



Broad Mobility Report

Alternative Mobility
Solutions and
Pedestrianization of Existing
Urban Neighbourhoods



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Table of Contents

1.	Background	4
2.	Need of the Study	6
2.1	Traffic vs. Mobility vs. Accessibility.....	8
2.2	Sustainable Modes and non-Sustainable Modes.....	10
2.2.1	Definition of Sustainable Transportation.....	10
2.2.2	Demand Management and Capacity Enhancement for Sustainable and Non Sustainable modes.....	12
3.	Existing Policy Frameworks and Guidelines.....	13
3.1	National Urban Transport Policy.....	13
3.2	Parking Policy.....	13
4.	Methodology.....	15
5.	Problem Analysis and Assessment.....	17
5.1	Existing Network	17
5.1.1	Location of bus stops	19
5.1.2	Associated Issues	20
6.	Proposal for Mobility	24
6.1	Broad Mobility Guideline	24
6.1.1	Through and Destination Streets	24
6.1.2	Sustainable and Unsustainable Modes.....	24
6.1.3	Strengthening of NMT Links.....	25
6.2	Broad Mobility Plan.....	25
6.2.1	Proposed Network and hierarchy of roads.....	25
6.2.1.1	Components.....	28
6.2.1.2	Proposed Public Transportation linkages and stops.....	29
6.2.2	Primary NMT Feeder Links to Public Transportation.....	30
6.2.3	NMT Network requirement	31
6.2.4	Parking	32
6.2.4.1	Public Bus Parking.....	32
6.2.4.2	Integration of Feeder Parking Areas	33
6.2.4.3	Private Car Parking (based on policy guidelines)	33
7	Annexure.....	34
7.1	Proposed Link - Press Enclave to Outer Ring Road (DIMTS Ltd)	34
	34

List of Figures

Figure 1 : Project Area bounded between the important streets of Delhi.....	4
Figure 2 : Sample activity surveys conducted at critical junctions and school premises	16
Figure 3 : Project Area highlighted in grey color crossing through different wards.....	17
Figure 4 : Landuse in project area with green open spaces, location of transport infrastructure, schools, hospital, religious sites and heritage buildings.	18
Figure 5 : The network of roads.....	18
Figure 6 : Current openings and predominant routes for thoroughfare traffic	19
Figure 7 : Malviya Nagar Terminal	20
Figure 8: Current location of transit stops – Bus Stops and Metro Stations and BRT stops.....	20
Figure 9 : Parking activities consuming road space and space for NMT users	21
Figure 10 : Extension of the shops onto the streets.....	22
Figure 11 : Street vendors in the area – potential safety for the streets	22
Figure 12 : Missing or inadequate footpaths.....	22
Figure 13 : Parks being used as parking areas (Hauz rani).....	23
Figure 14 : Obstruction/Impediments on footpath	23
Figure 15: Road Hierarchy in the network.....	26
Figure 16 : Proposed Cross section for Distributor Street	27
Figure 17 : Proposed Cross section for Local Streets.....	28
Figure 19 : Final location of bus stops in the area – on periphery.....	30
Figure 20 : Primary NMT Feeder Links to Public Transportation stops. (See Figure 11)	30
Figure 21 : NMT Primary Links from the metro station	30

1. Background

The project area is located within the urban precinct bounded on three sides by major vehicular roads in order of hierarchy; Outer Ring Road to the north, Lal Bahadur Shastri Marg to the east, Press Enclave Road to the south, the fourth road is Geetanjali marg running parallel to the Malviya Nagar Market. The neighborhood has availability of public transit with bus stops, BRT Corridor and the Malviya Nagar Metro Station.

