to cycle. PBS System will encourage people by eliminating the need to pay for parking personal vehicles for accomplishing shorter trips.

2.3. Vision and Objectives of PBS

As per the Integrated Mobility Plan (IMP) 2010, the vision follows the broad guidelines of NUTP on moving people and not vehicles. In line with it, the Vision statement for addressing mobility needs of Gurgaon is *"To ensure that the Gurgaon - Manesar Urban Complex will have a high class sustainable and efficient transport infrastructure that will meet the needs of the economic developments proposed in the area."*

To achieve the vision stated above, the IMP has also identified the following objectives:

- Integration of land use and transport-connectivity
- Enhance accessibility
- Provide better connectivity with Delhi
- Increase use of Public Transit
- Improve non-motorised and pedestrian facilities
- Improve safety of travel
- Reduce pollution

The vision statement and objectives stated in the IMP clearly establish Gurgaon City administration's commitment to foster sustainable transportation through high quality Public Transport and NMT facilities. Public Bicycle Sharing can play an important role in influencing mode choice and thereby contributing to sustainable mobility. A bicycle sharing system will lead to increase in the demand for high quality NMT infrastructure and help promote NMT. A well-connected bicycle network will not only improve accessibility but also increase the catchment of public transport by offering sustainable choices for the first and last mile. Currently 31% of all trips in the city are pedestrian and cyclist trips and 67% trips are motorised trips. A good PBS system can help shift more people from private motorised modes to public transport and bicycles. PBS will help reduce private vehicle dependency and positively affect road safety and air pollution.

The same vision and objectives stated in the IMP can be extended and attributed to developing the PBS system for Gurgaon. The Vision for the PBS system for Gurgaon can therefore be to **"Reduce dependence on motorised modes of transit, by creating safe and easy access to shared bicycle systems, as a sustainable travel alternative to motorised short trips".**

Objectives that are required to achieve this PBS Vision are to:

- Create awareness about the advantages of cycling
- Create bicycle supportive infrastructure
- Increase public transit connectivity by offering a cheap and sustainable mode of access from farther distances to and from transit stations
- Provide the convenience of a bicycle being available within a 2-3 minute walking distance from anywhere within the PBS zones by planning high density of PBS stations
- Reduce pollution levels to acceptable limits by promoting sustainable transport principles for daily commuting needs
- Make PBS an integral part of all transport & urban planning related projects and policies

2.4. Setting Goals

Gurgaon can set goals to achieve through the implementation of a PBS. Suggested goals include:

* Increase bicycling modal share to 20% from the existing 8% over the next 5 years
* Contribute towards reducing carbon emissions to acceptable limits at any location in the city
* Provide safe bicycling physical infrastructure across the city within 5-10 years
* Ensure first and last mile connectivity to Metro System through PBS
* Make PBS available within a 2 minute walking distance across the city in the next 10 years

A detailed baseline assessment has to be conducted to fine-tune and establish the facts, which need to be monitored on an annual basis. A monitoring and evaluation framework should be established to provide regular reports on system performance and achievement of the established goals. Such periodic assessment would help to improve the PBS system through its life span.

2.5. Assess Budget Availability

Municipal Corporation of Gurgaon's budget summary lists its budget under three separate heads:

(i)   Total expenditure incurred and estimated for the FY
(ii) Budget allocated for construction of new roads and bridges
(iii) Budget allocated for repair and maintenance of infrastructure assets.

MCG has estimated around 20% of its budget allocation for construction of new roads and bridges for 2015-2016 (refer Exhibit 2.22). Over the past several years the budget for roads and bridges has been negligible (refer Exhibit 2.21). The percentage share for maintenance of infrastructure assets has ranged from 18% to 44% over the past few FY's, which elucidates that the city is spending substantial amount on maintenance and repair (refer Exhibit 2.22) of roads and includes the NMT infrastructure enhancements as well.
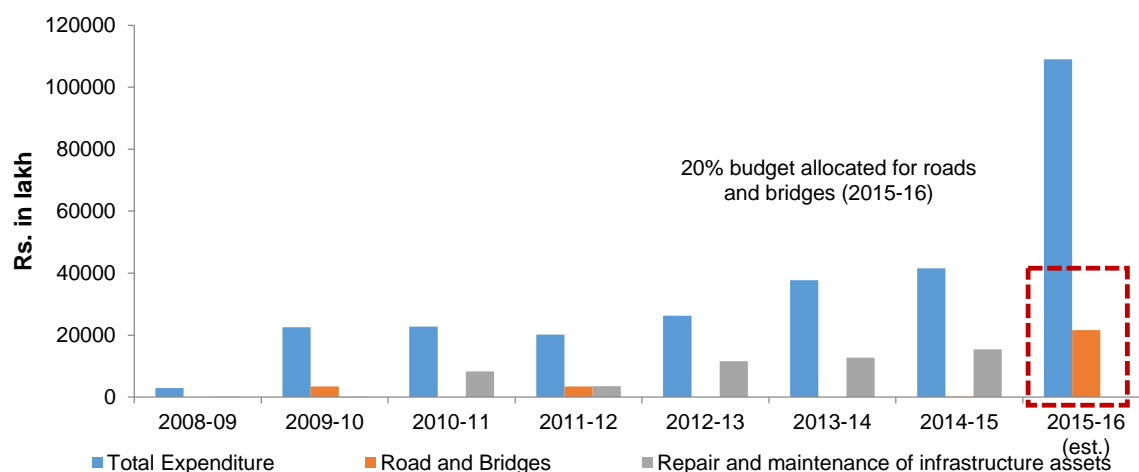
Exhibit 2.21: Budget allocation (in lakh) MCG 2008-16

Source MCG, 2015

Financial Year →	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016 (est.)
Total Expenditure	2927	22501	22776	20127	26303	37691	41556	109045
% share of road and bridges	0	15	0	17	0	0	0	20
% share spent on repair and maintenance of infrastructure assets	2	0	36	18	44	34	37	-

Exhibit 2.22: Total expenditure (in lakh) and percentage share MCG 2008-16

Source: MCG, 2015

2.6. Institutional Framework & Technical Capability

Institutional framework is critical for the efficient functioning of the urban transport system and decision-making. An efficient framework helps to upkeep the system in the form of monitoring, regulation, and financial and non- financial help. It is also essential to develop a supportive institutional framework to update city plans and develop policies that help the planning, implementation and operation of bicycle share system in Gurgaon.

2.6.1. Assessing Capacity of MCG
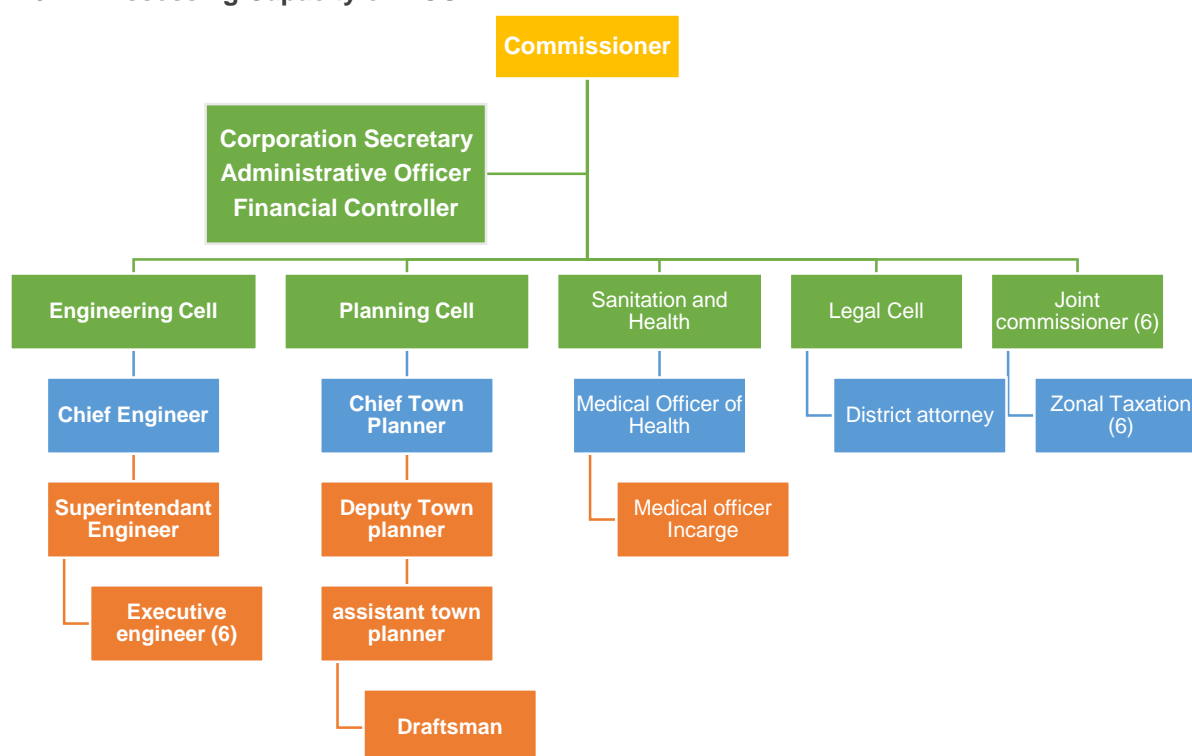
Exhibit 2.23: Organizational structure of MCG
Source: MCG, 2015

In cooperation with the municipal staff of Gurgaon, various departments and review authorities, a preliminary review of institutional capacities was conducted as part of the PBS planning process. The MCG formed in 2008, regulates functions related to roads, public transportation, water supply, and public safety services. The sources of income of the Corporation are property tax, entertainment tax and usage fees for utilities. Chief Engineer and Chief Town Planner of MCG could potentially lead the bicycle share system under Commissioner's administration. MCG doesn't have organised institutional support or cell for NMT sector so far.

Currently, MCG employees have no formal training in the field of Non-motorised Transport or any other sustainable transport system. However, it is encouraging that they are aware of function, need and requirement of the PBS system.

Sl.no.	Personnel/ Designation	Education Background	Exposure to NMT or ST Projects	Knowledge about cycle sharing
1	Chief Town Planner	Town planning	No	No
2	Chief Engineer	B.E (Civil)	No	No
3	Exec. Engineer	B.E (Civil)	No	No
4	Superintendent/ Deputy/ Assistant Town Planner	Town Planning	No	No

Exhibit 2.24: MCG Personnel exposure to NMT systems

The lack of formal training on NMT issues among staff will make it difficult for MCG to manage the PBS project single-handedly. MCG expressed interest in using this opportunity to build technical capacity through training and hand-holding support from an experienced agency. Hence, it is proposed that MCG hire an experienced Project Management Consultancy (PMC) that can handhold the agency through the process from the initiation to the finish. As a part of the PMC scope of services, knowledge transfer sessions to MCG officials shall be planned which shall help MCG in building its capacity. These are described in the Implement section of the report.

2.7. Stakeholder Identification and Interactions

Identification of key organizations, government stakeholders and civic groups is necessary to efficiently pre-plan the PBS system and take it ahead to the implementation stage. The stakeholders were met and the purpose and benefits of PBS systems for the city and its citizens was explained as a part of the discussions. During the interaction with stakeholders, opinions of various groups were understood. The consent of stakeholders will help meet bureaucratic and political processes and seek popular support for implementing the project.

Sl. No.	Stakeholder	Current roles
Government Department		
1.	Municipal Corporation of Gurgaon (MCG)	The MCG is the elected governance body in Gurgaon. The main duties of MCG include construction of new roads, maintaining old roads, building and maintaining parks for public utility, maintenance of sewage system, proper drainage system, rain water harvesting, making provision for sufficient and safe drinking water and providing adequate power.
2.	Haryana Urban Development Authority (HUDA)	Urban planning agency for the state of Haryana.
3.	Gurgaon Traffic Police	Enforces traffic rules and regulations.
4.	Delhi Metro rail Corporation (DMRC)	Manages and operates the Delhi Metro Rail.
5.	Rapid Metrorail Gurgaon Limited (RMGL)	Manages the rapid metro line linked to the Delhi metros yellow line.
Civil Society		
6.	EMBARQ	A think tank working on issues of sustainable transportation. They have been organizing the car free event Raahgiri, over 15 km in Gurgaon every Sunday morning since 2013.
7.	PedalYatri	A group of cycling enthusiasts that organise cycling trips in and around Gurgaon.
8.	Resident Welfare Associations (RWA)	Voluntary organizations that represent the interests of the residents of Gurgaon.
Corporates		
9.	National Association of Software & Services Companies (NASSCOM)	Represents and supports the interests of IT companies in Gurgaon

Exhibit 2.25: Stakeholders of Gurgaon PBS

As a part of developing the City Specific Plan for Gurgaon PBS system, extensive stakeholder consultations and interactions were carried out to streamline and consolidate the thought process on how to plan and implement the most beneficial PBS system. These interactions were focussed to

establish some facts as to where the PBS has to be planned, scope, size and funding availability for implementing the PBS system.

S. No	Date of Meeting	Agency Met	Officials Present
1.	12th August, 2015	DLF	Head Project - Sunil Koul
2.	25th August, 2015	NASSCOM	Member of the NASSCOM Regional Council, Haryana - Prabhat Aggarwal
3.	27th August, 2015	Rapid Metro (IL&FS)	Managing Director - Mr. Banga
4.	31st August, 2015	Coca- Cola	Marketing Head - Mr. Aiyaz Khan
5.	01 September 2015	DMRC	Director Operations, Shri Sharat Sharma
6.	2nd September, 2015	Gurgaon Traffic Police	DCP Traffic – Ms. Bharti Arora, IPS
7.	3rd September, 2015	MCG	Municipal Commissioner – Shri. Vikas Gupta , IAS
8.	3rd September, 2015	HUDA	Administrator - Smt. Anita Yadav, IAS

Exhibit 2.26: List of Stakeholders who were consulted along with dates

The following section briefs the opinions shared by each stakeholder during the interactions.

2.7.1. Delhi Metro Rail Corporation (DMRC)

DMRC which operates the Yellow line extension from Delhi to HUDA City Centre in Gurgaon is one of the main stakeholders for the PBS Project. This Metro corridor is the most potential route along which a PBS system can be planned. **DMRC was willing to provide the necessary land for the PBS system at its stations, up to a reasonable area, for parking the bicycles.** It also supported the idea of PBS with the only reservation that the implementing agency should ensure the safety of the PBS users or else the entire system would be a failure. As HUDA City Centre is one of the major destinations where the land availability at the station is substantial, it was suggested that the PBS system can kick-start around the HUDA City Centre Metro station initially and can be scaled up subsequently. DMRC also felt that the MCG has a major role to play as they are the primary development agency in Gurgaon and are also the owners of most of the vacant public spaces and underutilised right-of-ways in Gurgaon, which can potentially be used as PBS Stations.

2.7.2. Traffic Police, Gurgaon

The Traffic Police of Gurgaon, which was known for extending its support to implement several sustainable transportation measures such as Car-free days, Raahgiri etc. was receptive of the idea of PBS. They feel that a successful PBS system would help reduce congestion on the roads by freeing up more space as well as bring a reduction in accident rates. The **suggestions that came up from the discussions were: to provide at least basic minimum infrastructure for PBS system, such as bicycle lanes, physical demarcation using kerb stones etc. and to ensure safe bicycle riding environment for PBS users**. The other suggestion was to clearly identify the role of MCG and other stakeholders in the entire PBS project. A clear understanding of the roles and responsibilities of each and every civic agency would be key for running a PBS system without any hiccups. Keeping in view the success of the Raahgiri initiative, the Traffic Police has suggested that the PBS system be implemented near Sushant Lok and HUDA City Centre area.

2.7.3. Rapid Metro Rail

The Rapid Metro Rail is the only privately run metro rail system in India. It acts as a feeder service to the Delhi Metro connecting the heavily congested Cyber City area with the DMRC Yellow Line. In its operational phase 1, Rapid Metro has built 6 stations forming a loop configuration before connecting to the Yellow Line. As part of enhancing its commuter facilities, the Rapid Metro is planning to construct a pedestrian overpass on the NH8 connecting the Cyber City Metro station on one side to the Udyog Vihar area on the other side. The construction of this overpass would provide safe access to commuters working in Udyog Vihar to reach the Yellow line via Rapid Metro. However, once in

Udyog Vihar, commuters face issues with the IPT and last mile connectivity. Hence, the Rapid Metro officials suggested that the PBS system be planned in the **Udyog Vihar area as it would facilitate commuters and also increase the usage of PT/ Metro rail.**

2.7.4. National Association of Software & Services Companies (NASSCOM)

Gurgaon is making its mark on the global map by transforming into large scale IT destination. It has a significant percentage of employees working for software solutions and product development, with a major concentration around the Cyber City area. As part of the stakeholder consultations, discussions were held with NASSCOM, an association that represents the IT industry. As many IT employees commute between Delhi and Gurgaon every day for work, ensuring safe, secure and comfortable travel for its employees was an important aspect for the association. Though NASSCOM supported the idea of PBS, it had reservations in implementing the system in the Cyber City region because of the **lack of safe cycling infrastructure**. NASSCOM also felt the need for a safe and secure cycling infrastructure as a prerequisite for the organization to be a vocal advocate of the PBS system. As the Cyber City area has a dearth of RoW, it might be difficult to implement a PBS system with a dedicated cycle track that can ensure safety and security of PBS riders. It was suggested that **Udyog Vihar and HUDA City Centre** could be potential areas where PBS system could be implemented by developing cycle tracks alongside the wide Sector roads. NASSCOM agreed to share the PBS concept with their member organisations who could take it up as a Corporate Social Responsibility (CSR) initiative and route the funds for the project according to the member organisations interest.

2.7.5. HUDA

HUDA, during stakeholder interviews, expressed strong interest in supporting sustainable transport initiatives and has taken efforts to enlighten its staff about the benefits of sustainable transportation systems such as PBS and NMT. It has already prepared long-term proposals to develop several kms of dedicated cycle tracks across various locations in Gurgaon. HUDA was supportive of integrating its plans with the PBS system, provided a formal channel for enabling the system is worked out along with necessary regulatory and institutional paper work is completed. HUDA is responsible at a policy level and doesn't involve itself in day-to-day management of civic issues. Civic issues are the responsibility of MCG. HUDA has given its consent and has agreed to extend all necessary support to MCG for the proper planning and implementation of the PBS system.

2.7.6. Municipal Corporation of Gurgaon (MCG)

During the course of the project, MCG witnessed a change in leadership; however, all administrators were supportive of PBS and were willing to support the preparation of the PBS Plan and its implementation.

During the course of these discussions, it was evident that MCG had adopted the PBS concept out of self-motivation and the zeal to drive it through to the end. The PBS Plan has strong support from the current Commissioner. MCG was very receptive of the ideas shared by various stakeholders during the stakeholder interactive sessions.

Summary of stakeholder interactions

- All stakeholders were supportive of the PBS system in Gurgaon.
- **Suggestion for Phase1 implementation:** HUDA city centre Metro station area and Udyog Vihar region were suggested as areas where the initial phases of the project could be considered.
- **Land availability:** Apart from land that is available with the MCG, DMRC is willing to provide land for PBS station areas at the HUDA city centre Metro station.
- **Funding:** In addition to MCG funds, NASSCOM is willing to take the initiative and help gather CSR funds from its member companies.
- **Concerns:** Stakeholders were concerned about the safety of the bicyclists using the PBS system. They suggested up-gradations in the basic NMT infrastructure and provision of cycle

tracks in the areas where the PBS is planned to be implemented. They considered, the Cyber City area especially challenging as it has a narrow RoW. However, in most of the other areas, HUDA has already planned for several kilometres of bicycle tracks which could benefit the PBS system.

- **Governance:** Stakeholders wanted MCG to take the lead in implementing the system.

2.8. Initial Scale and Scope of Proposed Coverage Area

The potential area for the PBS system implementation initially has to meet the demand and the feasibility requirements to justify the PBS system for that region in all respects. MCG area has an average population density of 11 persons per hectare (ppha) while the eastern part of the city has a population density ranging from 100-300 ppha. The growth of population and the land use has taken place exponentially in the eastern part of Gurgaon because of the real-estate boom in the city. Even in the eastern Gurgaon region, there is a considerable variation of density depending on the location and availability of transportation infrastructure. Map 2.12 below presents the population densities in several locations across the city.

Additionally, stakeholder consultations also reiterated the need for PBS to serve the first and last mile needs of transit commuters who primarily lived or worked in the eastern part of Gurgaon. Therefore, the eastern part of Gurgaon has been delineated for the current study (Refer Map 2.11). The study area is of 185 sq.km covering the major residential spread, activity nodes and transit corridors.

2.8.1. Guiding Principles for Gurgaon PBS Location Identification

The network for the PBS system will need to be refined based on certain guiding principles that are specific to Gurgaon. Below are the identified objectives for PBS that will serve as design guidelines for detailed planning:

(i) The PBS system must help solve the basic issues that were identified in Gurgaon viz. lack of efficient PT System and last mile connectivity to the existing transit network, prevailing accident rates and alarming pollution levels

(ii) Availability of sufficient population densities that will ensure enough patronage for the PBS system in terms of the riders

(iii) The system must meet the need & expectations of the various stakeholders who have shared their thoughts from various perspectives

(iv) The potential locations for the PBS system should be based on stakeholders' local experience and their assessment of demand.

(v) The system must be planned near activity zones where the major bottlenecks exist in terms of the daily transportation needs of people.
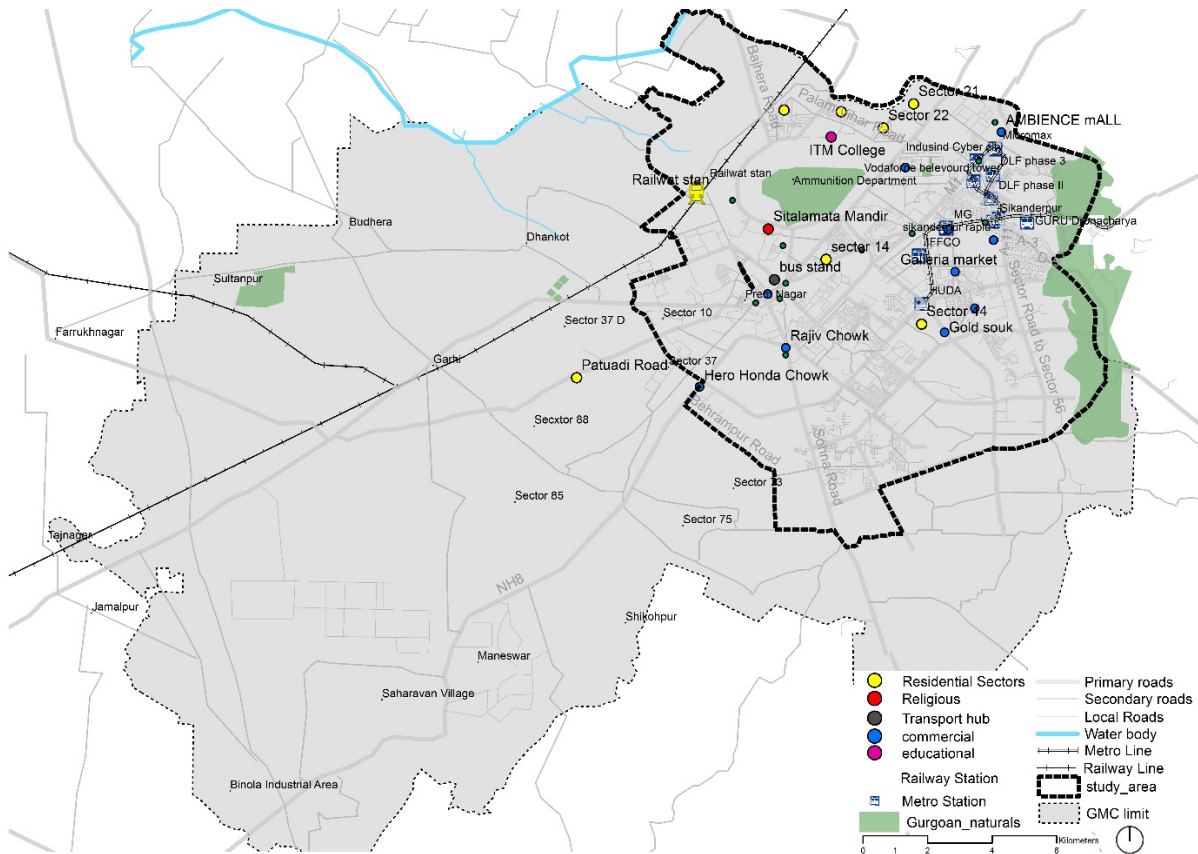
Map 2.11: Study area for Gurgaon PBS
Source: Centre for Green Mobility (CGM)
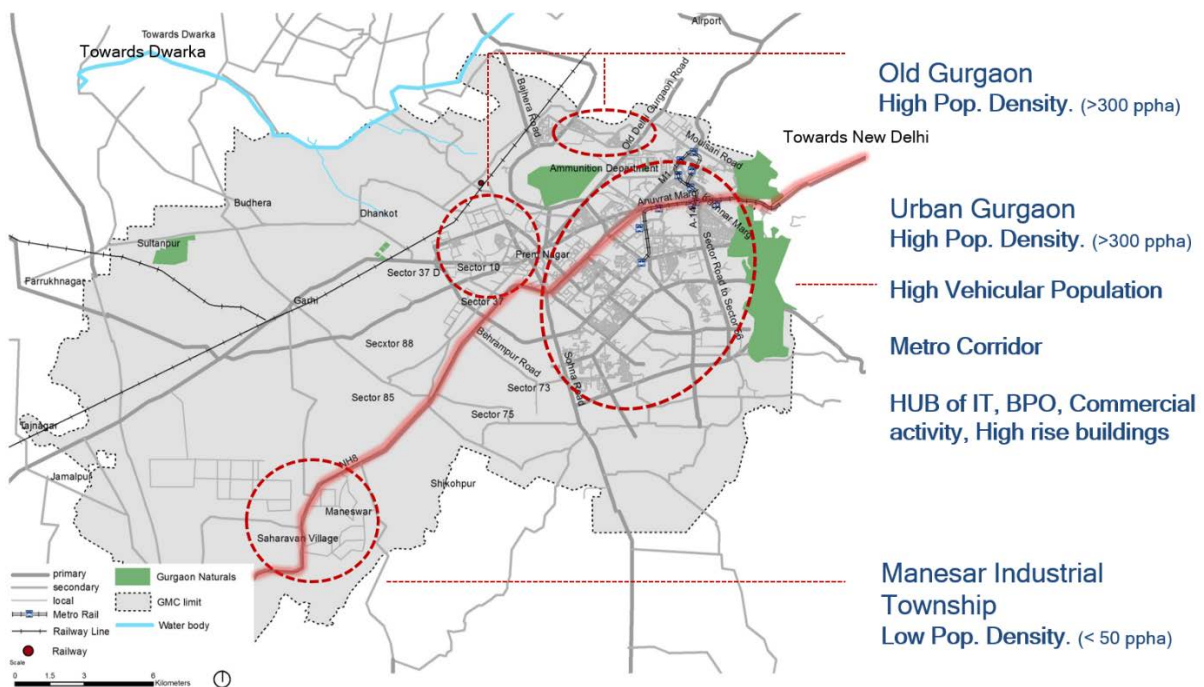
Map 2.12: Densities in the eastern part of Gurgaon
Source: Centre for Green Mobility (CGM)

CHAPTER III: ENABLE

3. ENABLE

The "Enable' step focuses on proactive actions that will help build commitment to the project at the conception stages, ensuring success during implementation. These tasks are initiated early-on in the process and must continue throughout the course of the project.

3.1. Establish Leadership Support

In order to be successfully implemented, the PBS program requires political, administrative and technical leadership. MCG is expected to spearhead the PBS project and provide the administrative leadership on the project. The political and technical leadership is recommended to be provided by a Technical Assistance Committee (TAC), consisting of city leadership, staff, private sector representative and other stakeholders such as transit agencies and civic society representatives, as deemed appropriate by MCG. The TAC shall help in building a political will and achieving a consensus amongst people from various groups. They shall also provide MCG with the necessary technical support by reviewing the project at important stages of implementation.

Technical Assistance Committee

- Political Leaders
- MCG / HUDA
- MCG / HUDA Planners
- Urban Transport Experts
- NASSCOM and Representatives from Corporates, Institutions
- Embarq
- Other Advocacy Groups
- DMRC / Rapid Metro
- Nominated Brand Ambassadors
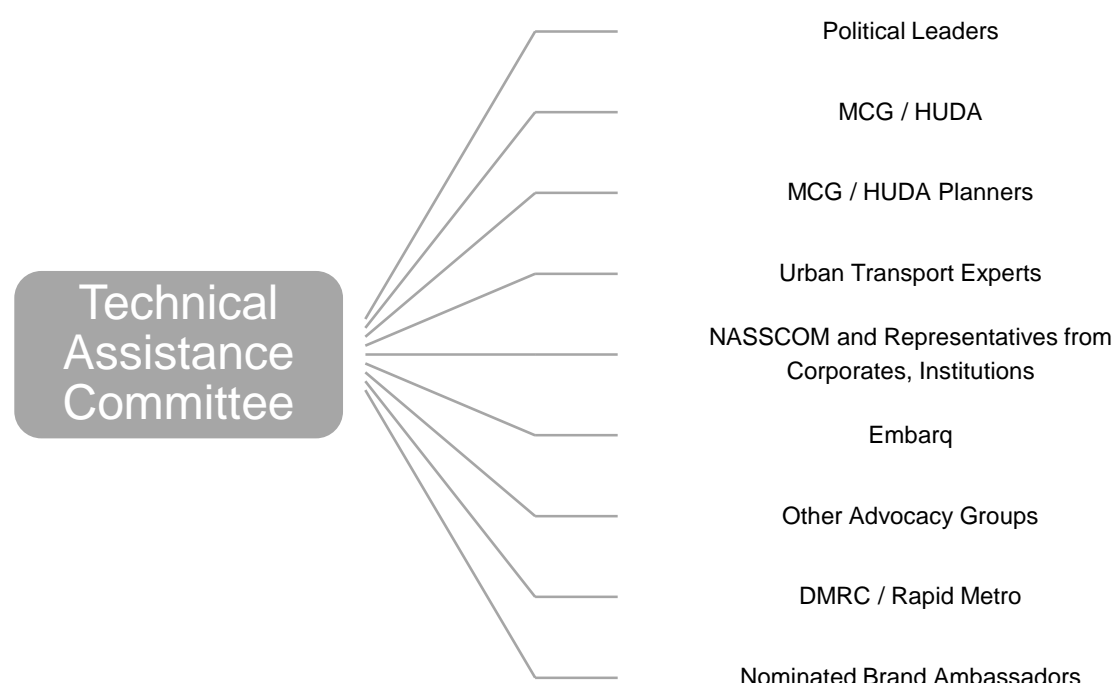
Exhibit 3.1: Composition of Technical Assistance Committee

3.2. Building Technical Expertise and Issue Awareness

Currently employees of the MCG have no formal training on design and management of NMT systems. Further, PBS is a new concept in India. This makes it difficult to anticipate the challenges municipalities will have to face while implementing the system. The MCG will have to learn from the Phase-1 experiences during the course of implementation. To assist with this process, MCG may choose to retain a dedicated Project Management Consultant (PMC). The PMC shall handhold the municipality through the design, building, operations and transfer (DBOT) of the PBS project. The PMC's scope of work may include drafting the necessary contracts, hiring a DBOT contractor to implement the project, offer transaction advisory services and possibly conduct monitoring and evaluation of the system post-implementation. Ideally, the M& E consultants should be different from the PMC to avoid any conflict of interest during the evaluation process.

3.2.1. Create Awareness and Enable Public Participation

The success of events such as Raahgiri in Gurgaon demonstrate people's willingness to adopt bicycling if they are made aware of the usefulness, benefits and most importantly provided a safe environment to cycle. Public participation and active citizen involvement is the key to the success of a PBS system. Events such as 'car-free days' in Gurgaon have helped in creating increased awareness in the public and gives them an opportunity to use alternative modes of transport such as bicycles. The MCG should continue to work with civil society organizations to set up events that create awareness about the benefits of adopting sustainable transportation choices. Once the PBS system is sustained, the intensity of the outreach activity can be minimised.

The PMC and M&E consultants may also operate citizen campaigns offline through outreach events and online through web based or social media platforms to allow the public to give feedback through surveys and opinion polls. This feedback is intended to provide important information for user opinions and preferences related to the PBS efforts in Gurgaon and help plan consequent phases.

3.3. Align PBS with Other Projects

The PBS system is envisioned as an integrated component of a larger transportation vision including other planned infrastructure projects. The coordinated impact of PBS implementation and other infrastructure projects will need to be studied at all stages of the project. The PBS system should be integrated with all existing NMT and transit improvement projects to achieve comprehensive and far reaching benefits of sustainable transportation in Gurgaon. The PBS system should support other means of public transit and not compete with them for ridership.

CHAPTER IV: PLAN + DESIGN

4. PLAN + DESIGN

The 'Plan + Design' chapter contains a series of proposals and recommendations detailing the various PBS components built upon the proposed PBS network which evolved through the exercise undertaken in the Assess Chapter. This chapter formulates in phases PBS Plan that determines the PBS coverage area, fleet size, station locations, and type of PBS technology for Gurgaon.

4.1. PBS System Phasing

The PBS system for Gurgaon city has to be detailed based on the baseline characteristics of the city aligned with the preferences of the stakeholders. This section proposes the coverage area and extent of the PBS system for Gurgaon city.

Like any other infrastructure project, a PBS system also has to be implemented in a phased manner to prioritise the implementation at a faster pace and also learn from the experience of the initial phases. Phasing is essentially a stepwise approach to gauge the acceptance and test the system's efficiency in a smaller area and then expand over the next few years. Such an approach helps in stabilising the system much faster. The initial phase has to be chosen strategically based on several parameters as the success or failure of the entire city-wide PBS system depends on the preliminary phases.

4.1.1. Criteria for Phasing

Delineating the incremental expansion of PBS serviced areas to cover the overall study area through a phased approach is a task which involves diverse factors beyond financial reasons alone. The first phase for the selected coverage area has to demonstrate a strong potential user demand for PBS systems which can pave way for the subsequent phases by showcasing success. The following criteria were established to determine the phasing plan for the proposed PBS network:

1. Potential to complement the existing transit network
2. Potential to connect major attraction and production nodes
3. Availability or ease in creating safe infrastructure to support the system
4. Potential for the system functioning to be tested efficiently and streamlined accordingly
5. Driven by potential demand expectations
6. Meet aspirations and preferences of various demographic sections
7. Availability of land for the core PBS Stations and distributed PBS Stations

4.1.2. PBS System Scope and Network Identification

Based on the phasing criteria defined in the earlier section, a detailed GIS based mapping exercise for the system was undertaken to evaluate coverage area alternatives and determine the appropriate phasing approach. The basic input used for this mapping exercise included population densities, city land use, road network, transit network and the activity centres/ generators across the city.

From the mapping exercise, a PBS priority coverage area evolved based on the highest number of origin and destination trips that could be generated. The analysis indicated that Gurgaon's proposed PBS system could be expanded to the coverage area in three phases. Phase I encompasses the area serviced by higher order public transit networks such as the Delhi Metro and Rapid Metro. In comparison to the Rapid Metro, the Delhi Metro transit corridor serves as the major life line passing through the activity generators of the city while also catering to the needs of the adjoining areas along the line. Phase II includes areas with high potential for growth and Phase III includes the rest of study area to ensure a complete PBS network coverage.

Population Density

+

Land Use

+

Road Network

+

Transit Network

+

Traffic Generating Activities

=

PBS Phase Map
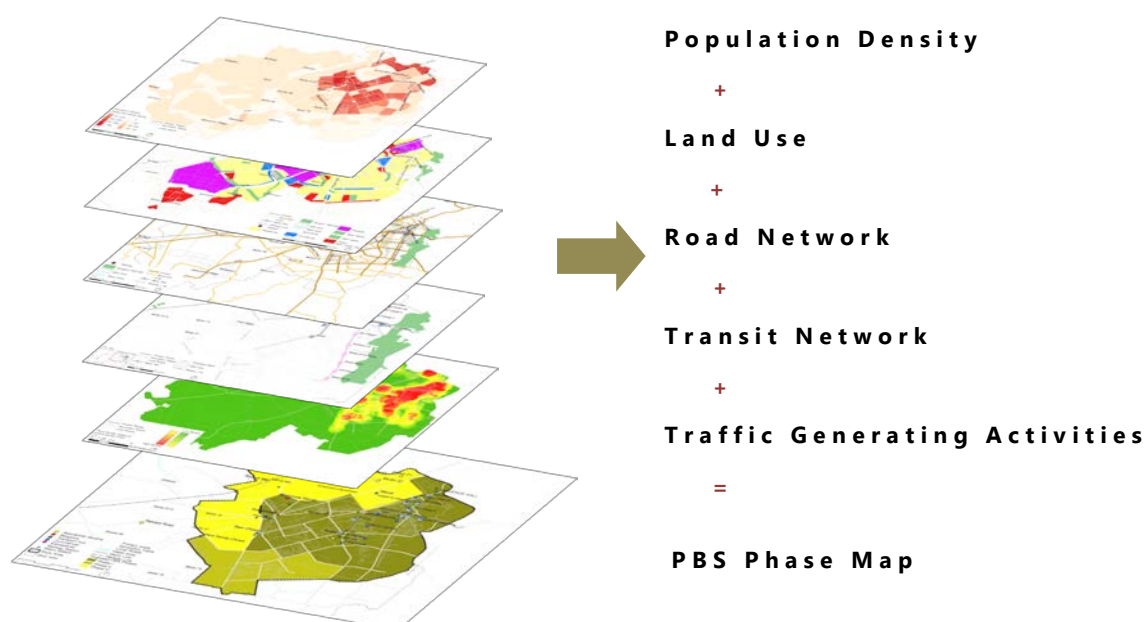
Map 4.1: Phasing methodology for Gurgaon PBS
Source: Centre for Green Mobility (CGM)

	PHASE I (within 2 yrs.) Has potential to create maximum PBS trips Areas: **HUDA City Centre Metro Station Vicinity, IFFCO Chowk, Sushant Lok, Galleria, Sector 29, Sector 44, parts of M.G road**	**PHASE II (within 5 yrs.)** Include areas with high growth potential Areas: **Remaining Delhi Metro Corridor stations, Rapid Metro Corridor, Udyog Vihar Areas**	**PHASE III (around 8 yrs.)** expands geographical limit, Include areas with growth potential Areas: **Railway Station, Palem Vihar, Sohna Road, Sector 21,22,23, Sitalamata Mandir, Bajhera Road**
POPULATION DENSITY (Map 1)	**High population density**. Largely covering areas with 150 to more than equal to 300 ppha	**Moderate population density**. Largely covering areas with density ranging between 150-250 ppha	**High to Moderate population density.** Largely covering areas with 50-more than equal to 300 ppha
LAND USE (Map 10)	Includes residential population, commercial areas, market places, recreational places	Includes largely office zones, work places some residential areas and some commercial areas.	Includes, mostly residential, public semi-public areas
ROAD NETWORK (Map 2)	Includes the new development along **NH8, MG Road and Galleria Market.** Several sector roads connecting the residential sector with the main arterials.	The **major arterials** that extends from the phase one and connect the extended residential areas with the PBS network– **Golf Course Extension road.**	The main arterial roads of old Gurgaon-**Old Delhi Gurgaon Road, Railway Road, Basai Road, Sohna Road, Pataudi Road, Palem Vihar Road, Bajhera Road**
TRAFFIC GENERATING ACTIVITY (Map 3, 4 & 5)	**High density** of commercial, recreational, public, religious places and schools colleges & other institutions	**Moderate number of PT and IPT stops** **Moderate density** of commercial, recreational, public, religious places and	**Low density** of commercial, religious places and **high number** of schools colleges & other institutions

Exhibit 4.1: Phasing plan and areas covered under Gurgon PBS

4.1.3. Refining the PBS Coverage Area

An extensive stakeholder consultation process was adopted as briefed in the Assess Chapter. The interactions and discussions helped in refining the preliminary coverage area and phasing plan based on priorities of various governmental agencies and citizen preferences.

The essence of the discussions which were held with various stakeholders along with an initial scope and size of the PBS system was put before MCG. Below is a summary of the points discussed with MCG, which were helpful in refining the phasing plan for the PBS system:

- PBS system has the potential to alleviate the traffic issues that the city is facing on a daily basis, especially the first and last-mile connectivity to and from the Delhi Metro.
- Safety and security of the PBS users has to be ensured from all respects to make PBS a successful initiative which would pave way for several similar projects in other parts of Gurgaon.
- Land to provide the PBS infrastructure such as PBS stations, maintenance & repair yards, distribution vehicles etc. should be identified and earmarked by MCG in the initial phase.
- MCG to act as the pivotal implementing agency and should be responsible to identify the roles and responsibilities of all other stakeholders and agencies.
- Delhi Metro and Rapid Metro lines should be the catalysts along and around which the PBS system should be planned especially around the HUDA City Centre Station and Udyog Vihar areas.

Based on the above recommendations, the three Phases finalised are as below:

Phase I – Vicinity of HUDA City Centre & parts of Delhi Metro Rail: This area has the highest potential for implementing the PBS system given the passenger demand that is there on this stretch of Delhi Metro. The Yellow line, specifically the 5 stations in Gurgaon, has the highest ridership numbers according to DMRC estimates.

Phase II – Around the planned Golf Course Rapid Metro & Udyog Vihar: The Golf Course Rapid Metro phase is anticipated to be operational in 2017. This is an extension to the existing Cyber City Rapid Metro line and connects the Yellow line with Golf Course Road.

Discussions with Rapid Metro also revealed a foot over bridge proposal for pedestrians to cross NH8 from the Cyber City Metro station to Udyog Vihar. As the proposal is in its preliminary stages, Udyog Vihar area is considered under Phase II. The construction of this bridge will facilitate implementation of Phase II of the PBS within a 5 km cycling distance from the Cyber City Rapid Metro station, including the Udyog Vihar employment centres. Estimates indicate that there is a potential of around 10,000 to 12,000 pedestrians[13] that may use the foot-over bridge in a day to access the Rapid Metro from Udyog Vihar area and vice-versa. However, due to the lack of the last mile connectivity from NH8 to the interiors of the Udyog Vihar area, a PBS system will potentially be the best alternative for the commuters. However, if the bridge is constructed as per schedule, Udyog Vihar area can potentially be moved to Phase I depending on the actual development on ground.

The area circled in red in Map 4.2 is not included in Phase II due to reservations voiced by Rapid Metro, who believed PBS services in this area would compete with the metro services, and NASSCOM, who opined that the narrow streets and traffic situation did not make the area conducive to PBS.

Phase III – Remaining parts of old Gurgaon and Sohna Road. The residual region is concentrated in the old Gurgaon region including the Sheetlamata Mandir area. Some of

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[13] *Detail shared during the stakeholder discussions*

these areas under Phase III do not have wider RoW's for separate bicycle lanes and road improvements need to be carried out before Phase III is implemented.

The Map 4.2 below shows the Hybrid catchment that is achieved by the entire coverage in phases I, II and III. The extent of this is around 138.4 Sq.km and is the core catchment region for the PBS system.
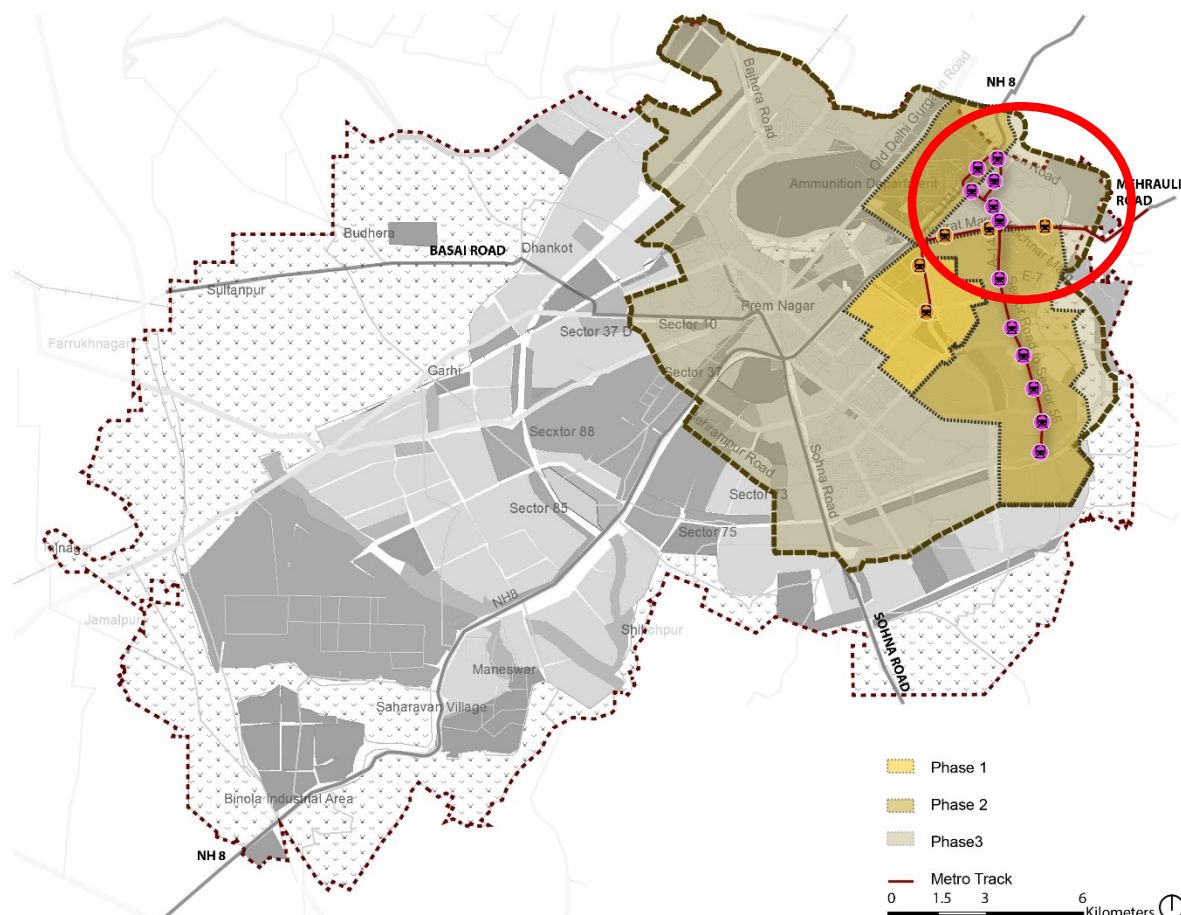
Map 4.2: PBS phasing map of Gurgaon
Source: IBI Group

Exhibit 4.2 below indicates the design details of all the PBS Phases.

S. No	Phase	Stretch/ Area name	Coverage Area
1	Phase I	HUDA City Centre	8.85 Sq.km
2	Phase II	Remaining DMRC Metro, Golf Course Rapid Metro & Udyog Vihar	31.29 Sq.km
3	Phase III	Residual areas	98.26 Sq.km
Total			**138.4 Sq.km**

Exhibit 4.2: Coverage area details of all the phases under PBS implementation

4.2. Data Analysis and Demand Assessment

Data analysis and demand assessment is the most important step to assess the potential bicycle sharing demand for Gurgaon. This section explains how demand analysis was undertaken from the available data sources in preparing the Gurgaon PBS Plan. While this is a data driven examination, the final recommendation for system launch and phasing will take into account the guiding principles for the location identification, as briefed in the previous sections.

Potential demand is the projected number of trips which have the potential to be made on a bicycle

once a PBS system is in place. People may use bicycle sharing system over their existing mode of commute to complete a trip, such trips are identified in this section.

The calculation of potential demand is based on the two approaches described in this section. Demand calculations are developed based on both approaches and are cross-verified to ensure there is no under- or over-estimation.

Approach 1 – Minimum Station Density: The first approach uses the optimum station density as the primary parameter for determining system size. This approach is intended to ensure a network coverage and density that increases the viability of using the system. A system with sparsely located stations are not likely to be used for short-distance trips. To use this approach, one must be assured of system patronage because of the presence of the following factors:

- A population density over 200 persons per hectare[14]
- A mix of residential, commercial and institutional uses
- A high proportion of young floating population (in the age group of 15 to 45 years)

Since the eastern part of Gurgaon has all of the above features, this approach is considered as the primary method of demand estimation.

The calculations are based on the best practices research presented in the PBS Guidance Document and shown below in Exhibit 4.3 and Exhibit 4.4:

S. No	Guidelines as per Guidance Document (GD)	
1	10 to 15 stations per square km of PBS influence area	
2	Number of bicycles in Small Stations	10
3	Number of bicycles in Medium Stations	20
4	Number of bicycles in Large Stations	40

Exhibit 4.3: PBS guidelines as per Guidance Document

S. No	Phase	Influence Region	Coverage Area (Sq.km)	Min. No of Stations	No of Bicycles*
1	Phase I	HUDA City Centre	8.85	88	880

Exhibit 4.4: Approach 1 - Phase 1 PBS bicycle estimation

* Assuming all stations are small stations, 10 bicycles per station in 88 stations result in 880 bicycles.

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[14] *Paris, which has one of the most successful PBS systems in the world has a population density of 210 persons per hectare.*

Approach 2 – Minimum Mode Shift: This approach is based on the results of the willingness-to-shift survey i.e., probability of people who are willing to shift or would use the new system. A willingness to shift survey was conducted at the site of the proposed Phase 1, near the HUDA City Centre. Details are provided below.

Commuter Survey at HCC Metro Station

A commuter survey to access the acceptance of PBS system at the HUDA City Centre Metro station has been conducted using an Android application developed specially for conducting the survey. Few screen-shots of the application are presented in the Exhibit 4.5 below:
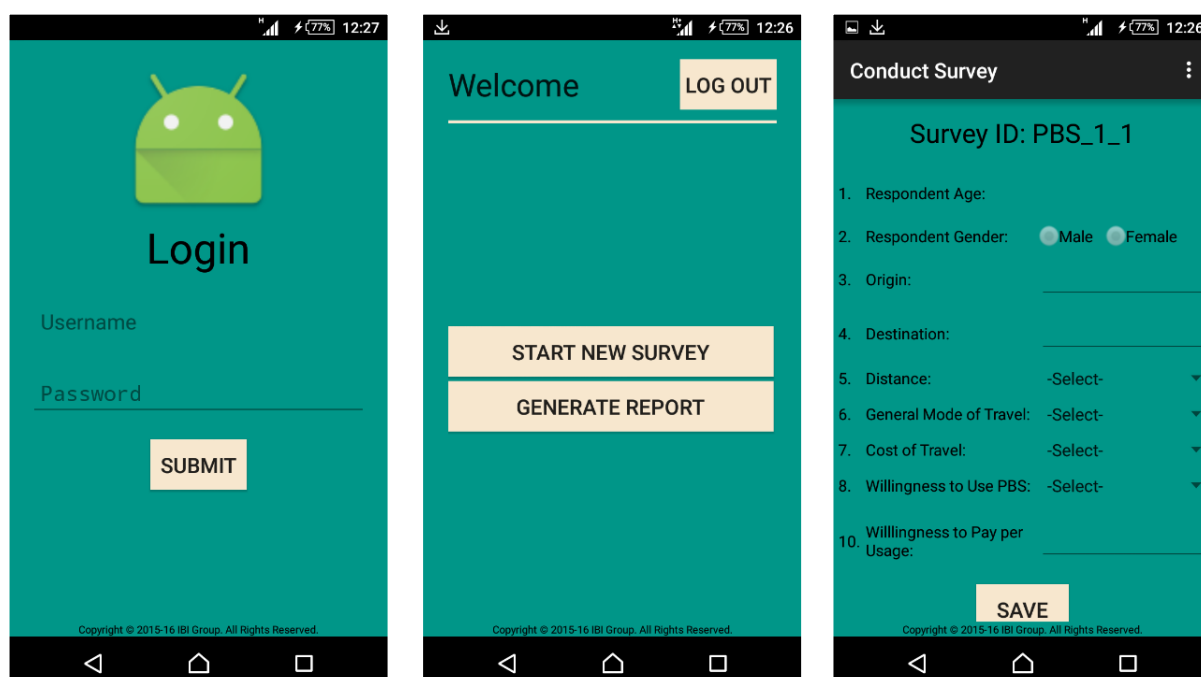
Exhibit 4.5: Snapshot of Mobile App developed for Gurgaon PBS Commuter Survey
Source: IBI Group

Some of the key observations derived from the Gurgaon PBS Commuter Survey include:

- The young demographic, particularly between the age group of 18-30 were very receptive of the idea around PBS. Among these, the ones particularly interested were the male populace.

- Public awareness about PBS system seemed to be of prime importance as most of the commuters had a vague idea about it. Respondents were more acceptable of the concept when they were explained the fundamentals of PBS systems and how it works.

- Most of the people who sounded receptive towards PBS resided in the vicinity of the HUDA City Centre metro station. They expressed a need for more alternatives for their commute to and from the metro station and are convinced about the potential success of a PBS system, if planned properly.

- Secure parking of the bicycles in order to avoid theft at nights was cited as one of the primary reasons for supporting PBS by survey respondents.

- Commuters interviewed seem to have a particular disdain towards the present IPT/ auto-rickshaw service available near the metro station. Generally, people were unhappy that they have to spend around Rs. 50-80 every day even for shorter trip lengths in the range of 2-4km. The commuters were therefore interested to explore alternatives to reduce their dependence upon IPT modes.

- The idea of PBS attracted more as a means for recreation rather than as a means of commute, especially with younger commuters.

Survey Inferences

During the pilot survey at the HUDA City Centre metro station, commuters were randomly selected across age, class and gender for responding to the survey on their Willingness to Shift (WTS) to PBS. There might be an inherent bias in the survey results because of a general unwillingness to participate in the survey from office goers and women. The questions asked were analysed and some of the results are presented in the exhibits below.

There were around 52% male respondents and 48% female respondents in the survey. 63.2% respondents were at least willing to consider using PBS, when operational.

% tage of Respondents Surveyed
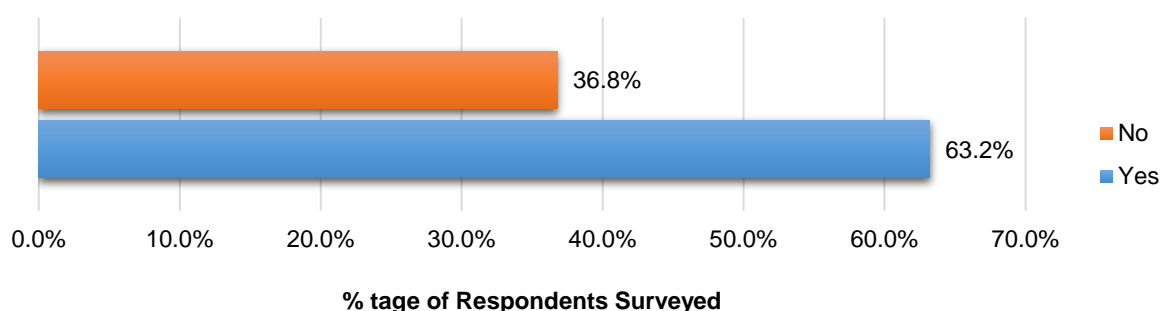
Exhibit 4.6: Overall Willingness to Shift to PBS
Source: IBI Group

Around 20% of the people who were willing to shift to PBS, reported completing trip lengths between 1.5 km and 2 km daily which translates to around 10 minutes of bicycling time. Interestingly, 15% of the willing to shift respondents had trip lengths over 5 km.
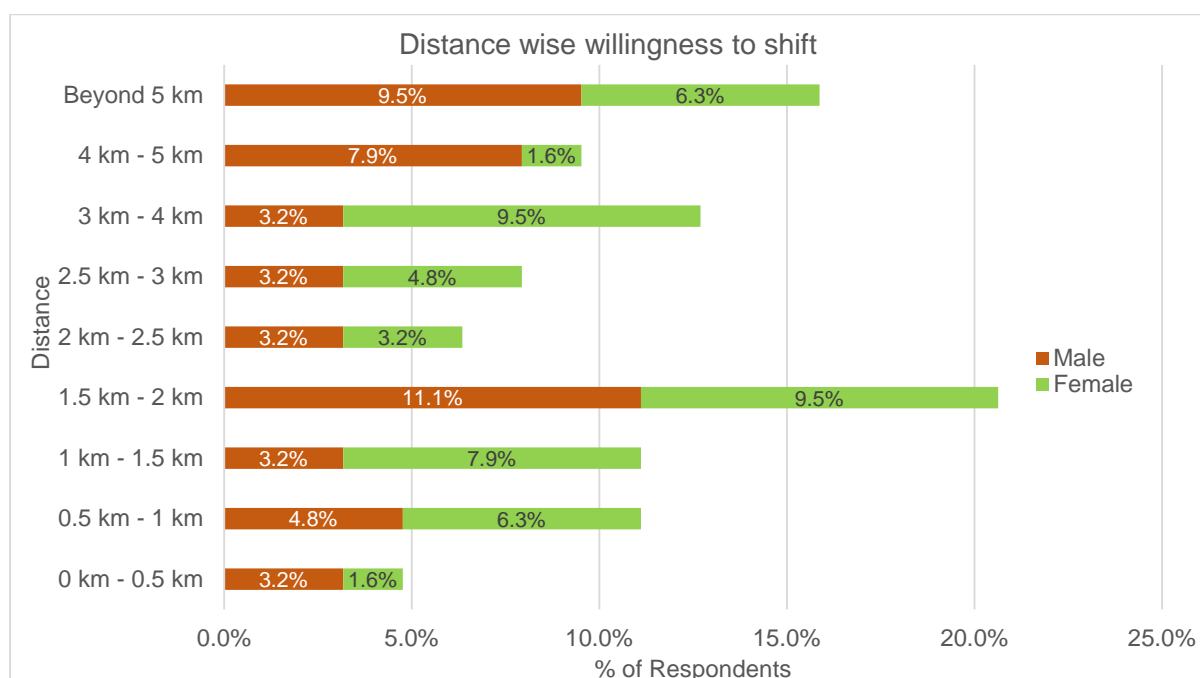
Exhibit 4.7: Distance Wise Willingness to Shift
Source: IBI Group

Exhibit 4.7 shows that the majority of the respondents who are willing to shift to the PBS System travel for a trip length of 2 km. Respondents whose trip length was beyond 5 km are not willing to shift. It is interesting to note that the total number of respondents who are willing to shift to PBS System are equally spread on either side of the benchmark trip length of 2.5 km.

Distance wise willingness to shift
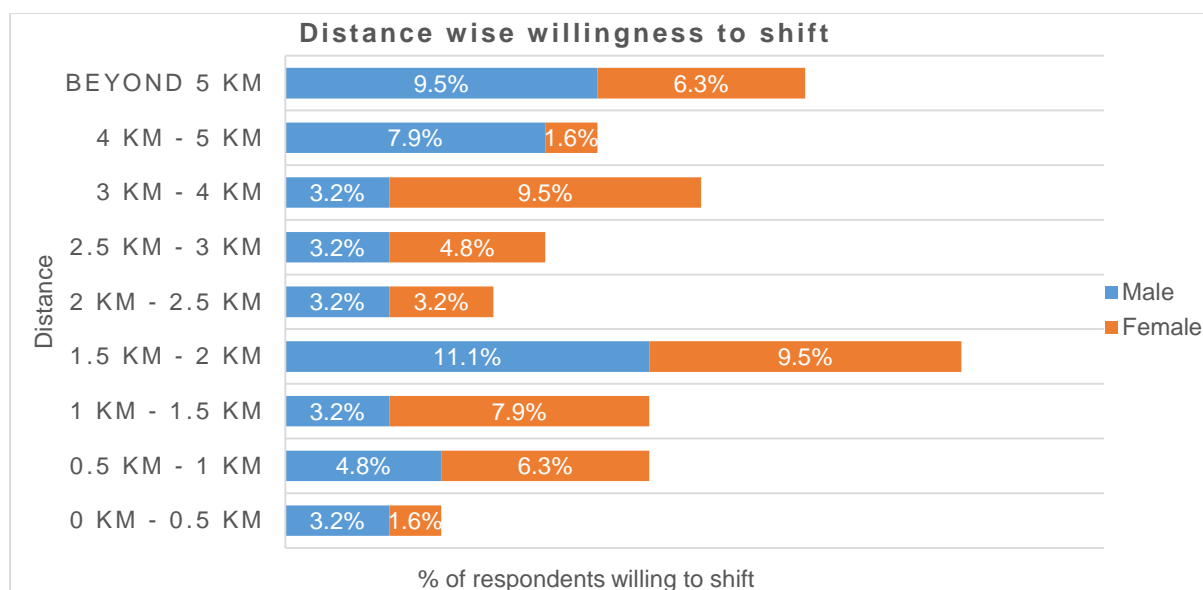
Exhibit 4.8: Gender break-up of respondents willing to shift
Source: IBI Group

The demographic composition of the survey participants was analysed and people within the age group between 21 and 30 years, were found to be most willing to shift to PBS as a mode of transport. This group constituted around 70% of the overall surveyed demographic. The age group between 31 to 45 years was the demographic least interested in PBS.