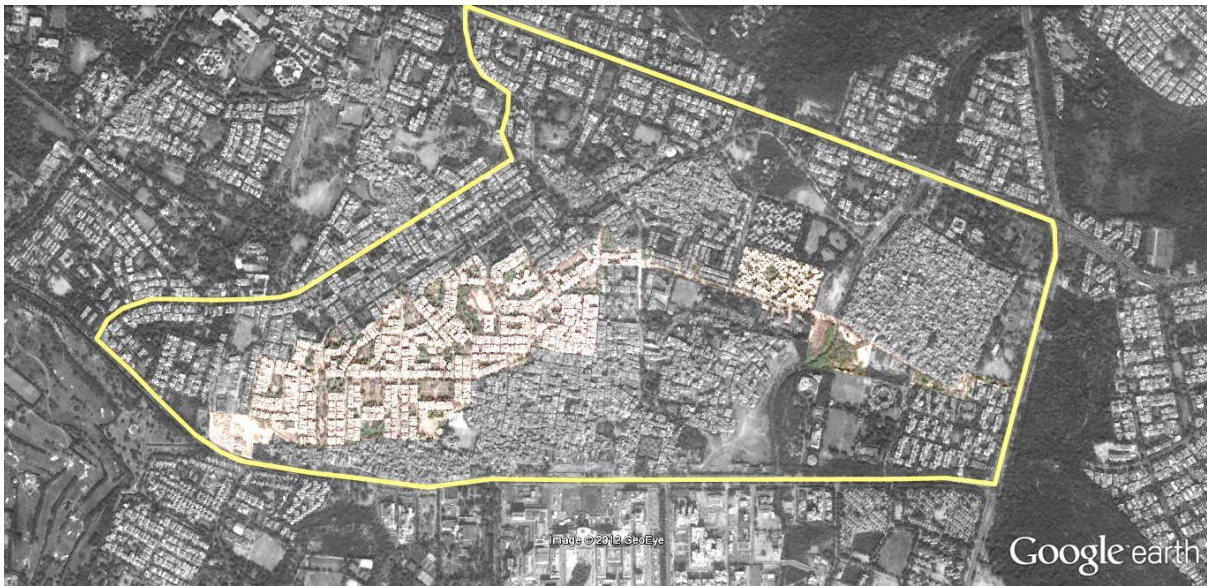


Figure 1 : Project Area bounded between the important streets of Delhi

The project focuses upon the “First / last mile Connectivity”, for main stream and potential users that remains unaddressed. Also, the current trend of increased private vehicle ownership is increasingly visible at the smallest neighborhood scales. This trend prompts an investigation on both the macro level network connectivity as well as the quality of public realm and livability within urban neighborhoods. The allocation of public/shared space of urban neighborhoods prioritized in favor of motorized transport results in spiraling unsustainable patterns of development.

Like the current trend in the city, the same has been observed in the chosen project area:

1. A lack of adequate infrastructure and alternatives for NMT assessed on the five basic principles of non-motorized transport and lack of access friendly infrastructure.
2. Increase in the ownership of private vehicles consuming open spaces, parks and breathing lungs of the city. It has also compromised on safety on the streets.
3. Urban Housing in the area is characterized by a diverse nature of neighborhoods which directly indicate a heterogeneous range of choices opted by residents for transit in the city. They are :
 - a) Plotted Housing
 - b) Group Housing
 - c) Unauthorized / Regularized Colony
 - d) Urban Village / Lal Dora
 - e) Slums and JJ Clusters
 - f) Other identifiable, public institutions (eg. schools, hospital, market, etc.)

The plotted housing, group housing, Unauthorized/ regularized colonies and Public institutions are seeing the greatest increase in the use of privately owned vehicles resulting in conflicts with the potential for pedestrianization and NMT.

Whereas the denser urban villages and slums, which have lower motor vehicle use, and are more dependent on public transportation, find their mobility inhibited due to the congestion on the street feeding the aspiration for private vehicle ownership.

4. When the 'First/Last Mile Connectivity' by pedestrian and NMT to public transportation nodes is not addressed this would lead to:
 - a) Reduced ridership in public transport
 - b) Increased fossil fuel consumption and carbon emissions
 - c) Unhealthy living environment

2. Need of the Study

The domination of motorized vehicles has made the non-motorized users and pedestrians vulnerable and invisible. With the changing character of urban structure and transit, the people living in the Delhi have become dependent upon cars and a motorized way of life. This has an effect on the consumption of road space and the public realm for the motorized and made the users on street vulnerable to accidents and unsafe environments.