Age wise willingness to shift
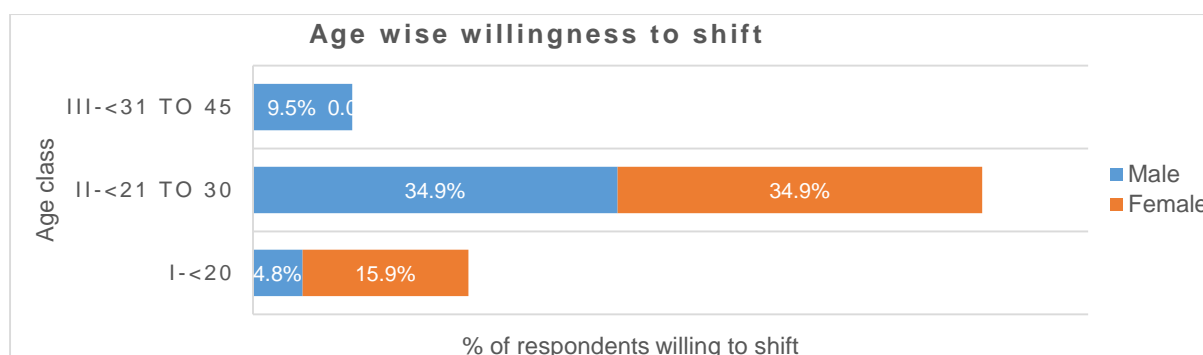
Exhibit 4.9: Gender break-up and Age Wise Willingness to Shift
Source: IBI Group
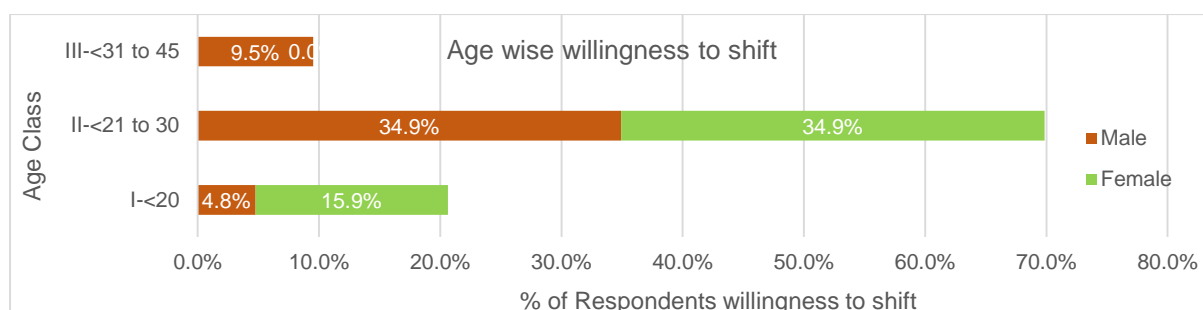
Exhibit 4.10: Age Wise break up of respondents who are willing to Shift to PBS
Source: IBI Group

Exhibit 4.10 *indicates that majority of the respondents who are willing to shift to* PBS fall within the age range between 21 to 30 years. It is quite reflective of the trend to note that none of the respondents whose age is above 45 years were willing to use PBS as their mode of transport leaving their current mode of transport.
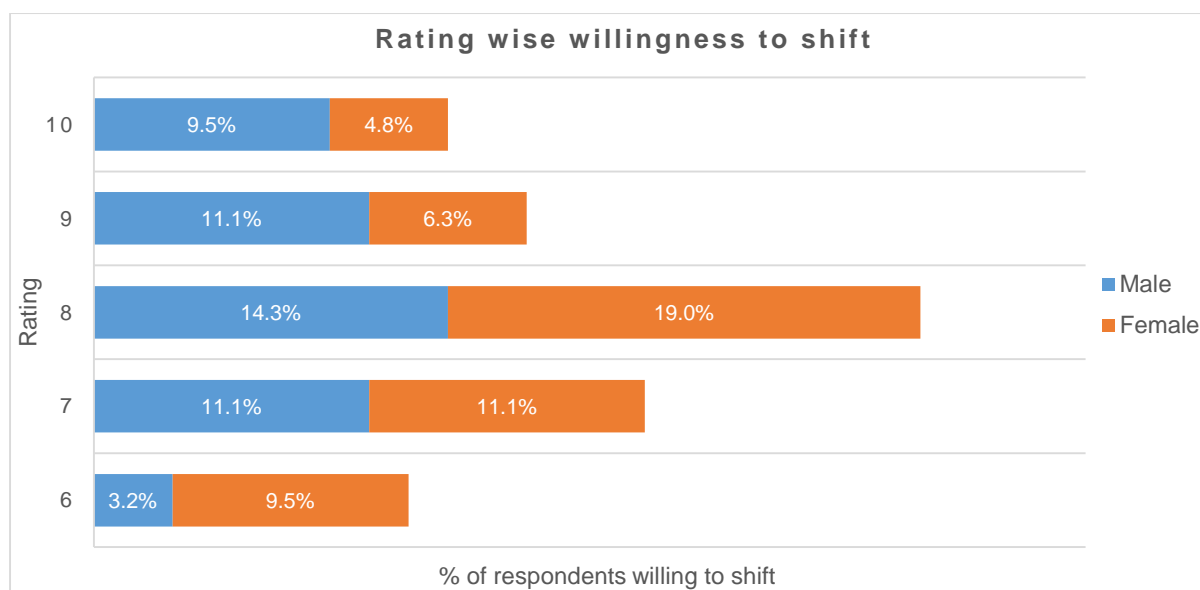
Exhibit 4.11: Rating Wise Willingness to Shift
Source: IBI Group

When the respondents were asked to give a rating on 1 (unwilling) to 10 (most willing) to shift to PBS out of the respondents, over 63% respondents gave a rating from 6 to 10. Exhibit 4.11 shows the detailed distribution the respondents who were willing to shift to PBS who gave rating between 6 and 10.

Out of the respondents who were already willing to shift to PBS, over 35% of such people use shared auto as their current mode to travel between HUDA City Centre Metro station and their final destinations. Interestingly, around 12% of the people willing to shift to PBS were personal motorised vehicle (2 & 4 wheelers) users currently.
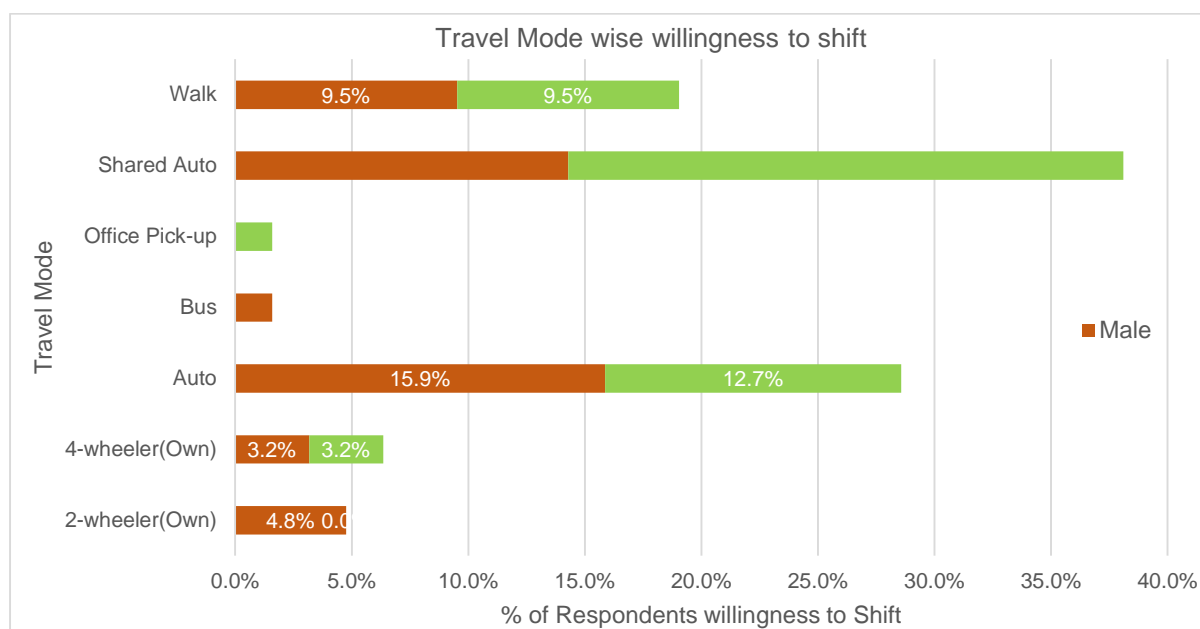
Exhibit 4.12: Travel Mode of respondents Vs Willingness to Shift
Source: IBI Group

Exhibit 4.12 shows that the majority of the people who want to shift to PBS have shared auto rickshaw as their primary mode of transport currently followed by auto rickshaw users. Respondents that reported either 2-wheelers or 3-wheelers as their primary mode of transport, expressed no desire of shifting to a different mode.

Travel Mode wise willingness to shift
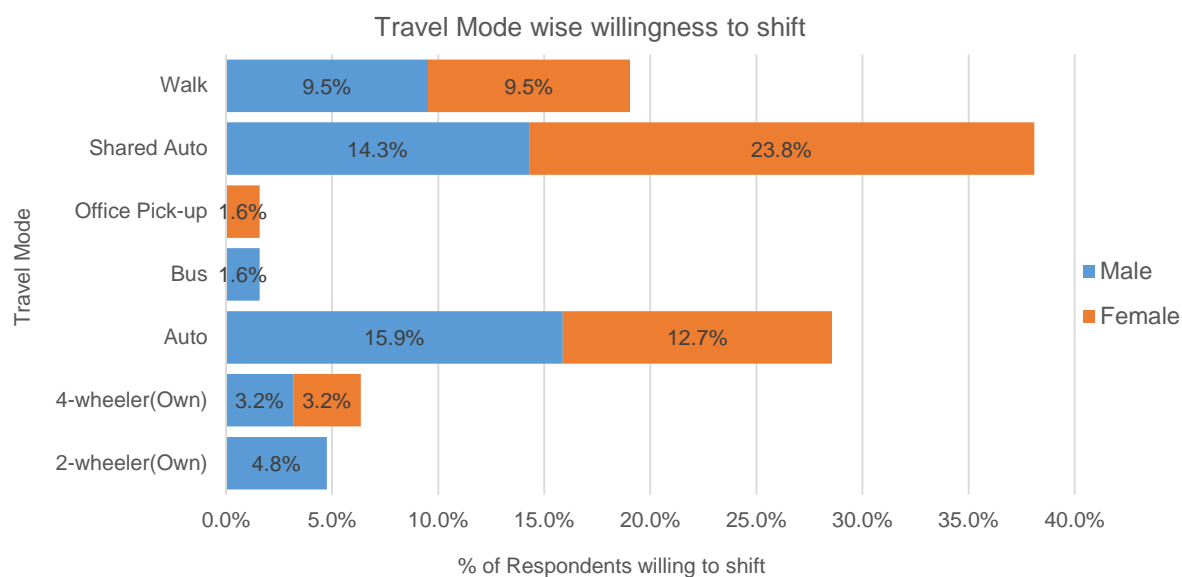
Exhibit 4.13: Gender break-up w.r.t Travel Mode of respondents Willingn to Shift
Source: IBI Group

The respondents who were willing to shift to PBS were put forth several options on how much they were willing to spend for using a PBS system for a single usage. Majority of these respondents (over 50%) are willing to spend between Rs. 10 and Rs. 20 for a single usage of the PBS system which is higher than the average metro trip, indicating that there is willingness to pay for alternative modes that give users flexibility in choosing their transportation mode.

Cost of Travel wise Willingness to Shift
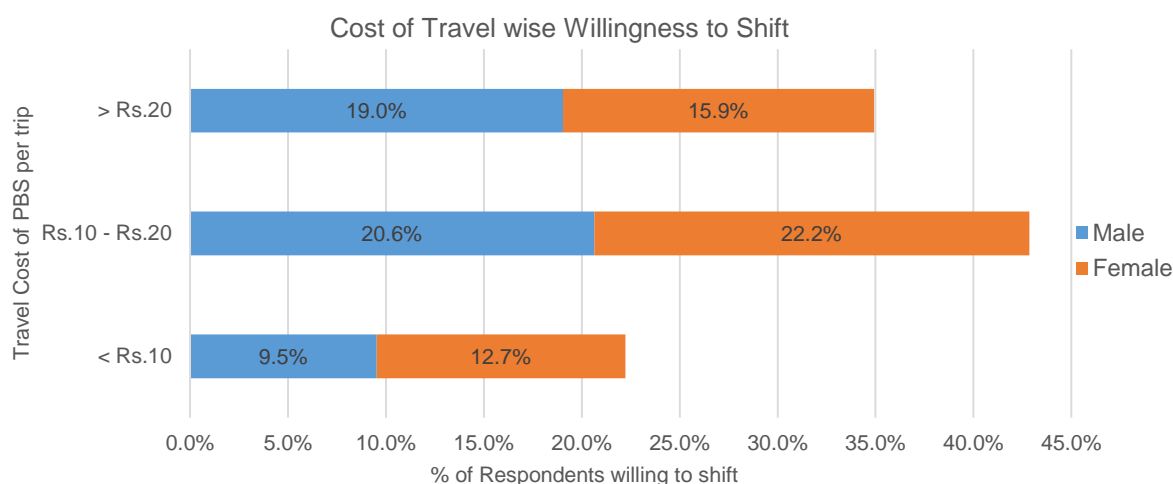
Exhibit 4.14: Cost to Travel Wise Willingness to Shift
Source: IBI Group

Through the survey results, it could be assumed that an optimistic estimate of potential modal shift to PBS among Metro riders is around 65%. The PBS system will be designed to serve at least 30% of the estimated optimistic peak hour demand.

Note: For demand calculations based on approach 2, the ridership numbers from the Delhi Metro Rail Gurgaon stretch were used.

S. No	Factors	Ridership Demand
1	Average Ridership at HCC[15] - January 2014	43175
2	Average Ridership at HCC - February 2014	45121
3	Maximum of Average Daily Ridership at HCC	45121
4	Peak Hour Demand (10% of Max. Avg. Daily Ridership)	4512
5	Overall Willingness to Shift – Full Demand (From Survey i.e. 63.2%)	2852
6	Catering to 30% of Full Demand	856

Exhibit 4.15: Approach 2 - Phase 1 PBS Bicycle Ridership Estimation

The required number of bicycles derived from Approach 2 indicate the minimum required demand, while the system will be designed based on the calculations shown in Approach 1. The first approach is therefore used to design the remaining phases.

S. No	Phase	Influence Region	Coverage Area (Sq.km)	No of Stations	Minimum no. of Bicycles
1	Phase I	HUDA City Centre	8.85	88	880
2	Phase II	Remaining DMRC Metro, Golf Course Rapid Metro & Udyog Vihar	31.29	312	3100
3	Phase III	Residual areas	98.26	982	9800
Total			**138.4**	**1382**	**13780**

Exhibit 4.16: PBS Bicycle Estimation for all the Phases based on PBS Guidance Document

The demand estimations presented in this section are preliminary estimates to initiate the detailed design for the overall PBS System. Aspects such as on-ground site conditions, land availability and potential demand based on perceptions of people in a particular area would play a major role in defining the scale and size of the larger system. The number of bicycles here are calculated purely assuming that all the stations are small sised stations. Based on the actual site survey and conditions the exact station sizing and number of such stations (small, medium and large) shall be identified and the bicycles would be recalculated. However, it could be safely assumed for planning purposes that the minimum number of bicycles (880) should be the ideal target to create a dense network of PBS stations.

Another important consideration while designing the PBS System for a city such as Gurgaon should be the accessibility of bicycle and PBS Stations to the potential users. To address this, the station density should be such that a bicycle is available at all potential origins and destinations across Gurgaon and enough bicycles are present based on the area under PBS such that potential users need not walk for more than 4 to 5 minutes in search of a PBS Station anywhere in Gurgaon.

4.3. Station Location and Sizing for Phase I PBS

Phase 1 covers the Yellow line corridor stations from MG Road Metro till the HUDA City Centre area. HUDA City Centre is the terminal point at one end of the Yellow Line and is a major activity centre. Several people commuting from Delhi on this line get down at the HUDA City Centre station and reach their final destinations by making a transfer mostly via IPT modes.

MCG can take up the implementation of the HUDA City Centre (HCC) Metro Station as a pilot under Phase I. Around this station, a well-planned PBS system will cover an area of roughly 9 sq.km. The other advantages of selecting this location for the Phase I are listed below:

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[15] *CGM Study of Ridership at Stations, 2014*

- Morning and evening peak congestion is observed at this metro station due to improper transfer facilities to the final destinations of the commuters.
- HUDA City Centre metro station is the busiest metro station in the Gurgaon Delhi Metro stretch.
- This station is a terminal station from where the commuters travel further to reach their final destinations.
- Ample land available on the station and DMRC was in principal willing to allocated space for the PBS Station and parking bicycles for the PBS system.

Maximum commuters who get down at this location have trip lengths below 5 km for which bicycling could be an alternative and PBS is the more lucrative option for commuters, compared to other IPT modes.

PBS bicycle stations should be located in a safe, accessible and visible location. Ideally, stations should be placed in close proximity to bicycling infrastructure (ex. bicycle lanes, shared use paths, etc.) to increase connectivity to the jurisdiction's bicycle network. Stations should be roughly at uniform distance from one another. The size of the station is to be determined as a function of the anticipated demand and the attractions of a particular area, and the station's location shall be dependent on the actual site environment. Bicycle stations are potentially placed at on-street parking bays, pedestrian walkways, adjacent to bus shelters and exit gates of metro stations for maximising visibility. The general guidelines that have to be followed for locating stations & docks are as follows:

1. Station to station distance should be around 250m-400m to ensure mostly dense and uniform coverage in high demand areas.
2. Case studies have revealed that to cater for surges in the demand at different times, the number of docks should be 1.5 times the no. of cycles[16].
3. Stations should be co-located near mass transit stations/stops or IPT stands.
4. Stations should be located preferably near bicycle lanes/tracks, if present, or at places on the street that are safe to access by bicyclists.
5. Stations should be best located in the vicinity of the junctions, so that users can access and egress from various directions.
6. Stations should be located inside residential cores but should preferably be accessible from the streets.
7. Stations have to be located near important public institutions or activity centres such as schools, colleges, parks, market places, commercial areas, offices, institutions and other activity nodes.

The distribution of PBS stations of different sizes is based on the density and intensity of activities in the vicinity. Map 4.4 shows the distribution of activities in the Phase I planning area. The largest stations (housing 40 bicycles)[17] are proposed to be located near activities generating maximum pedestrian traffic, including metro stations or near the edges of the planning area to increase effective coverage. The medium stations (housing 20 bicycles) are proposed near high intensity uses such as offices, institutes, and recreation spaces. The small stations (housing 10 bicycles) are proposed to be distributed evenly among the residential areas.

Therefore, if we re-calculate the number of bicycles required based on the stations and their sizing we arrive at 1260 bicycles based on established best practices of successful PBS models globally.

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[16] *PBS Guidance Document*

[17] *Station sizes are as per best practices provided in PBS Guidance Document*

Area	8.85 Sq.km
Total No. of Stations	**88**
Small Station	60
Medium station	23
Large Station	5
Total No. of bicycles based on PBS station sizing (Calculated as per Exhibit 4.3)	**1260**
No. of Docks (1.5 times the no. of bicycles)	**1890**

Exhibit 4.17: Bicycle & Station Sizing for Phase I, Gurgaon PBS
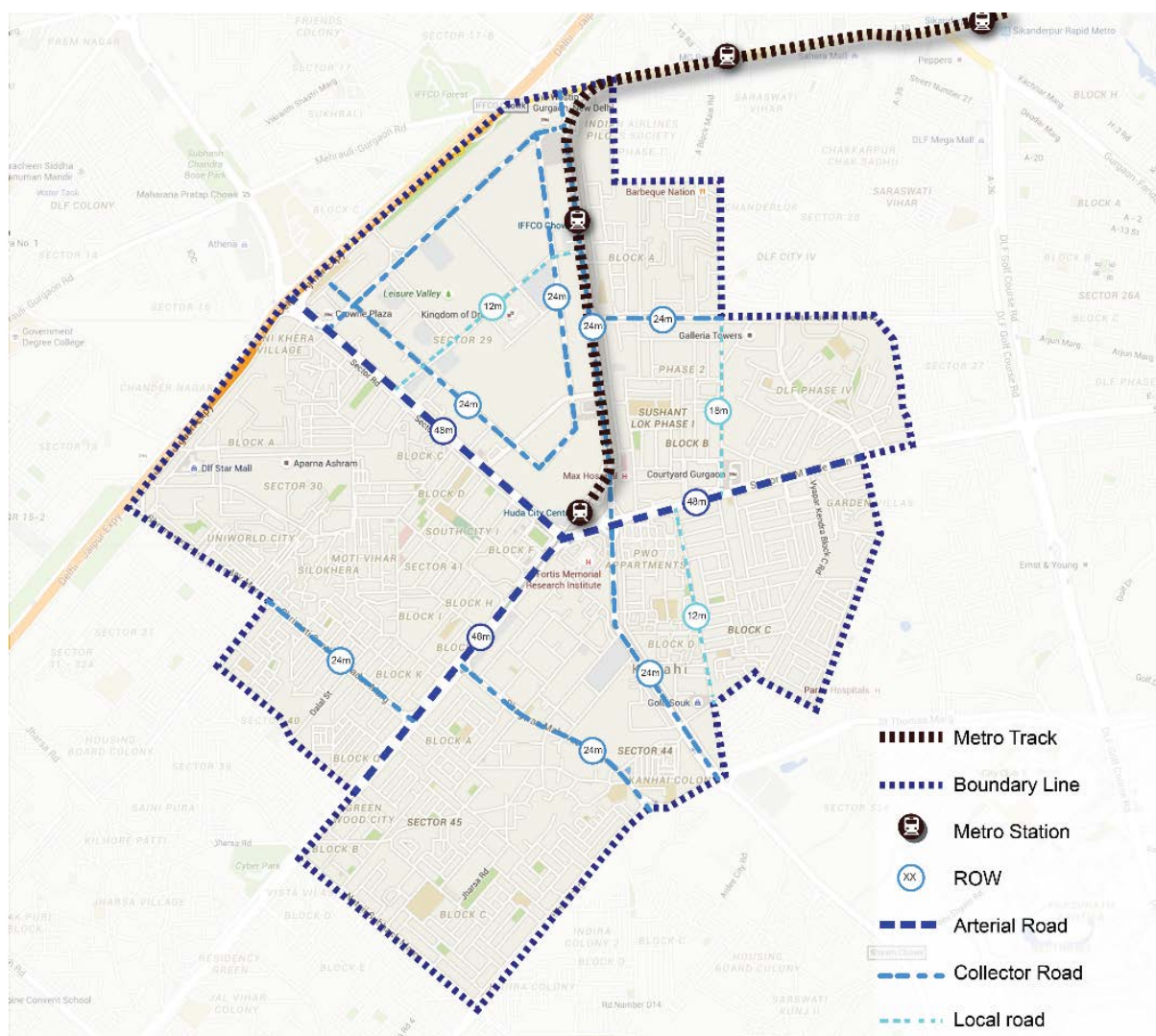
Map 4.3: Street hierarchy in Phase I Planning Area
Source: IBI Group, 2015
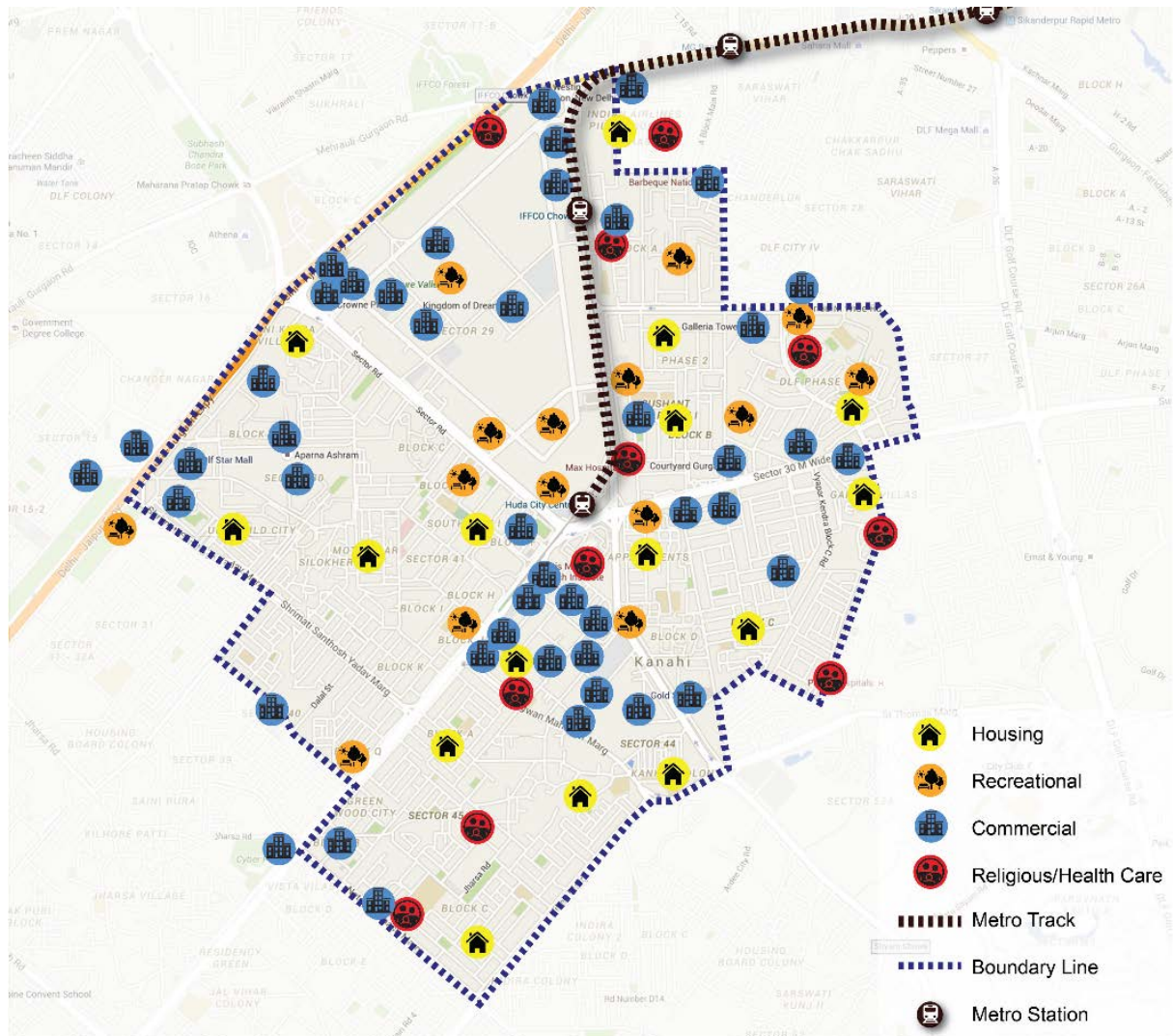
Map 4.4: Activity nodes in Phase I Planning Area
Source: IBI Group, 2015

Map 4.5: PBS station location map for Phase I
Source: IBI Group, 2015

4.4. Feasibility for Automation

Given the conditions of Gurgaon and the expectation of the potential users, an automated PBS system is felt as the most appropriate type of system for Gurgaon. Even though it is known that automation will increase implementation cost, the general demographic of users and expectations demonstrate a preference for automated PBS system. The key factors that were used to determine level of automation include:

1. Success of app-based, credit card based mobility systems such as Uber and Ola in Gurgaon demonstrate the willingness for the citizens to pay in exchange for convenient and reliable services.

2. The willingness to shift survey also found that most people were willing to pay up to Rs. 20 for a good quality service.

3. The coverage area is mainly populated by professionals working in multi-national firms with middle-income households.

An automated system will have sensors, computers and IT based communication to undertake the registration process, payment system, check-in and check-out of a bicycle at stations by user itself and does not necessarily require interaction with system staff to utilize the system. Automated systems have an advantage to operate 24 hours with machines processing tasks and an IT system

linking each mechanical task to a validation process. Though the capital cost of fully automated system is on a higher side, the entire process of management is a lot easier compared to the manual or semi-automated systems and thus in the long-term has comparatively a lower maintenance cost. The following section details some of the automated system features which can be used for the Gurgaon PBS. Detailed standards are provided in Appendix – F.

4.4.1. Basic Components of the Proposed PBS System in Gurgaon

4.4.1.1. Bicycles

The main component of the Gurgaon PBS system which are bicycles are equipped with internal brakes, enclosed chain, adjustable seat, mudguards, and reflective strips for safety, front and rear lights, bell, kickstand, portable lock, handlebar mounted basket and wide tires. In automated systems, bicycles are equipped with GPS units or Radio Frequency Identification (RFID) tag or some other type of technology for tracking the bicycle in real-time. Because the topography of Gurgaon is fairly flat, non-geared bicycles are recommended to save cost and allow easy maintenance.
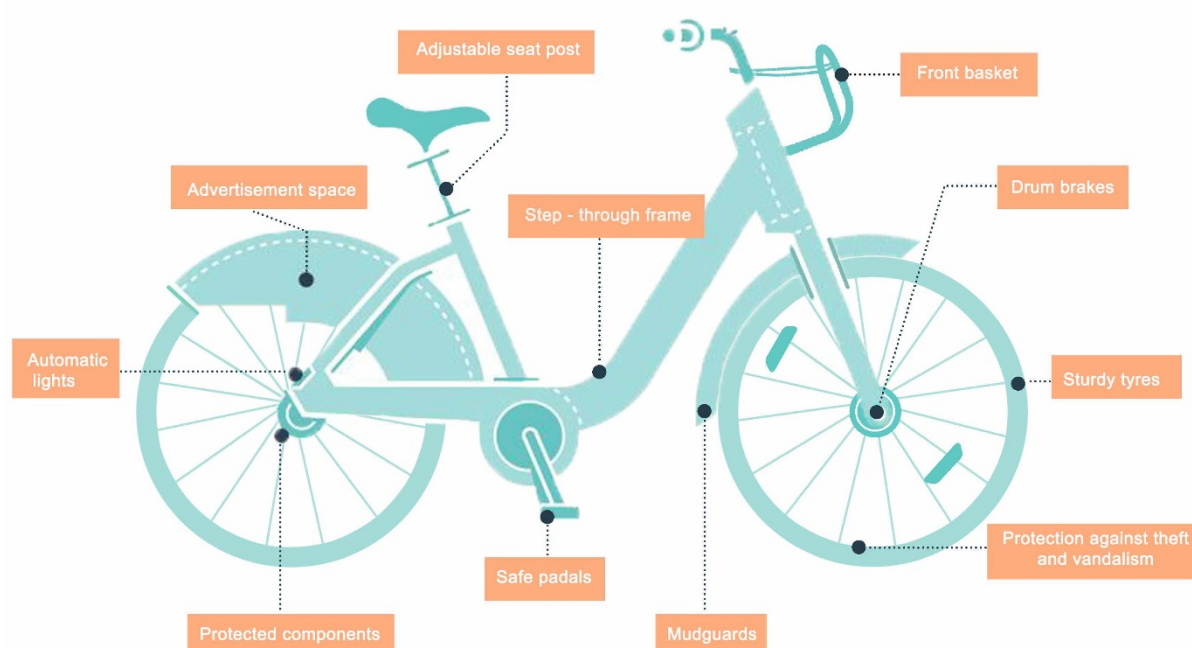
Exhibit 4.18: Components of the proposed Gurgaon PBS Bicycle
Source: Adapted from Guidance Documents, IBI Group

4.4.1.2. Docking stations

Beam-style docking stations are recommended for the Gurgaon PBS automated system. The space requirements with the beam dock will be 1.5 sqm per dock. The small, medium, and large stations will require 15 sqm, 30 sqm, and 60 sqm respectively. The docking station will be equipped with specialised coupling systems to lock the bicycle to racks. Stations are to be connected over an internet network in general and can be solar powered at times.

Exhibit 4.19: Beam-style docking stations proposed in Gurgaon
Source: Barcelona, Source: Duan Xiaomei, Itdp-China.org

4.4.1.3. Bicycle Issuance Mechanism

The automation will allow the Gurgaon PBS stations to be unattended. A user will be authenticated to check-in a bicycle at the stations using appropriate means by swiping a smartcard or magnetic stripe card. Multiple options to register as a user should be provided to encourage bicycle usage. An easy registration process will encourage visitors and tourists to Gurgaon to use the PBS system.

New user registration and access process should be handled at terminals/ kiosks located at the stations which are custom made and specially designed. The kiosks should have several advanced features such as new user registration using touch screens, communication using internet, payment mechanisms, user authentication, recharging of existing user account, account de-activation etc. These kiosks can help replace a station attendant once the system is stabilised and people are used to using the PBS system. Detailed specifications for the kiosks are provided in Appendix – F.

4.4.2.   PBS Enabled with Intelligent Transportation Systems Features

The automated PBS systems provide real time information on websites about bicycle availability at a particular docking station. Routing assistance is provided by including detailed maps with features like marking of the bicycle lanes, weather updates, traffic updates and safety advisories in most of the cases.

Usage of mobile app based systems is picking up on a rapid pace where a user can do multiple tasks without visiting the PBS kiosk. New user registration, payment validation, user profile, usage history etc. are now a touch away using advanced mobile applications. Such applications also provide real time information on bicycle availability, return process, nearest bicycle station using the user's current GPS location, status of the user's account etc.

Advanced applications that use demand statistics and usage patterns of the PBS system will help to expand the PBS system in the long-term or in subsequent phases. Applications for automatically alerting the staff to redistribute the bicycles based on the daily expected demand are increasingly being used through automation features and real-time tracking of the bicycles. Such systems where a user can actually reserve a cycle by paying a premium aren't uncommon and Gurgaon can try this option at least in some PBS Stations to understand user acceptability.
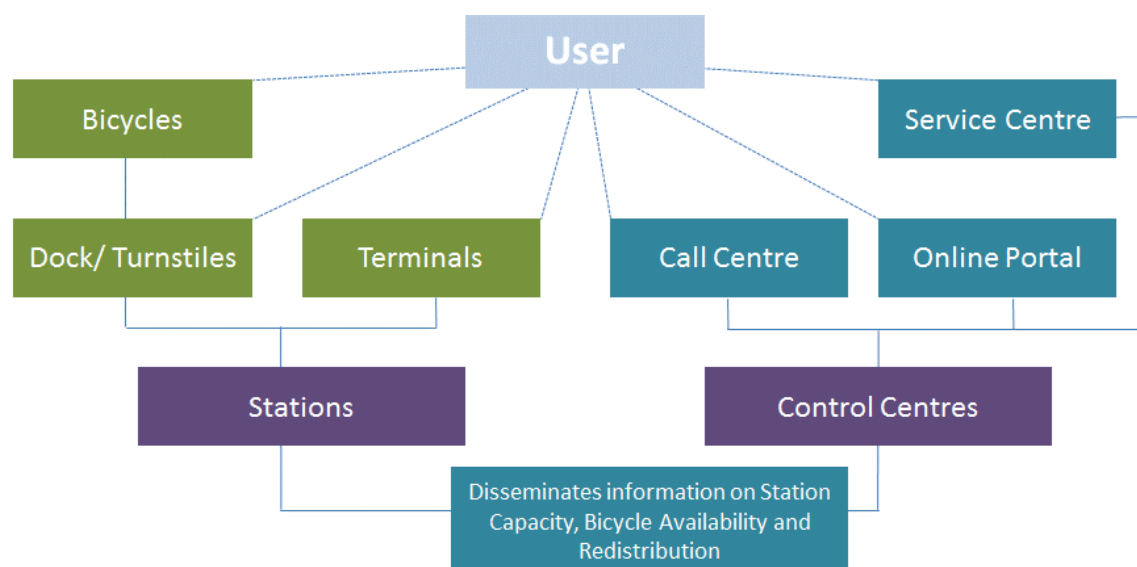
Exhibit 4.20: Information Flow in a PBS system
Source: Diagram Adopted From Schroeder, 2014

An IT system can store, retrieve and transmit information, and can connect the actual hardware of the bicycles, docks, terminals with control centre and in essence is the link between the various communication portals. The application of information technology has the potential of making PBS a cost-effective transportation solution at the citywide scale. Before the introduction of IT systems, a typical PBS system would rely heavily on human resources. A geo-fence can be created around a fixed area in the vicinity of the PBS stations coverage which would alert the operations staff in case a bicycle is taken beyond this geo-fenced region. Technology can now play a significant role in reducing theft and vandalism of cycles, especially because of real-time tracking of bicycles.

Considering the shortcomings of manual based system and associated challenges as theft, vandalism and poor utilization of resource; Gurgaon PBS is proposed as a fully automated PBS system. In fully automated system the IT application is high involving application of automated docking system, use of terminal, mobile based applications and use of smart card/ key for access. The information dissemination and tracking of accurate information depends on robust communication network. Fully automated systems are third generation systems and are becoming most common bicycle sharing schemes all over the world.

The PMC and MCG, with the advisory body, bicycle vendor, technology provider, and depending on funding, will need to decide on the optimum technology that the system wants to provide to its users.

4.4.2.1. User Registration and Validation

An efficient IT system allows people to register, pay and use the PBS system with ease. It allows users to alter, check or update their accounts, and to have their changes take immediate effect. Payment processing is also automated and instantaneous, making even small payments cost-effective, and eliminating the possibility of users avoiding payment. The IT system validates individual user while checking in/ out a bicycle from PBS station.

The system after authenticating registration process of the user, will give out smart card or key to its user. Such keys are user's RFID access to a PBS. While an RFID chip can be put into almost any

plastic casing, smart cards and keys are the most utilitarian casings for use in a PBS. Smart cards look like credit cards and can be put in a person's wallet or purse or slide into a pocket. Keys are small plastic emblems that attach to a key ring. The smart card or key is kept by the user and placed on the dock or terminal to identify and receive a bicycle. Some systems do not use docks but enable the deactivation of a locking mechanism with a code received via cell phone. Such systems would require strong cell phone identification mechanisms in place, and use the cell phone number as the identity for registration and link payment to that cell phone account.

4.4.2.2. Automatic Fare Collection Systems (AFCS)

Advanced PBS systems worldwide are now using AFCS Systems for enabling easy fare collection and validation processes. Such systems which are common in Metro rails and BRT can also be easily implemented for a PBS system. In case of fully automated system fare can be collected using any of the below fare media:

Smart Card (RFID) Based Fare Management

AFCS Systems can use smart card as the medium for fare payment at the PBS kiosks and other terminals. The smart cards are based on standard global technologies such as Mifare which is widely used in transport applications. The user requires loading currency value of their choice on the smart card which enables them to operate and pay for PBS system. The docking stations essentially have smart card readers attached to the kiosk/ terminal. This interface is centrally connected to the fare management and authorization server for the purpose of card authentication and fare management. The terminal authorization device will be connected to the central ITS infrastructure via mobile communication device which extends internet connection capability to the authorising device for the purpose of authentication and process management with central infrastructure.

Exhibit 4.21: Left- Smart Card, Right-Key of Barclay Cycle Hire. Now renamed as Santander Bike hire system, London

Mobile Technology Based Fare Management

These type of AFCS systems utilize a mobile device as the fare deduction device. This system operates in conjunction with mobile operators as VAS – Value Added Service. The users can typically request a bicycle from the mobile using SMS or APP and the central server sends the authentication PIN number on the mobile. The user would need to enter the PIN number on the terminal for the purpose of unlocking the bicycle. The system could operate for both pre-paid and post-paid customers. In case of prepaid customers, the rental amount would be deducted from the balance on the phone instantly and in-case of post-paid customers the hire charges would be billed on monthly basis with the phone bill. In this case the billing would be handled by mobile service operator on a revenue share basis model.

4.4.2.3. Bicycle Tracking

As mentioned earlier, advanced automated PBS systems use GPS and Radio Frequency Identification Devices (RFID) to track the movement of bicycle and the associates the bicycle with an authentic user. RFID are electronic tags that hold an identity in a small chip that is usually housed in plastic. In a typical PBS, there are two RFID tags: one identifies the user and is housed in a card or a

key, and the other identifies the bicycle and is housed in the bicycle. The RFID tags of both the user and the bicycle are passive, meaning that they simply store the identity of the individual or bicycle. When the tag touches or comes in close contact with the RFID reader, the reader actively collects the passive tag's information. An important concept to understand is that the RFID chip only stores the identity of the user or the cycle and no information besides that. Additional information about an individual identity can be accessed only through the IT system which will have detailed records on the user's account or bicycle history. User records generally include the type of account or subscription, good or bad standing with the system, previous trip data, and any balance on the account. Information on the bicycle could include its location at any point in time, trips it has made, and repairs it has undergone.

4.4.2.4. PBS Control Centre

A control room or operational centre serves as a central space where a large physical facility or physically dispersed services can be monitored. In case of PBS, control centre will serve the user with information and also coordinate with the online portals, and keep account of bicycle whereabouts, by monitoring the IT data. Control rooms install multiple electronic displays and control panels conducting video surveillance and recording for security and personnel accountability purposes. They are manned 24 hours to ensure continuous vigilance. Typical functions of a control room include:

- Fleet Management
  - Disseminate information regarding redistribution of bicycles
  - Response to the breakdown of bicycle reported by station in charge or user
  - Tracking of bicycles through GPS
- User Interface Management
  - Provide information to user on bicycle/ dock availability via app, SMS, phone call
  - Authorization of smart card/ key or code used by the user to sign in the system at any PBS station.
  - Maintain website and disseminate information through online –via app, SMS, phone call, about station location, and subscription detail, user fee and other information concerning users.
  - Terminals act as interface between the user and control room in this process as well.
  - Track information of user through RFID tags installed in their smart card/ key or code generated through terminals
- Central Fare collection Monitoring
  - Centrally manage the fare collection
  - Auditing of the fare revenue collected
- MIS reporting and Operational Performance Management
  - Staff management
  - Prepare daily weekly and Monthly reports

4.4.2.5. Data Tracking and Dissemination

The amount and accuracy of information that can be collected and analysed is dependent on the IT system. Besides the obvious trip pattern data, the IT system can also provide information on user profiles and preferences that can be used to adjust the operational and revenue models and maximize efficiencies. The IT functionality of a system can also lend itself to a larger utility such as allowing public use of the system data. If data from the PBS system is made available to the public, the user experience can be greatly enhanced by making use of a broad array of applications that can communicate this tracked data in simple, relevant formats. For example, several smartphone apps have been developed for many current PBS systems that allow a person to simply tap their phone to

find the closest station and its current capacity. Some apps also show bicycle sharing stations, their capacity and their locations relative to other transport options and points of interest. Trip-planning apps utilizing real-time availability at stations can suggest routes, times and availability of a PBS compared with or in conjunction with other modes of transport.

The control Centre shall relay station capacity to the different user platforms, such as station terminals, websites, phone apps and other transport operators. Communicating the availability of bicycles and open docks at various stations will help the operator manage the redistribution system, and users to get informed about bicycle availability and station information.
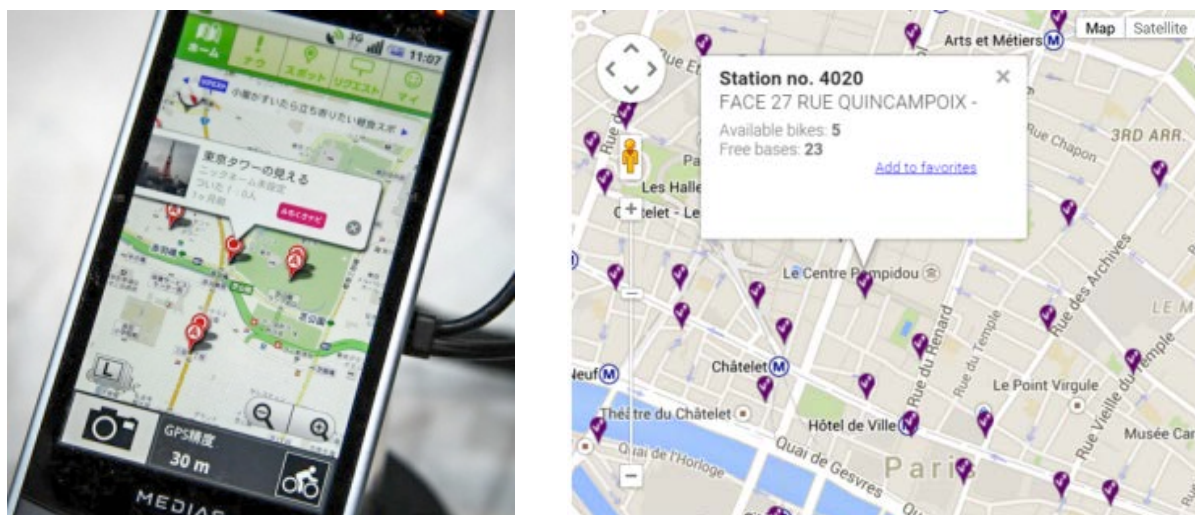
Exhibit 4.22: Left- A Bicycle-Finding Smartphone App Is In Use, China. Spot Cycle Delivers Similar Functionality for Smartphone-Bearing PBS Users in Europe and the U.S.A. (Schroeder, 2014), Right- Online Portal Showing the Real Time Information of Bike Availability,

A summary of the proposed PBS components in Gurgaon along with design quantities are provided in the Exhibit 4.23:

Component	Item	Quantity
Hardware	Non-Geared Bicycle with GPS	1260
	Dock (Electronic)	1890
	Terminal at PBS Station	121
	Redistribution Vehicles	13
	Maintenance Vehicles	1
Civil Infrastructure	Control Centre	1
	Station - Small	60
	Station - Medium	23
	Station - Large	5
	Maintenance Garage Set-up	2
Software	Central software	1
	Mobile and Web Applications	1

Exhibit 4.23: Principal PBS Components proposed in Gurgaon

4.5. PBS Branding

Branding is essential to create an identity for Gurgaon PBS. It will promote the idea of PBS to the people by explaining its functioning and services. A well planned and designed bicycle share system requires a befitting identity and good promotion for better and successful implementation. A bottom-up approach in creating a brand identity helps in creating a feeling of ownership among citizens. Therefore, combining branding efforts with communication and outreach efforts help in creating dual advantages, viz. creating awareness and developing an identifiable brand identity.

An appropriate branding identity will help establish the right image in the customers mind. The PBS system name should be relatable to the locals who use the system. It should allow a layperson to associate himself/herself with it. Many PBS systems tag its city's name with colloquial words related to cycling or transport to give the system a distinctive identity.

Alternatively, the sale of branding rights can also be used as a way of attracting capital funds. The London PBS system for example, sells its branding rights in exchange for funding construction and improvements in the system. The appropriate branding strategy for Gurgaon must be selected with consultation of the MCG and Technical Advisory Committee.

From international experience, it is observed that to gain benefits through proper branding and image building, services of a professional consultant firm are beneficial. The consultant can help MCG in creating the brand image and build the value of a PBS system by following a systematic process based on the learnings and experience of such a consultant on similar projects elsewhere.

Exhibit 4.24: System Logo, from left; Ahmedabad Mybyk, Mumbai Cycle Chalao, Bengaluru Namma cycle, Bengaluru ATCAG, Paris Velib, Boston Hubway, Barcelona Bicing.

A PBS logo helps in the creation of brand identity for the system and shall act as a signature that symbolises the entire system. PBS logos should be designed to be illustrative, symbolic & textual or any combination of these three. It functions as a unique identity, and through colours, fonts and images they provide essential information about the system that allows the users to identify with the system's core brand. Boosting the system name and logo with a tag line or slogan helps to define and highlight the aspects of the system. The PBS tag lines in general need to stress on the health fitness aspects, carbon saving, easy access, convenience of transport system and modernity of the system. The new systems image, brand name, logo and slogan should be protected by trademark and copyrights. The copyright should be held by the public authority and not by any of the related private sector firms such as the operators or marketing firms.

4.6. Supporting NMT Infrastructure

A recurring concern among all the stakeholders consulted in Gurgaon was the lack of safety for cyclists. To address this concern basic NMT infrastructure, including intersection improvements and bicycle lanes, is proposed along the key arterials in the Phase I planning area. Two roads with existing cycle lanes as shown in Map 4.6 are earmarked for improvements. New bicycle lanes are proposed along 9 km roadway. These include lane markings and dedicated cycle tracks, as shown in Exhibit 4.25. A total of 26 intersections are earmarked for improvement.

Component	Item	Quantity
Intersection Improvement	Minor	16
	Major	10
Cycle Lanes	Improvement of Existing Bicycle Lanes	2
	Lane Demarcation (New)	5.25 Km
	Dedicated Cycle Tracks (New)	3.75 Km

Exhibit 4.25: Proposed Civil Infrastructure for supporting Phase I PBS
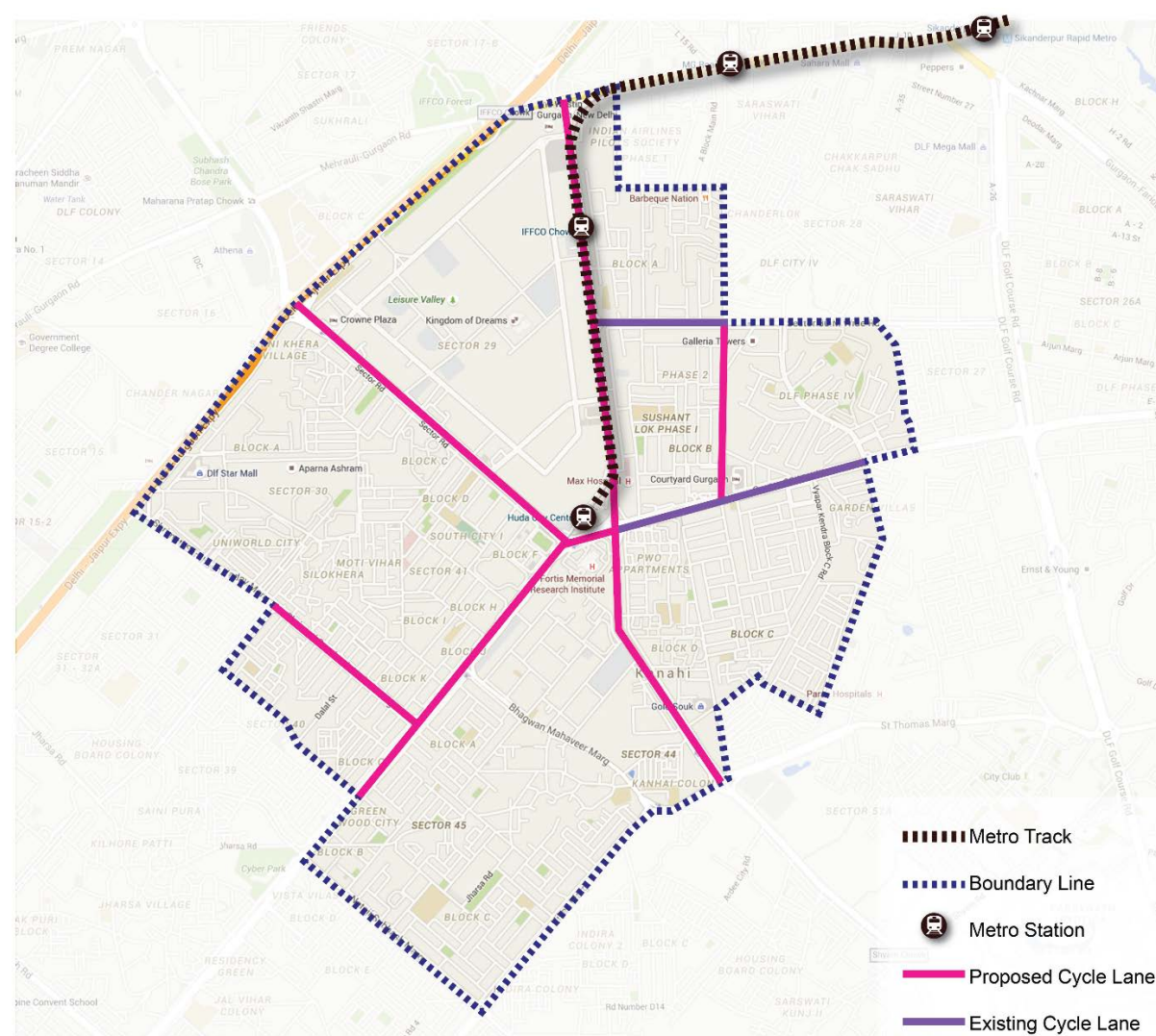
Map 4.6: Existing and proposed bicycle lanes in Phase I
Source: IBI Group, 2015
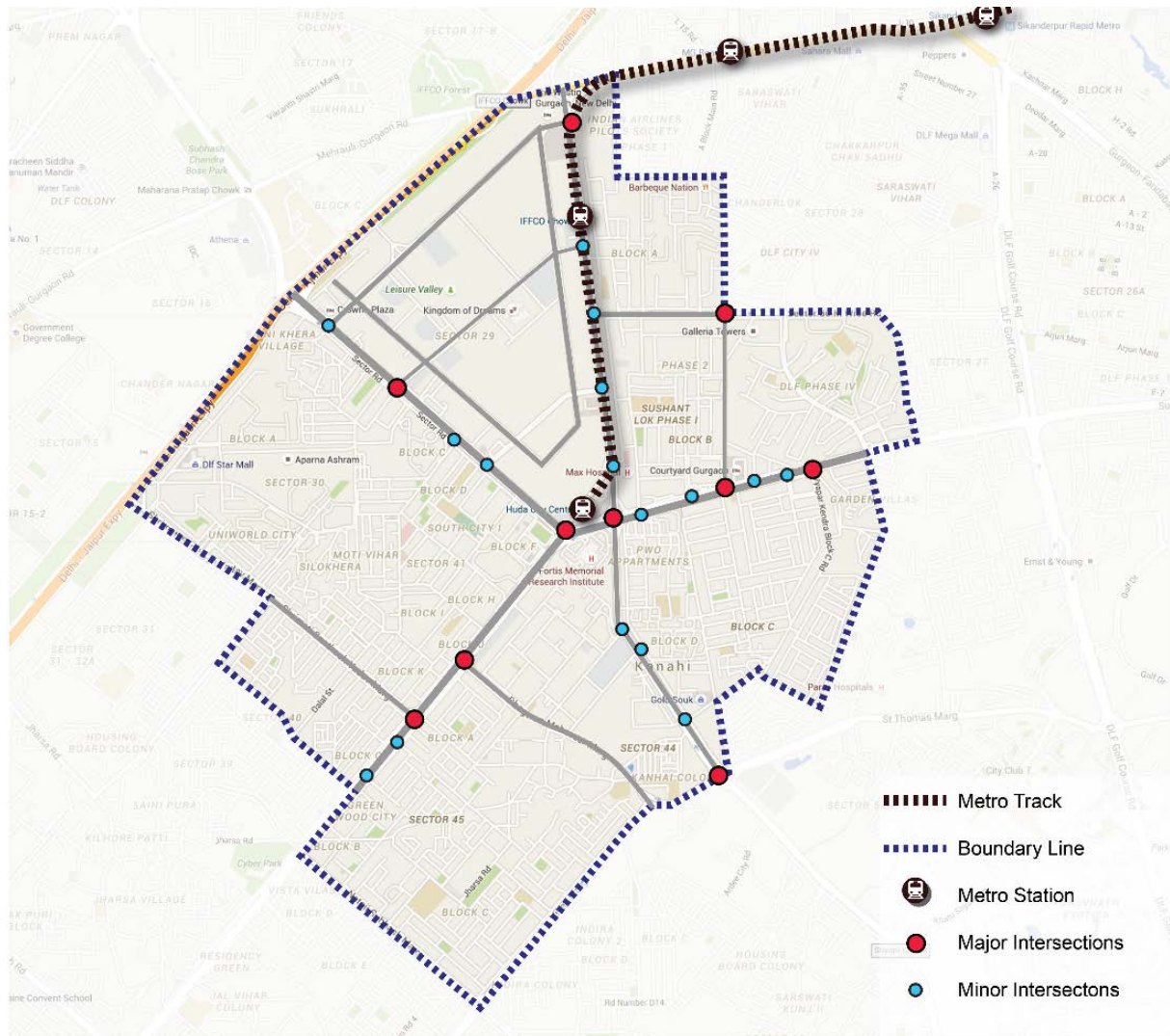
Map 4.7: Proposed intersection improvements in Phase I Planning Area
Source: IBI Group, 2015

SECTION V: INVEST

5. INVEST

Invest provides an overview of the financing tools- public funding sources, sponsors and other revenue sources that are essential for long term viability of the system.

Capital expenditure for Gurgaon PBS includes the assets- cycles, docking stations, terminals, software, maintenance equipment, redistribution vehicles and control centre. Along with the capital cost for staff, it also involves installation, marketing, and website creation cost. Operational cost includes salary of staff, replacement parts, fuel for service and redistribution vehicles, electricity, insurance, administrative costs, and depreciation on assets. In the proposed study, cost of each bicycle is around 7% of total capital cost. These bicycles have been proposed with GPS, RFID tags, and identical spare parts installation. The reason for investing on good bicycles is to ensure their durability and reduce the chances of theft and vandalism.

5.1. Capital Costs

The PBS System for Gurgaon shall be developed under 3 different phases as explained in the previous Chapters. Based on the area and no of docking stations the number of bicycles have been finalised.

Phase	Area (Sq. Km)	Bicycles	PBS Stations			
			Small	Medium	Large	Total
1	8.85	1260	60	23	5	88
2	31.29	3100	148	57	13	218
3	98.26	9800	467	179	39	685
Total	**138.4**	**14160**	**675**	**259**	**57**	**991**

Exhibit 5.1: PBS Infrastructure and Station Detailing

The following are the unit rates taken for the various components of the Capital Expenses (CAPEX) required for the PBS Phase 1 implementation. The costs for a completely automatic, semi-automatic and a manual system have been presented in the table below.

The basic difference between these systems is the level of automation as detailed in the previous chapters.

Component	Automatic	Semi-Automatic	Manual
Bicycle	15,000		
Dock (Electronic)	70,000	-	-
Terminal at PBS Station	2,20,000	1,00,000	10,000
PBS Station - Small	1,00,000	5,00,000	5,00,000
PBS Station - Medium	2,00,000	8,00,000	8,00,000
PBS Station - Large	3,00,000	12,00,000	12,00,000
Redistribution Vehicles	8,00,000		
Control Centre	2,00,00,000	20,00,000	-
Maintenance Garage Setup	8,00,000		
Installation + Project Management cost	25% of total		
for Bicycle with GPS	2,000	-	-

Exhibit 5.2: Infrastructure (CAPEX) - Unit Rates in INR

Notes:

1) *The Terminal at PBS Station for a Semi- Automatic System would work along with a computer/ tablet enabled with a smart card reader. For a manual system only paper tracking is proposed.*

2) *The land acquisition costs for none of the infrastructure such as PBS Stations, Garage or Cycle lanes has been taken into account. The MCG along with other stakeholders shall contribute to the land required for developing the System.*

3) The unit cost mentioned in the above table against PBS Stations is only the set-up cost and not the civil construction cost. In case of the Semi- Automatic and Manual Systems, the cost of a container (Similar to Ahmedabad) or a bicycle cage type (Similar to some bicycle stations in Gurgaon) to hold the bicycles is proposed and the cost for such component is considered in the above table.

4) For the semi-automatic system, a user account management module with smart card system is proposed at the control centre level.

Based on the unit rates mentioned in the Exhibit 5.2, the total CAPEX for the all the phases of PBS implementation is detailed as an Appendix – G.

Considering various factors, a fully automatic PBS System is recommended to be implemented for the Phase 1 PBS System which would cost around INR 28 crores (Rs. Twenty Eight Crores). The overall outlay for all the 3 phases of PBS System for Gurgaon is presented in the Exhibit 5.3 below:

All Figures in INR	Phase 1	Phase 2	Phase 3	Total
Automatic	27,74,95,000	65,13,25,000	1,98,71,62,500	**2,91,59,82,500**
Semi-Automatic	11,12,50,000	27,04,50,000	84,55,00,000	**1,22,72,00,000**
Manual	9,51,37,500	23,40,87,500	73,70,25,000	**1,06,62,50,000**

Exhibit 5.3: Total CAPEX Cost for each PBS Phase (excluding Supporting Civil Infrastructure)

5.2. Operational Costs

There are several people required to manage the PBS System once implemented. The roles and responsibilities of each of the required personnel are identified below:

S. No	Role	Responsibility
1.	Operations Manager	Responsible for overall PBS operations and management of the PBS project and ensure customer satisfaction
2.	Shift In-charge	Shall be responsible for their respective shift for managing PBS operations at desired service levels
3.	Control Centre Operators	Shall be a nodal point of contact for information dissemination and ensuring the circulation of cycles and monitoring of the performance of PBS
4.	Customer Service - Call Centre	Shall support customers on resolving queries, information and complaint redressal
5.	Administration	Shall support routine office administration and project functions
6.	Human Resources	Shall be responsible for recruitment, training, payroll and other HR related functions
7.	Marketing Manager	Responsible for marketing and advertisement of PBS and public outreach
8.	Accounts	Responsible for accounting, cash management and bank transfers
9.	Station Attendant	Shall support customers in issuance and receiving of cycles and to ensure minimum cycles are maintained in co-ordination with Control Centre
10.	Point -of Sale Operators	Shall be responsible for distribution of smart cards/ passes and collection of cash and refunds
11.	Driver	Shall be responsible for driving of redistribution vehicles and circulation of cycles
12.	Helper	Shall support redistribution vehicle driver in shifting of cycles
13.	IT Support	Shall be responsible for maintenance and upkeep of IT and other automated system deployed on the project
14.	Workshop Mechanics	Shall be responsible for maintenance and repair of cycles
15.	Guard	Shall be responsible for security of the premises and material in the workshop, stores and Control centre
16.	Cleaner	Shall be responsible for regular cleaning of cycles and PBS stations

Exhibit 5.4: Roles & Responsibilities of PBS Operations Personnel

Exhibit 5.5 presents the operational manpower requirement for managing the PBS System at various levels of automation.

Location	Operational Personnel	No. of Personnel for Automatic System	No. of Personnel for Semi-Automatic System	No. of Personnel for Manual System
Control Centre	Operations Manager	1	1	1
	Shift In-charge	3	3	3
	Control Centre Operators	8	5	0
	Customer Service - Call Centre	8	5	0
	Administration	2	2	2
	Human Resources Manager	2	2	4
	Marketing Manager	1	1	1
	Accounts Manager	2	1	2
Field Operations	Station Attendant	0	212	212
	Point -of Sale Operators	24	24	0
	Driver	32	32	32
	Helper	32	32	32
Support Team	IT Support	8	5	0
	Workshop Mechanics	5	5	5
	Guard	4	4	4
	Cleaner	20	20	20
	Office Helpers	2	2	4

Exhibit 5.5: Personnel Requirement under Phase I PBS System

Based on the manpower estimates discussed above, the total operating costs (OPEX) for the Phase 1 PBS system, including other costs such as administration, maintenance, insurance, and other expenses are calculated and shown in Exhibit 5.6 below:

OPEX COST per Year in INR			
Component	**Automatic**	**Semi- Automatic**	**Manual**
Man-power	1,78,80,000	3,60,60,000	3,23,04,000
Spare parts	62,37,000	12,92,400	9,05,700
Office & Garage Rental	36,00,000	36,00,000	36,00,000
Fuel costs	91,98,000	91,98,000	91,98,000
Cycle Repairs & Maintenance	15,12,000	15,12,000	15,12,000
System Insurance	27,49,750	11,12,500	9,51,375
Replacing Missing Bicycles	3,78,000	3,78,000	3,78,000
Replacing Faulty Bicycles	5,67,000	5,67,000	5,67,000
Administration & Miscellaneous Costs	48,48,350	35,31,980	34,22,415
Total OPEX Cost per Year	**4,69,70,100**	**5,72,51,880**	**5,28,38,490**

Exhibit 5.6: OPEX Cost for Phase I PBS System

From the above table, it can be observed the OPEX costs for fully automatic operations are lower than a semi-automatic or manual system.

5.3. Supporting Infrastructure Costs

Apart from the PBS CAPEX and OPEX costs, for supporting a PBS System, the following additional infrastructure costs may be be incurred during the Phase 1 implementation of the PBS System as mentioned in the Exhibit 5.7.

Component	Item	Quantity	Unit Cost (INR)	Total Cost (INR)
Intersection Improvement	Minor	16	10,00,000	1,60,00,000
	Major	10	25,00,000	2,50,00,000
Cycle Lanes	Improvement of Existing Bicycle Lanes	2	1,00,000	2,00,000
	Lane Demarcation (New)	5.25 Km	2,00,000	10,50,000
	Dedicated Cycle Tracks (New)	3.75 Km	30,00,000	1,12,50,000
Total Cost (INR)				5,35,00,000

Exhibit 5.7: Cost for developing Supporting Civil Infrastructure for Phase I PBS

5.4. Overall Costs for PBS System

The total cost for PBS System inclusive of Capital cost for only PBS Components and the supporting infrastructure is presented in the Exhibit 5.8. For Phase 1 the total **Capital cost including civil works is INR 33.09 Cr** (Rupees. Thirty Three Crores Nine Lakhs)**.** The **annual** operating cost for the Phase 1 is estimated at **INR 4.7 Cr** (Rupees Four Crores Seventy Lakhs).