The report highlights the need of prioritization between modes to make ease of access and mobility rather than provide capacity enhancing solutions. It looks into the project area from a larger network point of view and understands the usage typology of traffic in the area. An insight into what affects the last mile for the people /residents living in the neighborhood.

Delhi is still unprepared to deal with the growing demand for travel: In this decade, total daily travel trips in Delhi will nearly double. It will increase from about 15 million motorized trips a day now to more than 25 million a day by 2021. Experts warn that this is an underestimation as the short and local trips are not even included in this count. Further motorization of those trips will spell disaster

Cars are taking over roads very rapidly: Currently, about 14 per cent of the daily trips are moved by cars, already choking the city. By 2021, the share of private vehicles will increase phenomenally while that of bus transport will decline. How will Delhi find more space to move so many private cars to cater to the growing travel demand? Delhi has already devoted maximum geographical space – 21 percent – for road network.

There is a phenomenal increase in car numbers on key South Delhi arteries. On Swarn Jayanti Marg in Dhaula kuan, the share of cars is as much 68 percent; on the Outer Ring Road, this share is nearly half of all traffic.

As car numbers are increasing, the people carrying capacity of Delhi roads is declining. If this trend continues, how will Delhi meet the burgeoning travel trips that will double by 2021?

Cars are blocking the invisible majority – walkers and cyclists: Cars and two-wheelers are taking over the roads, edging out walkers and cyclists who are the majority in the city. While the total number of daily car trips in Delhi is about 3 million, that of walking and cycling is 8 million – 2.5 times more. Cycling trips at 2.8 million are almost equal to car trips. This staggering number is never visible and noticed for policy action.

Delhi has one of the highest walk and cycle trips in the country: In absolute numbers, Delhi tops in daily cycling trips and is second only to Mumbai in walking trips. Even in car-dominated roads like the Outer Ring Road, the share of cycles is quite close to that of autos – 7 per cent and 9 per cent, respectively.

Some stretches in Delhi show higher number of cycle trips than cars: In places like Uttam Nagar and Subhash Nagar on Shivaji Marg, and Jyoti Nagar East etc on Loni Road the numbers of cycle and cycle rickshaw outnumber cars. For instance, on the Subhash Nagar stretch, there are 18,000 non-motorised transport vs. 4,000 cars.

Delhi has the dubious distinction of recording highest pedestrian fatalities in road accidents: Policy disdain and neglect is responsible for this homicide of zero emitters who are part of the solution to the mobility crisis.

The only way Delhi can avert a serious mobility and pollution crisis is to scale up public transport along with walking and cycling. The Delhi Master Plan has set the target of increasing the share of public transport to 80 percent by 2020 from the current share of 40 per cent. This scaling up is possible only if walking and cycling are equally scaled up to improve access to buses and Metro. Each and every public transport trip begins and ends as walk trip. Even 50 percent increase in public transport ridership will increase demand for walking and need significant expansion of walking infrastructure.

Unfortunately, obsession with seamless, signal free travel for motorized vehicles through flyovers, expressways and elevated ways is disrupting direct shortest routes of the walkers and cyclists and increasing distances and travel time for them. This can adversely affect public transport usage.

The main objective of this report is to therefore assess and outline broad measures and lay down key principles and parameters that could increase walkability and usage of NMT in the neighborhood. The street network can be designed as per the ROW and design speed allocated. With the use of existing policy frameworks and benefits of NMT to cover the last mile shall help to topple the domination of the car and try and maximize the usage of the public realm to make the neighborhood green and active

As per a study done by CRRI, a car is parked for 90 to 95 % of the time of its use. This fact has to contest with the following realities:

Insatiable demand for land: If demand for land for an average car is computed -- the total cars already use up 10% city's urbanised area. The forest cover in Delhi is 11.5 %. -- Daily registration of cars is generating demand for land bigger than 310 football fields! Land is expensive and has other opportunity costs.

Inequitous use of land: A car is allotted 23 sq m for parking. Under low cost housing scheme only 18-25 sq m is allotted to very poor families. The car owning minority using up more and more road space and urban space.