All Figures in INR	Phase 1	Phase 2	Phase 3	Total
Automatic	33,09,95,000	80,28,25,000	2,40,51,62,500	3,53,89,82,500
Semi-Automatic	16,47,50,000	42,19,50,000	1,26,35,00,000	1,85,02,00,000
Manual	14,86,37,500	38,55,87,500	1,15,50,25,000	1,68,92,50,000

Exhibit 5.8: Total CAPEX Cost for each PBS Phase (including Supporting Civil Infrastructure)

5.5. Funding and Revenue Sources

In order to diversify it's funding and revenue sources, MCG could potentially evaluate one or more of the following alternatives to augment the system's financial gap:

Direct Funding

Funds for capital expenditure will need to be collected through direct funding sources listed below. A bank loan should also be considered to pay for a portion of the capital expense. Such loans would need to be repaid through funds collected from revenue collection and cross-subsidy sources.

- **Municipal and State Budget:** Financing PBS through direct government subsidy is the most cost efficient way of ensuring benefits to the system. Allocation from city's resources can provide the necessary impetus to the system.
- **Transit-linked Funding:** Delhi Metro and Rapid Metro can bring in a component of PBS funding from the annually budgeted amounts.
- **Grants:** Gurgaon city government can also apply for funding from the State or the Central Government under various sustainable transport schemes for planning purposes or include the proposal as part of its Smart City Proposal for future funding.
- **Funding through Corporate Social Responsibility (CSR) Activities:** During interactions with private sector associations such as NASSCOM, it was evident that the corporate world in Gurgaon, especially the IT Sector firms, have enough resources allocated to the CSR activities and can potentially be routed to fund and finance the PBS System partly or fully.

Direct Revenue

Direct revenue collections from user fees and subscription fees will help in repayment of loans and pay operational costs. The amount of revenue that is collected depends on the fare structure. The proposed fare structure has been illustrated in Exhibit 5.9. The fare slabs presented here have been derived from the willingness to pay survey (Section 4.2). Also, a comparison was done with IPT fares in the city to determine the acceptable fare for a PBS system. The proposed fare should also encourage people to use and maintain the equipment carefully. It is recommended to have the initial 30 minutes as a free ride, followed with increasing rental fares for every extra 30 minutes. This is will discourage long term use and keep more cycles in circulation. Penalty fees are also proposed including Rs. 100 for loss of card, duplicate card issued after re-validation of residential address; Rs.1000 for loss or major damage to the bicycle. The automated system should allow direct debit of penalties from verified e- wallets or credit cards.

One time Annual Registration: Rs.600	To be renewed every year after signing in. Validation of residential address by operator before being given to the commuter. Each member of the family pays separately, gets a separate card.
	INR 100 may be charged for loss of card, duplicate card issued after re-validation of residential address

User Fee INR	Time
Rs. 0	First 29 minutes
Rs. 20	30 – 59 minutes
Rs. 50	60 – 89 minutes
Rs. 100	90 – 119 minutes
Rs. 200	120 – 149 minutes
Registration methods:	Website, Mobile application, Hard copy at Bicycle Stations.
Operation:	Smart Card, SMS, Multi-utility Card

Exhibit 5.9: Fare Structure for Gurgaon PBS

Assuming 2500 subscribers of the Phase 1 system and an average 100 daily trips longer than 30 minutes:

Estimated Annual Revenue = ₹ 15,00,000 (from subscription) + ₹ 7,00,000 (from user fees)

= ₹ 22,00,000

Cross Subsidies

- **PARKING CHARGES**: Parking charges are a good way to generate revenue from the streets and use them for the PBS System. A detailed parking assessment should be carried out by MCG to assess the potential revenue from the parking fees implementation. As parking fee is being collected at several locations in Gurgaon, stakeholders should build mechanisms to route the same resources to the PBS System.
- **ADVERTISEMENT FEE:** Advertisement on each PBS station and cycle has potential to generate revenue for the PBS System. Advertisement fee will be charged for first 3 years. The following is the assumption of revenue generation from advertisement. (Exhibit 5.10). Advertisement plays a major role in generating revenue sources and an approximation of the revenue potential from this source is presented below.

Potential advertisement charge from each PBS station/month	INR 10,000
Potential revenue through advertising per sq.ft.	INR 250 per sq.ft. per month

Potential advertisement charge from each cycle	INR 100 per month

Exhibit 5.10: Potential Revenue from advertisements

5.6. Operational Model

The Gurgaon PBS system should be owned by the municipal body and operated by private participation under service-based contracts. Private vendors will operate the system against a fixed-monthly fee from the government as service charges. These charges will be based on performance measurements that will act as incentives or penalties to the operator. The operator shall agree to Service Level Agreements (SLA) in the contract. The system will run on revenue generated from user fee, subscription fee, parking fee and advertising fee. After system is in place, a corporate sponsor maybe invited for overall branding of the system. (Refer Exhibit 5.11)

Government Sponsor
- Provides operating subsidy from funds collected from parking fees

Private Sponsor
- Provides operating funds against advertising rights
- Provides CSR funds

MCG
- Provides capital from municipal budget
- Monitors performance
- Provides space for stations
- Sets fare structure
- Hires contractors for packaged functions
- Approves expansions
- Service Level Agreements

Design – Build - Operate
- Designs and Builds the infrastructure as per contractual rules
- Operates against a fixed monthly fee from the MCG
- Maintains the system
- Transfers Revenues to MCG
- Adheres to performance standards
- Provides and maintains user interface

User
- Pays user charge to operator

Monitoring
- Monitors usage and provides reports to MCG on system performance, ridership, system benefits against fixed annual fee

Communication
- Markets and Brands the system against fixed lump sum fee

Exhibit 5.11: Operation Model of Gurgaon PBS proposed

SECTION VI: IMPLEMENT

6. IMPLEMENT

6.1. Establishing an Institutional/ Monitoring Structure

Defining the roles and responsibilities of various governmental agencies is a crucial step in implementing the recommendations of the PBS Plan.

The following agencies will have a vital role to play in the implementation phase:

1) **MCG**: Is the nodal body for the implementation, management and operation of PBS, and shall be responsible for overall viability and sustainability of the PBS system. The Deputy town planner of the planning cell shall be responsible for the implementation of the system in the city and will be supported by the Project Management Consultant (**PMC)**. The project management consultants shall handhold the MCG through the design, build operate process, including

   a. Preparing the DRP

   b. Day to day project management

   c. Writing tenders

   d. Bid process management

   e. Hiring DBOT and NMT infrastructure contractors and M&E consultants

   f. Testing the project

   g. Training the MCG staff on operations and management (with help from DBOT contractors)

   h. Ensuring a smooth transition from DBOT contractors to the MCG

2) **Project Implementing Agencies**: The Implementing agencies will be hired by the PMC to implement the PBS project. It shall comprise of the following units:

   - **Design, Build, Operate, and Transfer Contractors:** The contractors shall build the project (procure equipment, installation), operate it for a period of 3 years and then hand over the project to the MCG to run. The DBOT contractors shall in coordination with PMC hold training workshops on operations and management for the MCG.

   - **NMT Infrastructure Contractors:** The infrastructure contractors shall:

      a. Build NMT infrastructure, including segregated and mixed cycle tracks as well as other streetscape amenities in accordance with the Planning and Design Guidelines for Non-motorised Transport, 2014 and Urban Road Codes, 2012

      b. Undertake Intersection improvements as per design guidance provided by the PMC

   - **Monitoring and Evaluating Consultants:** The M&E consultant shall monitor the system at different stages of building and operation. They shall set up data collection systems and collect relevant data regarding implementation, shift in modal share, ridership etc., as well as write a report on the learnings from the implementation of the phase 1 of the PBS project at prescribed intervals.

3) **Technical Assistance Committee:** The TAC should be set up as early as possible engage the various stakeholders, namely, city leadership, staff, officials, private and civic society representatives and NGOs from the initial stages of the project. The role of the TAC will be advisory and meet with the MCG at regular intervals.
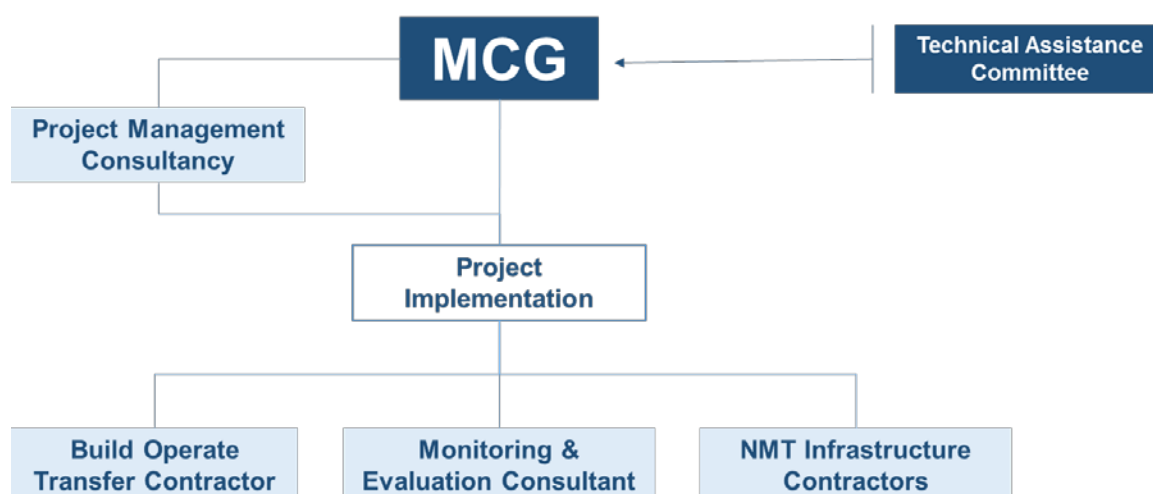
Exhibit 6.1: Proposed Institutional Structure for PBS Implementation

6.2. Project Framework Roles and Responsibilities Matrix

Activities from previous chapters have been categorised in a matrix with roles and responsibilities assigned to various identified authorities. This matrix shows the authorities that are primarily responsible for undertaking the task or is supportive to pursue the task.

P: Primarily Responsible,   S: Support,   O: Oversight

Exhibit 6.2: Roles and Responsibility Matrix. Source: IBI Group

Activities/ Authorities	MCG	PMC	DBOT	M&E	TAC
Create a Project team	P				
Hire a PMC	P				
Elect a TAC	P				
Identify funding sources	P	O			S
Prepare DBOT contract documents		P			S
Hire DBOT contractor		P			S
Prepare M&E terms of reference		P			S
Hire a M&E consultant		P			S
Procuring Equipment		O	P		S
Project Implementation- Installation of Station, Hardware, Recruitment of staff, launch of web bed applications, Public outreach, Branding		O	P		S
Testing of system- IT, Hardware, Trail Run		P			S
Operations		O	P		S
Monitoring of Operation		O		P	S
Handling over the project to transit authority	P	S			S
System Optimization	P				S
System Expansion	P				S

6.3. Activity Scheduling of PBS

Activity scheduling is the list of activities involved for implementing PBS in Gurgaon. In this chapter, the documentation with time frame is discussed. The activities that Gurgaon has to undertake to implement the system are demonstrated graphically. It is expected that implementation of the Phase 1 PBS system in Gurgaon HCC can be accomplished in 16 months from start of the project.
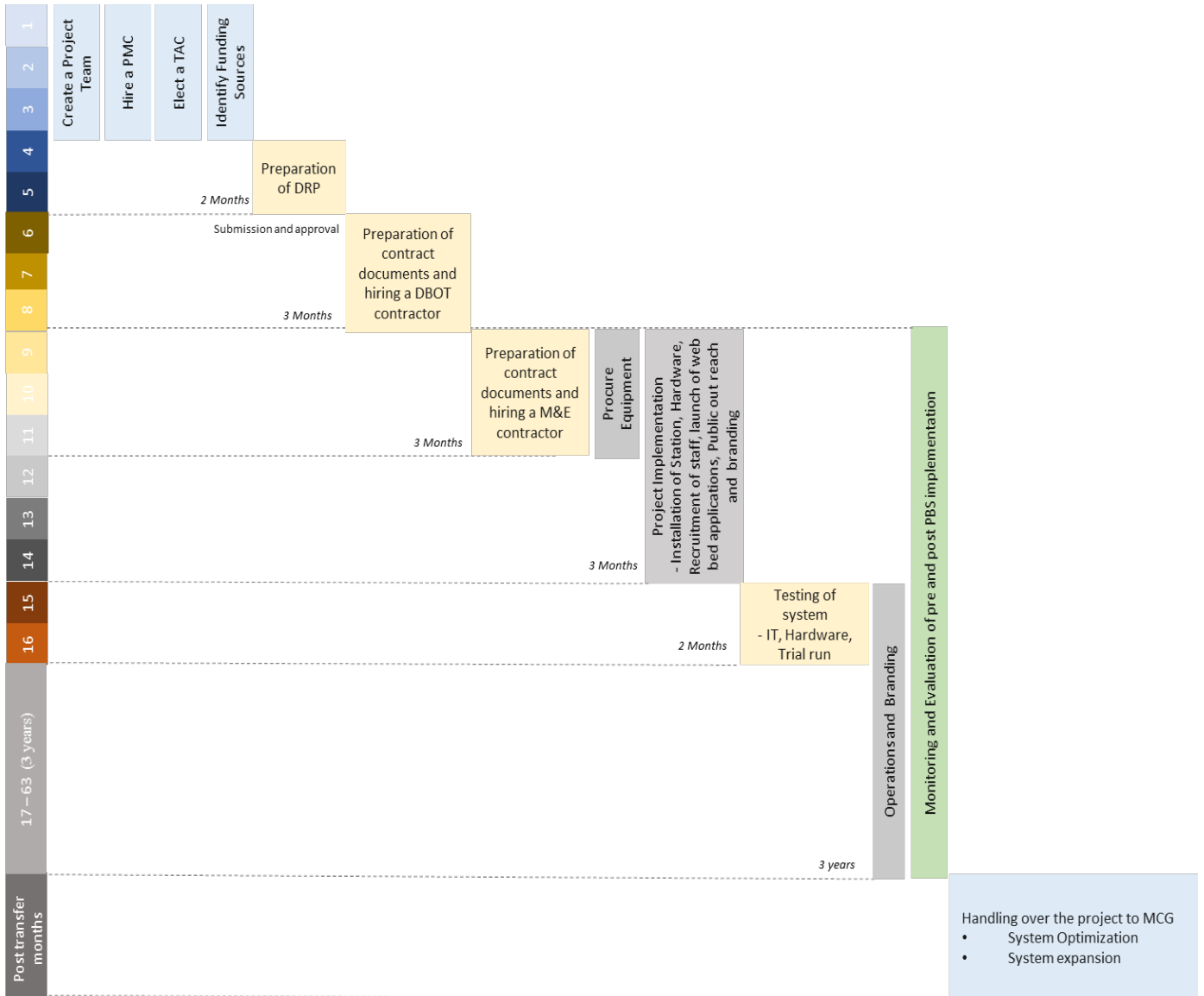
Exhibit 6.3: PBS Activity Scheduling

6.4. Performance Standards for Operations

Performance evaluation is very critical for MCG to ensure good quality of service to the users and also to utilize the resources efficiently for the achieving the project objectives. The performance evaluation of system also helps in expanding the system with corrective measures from the experience. The various measurable parameters such as station inspection frequency, bicycle maintenance frequency, amount of bus fleet availability, etc. are measured continuously by an independent agency or by VMSS using which the performance of DBOT contractor is evaluated. All the parameters should be compared with the values of parameters defined in the service level agreeement. The service level agreement shall be defined for the system based on intended level of services and availability of resources. A sample SLB to incentivise and reward the operator for excellent performance and penalise for non-performance. (adapted from a similar exercise) is appended in Annexure H).

The following flow chart in exhibit 6.4 shows the briefly the methodology suggested for performance evaluation of operator.
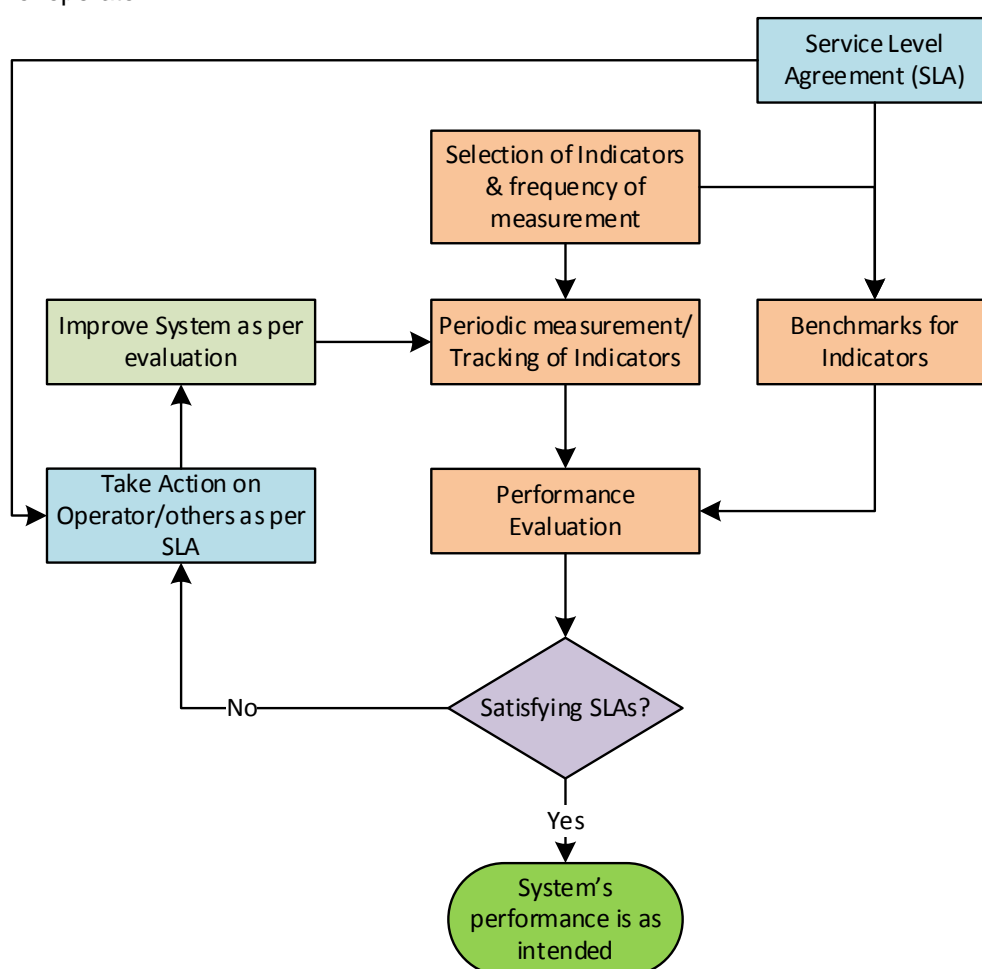
Exhibit 6.4: Suggested performance evaluation methodology
Source: IBI Group

6.5. Communication and Outreach Plan

Preparing a communication and outreach plan is one of the several straregies to increase awareness regarding the PBS systems and its benefits to concerned stakeholders. The information is distributed through multi-channel platforms including print media, press releases, advertising in movie theaters, broadcasting (radio and television), ward-level meetings, and social media channels. MCG will have to undertake the following tasks as part of its communication and outreach strategy:

- Hire a communication consultant and create a communication strategy.
- Organise public events, promotional campaigns, and workshops to reach out to the community. Social marketing also provides avenues to integrate the system with existing transport system. The existing stigma of using bicycles as mode of commute needs to be changed with the help of public events and social marketing.
- Develop a multi-fold media strategy covering announcements in newspaper, magazines, community flyers, radio and television.
- Involve key political and administrative figures to send messages about cycling and healthy living.
- Identify brand ambassadors who can help create a positive image of cycling.
- Interact with media and communication professionals and share information of the goals and operations of the system. Share results of surveys and field studies. Sharing of information will bring in transparency and acceptance.
- Use social media platforms to engage with youth. Design special programs for targeted users.
- Hold public debates and write articles on blogs, newspapers and websites on the benefits of cycling and its impact on the city's health and environment.

6.6. Capacity Building Programmes

Training programmes are an effective way to ensure that PBS has the required in-house technical support from the people who are directly or indirectly involved with running the system. Capacity building help stakeholders visualise desired results better, especially during the initial stages when the gains from the system are gradually unfolding. It is beneficial, in the longer run, to have in-house expertise on management of the system.

Training and capacity building programs for government officials should include imparting knowledge of system planning, design and operations. The capacity building programs should be held regularly even after system implementation for long term success. The proposed capacity programs include:

1. **NMT Demand Assessment Techniques** – This program should include interactive workshops where MCG urban/transport planners are trained in demand assessment techniques. Attendees should also receive training on use of software and survey technologies for improving efficiency of the processes.

2. **PBS System Planning** – Participation of MCG employees during the planning process, either through planning workshops or consultative sessions will help in developing technical expertise for PBS planning. The DBOT contractor should provide formal training sessions to MCG planners at the end of their contract, before hand-off, on interpreting the reports produced by the MIS reporting software and using them to adapt PBS services to respond to demand.

3. **Design of PBS Components** – MCG employees should be included in training workshops and system testing demonstrations held by the PBS system vendors. Regular consultative workshops, conferences or study tours are encouraged to learn about the state-of-the-practice and technological innovations.

4. **PBS System Operations** – The DBOT contractor should conduct individual system operations training sessions providing hands-on training on (a) operating the fleet management software, fare collection software, and user interfaces; (b) operating the MIS reporting software to produce monthly/annual reports; (c) operations and maintenance of the bicycle fleet and redistributing vehicles; (d) operations and maintenance of the permanent infrastructure such as docks and terminals; (e) personnel management; and (f) fare determination and revenue management.

APPENDIX – A

Key Map

Legend:
- 🟡 Residential Sectors
- 🔴 Religious
- ⚫ Transport hub
- 🔵 Commercial
- 🟣 Educational
- Railway Station
- Metro Station
- Study Area

- ▬ Primary roads
- ▬ Secondary roads
- Local Roads
- ▬ Water body
- Metro Line
- Railway Line
- GMC limit

0 0.5 1 2 3 Kilometers
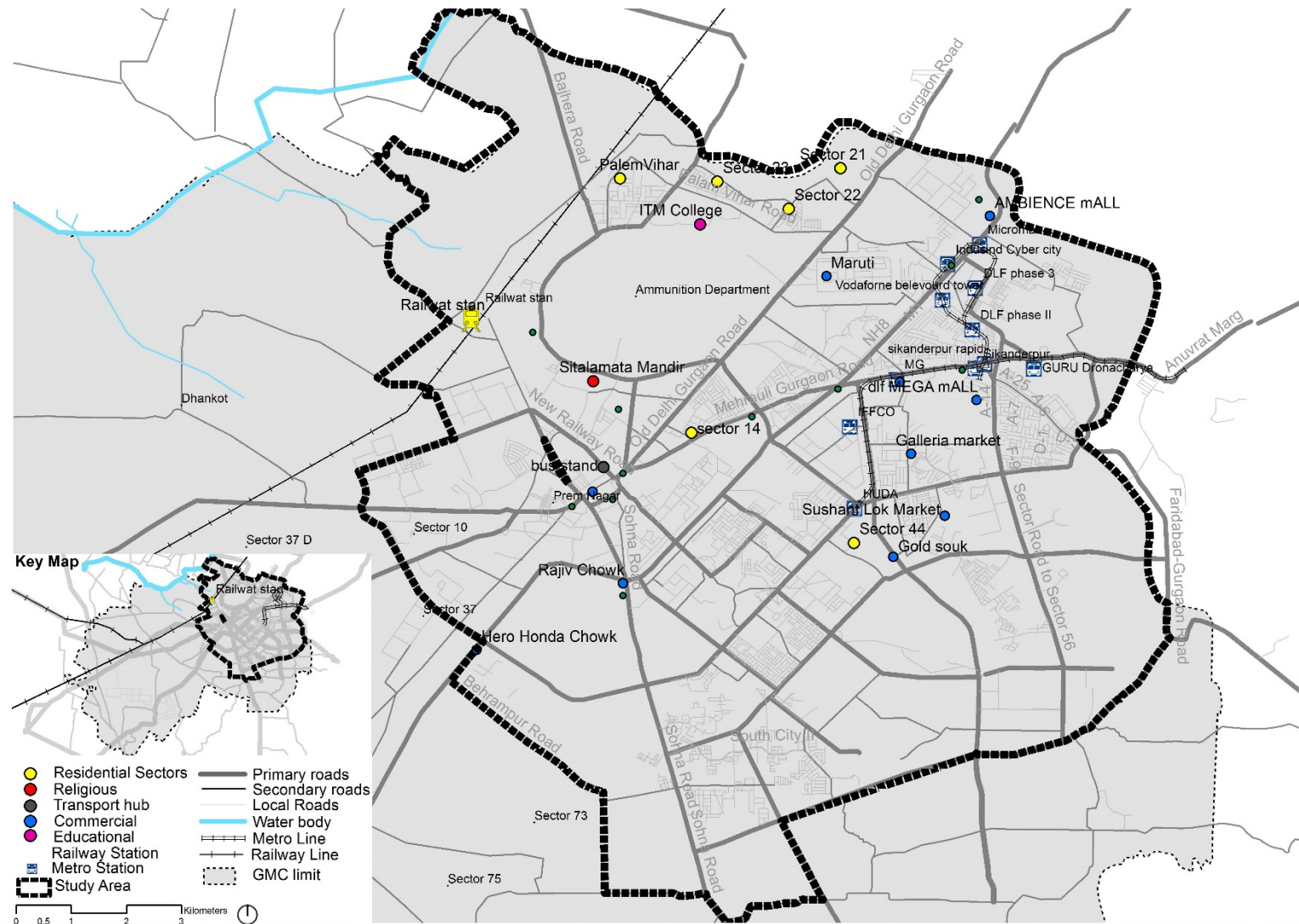
Guidance Document For Public Bike Sharing Scheme

Study Area Map

City Specific Plan - Gurgaon

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UN | IBI

Sector 21
Sector 23
Sector 22
PalemVihar
Micromax
ITM College
Indusind Cyber city
DLF phase 3
Vodaforne belevourd tower
Railwat stan
DLF phase II
Railwat stan
Ammunition Department
Sikanderpur
Railway stan
MG
Sitalamata MandircITY cENTRE mALL
GURU Dronacharya
IFFCO
sector 14
Galleria market
bus stand
HUDA
Prem Nagar
Sector 44
Sector 37 D
Sector 10
Gold souk
Rajiv Chowk
Budhera
Dhankot
Sultanpur
Farrukhnagar
Garhi
Sector 37
Patuadi Road
Hero Honda Chowk
Secxtor 88
Sector 73
Sector 85
Sector 75
Tajnagar
Jamalpur
Shikohpur
Manesar
Saharavan Village
Binola Industrial Area

Legend:
- Water body
- Primary Roads
- Secondary Roads
- Metro Line (DMRC)
- Rapid Metro
- Railway Line
- Metro Station (DMRC)
- Rapid Metro Station(RMGL)
- GMC limit
- Major Residential
- Religious
- Transport hub
- Commercial
- Schools/ Colleges
- Railway station
- Study area

0 1 2 4 km

Towards Dwarka

Airport

Bajhera Road

Old Delhi Gurgaon Road

Moulsari Road

Ammunition Department

M1

Anuvrat Marg

A-1

Sohnar Marg

Budhera

Dhankot

Prem Nagar

Sultanpur

Sector 37 D

Sector 10

Sector Road to Sector 56

Farrukhnagar

Garhi

Sector 37

Secxtor 88

Behrampur Road

Sohna Road

Sector 73

Sector 85

Sector 75

Tajnagar

NH8

Shikohpur

Jamalpur

Maneswar

Saharavan Village

primary
secondary
local
Metro Rail
Railway Line
Railway

Gurgaon Naturals
GMC limit
Water body

Scale
0   1.5   3   6
Kilometers

Guidance Document For Public Bike Sharing Scheme

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Base Map - GIS
City Specific Plan - Gurgaon