2.1 Traffic vs. Mobility vs. Accessibility¹

The growth of automobile mobility over the last thirty years is slowly suffocating the cities. Until now, the remedies have most of all tried to satisfy the need for mobility by acting on the supply of transport. This approach has proved to be all but ineffective. A new, more global approach aiming to improve both mobility and accessibility is being implemented across the globe and a clear understanding needs to be attained for the use of the terms like Traffic, Mobility and Accessibility to outline the key principles and strategy for this project.

Traffic: Definition

Traffic refers to vehicle movement. This perspective assumes that “travel” means vehicle travel and “trip” means vehicle-trip. It assumes that the primary way to improve transportation system quality is to increased vehicle mileage and speed.

Users

From this perspective, transportation users are primarily motorists (including drivers and passengers). Non-motorists are considered a relatively small and unimportant minority, defined as members of households that do not own an automobile.

Modes

This perspective focuses on automobile travel. It places little value on transit and cycling, since they represent a small portion of vehicle-mileage and are relatively slow. It considers walking primarily as a way for motorist to access parking facilities or as a form of recreation, and so devotes little transportation funds to non-motorized facilities.

Mobility : Definition

Mobility refers to the movement of people or goods. It assumes that “travel” means person- or ton-miles, “trip” means person- or freight-vehicle trip. It assumes that any increase in travel mileage or speed benefits society.

Users

From this perspective, transport users are mainly motorists, since most person- and ton miles are by motor vehicle, but recognizes that some people rely on non-automobile modes, and some areas have large numbers of transit, rideshare and cycling trips

Modes

This perspective considers automobiles most important, but values transit, ridesharing and cycling where there is sufficient demand, such as downtowns and college campuses, and so justifies devoting a portion of transport funding to transit, HOV and cycling facilities. It supports an integrated view of the transportation system, with attention to connections between modes. For example, it considers walking and transit complementary modes since most transit trips involve walking links.

Accessibility : Definition

Accessibility (or just access) refers to the ability to reach desired goods, services, activities and destinations (collectively called opportunities). Access is the ultimate goal of most transportation, except a small portion of travel in which movement is an end in itself (jogging,

¹ Measuring Transportation. Victoria Transport Policy Institute. <http://www.vtpi.org/measure.pdf>

horseback riding, pleasure drives), with no destination. This perspective assumes that there may be many ways of improving transportation, including improved mobility, improved land use accessibility (which reduce the distance between destinations), or improved mobility substitutes such as telecommunications or delivery services.

Users

From this perspective, transportation users consist of people and businesses that want to reach a good, service, activity or destination. It recognizes that most people use various access options, and so cannot be classified as simply a motorist or transit rider.

Modes

This perspective considers all access options as potentially important, including motorized and non-motorized modes, and mobility substitutes such as telecommunications and delivery services. It supports an integrated view of transportation and land use systems, with attention to connections among modes and between transport and land use conditions. It values modes according to their ability to meet users' needs, and does not necessarily favor longer trips or faster modes if shorter trips and slower modes provide adequate access. It supports the broadest use of transport funding, including mobility management and land use management strategies if they increase accessibility.

	Traffic	Mobility	Access
<i>Definition of Transportation</i>	Vehicle travel.	Person and goods movement.	Ability to obtain goods, services and activities.
<i>Unit of measure</i>	Vehicle-miles and vehicle-trips	Person-miles, person-trips and ton-miles.	Trips.
<i>Modes considered</i>	Automobile and truck.	Automobile, truck and public transit.	All modes, including mobility substitutes such as telecommuting.
<i>Common performance indicators</i>	Vehicle traffic volumes and speeds, roadway Level of Service, costs per vehicle-mile, parking convenience.	Person-trip volumes and speeds, road and transit Level of Service, cost per person-trip, travel convenience.	Multi-modal Level of Service, land use accessibility, generalized cost to reach activities.
<i>Assumptions concerning what benefits consumers.</i>	Maximum vehicle mileage and speed, convenient parking, low vehicle costs.	Maximum personal travel and goods movement.	Maximum transport options, convenience, land use accessibility, cost efficiency.
<i>Consideration of land use.</i>	Favors low-density, urban fringe development patterns.	Favors some land use clustering, to accommodate transit.	Favors land use clustering, mix and connectivity.
<i>Favored transport improvement strategies</i>	Increased road and parking capacity, speed and safety.	Increased transport system capacity, speeds and safety.	Improved mobility, mobility substitutes and land use accessibility.