IBI

May 2016

80
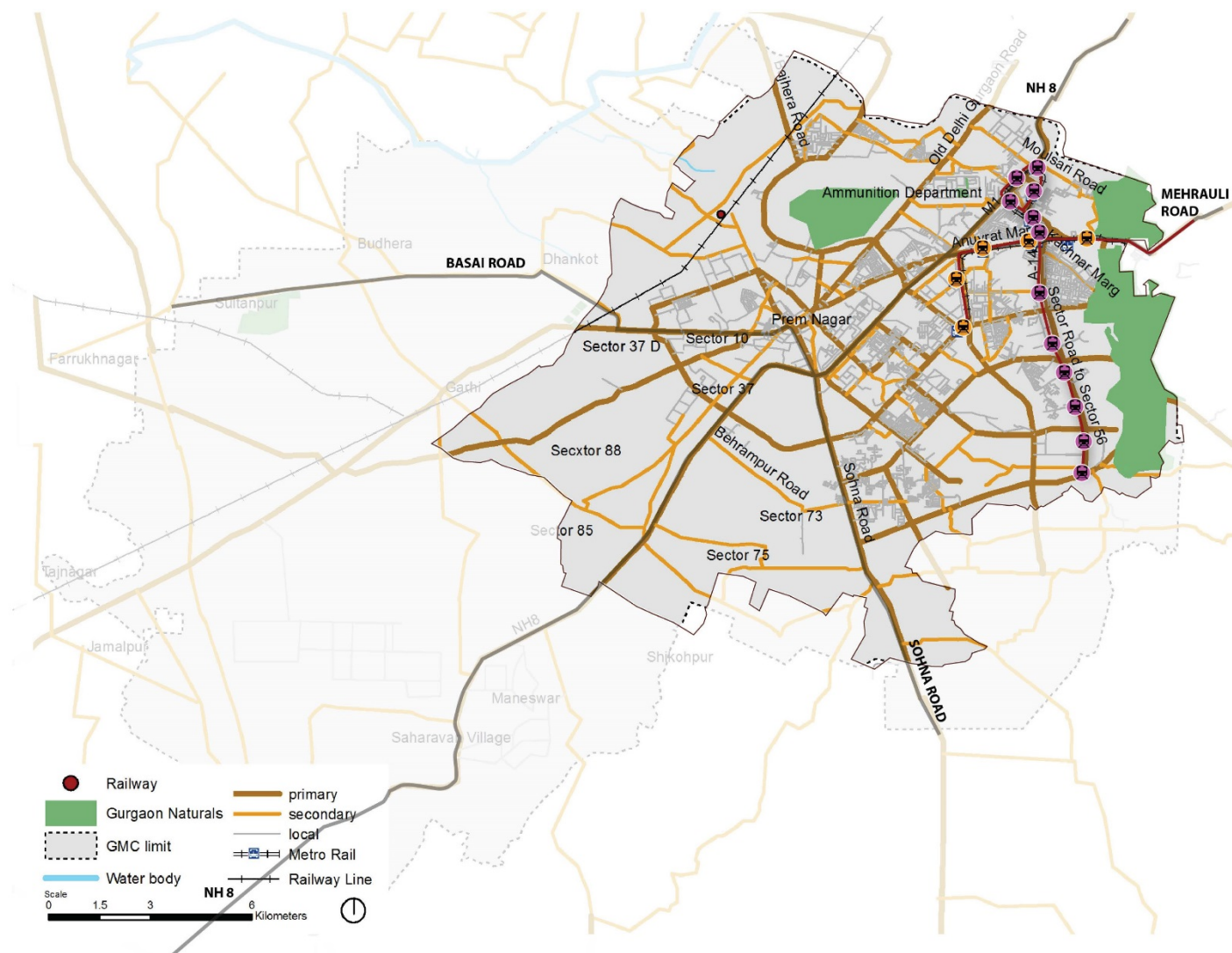
Road Network Map
City Specific Plan - Gurgaon
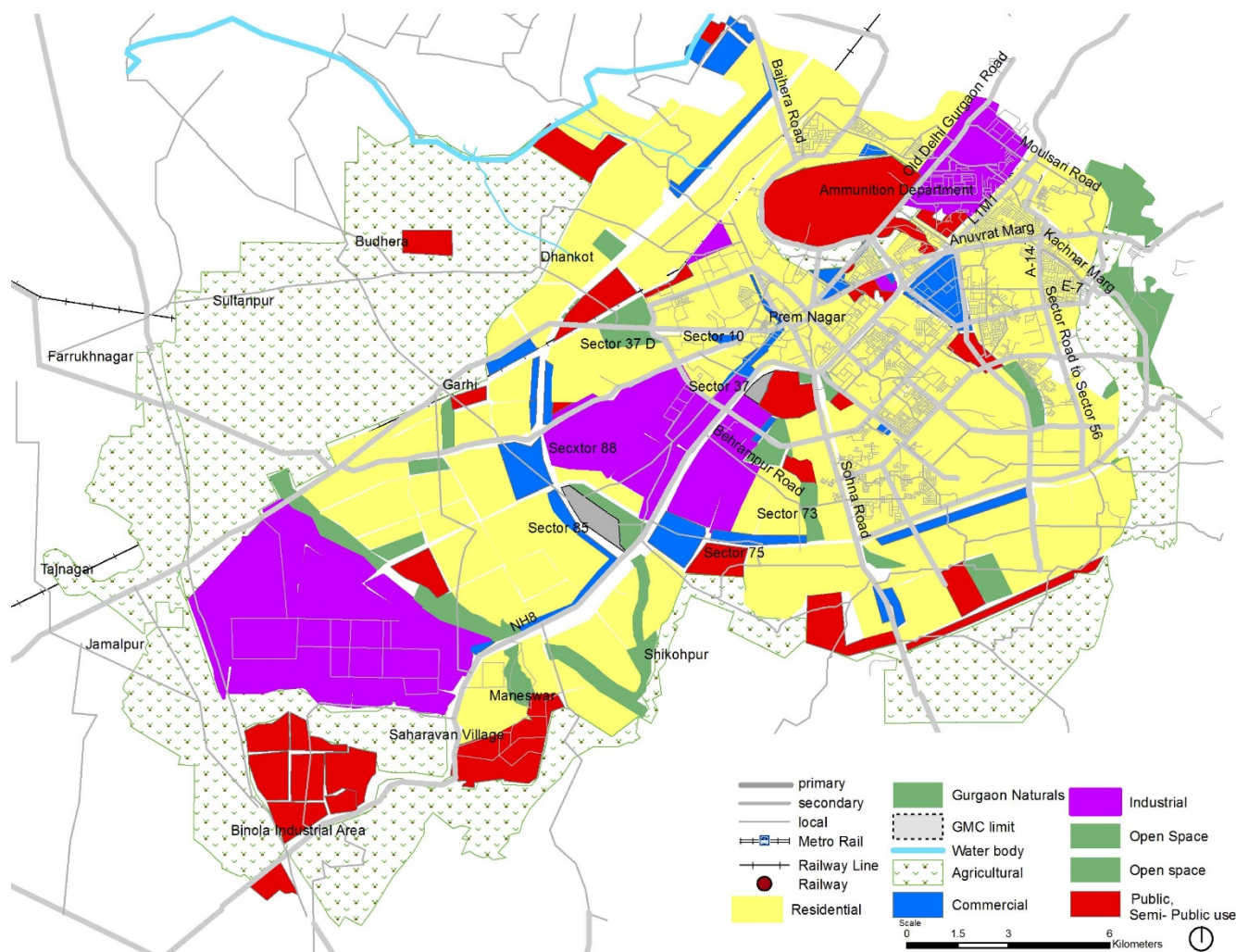
Guidance Document For Public Bike Sharing Scheme

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Legend:
- primary
- secondary
- local
- Metro Rail
- Railway Line
- Railway
- Residential
- Gurgaon Naturals
- GMC limit
- Water body
- Agricultural
- Commercial
- Industrial
- Open Space
- Open space
- Public, Semi- Public use

Scale
0   1.5   3   6
Kilometers

Proposed Land Use Map
City Specific Plan - Gurgaon

Guidance Document For Public Bike Sharing Scheme

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Proposed Bike Lane Map
City Specific Plan - Gurgaon

Location	Peak Hour	count
IFFCO Chowk	18.00-19.00	1706
Rajiv Chowk	18.00-19.00	1115
Sethi Chowk	18.45-19.45	1115
Near Bus Stand	18.00-19.00	1002
Sukhrali Chowk	18.15-19.15	999
Prakash Puri Chowk	8.15-9.15	988
MG road	8.00-9.00	856
Shankar Chowk	10.15-11.15	695
Fountain Chowk	8.00-9.00	693
Vishwakarma road	9.00-10.00	590
Sheetla Mata Mandir chowk	9.15-10.15	294

2000 Pedestrian Count

■ Pedestrian Count

Key Map

Guidance Document For Public Bike Sharing Scheme

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Pedestrian Count Map
City Specific Plan - Gurgaon

IBI

Legend

Primary Roads
Secondary Roads
Local Roads

Population Density
Person per hectre (ppha)

0
1-50
50-100
101-150
151-200
201-250
251-300
> 300

Scale
0   1.5   3   6
                    Kilometers
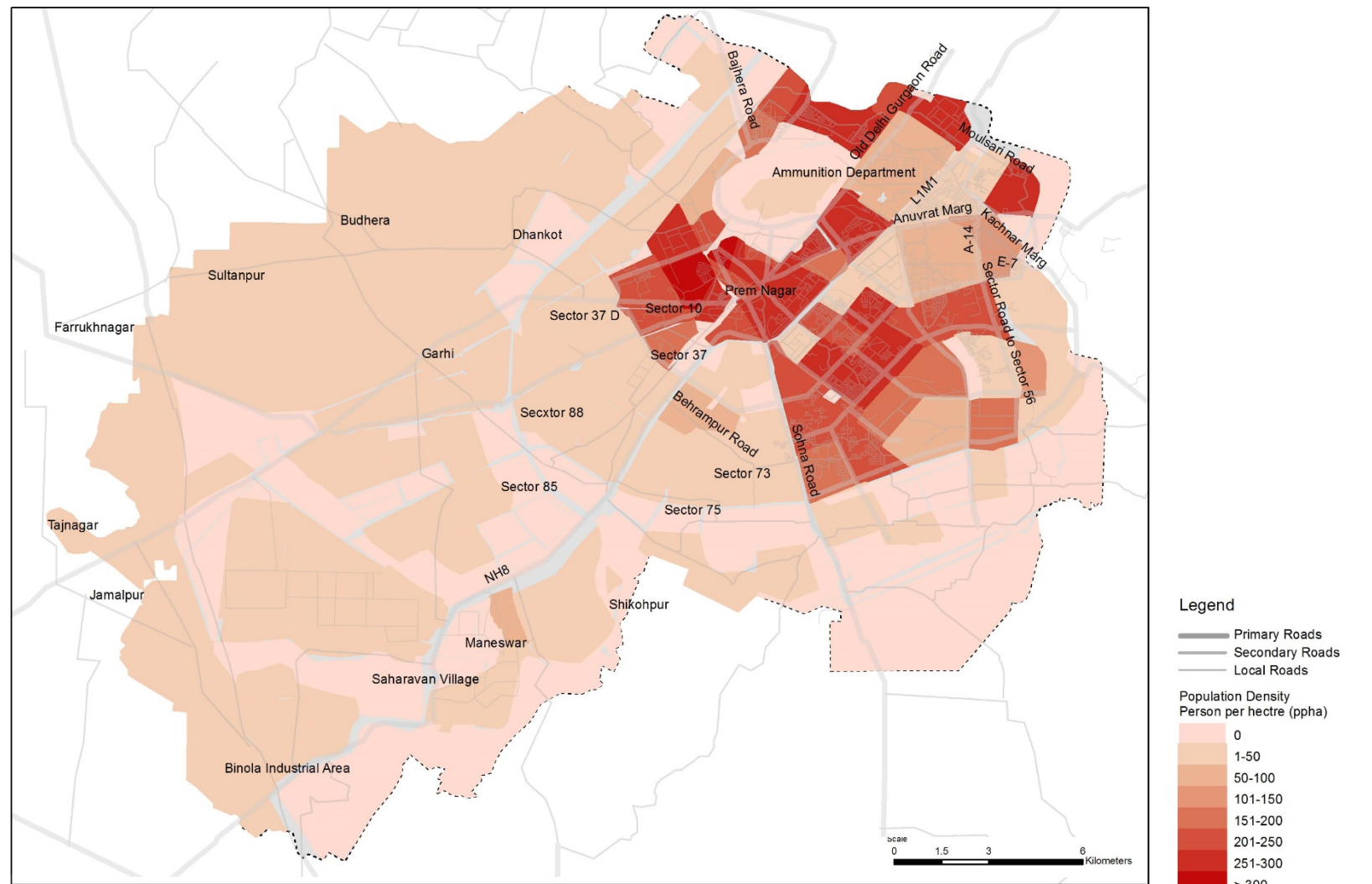
Guidance Document For Public Bike Sharing Scheme

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Population Density Map
City Specific Plan - Gurgaon

Schools and Colleges
DMRC Stations
Rapid Metro Stations
Metro Track

0   1.5   3   6
Kilometers

Legend:
- Residential
- Recreational
- DMRC Stations
- Rapid Metro Stations
- Railway Station
- Bus Stand
- Commercial
- Religious/Health Care
- Metro Track

0   1.5   3   6
Kilometers
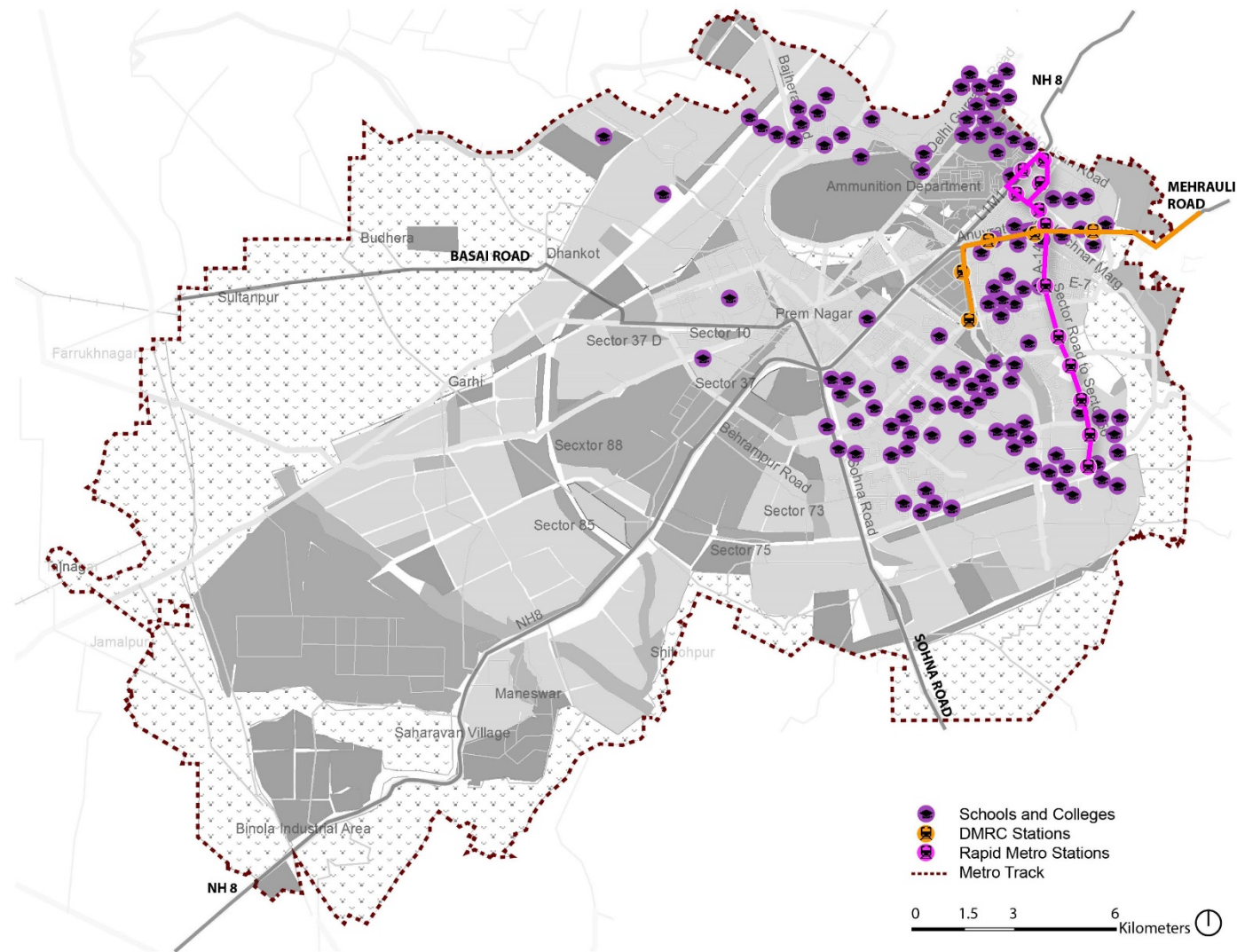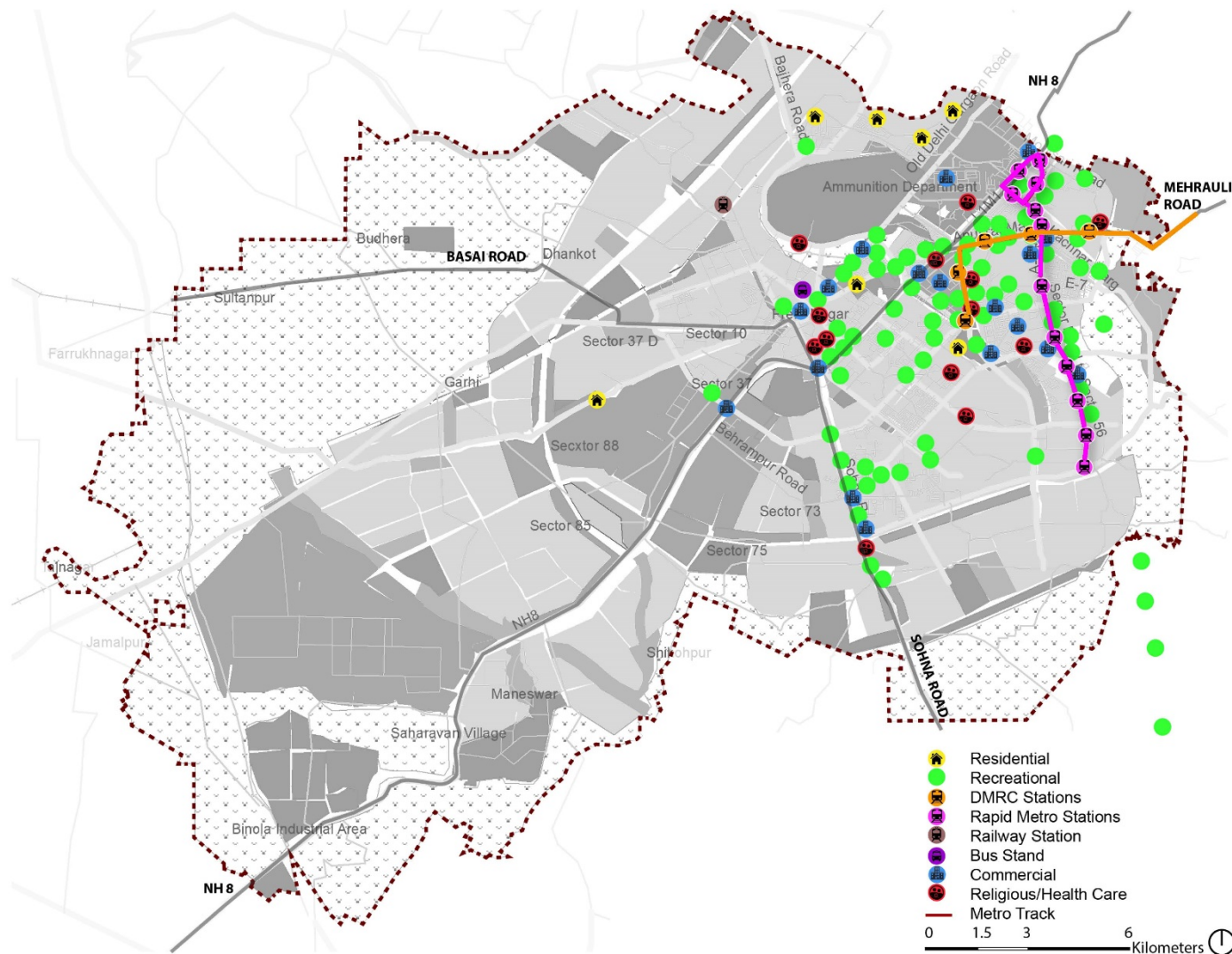
Guidance Document For Public Bike Sharing Scheme

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Existing School and Colleges
City Specific Plan - Gurgaon

Low Density

High Density

Primary Roads
Secondary Roads
Local Roads

Scale
0   1.25   2.5   5
Kilometers

NH 8

MEHRAULI
ROAD

BASAI ROAD

SOHNA ROAD
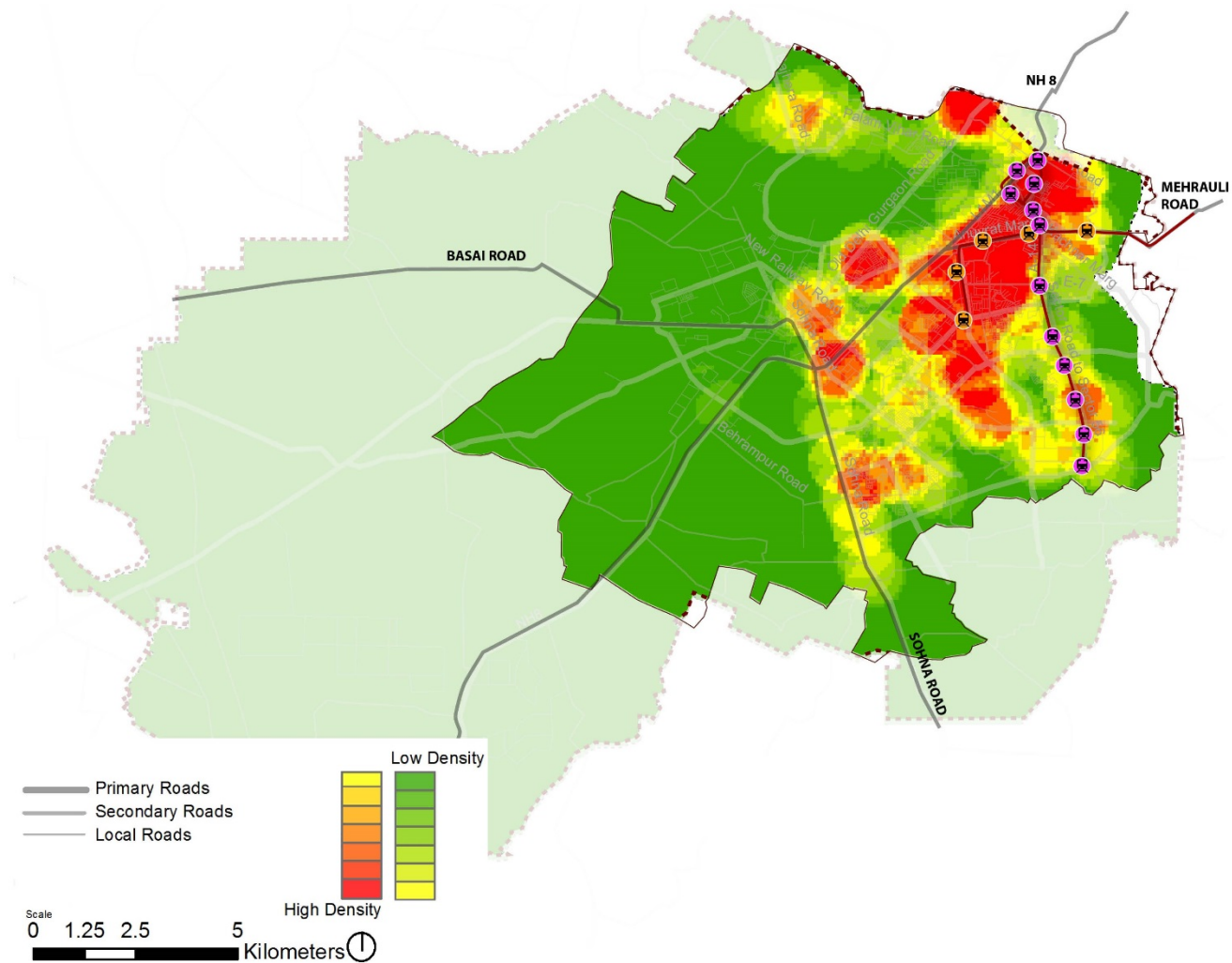
Guidance Document For Public Bike Sharing Scheme

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Heat Map based on activity/transit nodes
City Specific Plan - Gurgaon

APPENDIX – B

Phase 1
Phase 2
Phase3
Metro Track

0   1.5   3   6
                    Kilometers
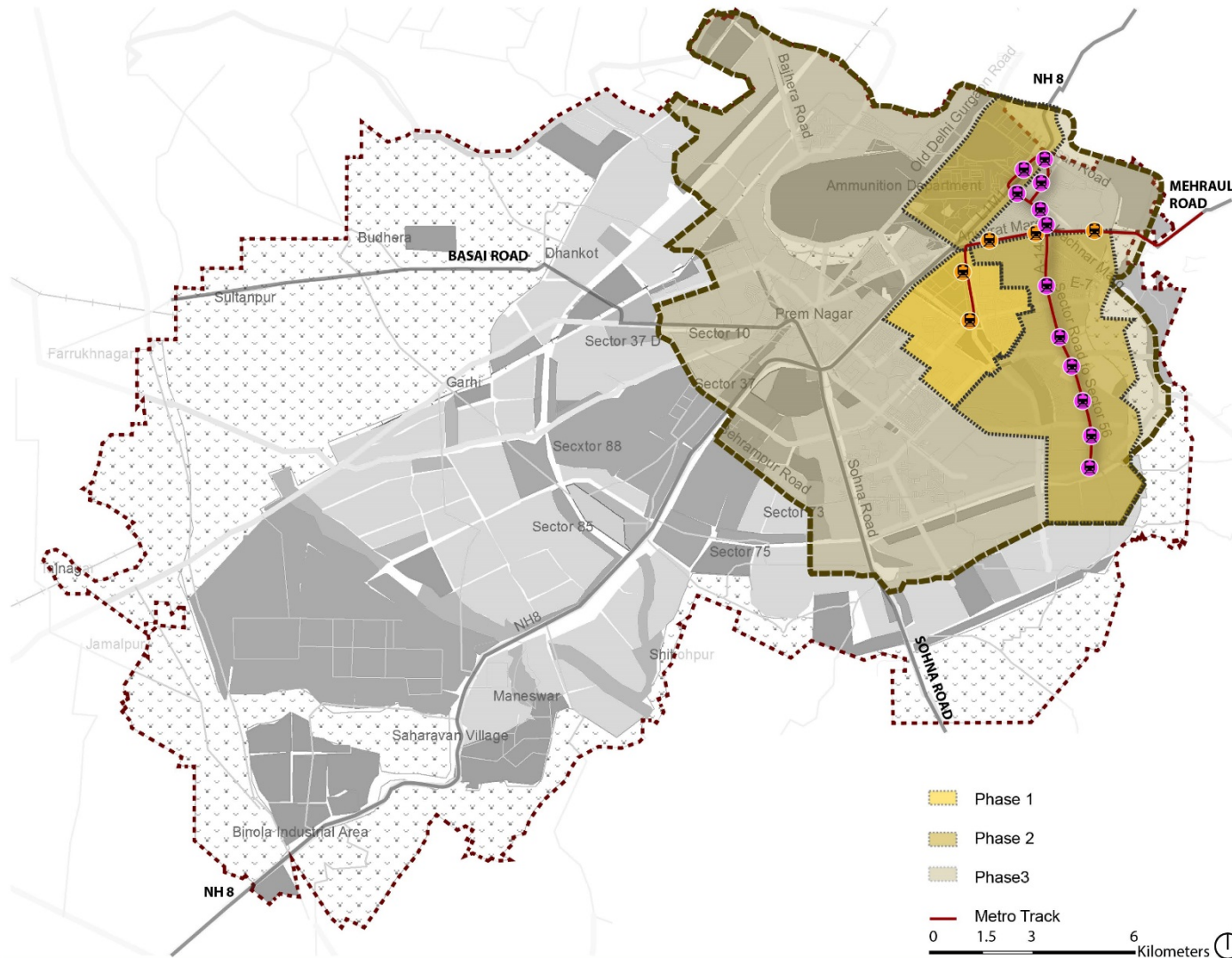
Guidance Document For Public Bike Sharing Scheme

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Proposed Phasing Map
City Specific Plan - Gurgaon

IBI

Legend:
- Housing
- Recreational
- Commercial
- Religious/Health Care
- Metro Track
- Boundary Line
- Metro Station
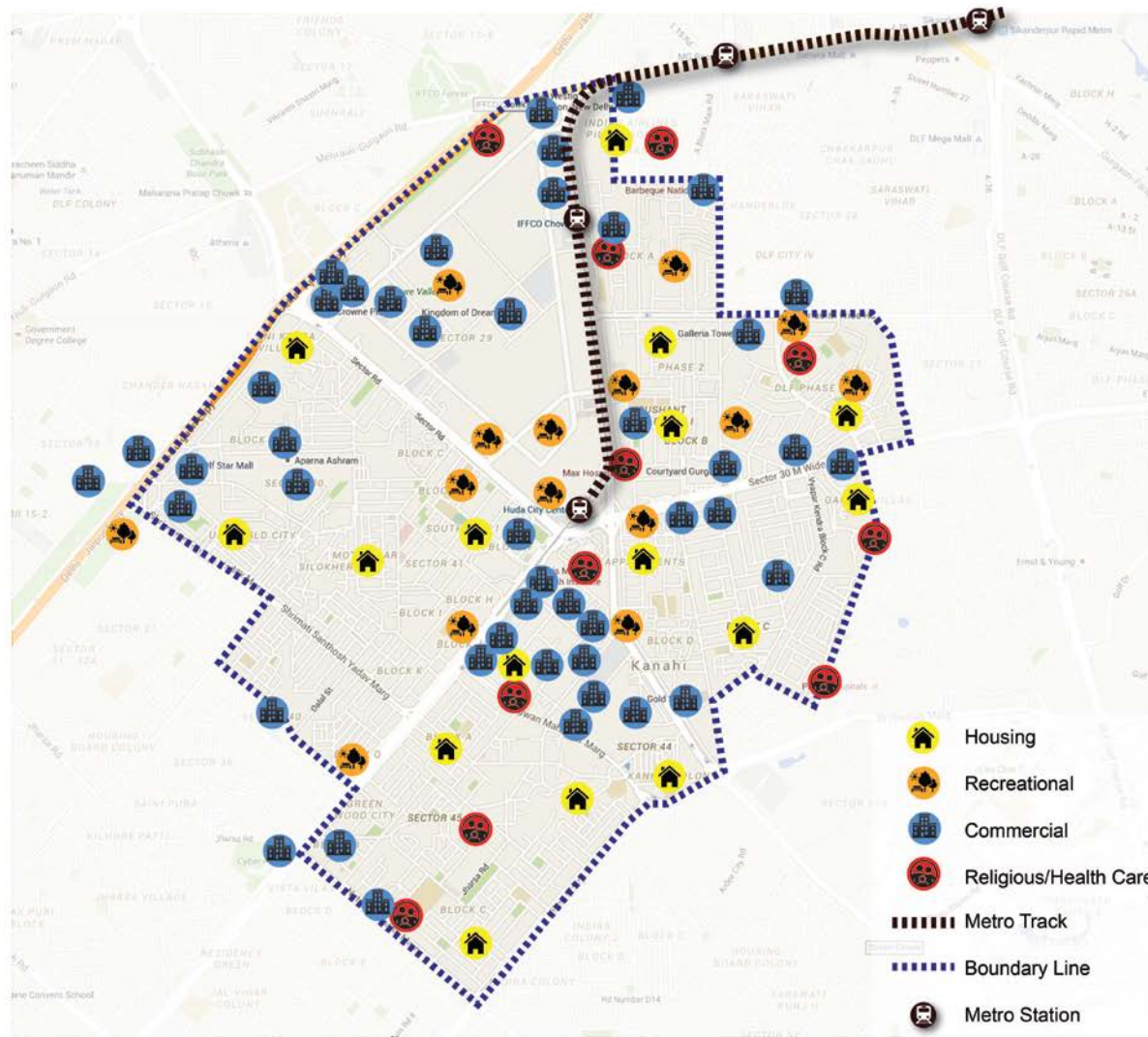
Existing Destination Map
City Specific Plan - Gurgaon

Legend:

▮▮▮ Metro Track

▪▪▪ Boundary Line

🚉 Metro Station

(xx) ROW

▬ ▬ ▬ Arterial Road

– – – Collector Road

– · – · Local road
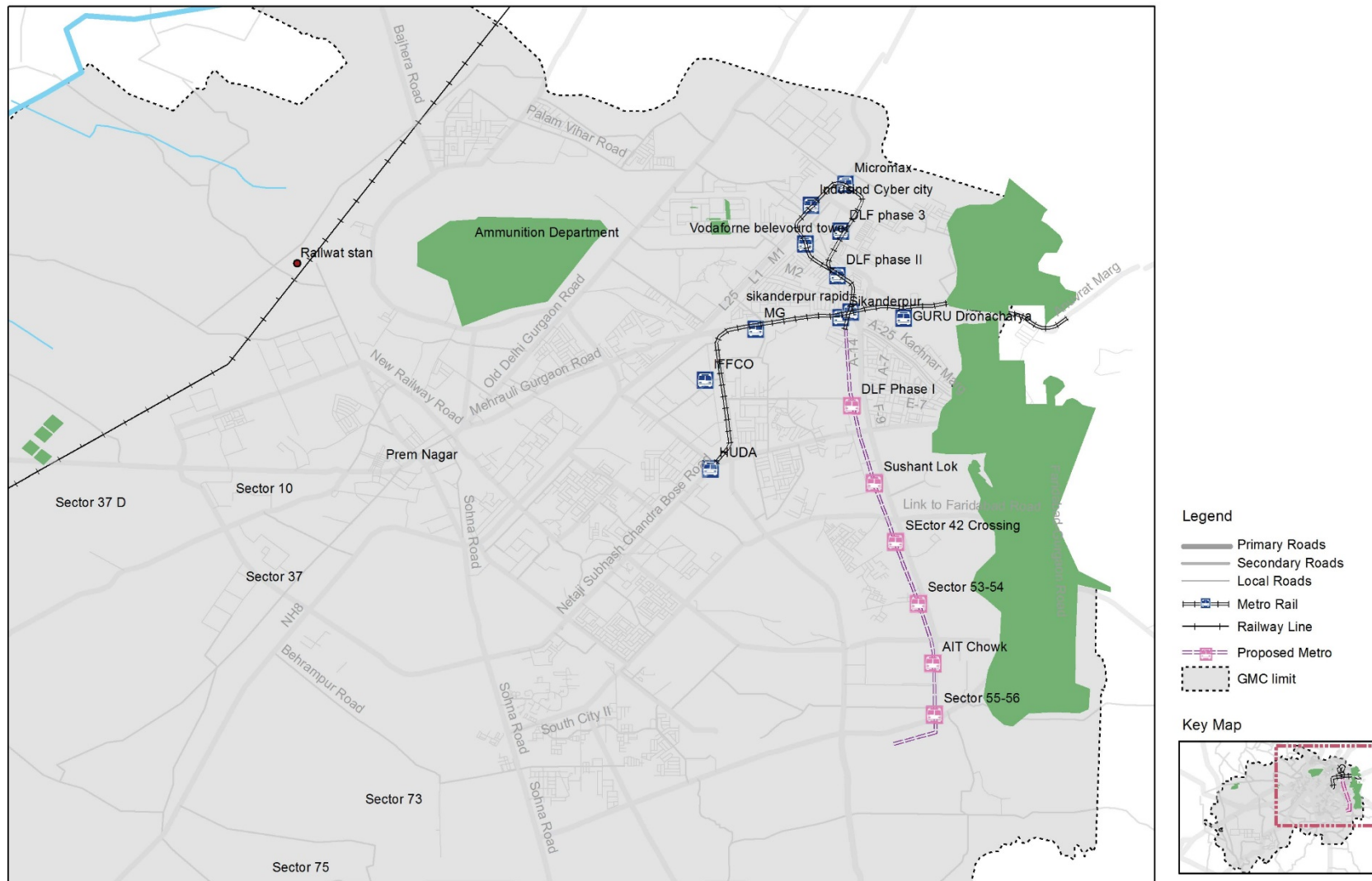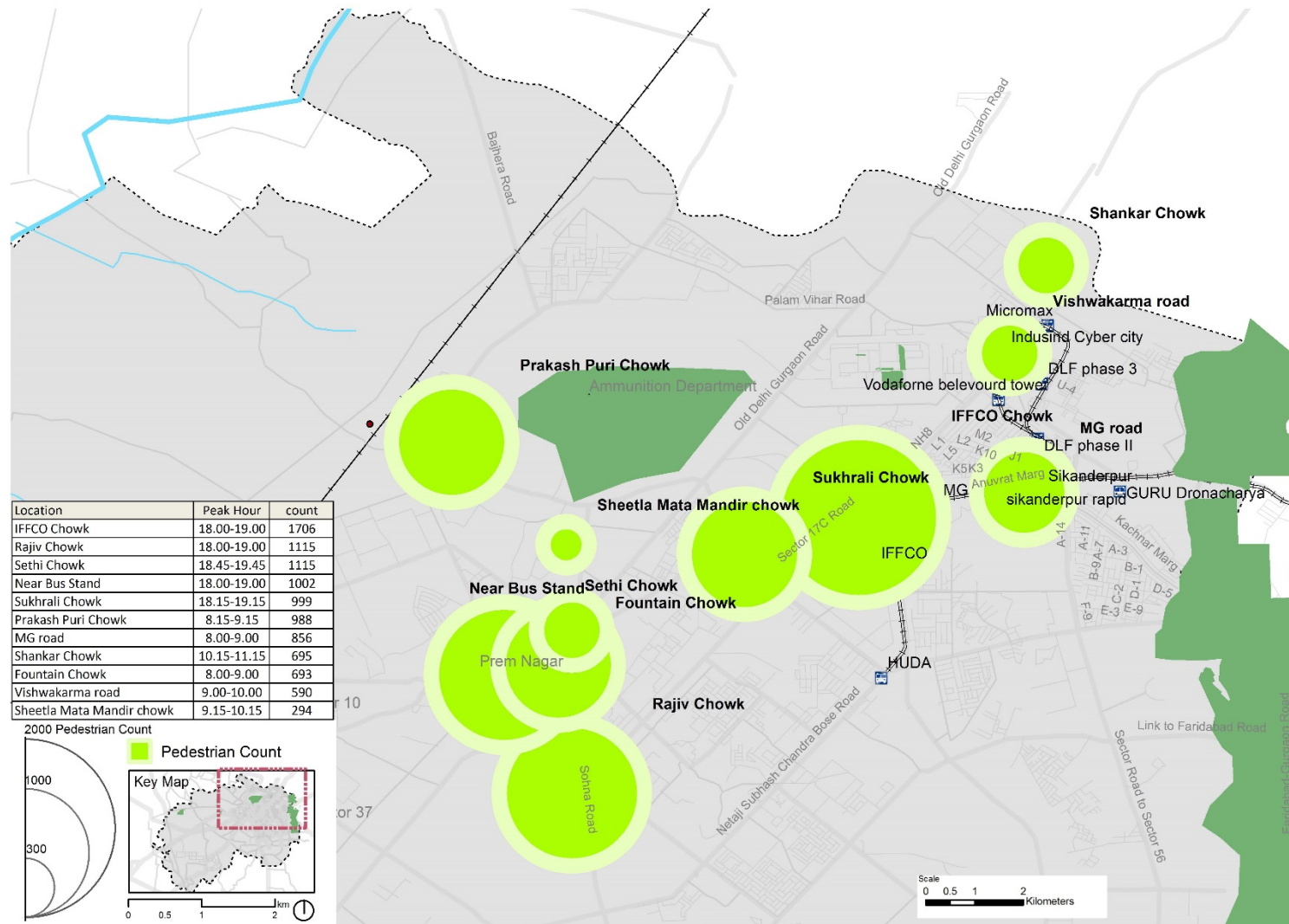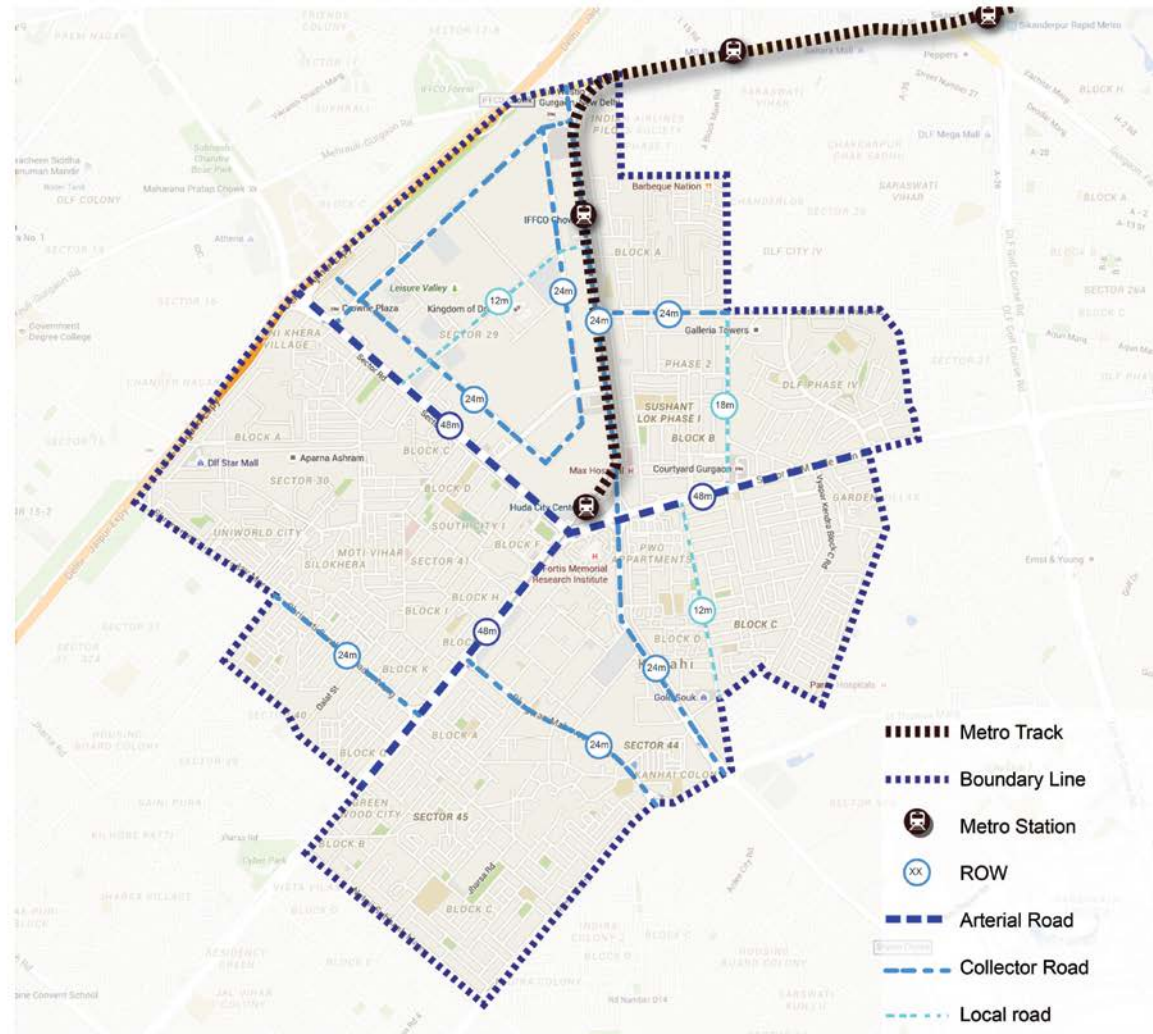
Guidance Document For Public Bike Sharing Scheme

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Existing RoW Map
City Specific Plan - Gurgaon

IBI

Metro Track
Boundary Line
Metro Station
Proposed Cycle Lane
Existing Cycle Lane

Proposed Bike Lane Map
City Specific Plan - Gurgaon
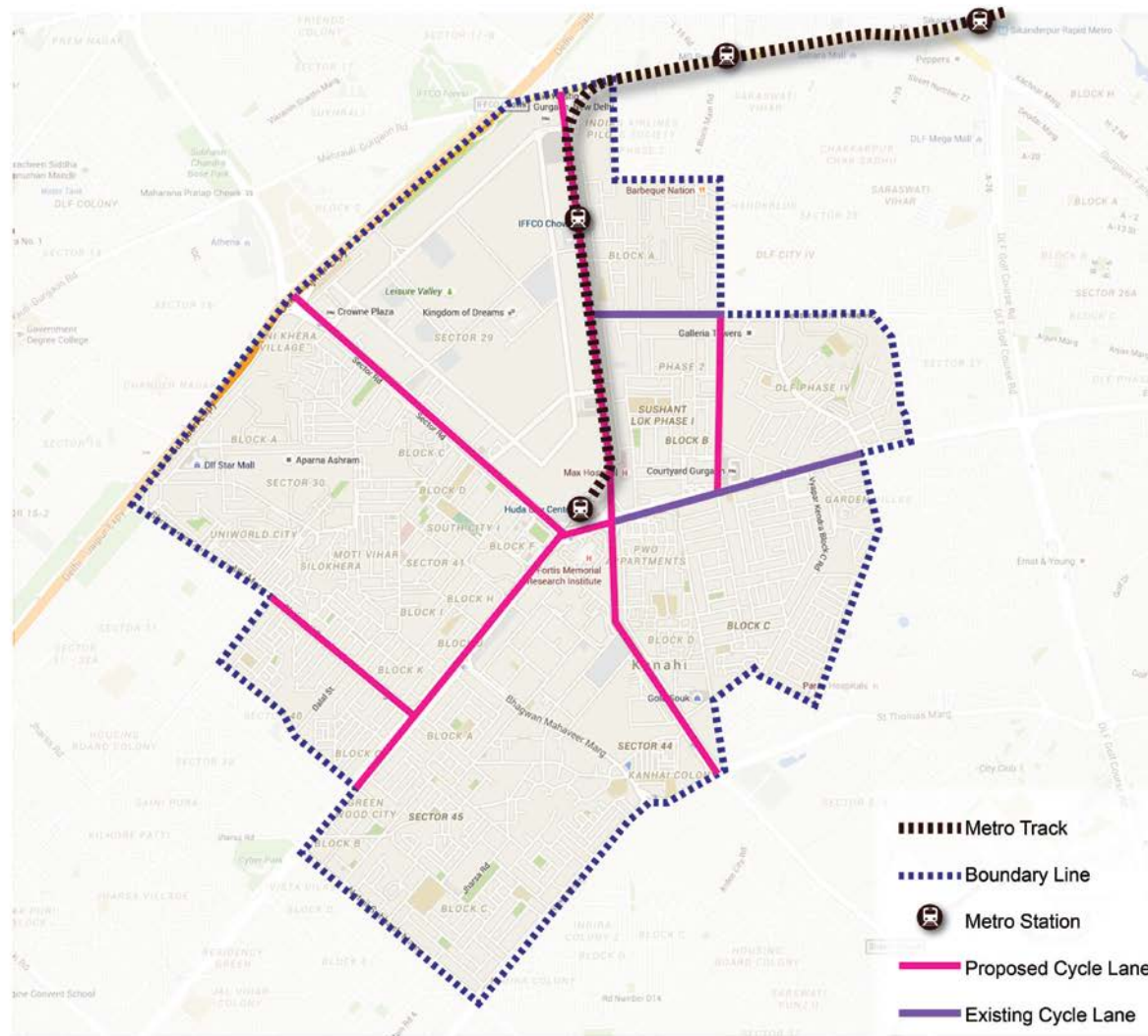
S	Small Docking Station
M	Medium Docking Station
L	Large Docking Station
▬▬▬	Dedicated Bicycle Lanes
▮▮▮▮▮	Metro Track
▪▪▪▪▪	Boundary Line
🚈	Metro Station
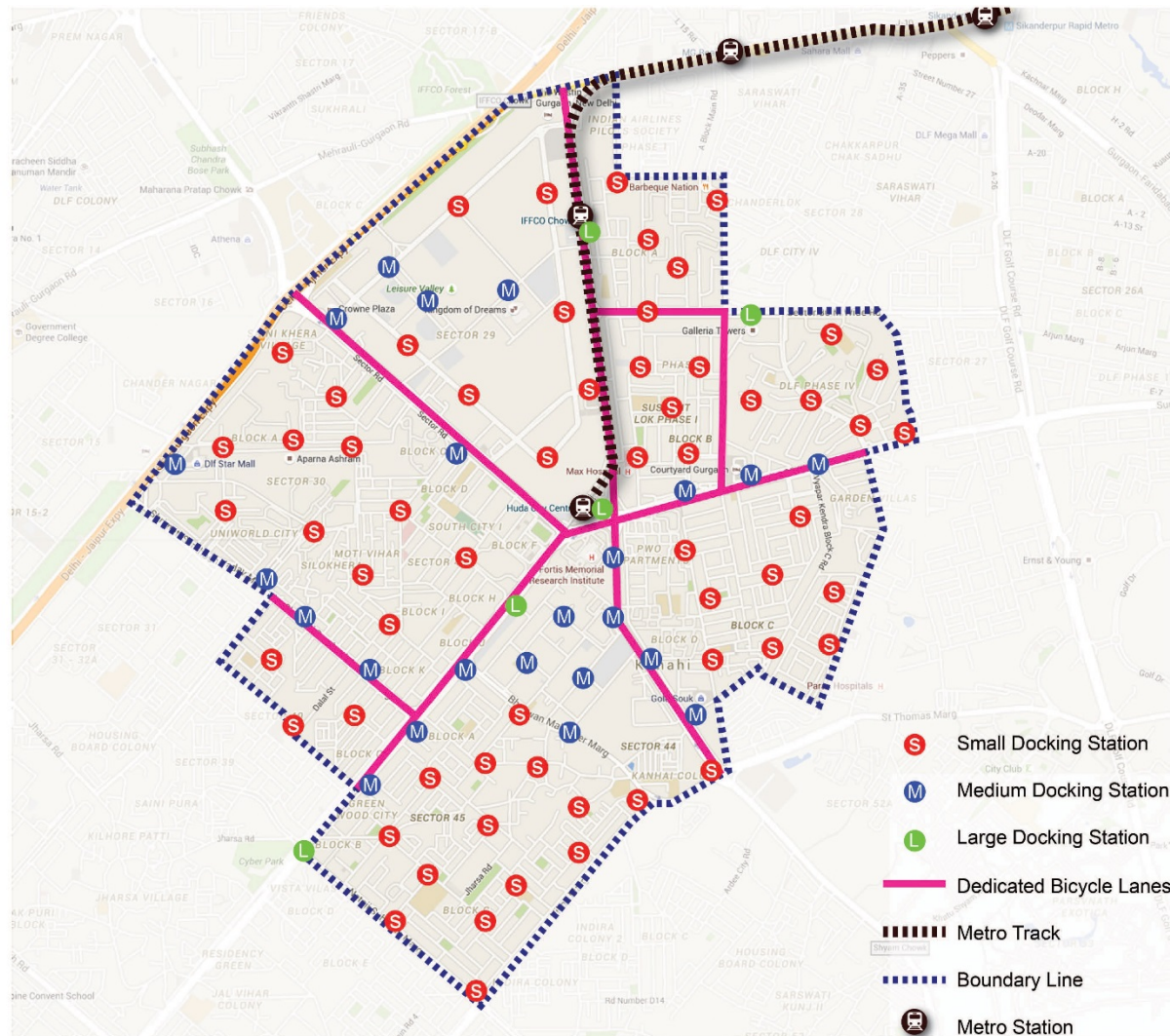
Proposed Docking Station Map
City Specific Plan - Gurgaon

Metro Track
Boundary Line
Metro Station
Major Intersections
Minor Intersectons

APPENDIX – C

Bus routes of Gurgaon| Source: Haryana Transport Department

Route No.1

Mahavir Chowk – Sec-12 – Sheetla mata mandir – Palam vihar – Columbia Asia hospital – ITM university – Sec.23 – Sec.22 market – IDPL – Dundhera border back – IDPL – Maruti udyog –Atul Kataria chowk – Sec.14 – Mahavir chowk

Route No.2

Mahavir chowk – Railway station – Parkashpuri chowk – Sec-4, 7, 9, 9A – Sec.10 Umang Bhardwaj chowk – Hero Honda and back.

Route No.3

Huda city centre sec -29 metro station – signature tower – IFFCO chowk – M.G.Road metro – Sikenderpur metro – Bristol hotel – Golf course – Sec.43,42 – Genpact- AIT chowk – Sec-58 – Basera chowk – Kendriya vihar – Devi lal botanical park – Wazirabad – ARDEE city – Gold souk – Huda city centre sec-29

Route No.4

Sec-29- Metro station – Sec-41,45- South city – Sec 40 – Cyber park – Sec-39,46 – Bakhatwar chowk – Nine X – South city – Sec-49 – Nirwana – In field garden – Sec-46,51 – Sec-52 – Sushatnt lok – Paras hospital – Zen park – Global flyover – sec-27 – DLF phas-4 – Sec-29

Route No.5

Rajiv chowk – Medicity hospital 32, 39 – Golory food court–31, 40- South city-I- Unitech building 45,46 – Artimis hospital – B.P.T.P freedom park – AEZ sec 62,65,66 – Nine X road – Bhakthawar chowk – Medicity hospital – Rajiv chowk

Route No.6

IMT maneser – Rampura – Kherki daula – Narhingpur – Hero Honda chowk – anaz mandi – Shanti nagar – Raj nagar – Rajiv chowk – Sec- 15 chowk – Sec-31 Chowk – Singature tower – Iffco chowk – Atlas – udyog vihar – Rangpuri – Palam more – Daula kuan and back

Route No.7

Gurgaon via IFFCO chowk – M.G.road metro STn – Sikenderpur metro STn – D.T.Mega mall – Golf course – Genpact – DLF phase -V- AIT chowk – Huda office – Kendriya vihar – Wazirabad – HUDA city center sec- 29 metro STn – Bakhtwar chowk – Subhash chowk – Rajiv chowk – Sohna adda – Bus stand Gurgaon

APPENDIX – D

How A PBS system works?

Register →

Register online through system web portal or manually from station. After registration and authentication of data, user will be given smart card/key/code for subscribed period

ONLINE | AT STATION

Take → **Ride** → **Park**

TAP AND TAKE THE BIKE | | INSERT THE BIKE BACK IN THE SLOT THATS IT!!
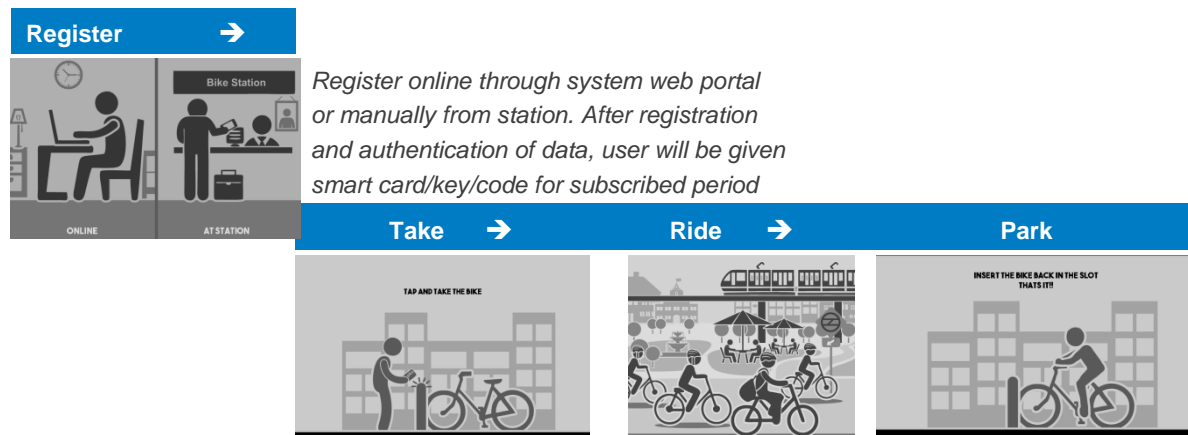
The user needs to register to the system, either online from system website or manually from authorised PBS station. On registration user will be given key/card or code against his/her subscription only after authentication of user identity. He/she can release system bicycle from dock using card/key/code, take ride to desired destination. First 29 minutes ride will be free, after that user will be charged with nominal fee. User may dock the cycle back in any PBS station, in case the station is full and no dock is available, a grace period of 10 minutes will be given to the user to go to next closest station and park.

APPENDIX – E

Typical cross sections of road with NMT infrastructure
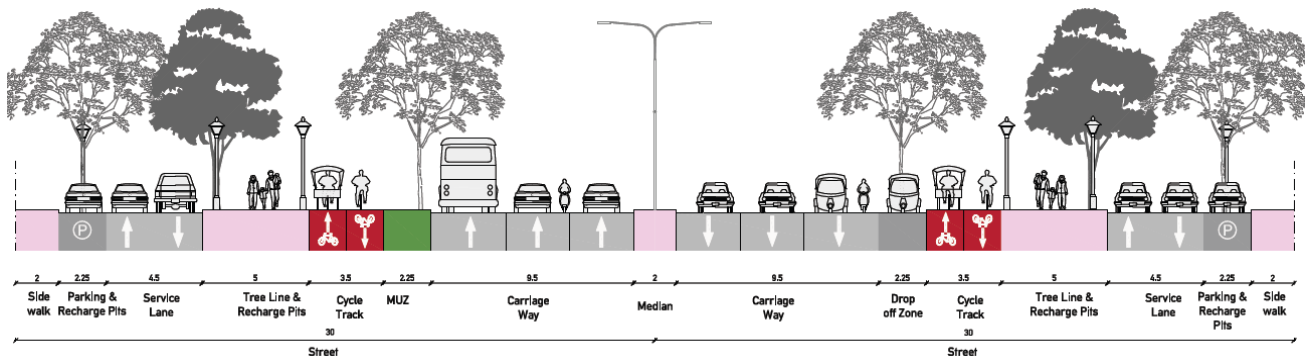
Typical 60m road section
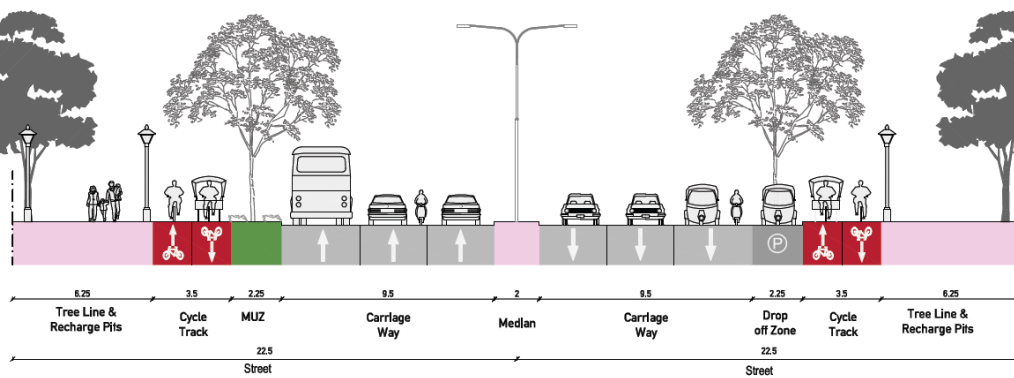
Typical 45m road section
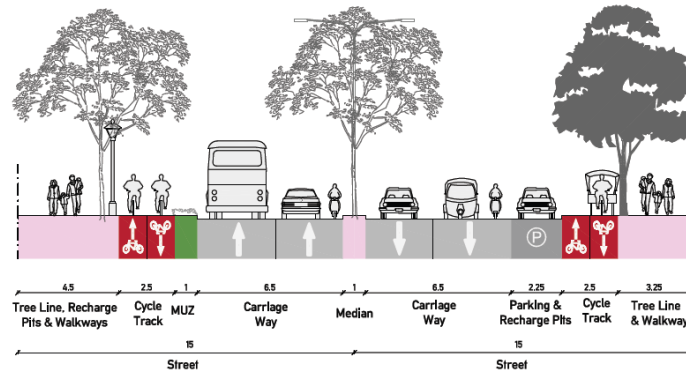
Typical 30m road section
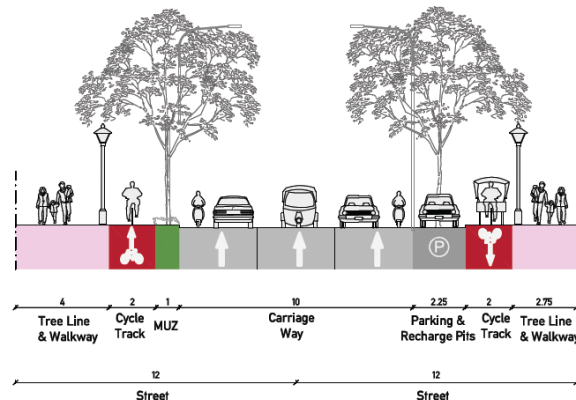
Typical 24m road section

APPENDIX – F

PBS TOR FOR GURGAON

1. INTRODUCTION

1.1. Project Background

Gurgaon is located in the state of Haryana and falls under National Capital Region (NCR). Gurgaon is one of Delhi's four major satellite cities which emerged as one of the leading financial and industrials hubs in India. Municipal Corporation is the governing body of Gurgaon since 2008. The city has witnessed tremendous growth in the last decade with development in various sectors such as IT, BPO, Commerce and Industries. This has led to a subsequent rise in population and private vehicle ownership in the area leading to congestion, pollution and accidents.

To alleviate these problems the Municipal Corporation of Gurgaon plans to introduce a citywide public bicycle based transportation system to provide a low-cost, environmentally friendly mobility option to city residents as well as to the tourists. The Public Bicycle Sharing (PBS) will be available through a network of cycle docking stations at specific sites. The PBS System shall enable users to check out cycles at one station and return to any other station in the network. The implementation of the PBS System shall be completed in phases; this TOR applies to the implementation of the Phase 1 of the project.

1.2. Project Goals

The overarching goals of the project are as follows:

- Increase bicycling modal share to 20% from the existing 8% over the next 5 years
- Ensure first and last mile connectivity to Metro System through PBS
- Reduce carbon emissions to safe limits at any location in the city
- Provide safe bicycling physical infrastructure across the city within 5-10 years
- Make PBS available within a 2 minute walking distance across the city in the next 10 years

The Municipal Corporation of Gurgaon wishes to hire a *Project Management Consultant (PMC)* to assist the corporation in planning and implementing the PBS system. The PMC's role shall include:

1. Development of a PBS Phase 1 Detailed Project Report by studying the existing City Specific Plan (CSP) for PBS for Gurgaon city.

2. Preparation of Bid Documents and Bid Process Management for hiring of:

    a) Design-Build-Operate-Transfer (DBOT) Contractor

    b) NMT Infrastructure Construction Contractor

    c) Monitoring and Evaluation Consultant

3. Contract and Quality Management

4. Development of Marketing and Branding Plan

5. Public Outreach

The PMC will provide the services described above over a period of five (5) years.

1.3. Service Area

Majority of population of Gurgaon resides in the northeastern part of the municipal limits in MCG serviced by the Metro rail. To ensure maximum use and integration with public transit, Phase 1 of the project shall be implemented around the HUDA metro station. The preliminary phasing details are available in the Gurgaon City Specific PBS Plan (see map). The system shall be expanded in the subsequent phases.
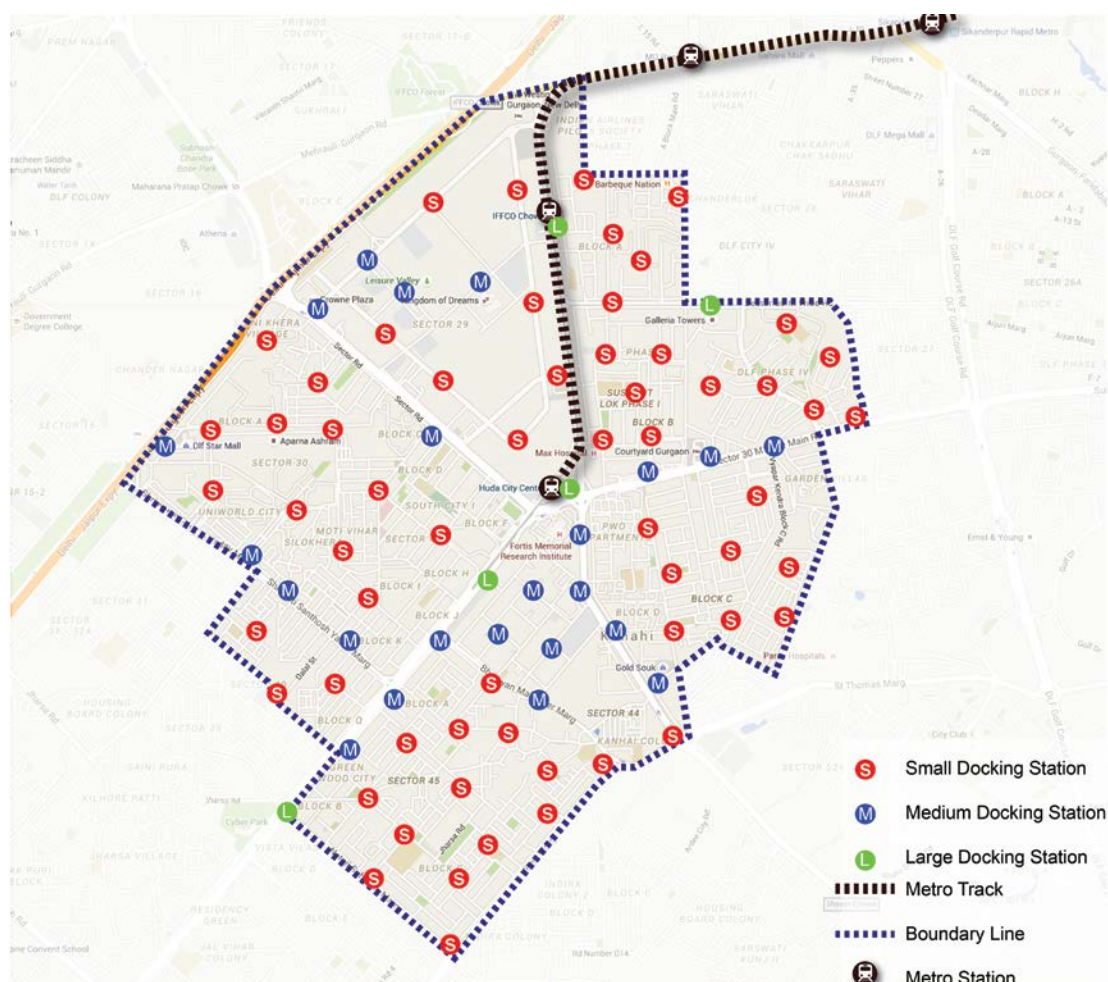
Map 1: Conceptual Representation of Phase One

1.4. PBS System Features

The PBS System is envisioned to be a fully automated public bicycle sharing system. A preliminary system design has been developed as part of the Gurgaon PBS City Specific Plan. According to this Phase 1 of the system comprises of the following key components:

Component	Item	Quantity
Hardware	Non-Geared Bicycle with GPS	1260
	Dock (Electronic)	1890
	Terminal at PBS Station	121
	Redistribution Vehicles	13
	Maintenance Vehicles	1
Civil Infrastructure	Control Centre	1
	Station - Small	60

Component	Item	Quantity
	Station - Medium	23
	Station - Large	5
	Maintenance Garage Set-up	2
Software	Central software	1
	Mobile and Web Applications	1

1.5. Transit Integration

Seamless interoperability of the public bicycle share system and the metro system is desirable. The PBS System must be provisioned to integrate with the DMRC and Rapid Metro operations in the following key aspects:

1. Integrated fare and payment system

2. Passenger Information System – The PBS stations near metro stations must have metro information signs. Similarly way-finding and informational signage about the PBS stations should be provided at metro stations.