This table compares the three major approaches to measuring transportation.

Table 1 : Comparing Transport measurements²

² Measuring Transportation. Victoria Transport Policy Institute. <http://www.vtpi.org/measure.pdf>

2.2 Sustainable Modes and non-Sustainable Modes

2.2.1 Definition of Sustainable Transportation³

A sustainable transportation system is one that:

- allows the basic access needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health, and with equity within and between generations.
- is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy.
- limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources, limits consumption of renewable resources to the sustainable yield level, reuses and recycles its components, and minimizes the use of land and the production of noise.

The way we choose transport options and have ability to interact with one another has definite impact on social concerns⁴ .:

Mobility Equity When there are no other options except private transportation modes (such as cars or bicycles), there are individuals who experience reduced mobility. They may be unable to use the vehicle, or often in the case of automobiles, unable to afford one. This creates a dichotomy between the mobility rich and the mobility poor. Providing public transit and improving walkability improves mobility equity.

Accessibility Related to mobility equity, transportation systems also affect accessibility to opportunities. Opportunities include recreation, work destinations, social destinations, and shopping. Transportation vehicles can be designed to accommodate a wide variety of users, and services can be created to assist in the mobility of those with disabilities to improve access.

Social Exclusion : The mobility poor experience social exclusion in two ways. First, they are less able to travel to maintain social ties. Second, they are less likely to meet new people, as they cannot access public spaces or attend social events.

Community Cohesion Dense, transit oriented, and walkable neighborhoods which have ample space for interaction enhance the sense of place and foster community cohesion. Communities with higher levels of social capital are more resilient, have better civic participation, and have lower rates of residential mobility.

Physical Activity Physicians recommend at least 30 minutes of exercise every day. It is easy to get this by walking or cycling. However, without non-motorized options, people often have trouble getting daily activity.

Air Quality Exhaust from vehicles worsens air quality. Individuals who live or work along arterials with heavy traffic may experience asthma, allergies, and general poor health.

³ http://cst.uwinnipeg.ca/documents/Definition_Vision_E.pdf

⁴ <http://transportation.ubc.ca/transportation-office/sustainable-transportation/>

Safety and Accidents Vehicular accidents are a leading cause of death. Travel at high speeds endangers people both within the car and outside of it. Alternative modes such as transit, cycling, and walking are generally safer ways to travel.

Environmental Concerns⁶

Climate Change Greenhouse gases, especially carbon dioxide, are causing the earth's climate to heat up. Transportation is a big producer of GHGs.

Air Pollution/ Particulates Along with GHGs, exhaust from transportation vehicles release small particles which pollute the air. This affects biological health generally.

Water Pollution Runoff from impervious surfaces such as roads and parking lots contains oil, gasoline, and other toxic chemicals. Often, this runoff ends up in natural waterways. This compromises aquatic ecosystems.

Habitat Destruction/Degradation Transportation infrastructure requires space. Typically, that space will have been occupied by a variety of flora and fauna. Environmental impact statements are an attempt to anticipate the ecological implications of the project, but they cannot mitigate all damage.

Economic Concerns⁷

There are many ways in which our transportation systems are inefficient. The way our economy is structured encourages bad transportation behavior.

Personal Income and Purchasing Power Individuals have different income levels. Some are able to afford a variety of transportation options. Others have very limited options based on what they can afford.

External Costs of Transportation Some costs of using particular modes are not paid by the users. Automobile users often do not pay for parking, the environmental damage of pollution, or for the use of roads during peak periods.

Fixed Costs Vs. Variable Costs Owning a car is very expensive. One must pay for registration, the lease, and insurance, all before taking it out on the road. However, using the car is relatively inexpensive with ownership because the only variable costs are gas, wear-and-tear, and parking/tolls. This encourages car owners to drive more than they need to.

Energy Security Much of our transportation system depends on fossil fuels. There is only a limited quantity of oil, and we may have already reached a point where demand outstrips the discovery of new sources.