3. Trip planning applications should be able to provide information on seamless transfers from metro to PBS.

2. BROAD SCOPE OF WORK

The Municipal Corporation seeks to prepare detailed designs and implement Phase 1 of the PBS Plan. The PMC shall provide the following services:

2.1. Development of a PBS Phase I Detailed Project Report:

This includes preparation of a Detailed Project Report (DPR) for the Phase 1 and its area of influence as identified in the PBS city specific plan. It would consist of the following steps:

Task 1: Establish a Baseline

The PMC shall vet out the preliminary assessments made in the City Specific Plan for PBS in Gurgaon by reassessing the:

i.   Demand and need for PBS based on analysis of activity and mobility patterns.

ii.   The current state of the infrastructure for PBS implementation – audits to establish level of service

iii.   Regulatory, legislative and institutional ecosystem of stakeholders and their capacity to run the system.

iv.   Budgetary analysis and financial systems of the Municipal Corporation for the implementation of Phase 1

Task 2: Prepare a PBS service plan and design guidelines for Phase 1 and its area of influence:

The PMC shall:

i.   Finalise the number of cycles, stations and number of docks at each station based on the demand assessment.

ii.   Finalise the placement and prioritization of PBS stations based on detailed demand assessment.

iii.   Develop a redistribution system and finalise the necessary infrastructure and manpower required for redistribution

iv.   Reassess financial feasibility of full automation of PBS system on the basis of target consumer and their paying capacity.

v.   Refine hardware and software designs and specifications.

vi.   Design PBS station areas to integrate with the existing surroundings.

vii.   Provide for seamless integration with the Delhi metro with respect to payment systems, way finding, trip planning, user experience, and real-time operational data for efficiency gains.

Task 3: Prepare designs and working drawings for NMT infrastructure improvements.

i.   Identify the missing links for connectivity and additional recreational routes.

ii.   Suggest strategies for retrofitting existing infrastructure and planning new infrastructure for PBS use, especially along identified cycle routes.

iii.   Design of information systems, maps, ITS, signage and other user interfaces.

Task 4: Develop a Monitoring & Evaluation Framework.

    i.   Identify the parameters that influence the PBS System from transportation, environmental and social perspectives etc.

    ii.   Define the process of establishing a baseline for the PBS System

    iii.   Define the type and frequency of primary and secondary data collection activities for monitoring and evaluating the identified parameters.

    iv.   Define reporting structure clearly specifying the outcome required from the subsequent surveys and data collection activities.

2.2. Preparation of Bid Documents and Bid Process Management

Task 1: Preparation of Bid Documents for the following components

    a)   Design-Build-Operate-Transfer (DBOT) Contractor – Specifications and BOQ

    b)   NMT Infrastructure Construction Contractor

    c)   Monitoring and Evaluation Consultant

    i.   The PMC shall identify the scope of work to be executed under each of the above components after detailed discussions with MCG

    ii.   The PMC shall as a part of the bid preparation shall conduct a market research to understand the qualifications and the capabilities of the bidders for the said components

    iii.   The PMC shall encourage the prospective bidders to attend a Bidder Workshop to be hosted by MCG for feedback on the process being adopted for various components of the PBS System

Task 2: Provide Cost Estimates

    i.   The PMC during this stage shall work out the time duration required to efficiently carry out the work under each of the components

    ii.   The PMC shall also finalise the team for each component to be provided by the bidder and the qualifications, duration of each of the team member (especially for the technical assistance studies)

    iii.   The PMC shall advice MCG on the advantages and risks of going for a global bid for the components and advice MCG suitably to arrive at a decision which shall help the execution of the project with optimum resources

    iv.   The PMC shall provide detailed cost estimates for all the components of the various bids in a detailed manner keeping into account all the above considerations.

Task 3: Provide pre bid tendering services and bid process management

    i.   The PMC on behalf of MCG shall prepare all the tender documents as per the standard procedures of MCG working closely with the contracts and the accounts team of MCG.

    ii.   The PMC shall be responsible for compiling and drafting the replies for all the queries received from prospective bidders.

    iii.   Once the bids are received from the bidders for various components, it is the PMC's responsibility of evaluating and preparing the capability ranking of all the bidders. The PMC has to maintain strict confidentiality during this process and is not permitted to talk directly with any of the bidders during this stage.

Task 4: Selection of Contractors & Consultants

    i.   The PMC shall participate in the contract negotiations and scope finalization with the most preferred bidder in presence of MCG officials at all times.

    ii.   The procurement expert from the PMC shall be responsible for identifying the project risks and advising MCG suitably at all times

2.3. Contract Management and Quality Control

Task 1: Quality Control and Testing of Equipment and Installation

    i.   The PMC shall have staff on ground during this entire duration to ensure that the finalised contractor for various components is performing his duties as per the contract conditions in all respects

    ii.   The MC shall alert MCG in case of any contract deviations or where the contract conditions are ambiguous. The decision of MCG shall be binding on all parties in such cases and the PMC shall ensure that the decision is implemented by the contractor

    iii.   The PMC shall witness the testing of various equipment or material used for the project and shall certify their quality and applicability as per the contract on behalf of MCG.

    iv.   The PMC shall also supervise and monitor the work progress as per the timelines agreed and advice the contractors and MCG on the same, in case there is a technical complexity that arises, the PMC shall look into it in a detailed manner and address the same. An alternative approach should always be suggested by PMC in case of persistent delays due to any issue to ensure the project is on track.

Task 2: Passenger Fare Determination and Revenue Collection Systems

    i.   The PMC shall participate in fare determination deliberations in presence of MCG officials at all times.

    ii.   The PMC shall approve the identified sources of revenue generation and supervise the revenue collection system.

Task 3: Data Reporting

    i.   The PMC shall review and approve the refined monitoring and evaluation framework prepared by the M&E Consultant for continual monitoring of the system performance.

    ii.   The PMC shall ensure that the central software is capable of providing monitoring reports as well as raw data when desired.

    iii.   The PMC shall also review samples of all key operational reports and data that the contractor will use to monitor system performance and/or make operational decisions.

    iv.   Operations and Maintenance Plan: The PMC shall review and finalise the O&M plan in accordance with the contract with the DBFOT contractor.

Task 4: Transfer of Operations Plan

    i.   The general duration of the DBFOT operator for the PBS system can be around 5 years from start of operations. The PMC shall finalise the change management plan for transferring the operations to MCG or a new operator post the initial duration of the project.

    ii.   The PMC shall also be drafting a capacity building and a training programme for MCG within this duration to take over and review the performance of the PBS project post PMC services

2.4. Public Outreach and Marketing

The PMC will lead the marketing and branding tasks with implementation support from the DBOT Contractors.

Task 1: Community Outreach Plan: The PMC shall prepare a plan to meet stakeholders at various stages of the project and keep them abreast with the implementation process and receive regular feedback.

Task 2: The PMC has to submit a detailed year wise marketing plan indicating the list of activities and the estimated cost duly approved by the MCG. The PMC will be responsible for carrying out the approved marketing activities over a period of 5 years to promote Gurgaon Public Bicycle Sharing System. Apart from marketing activities the PMC will also be responsible for brand strategy development and implementation. The PMC has to make a logo and suggest a suitable name for Gurgaon Public Bicycle Sharing System. The logo and name are subject to approval by the MCG.

Task 3: During the first 6 months since the commencement date, the PMC will set up temporary manned sales kiosks at the 12 major docking stations. The kiosks shall provide print material on how the Cycle Sharing System works, conduct live demonstrations, and carry out other activities to inform potential users about the Cycle Sharing System. The kiosks will also accept Membership applications.

Before and after the commencement date of Gurgaon PBS, the PMC shall carry out marketing activities to promote the system as per the approved marketing plan.

3. DESIRED HARDWARE AND SOFTWARE SPECIFICATIONS

This section provides a list of specifications that are desirable but not binding for the purpose of this RFP. The DBOT Contractor is required to suitably modify the specifications as per the needs identified in the DPR.

3.1. Bicycle Specifications

A successful system will provide the following specifications for bicycles.

- Upright riding position for confident riding in traffic,

- Single-speed bicycle

- Lighting system compliant with all State and local laws that automatically illuminate when the bicycle is in use and remain on for at least two (2) minutes after the bicycle comes to a stop.

- Front, rear, and side reflectors

- Reliable and intuitive braking system

- Easy to operate, easy to mount and hold in stopped position

- Protection from grease, dirt, and tire spray, including enclosed drive train and full fenders.

- Cargo capacity for items such as a typical briefcase, book bag, and/or grocery bag weighing up to five kg, variety of sizes and configurations

- One size, which will fit users from 4'8" to 6'4" in height with tool-free seat only adjustment

- The bicycle shall be of unisex design with a frame that suits all individuals irrespective of gender

- Features designed to encourage ridership by women in traditional clothing

- Theft and tamper-resistant (potentially through use of components not compatible with other bicycles and/or requiring tools not commonly available)

- The bicycle shall be provided with a bell for alerting other road users if required

- The bicycle shall carry a unique ID for identification purposes

- Puncture-resistant tires

- Shall be provided with a front basket with a load carrying capacity of upto 5 kg without obstructing the movement of the handle

- Pedal-powered front/rear light system. Multiple power sources preferred.

- Kickstand or other device to allow bicycle to be supported upright

- Bicycles should look good in the urban environment and must be capable of being branded appropriately for a title sponsorship.

- Capacity for sponsorship or advertising that can be easily changed.

- The customer service telephone number on every bicycle with durable, weather resistant labels

- Colour customization

- Repair and maintenance manual included

- Parts and materials durable to withstand extreme weather conditions including extreme heat

- Useful life greater than five (5) years and a 5 year warranty preferred, but not required

- Fully protected or enclosed cables preferred

- Clearly visible space on bicycle for safety and instructional messaging

- If parts need to be modified or replaced if the software changes, they will be provided by the vendor at no cost.

- Equipment/software will be state of the art and easily upgradable.

- Active and/or Passive GPS tracking system integrated into the bicycle to recover missing or stolen bicycles, and to interface with website for personal health and performance data monitoring.

- Smart phone mount

- Ability to check in / check out without the use of a docking station

3.2. Docking Station Specifications

A successful system would address the following specifications for docking stations:

- Compliance with the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995, and other requirements of the municipality, institution and/or private landowner in positioning stations

- Capacity to maintain security of the system during a power failure or loss of system communication

- Flexibility to install stations outside or in a covered area (e.g., parking garage).

- Capacity to issue real-time reports between stations and headquarters to report number of bicycles per station to facilitate re-distribution and locate bicycles needing repair

- Kiosk and map panel options that adhere to MCG specifications.

- Ability to operate without need to connect to electrical grid (this may be accomplished by solar power or other types of alternative energy sources, as feasible); including employment of a backup power source.

- Smallest feasible footprint to enable installation in a location currently used as a parking space or on a wide sidewalk with a layout that does not impede pedestrian traffic and ideally has no components that extend horizontally beyond the bicycle containment area footprint.

- Aesthetic compatibility with streetscape and neighbourhood context, both when station is full of bicycles and when it is empty

- Adequate space at kiosk for a lighted map indicating both station locations and bicycle routes

- Way-finding attributes that include maps and destinations of interest and nearby stations in English and Hindi.

- Ability to prevent out-of-service bicycles from being checked out, along with an indicator showing whether a bicycle is available or out-of-service.

- Unified look-and-feel of all stations within the network.

- Capacity to convey safety messaging, bicycle laws and warnings affecting cyclists in an easy-to-read format in all lighting conditions in English, and Hindi.

- Stations that are modular, easily relocated, require minimal time to install/remove and do not leave behind attachment points that could trip a pedestrian or impede traffic or parking.

- Useful life greater than five years.

- Can be deployed without kiosk

- Lighted space at each station for advertising panel

- Visible customer service phone number

- Stations must be able to be branded by a title or station sponsor

- Parts and materials are durable to withstand close proximity or exposure to extreme heat and dust

- Includes an installation and use manual

- Users can choose which specific bicycle they would like to rent

- Out of service bicycles are easily identified.

- Capacity for station and major components (bicycle, docks, terminal) to self-report malfunctions and mechanical problems.

- Clear and prominent instructions directing users how to report problems or a bicycle in need of repair

- If parts need to be modified or replaced if the software changes, they will be provided by the vendor at no cost.

- Ability to distribute fare media (i.e. key fobs or RFID cards) that can simplify the checkout process for casual users.

- Docking stations should be designed in such a way that they can be flexibly deployed on a variety of surfaces, grades, and configurations. No electrical service will be provided but in the event the System Operator chooses to obtain electrical service, all appropriate permits for electrical service and construction will be required.

3.3. Docking Station Terminal Specifications

- The primary purpose of the terminal at the docking station shall be to control the docks linked to it

- The terminal shall wirelessly communicate to its associated docks

- Each terminal shall be capable to control upto at least 15 individual docks

- The terminal shall be externally powered.

- A UPS having a back-up to carry out operations for at least 4 continuous hours during power outages shall be provided

- The terminal shall have a very user friendly and user interactive GUI for the user to perform the intended functions on it.

- The terminal shall be of touch screen type with at least 8" (diagonal) of usable & interactive touch sensitive screen

- The terminal shall be able to display a zoom-able map of the PBS System at desired resolution

- The terminal shall have the capability to be made completely solar powered (optional)

- The terminal shall be a stand-alone structure with good quality mounting arrangement on the floor of the PBS Station

- The terminal shall be able to produce different audible, visible and viewable alerts based on the transaction type

- The terminal shall have a capability to be upgradable with minimum modification to integrate it with a debit/ credit card machine for recharging the smart card without manual intervention

- The terminal shall be integrated with RFID readers (or similar) for smart card validation, receipt printing unit, biometric authentication (desirable) and necessary standard accessories

- Real-time information shall be displayed on the touch screen by fetching it from the central server.

- The terminal unit shall be ruggedised and shall be able to withstand Indian environmental conditions, be rust proof and with pleasing colors based on the branding scheme to be shared at a later stage

- The terminal shall be capable to be connected to the central server using internet and OFC communication system

- The terminal shall be able to perform self-diagnostics and send alerts to the central server in case of any mal-function

3.4. Bicycle Dock Specifications

- The primary purpose of the bicycle dock is to hold the bicycle securely in its position until it is released using proper authentication method at the connected terminal

- The user authentication shall happen using an RFID system or similar technology at the terminal which is wirelessly connected to the docks

- The dock shall preferably be based on electro-mechanic lock technology or equivalent

- The dock should have an indication of status based on colored LED lights

- The dock shall be modular and secure to move easily without much of civil work being involved

- The dock shall be designed for outdoor environment having at least IP 65 rating and rust-proof

- The dock shall have the provision of external power supply

- The dock shall also be powered internally using suitable back up power systems in case of power supply failure for at least 4 continuous hrs.

- The dock shall be able to produce distinctive sounds while releasing and locking a bicycle

- The lock attached with the dock should ideally lock the front wheel of the bicycle

- The designed life for the dock shall be at least 5 years under moderate usage conditions.

3.5. Redistribution Vehicle

The redistribution vehicle shall help to balance the bicycle requirement for addressing peak and off-peak demand fluctuations.

- The redistribution vehicle shall be able to carry at least 10 bicycles at any time without damaging

- The vehicle shall have mounting arrangements to secure the bicycles to avoid any collision and rupture during the movement of the vehicle to withstand acceleration and braking

- There shall be a provision to attach any towing facility at the rear of the vehicle in case of need

- The redistribution vehicle shall not deviate from any RTA rules and regulations as the internal design shall be modified to accommodate bicycles

- A closed container type vehicle is preferred as a redistribution vehicle

- Provisions for a tool kit and emergency medical kit along with minimum required fast moving spares shall be made in the design of the vehicle

3.6. Software Specifications

A successful system will address the following specifications for PBS software in each category:

Administrative

- Determining where each bicycle in the system is located in real time, and when it might have been lost

- Determine how many rides/km each bicycle has taken to facilitate maintenance.

- Produce a daily maintenance list for all system components

- Find disabled bicycles using the system

- Creating reports on usage and miles traveled on a system wide and bicycle-- ▪by---‐ bicycle basis

- Shut down individual stations or the whole system temporarily

- Process for verifying user information via credit user information as well as adherence to current PCI (Payment Card Industry) standards (including chip-and-pin technology)

- IT system complies with current standards for data security, particularly for financial data, user names, and addresses. Describe any third party testing or verifications and liability and risk.

- The mobile app and website should communicate with PBS software system in real time

- Administrative functions of PBS software are accessible to PBS staff via web access from any internet-enabled location.

- Administrators and customer service representatives can access the functionality of individual stations / kiosks to assist end users.

- Administrators should be able to easily look up user accounts based on name, phone number, email, or user id.

- Administrators should be able to easily look up individual bicycles and stations for operational status

- Anonymised and scrubbed system functionality and data (ride and real time availability data, membership signup, payment, location based advertising) will be exposed to third party and open source software developers through secure APIs

- MCG or designated Operator will own the data generated by the system

- Software provides a comprehensive solution that helps the Operator streamline all aspects of the program, including managing fleet and equipment, customer service, finances, rebalancing, reporting, and pricing. Software is easily customizable and upgradeable.

- Software is easily configurable by the Operator to allow for various subscription types, reports, prices, or other features including the ability to administer discounts and promotions.

- Data including financial data is highly secure according to industry standards.

Website and Mobile Application

- System users can purchase memberships and agree to the terms of a liability waiver. Languages include English and Hindi.

- The website allows users to search for station locations through a variety of inputs (e.g. user‑ entered address, intersection or landmark names, selecting from an interactive map etc.)

- Members can access and update their membership information, re‑‑ ‑ subscribe to the System and replenish their accounts

- Allows members to track their use of the PBS system

- Accessible from desktop computers and hand‑held wireless devices such as PDA's, Smartphones, and web‑enabled cell phones using browsers. Flash should not be used.

- Critical functionality does not use any extensions that are not pre‑installed in the vast majority of browsers and any mark up or scripting should function correctly in all widely used browsers.

- Website and app should allow the operator to place advertising messages based on location

- Ability to indicate the closest station and number of bicycles to mobile or web user

- Routing and directional capabilities and support of the system's "Visitor Routes"

3.7. Kiosk and Payment Technology

A successful system will address the following specifications for kiosks and payment technology

- Ability to receive and manage all payments, fees, penalties, or other monetary transactions by users of the system

- Ability to accommodate different payment schemes including schemes that do not adhere to the industry standard

- Ability to provide ease of use to both "walk-up customers" and "subscribers"

- Adherence to industry standard data security and safeguards for financial and personal data of system users

- Ability to accept walk-up renters with agreement to liability waiver.

- Ability to interface with a unified electronic fare system

- The device and reader should be ISO 14443 compliant and capable of reading EMV cards.

- The security of the device be it card, phone, or fob should be equivalent to Mifare ultralight C or higher

- Limit on the number of subscriptions and walk-up rentals that can be purchased by one user or using one credit card.

- Touch-screen capabilities.

- Technology to accept and validate a variety of payment methods (e.g., cash, credit card, pay by phone)

- Legibility in all lighting conditions and operational in all normal weather conditions.

- Parts and materials durable to withstand coastal conditions including salt water and high humidity

- Flexibility to add features and modify terminal as needed.

- Ability to push software and/or firmware updates efficiently and with little downtime

- Automatic confirmation that subscriber's credit card is valid and has sufficient funds to cover charges if bicycle not returned (preferably before each bicycle is removed).

- Ability to use all major national and international credit cards

- Clear customer service number and instructions

- Include a process for facilitating users who desire to park a bicycle at a station where all docks are occupied

- A process for facilitating users who desires to get a bicycle at a station where all docks are empty

- Capacity to maintain security of the system during a power failure event or loss of system communication

- Instructions and interface available in multiple languages including English and Hindi.

- If parts need to be modified or replaced if the software changes, they will be provided by the vendor at no cost.

3.8. Data Services and API Specifications

The Gurgaon PBS system will require daily and weekly performance reports. The Contractor will be expected to provide current performance measures on a real-time basis at the request of MCG or designated Operator or its representatives. The Contractor is expected to provide data on their website that is available to the public, which includes at a minimum the information regarding ridership, fleet performance and safety, customer service, and membership. The availability of data to the public is important to MCG to ensure that the public sees a return on investment for the use of public property and funds. All publicly available data should be made available as machine readable APIs.

A successful RFP would address the following specifications for data services and APIs:

- Database management system, including search functions and the possibility of using anonymised data for transportation planning purposes

- The Contractor will provide reports or enable access to MCG or designated Operator in accordance with an agreed upon schedule or on an as-needed basis

- All system data should be available in for immediate access for a period of one year, and archived indefinitely.

- The database is searchable and can provide both anonymised and non- - anonymised reports as necessary

- Anonymised and scrubbed system functionality and data (ride and real-time availability data, membership signup, payment, location based advertising) will be exposed to third party and open source software developers through secure APIs

- Open architecture use as much as possible

Data Report

The Station Status for each active station in the system should, at a minimum, include the following data:

- Station number and identifier

- Station name

- Station address

- Station coordinates

- Station payment terminal availability (Does the station have the ability to process credit/debit cards?)

- Installed date

- Station status (open/closed)

- Station docks total

- Station docks available

- Bicycles currently available

- Broken bicycles at the station (if any)

- Last communication with the central computer system

- Last update from station

Ridership

- Number of trips per month

- Trip origin/destination by station

- Trips per time interval

- Percentage of trips per time interval

- Miles traveled per month

Fleet Performance and Safety

- Bicycles in service

- Fleet maintenance (number of bicycles inspected/repaired per month)

- Bicycles damaged per month

- % of time in service or available/in use

- Average response time inspect/repair a bicycle and return to service

- Average response time to remove damaged bicycle from service

- Membership/Pass Status

- Total number of users by membership

- New members

- Renewal rates

Customer Service Data

- Stations full or empty- number of instances

- Stations full or empty- time interval

- Stations full or empty- Percentage of instances per time interval

- Stations full- instances of additional time granted

- Stations full- Total number of extra minutes granted

- Rebalancing- Number of times bicycles picked up and dropped off at stations

- Customer service calls- Number of incoming calls and lost calls

- Average call length

- Average time to rebalance bicycles

- Average wait time for a customer call

- Customer call satisfaction

Trip Duration Data

- Trip/record identifier

- Start date and time

- End date and time

- Start station location

- End station location

- Bicycle number

- Membership/user type

- Miles traveled by trip

- Calories burned by trip

- Number of trips

- Ability for users to compare data versus "average user" or "similar user"

- Petrol saved per trip

- Average trips length and duration

3.9. Call Center Specifications

It is expected that the Contractor will assist MCG or designated Operator in setting up the Call Center. A description of the call center should include the number of anticipated customer service employees, and address the ability of customer service personnel to respond to voice, email, and text requests for help. In addition, the data systems should have the capacity to track customer service issues and generate status reports. The call center software and/or

operating system proposed for use to handle, track and service calls must be specified must meet the following criteria:

- The system must be able to immediately aid users with mechanical issues and/or injuries.

- The customer service telephone number should be provided on every bicycle and station, with durable, weather resistant labels.

- There must be adequate staffing to ensure a maximum wait time of one minute, 24/7.

- The Contractor must present a program that ensures high customer satisfaction rating and allows the operator to address problems immediately.

APPENDIX – G

Component & All Costs in INR	Item	Automatic			Semi-Automatic			Manual		
		Phase 1	Phase 2	Phase 3	Phase 1	Phase 2	Phase 3	Phase 1	Phase 2	Phase 3
PBS System	Bicycle	1,89,00,000	4,65,00,000	14,70,00,000	1,89,00,000	4,65,00,000	14,70,00,000	1,89,00,000	4,65,00,000	14,70,00,000
	Dock (Electronic)	13,23,00,000	32,97,00,000	1,03,00,50,000	-	-	-	-	-	-
	Terminal at PBS Station	2,66,20,000	6,62,20,000	20,72,40,000	1,21,00,000	3,01,00,000	9,42,00,000	12,10,000	30,10,000	94,20,000
	Control Centre	2,00,00,000	2,00,00,000	2,00,00,000	20,00,000	20,00,000	20,00,000	-	-	-
	Redistribution Vehicles	1,00,80,000	2,48,00,000	7,84,00,000	1,00,80,000	2,48,00,000	7,84,00,000	1,00,80,000	2,48,00,000	7,84,00,000
	Maintenance Garage Set-up	24,00,000	48,00,000	1,60,00,000	24,00,000	48,00,000	1,60,00,000	24,00,000	48,00,000	1,60,00,000
	Installation + Project Management cost	5,25,75,000	12,30,05,000	37,46,72,500	1,13,70,000	2,70,50,000	8,44,00,000	81,47,500	1,97,77,500	6,27,05,000
Civil Infrastructure (PBS Stations)	Station - Small	60,00,000	1,48,00,000	4,67,00,000	3,00,00,000	7,40,00,000	23,35,00,000	3,00,00,000	7,40,00,000	23,35,00,000
	Station - Medium	46,00,000	1,14,00,000	3,58,00,000	1,84,00,000	4,56,00,000	14,32,00,000	1,84,00,000	4,56,00,000	14,32,00,000
	Station - Large	15,00,000	39,00,000	1,17,00,000	60,00,000	1,56,00,000	4,68,00,000	60,00,000	1,56,00,000	4,68,00,000
Total CAPEX		27,49,75,000	64,51,25,000	1,96,75,62,500	11,12,50,000	27,04,50,000	84,55,00,000	9,51,37,500	23,40,87,500	73,70,25,000
Incremental Component	Bicycle with GPS (INR)	25,20,000	62,00,000	1,96,00,000	-	-	-	-	-	-
Total CAPEX with Incremental Components		27,74,95,000	65,13,25,000	1,98,71,62,500	11,12,50,000	27,04,50,000	84,55,00,000	9,51,37,500	23,40,87,500	73,70,25,000
Component	Item	Automatic			Semi-Automatic			Manual		
Supporting Civil Infra	Intersection Improvement Minor	1,60,00,000	5,00,00,000	12,00,00,000	1,60,00,000	5,00,00,000	12,00,00,000	1,60,00,000	5,00,00,000	12,00,00,000
	Intersection Improvement Major	2,50,00,000	6,25,00,000	17,50,00,000	2,50,00,000	6,25,00,000	17,50,00,000	2,50,00,000	6,25,00,000	17,50,00,000
	Improvement of Existing	2,00,000	-	-	2,00,000	-	-	2,00,000	-	-
	Cycle Lanes Lane Demarcation (New)	10,50,000	-	-	10,50,000	-	-	10,50,000	-	-
	Cycle Lanes Dedicated Cycle Tracks (New)	1,12,50,000	3,90,00,000	12,30,00,000	1,12,50,000	3,90,00,000	12,30,00,000	1,12,50,000	3,90,00,000	12,30,00,000
Total Cost of Supporting Civil Infra		5,35,00,000	15,15,00,000	41,80,00,000	5,35,00,000	15,15,00,000	41,80,00,000	5,35,00,000	15,15,00,000	41,80,00,000
Fully Loaded PBS System		33,09,95,000	80,28,25,000	2,40,51,62,500	16,47,50,000	42,19,50,000	1,26,35,00,000	14,86,37,500	38,55,87,500	1,15,50,25,000

APPENDIX – H

Service Level Benchmarks (Adapted from Bhopal RFP)

	S. No:	Performance Indicator	Explanation	Time	Acceptable Service Level	Compensation- Meeting the standard
Bicycle Distribution	1	High priority stations*- empty, peak hours	Percent of the time that high-priority stations are empty during peak hours	7am - 10 am & 4pm-7pm everyday	Should be less than 5% of the total time of operation	5% of the Operating Cost/ month
	2	High priority stations- empty, non- peak hours	Percent of the time that high-priority stations are empty during peak hours	Operating hours excluding peak hours	Should be less than 10% of the total time of operation	2.5% of the Operating Cost/ month
	3	Low priority stations- empty, peak hours	Percent of the time that high-priority stations are empty during peak hours	7am - 10 am & 4pm-7pm everyday	Should be less than 15% of the total time of operation	2.5% of the Operating Cost/ month
	4	Low priority stations- empty, non- peak hours	Percent of the time that high-priority stations are empty during peak hours	Operating hours excluding peak hours	Should be less than 20% of the total time of operation	2.5% of the Operating Cost/ month
Availability	5	Bicycle Availability	Average cycle fleet available per day	At 6 am or when the operations start in the day whichever is later	Should always be 95% or more of the total authorised fleet size	2.5% of the Operating Cost/ month
	6	Service Availability	Number of hours when the system is operational	Operating hours of the system	Should always be 100% of the agreed hours of operations (unless permission has been granted by BMC for otherwise)	2.5% of the Operating Cost/ month

Category	No.	Indicator	Description	Period	Target	Cost
Registration	7	Registration of Members	% of valid applications and registrations that are processed and membership issued within a day	All through the month	90% of all valid applications will have to be processed within 1 day of receipt of application	5% of the Operating Cost/ month
Registration	8	Registration of Non Members or Renewal of Membership or Top up of smart cards	% of valid applications for non-members, renewals and top of smart cards within half an hour	All through the month	90% of all applications will have to be processed within half an hour	5% of the Operating Cost/ month
Maintenance	9	Availability of the Website and smart phone app	% of total time in a month when website and smart phone app is not available	All through the month	The website and smart phone app are available for at least 90% of the time during the entire month	2.5% of the Operating Cost/ month
Maintenance	10	Maintenance Schedule	Following the pre-determined maintenance schedule	All through the month	The maintenance schedule is followed more than 90% of times as pre- determined	5% of the Operating Cost/ month
Usage	11	Ridership Level	Average ridership of the system per cycle/ day	All through the month	If the average ridership in the system is more than 4/ cycle/ day	5% of the Operating Cost/ month
Usage	12	Memberships	Total Memberships/ month	All through the month	If the total no: of memberships for the system is 750 members or more	5% of the Operating Cost/ month
Awareness	13	Trial Users	No: of people who were riding during the trial riding sessions/ no: of unique trial sessions	All through the month	If the total no: of trial users is more than 500 unique users/ month & more than 10 trial sessions/ month with different groups	5 % of the Operating Cost/ month