Subsidization Much of our transportation system is subsidized. Taxes pay for roads and bridges, and parking is often paid for by land or business owners. This encourages inefficient behavior because the services are essentially free to the users.

Induced Demand When transportation infrastructure is designed for private vehicles, individuals benefit from that. In an example of a highway, individuals are able to move further away from the city, but still commute to the business district. This transportation demand was effectively created by the infrastructure. By this logic, expanding the highway system only creates more demand, rather than alleviates it.

⁶ <http://transportation.ubc.ca/transportation-office/sustainable-transportation/>

⁷ <http://transportation.ubc.ca/transportation-office/sustainable-transportation/>

Based on the above description of the idea of sustainable transport , modes can be categorized as sustainable or unsustainable mode.

In such a case, walking, cycling, intermediate para transit and public transport are therefore key modes of sustainable transport. Two wheelers and cars used for private consumption definitely come under unsustainable modes which continue to consume road space and have repercussion on social, environmental and economic concerns .

2.2.2 Demand Management and Capacity Enhancement for Sustainable and Non Sustainable modes

It is easy to understand between demand management and capacity enhancement once a prioritization is done between sustainable and unsustainable mode. Demand Managements helps us resolve the existing transportation demand for un-sustainable modes by restricting space allocation for such modes. No capacity enhancement will help unsustainable modes for a long period since it is impossible to satisfy the exponential demand of motorized vehicles keeping in mind of prioritization of scarce land and limited road space.

Much attention needs to be done on capacity enhancement of sustainable modes such as walk, cycle, feeder transport and public transportation. Creating a denser network and choices for NMT, adequate feeder infrastructure and better street infrastructure shall be key to benefit sustainable transport. This will instill and induce social , environmental and economic benefits to the community at large.

3. Existing Policy Frameworks and Guidelines

3.1 National Urban Transport Policy

The National Urban Transport Policy for India was published by Ministry of Urban Development, Government of India, April 2006. Some of the key objectives⁸ are outlined below:

Bringing about a more equitable allocation of road space with people, rather than vehicles, as its main focus.

Encourage greater use of public transport and non-motorized modes by offering Central financial assistance for this purpose.

Reducing pollution levels through changes in traveling practices, better enforcement, stricter norms, technological improvements, etc.

The highlights of NUTP are as follows:

- High parking fee should be charged in order to make the use of public transport attractive.
- The parking fee should reflect the *value of the land that is occupied*.
- Public transport vehicles and non-motorised modes of transport should be given preference in the parking space allocation. This along with easier access of work places to and from such parking spaces can encourage the use of sustainable transport systems.
- Park and ride facilities for bicycle users with convenient interchange are a useful measure.
- Adopt graded scale of parking fee that recovers the economic cost of the land used in such parking with the objective of persuading people to use public transport to reach city centres.
- The policy suggests that multilevel parking complexes should be made a mandatory requirement in city centres that have several high-rise commercial complexes and these can come up through public-private partnerships. These would be encouraged to go in for electronic metering so that there is better realization of parking fees to make the investments viable and also a better recovery of the cost of using valuable urban space in the parking of personal motor vehicles.
- **In residential areas also, the policy suggests changes in byelaws to free the public carriageway from parked vehicles impeding the smooth flow of traffic. It suggests making provisions in the appropriate legislation to *prevent* the use of right of way on road systems for parking purposes.**

3.2 Parking Policy

The National Urban Transport Policy (NUTP) is the first attempt at the national level to reorient the goal of parking policy to some extent. It has laid down a few principles to govern the parking reforms in Indian today. The NUTP has recognized an important principle for guiding the parking policy.

These include:

- Land is valuable in all urban areas. Parking places occupy a large part of such land. This should be recognized in determining the principle of parking space.
- Levy high parking fee that represents value of land occupied
- This should be used as a means to make use of public transport and make it more attractive. Graded parking fee should recover the cost of the land.

⁸ <http://urbanindia.nic.in/policies/TransportPolicy.pdf>

- Allocate parking space to public transport and non-motorised transport

These principles have thus codified the travel demand management principles that should guide the parking management in cities. It has put a strong emphasis on the pricing strategy to influence the travel decision and make public transport more attractive.

Delhi is one of the few Metropolitan cities in the world where Parking in public spaces is permitted – almost for “free”. This is virtually undemocratic since one sector of society is subsidized to occupy public land for a private use, without providing any benefits to the larger public.

i. Land Consumption⁹

- A typical vehicle stays parked 95 per cent of the time. A 2006 study by the Central Road Research Institute in New Delhi estimated that of the 8,760 hours in a year, an average car's steering time is only 400 hours. This means it is driven for only about an hour a day.
- Each car needs/ occupies an average of three different parking locations in the city every day. The land required to park a car is approx. 23 sq m, which includes the space occupied by the vehicle as well as the minimum space needed to move it into and out of the space. This is called equivalent car space, or ECS.
- Therefore, each car effectively consumes 69 sq.m. of land every day, most of which is public land.
- On the other hand, a very poor family (EWS) in Delhi gets a plot or apartment of 25 sq.m.
- **Delhi, in other words, allots more public land per day for parking cars than it does to house its poor.** And all this for only 20 per cent of city's population which have a family car, based on figures of the 2008 Household Survey by the Department of Transport, GNCTD.

The key elements of the policy are :

- Parking management and enforcement
- Parking provision and standards
- Parking pricing and travel demand management strategy
- Parking for public transport oriented development

On-street parking: A serious challenge On-street parking cannot be eliminated. Need to find strategies to reduce it and ensure optimal use of curb side

Some non-negotiables have been outlined by EPCA, such as **parks / playgrounds would not be permitted to be utilized for parking purpose as it would destroy breathing space / playground for children**

Some measures that can be taken up by MCD, NDMC in Delhi to:

- Demarcate legal parking spaces. Organise them well.
- Inventorise the parking spaces. Put out the list on the website
- Prevent encroachment of walkways
- Put up signages and information systems
- Introduce metering
- Impose penalty
- IT applications as necessary

⁹ Source: Centre for Science and Environment courtesy India Environmental Portal

4. Methodology

An assessment of the area has been done by the design team by a series of surveys, activity mapping etc as a critical documentation of the use of neighborhood, the nodes and the open areas. Data Collection includes :

Geometric Survey : A total station based geometric survey of the project area has been done for a basic requirement to design. A total station survey will give complete topographical data of existing underground and overhead features like services and utilities, the existing landscape, buildings and structures. It includes existing road infrastructure with median, road edge, footpath etc.

The details of geometric survey data can be broadly classified as following:

Road Right of Way includes width of carriageway, footpaths, central verge, drains

Buildings and Structures : Dimensions and details of built-up areas including setbacks from building line/boundary wall. Type of building, such as temporary, permanent including number of storey's and basement details; Details of religious structures such as temple, Gurudwara, Mosque, Church, Monuments, tombs, etc.; Details of land along the route and their uses such as residential, commercial, religious, parks, green areas, vacant lands etc; Encroachments of the right of way.

Utilities Utility services such as electric lines, telephone lines, H.T., L.T. Transmission lines;

Vertical Clearances to power line or telephone / telegraph lines at road crossings and at locations where Flyovers are proposed. Traffic Signals, light posts, bus stops, Junction boxes (telephone and power), wire and water hydrants (firefighting and others), transformers, telephone posts;

Any other structure or details which may be relevant, Underground utilities (Public & Private) i.e. cables, sewers, pipelines.

Trees and open green spaces

Activity Survey : In activity survey allows an understanding of the user requirements and behavior, which cannot be reflected by a geometric survey. Topographic or geometric surveys are limited to static physical features of the site. An activity survey records dynamic, formal and informal activities at the site, such as parking, hawking, service activities, etc. The survey records social and commercial demands from the corridor; which exist even in the absence of formal planning. This presents an opportunity for integrated planning to address these requirements, which otherwise have a potential of compromising planned usage of the corridor.

This includes the following:

Formal and informal parking classified as per type, location and character

Shop spillovers on the existing corridor in terms of goods displayed and/or stored on public land
Hawker activity as per type of hawkers (mobile, stationary or semi-permanent) indicating area occupied, numbers, spread, etc.

Any other observed localized activity on site, which is not recorded in the total station survey.

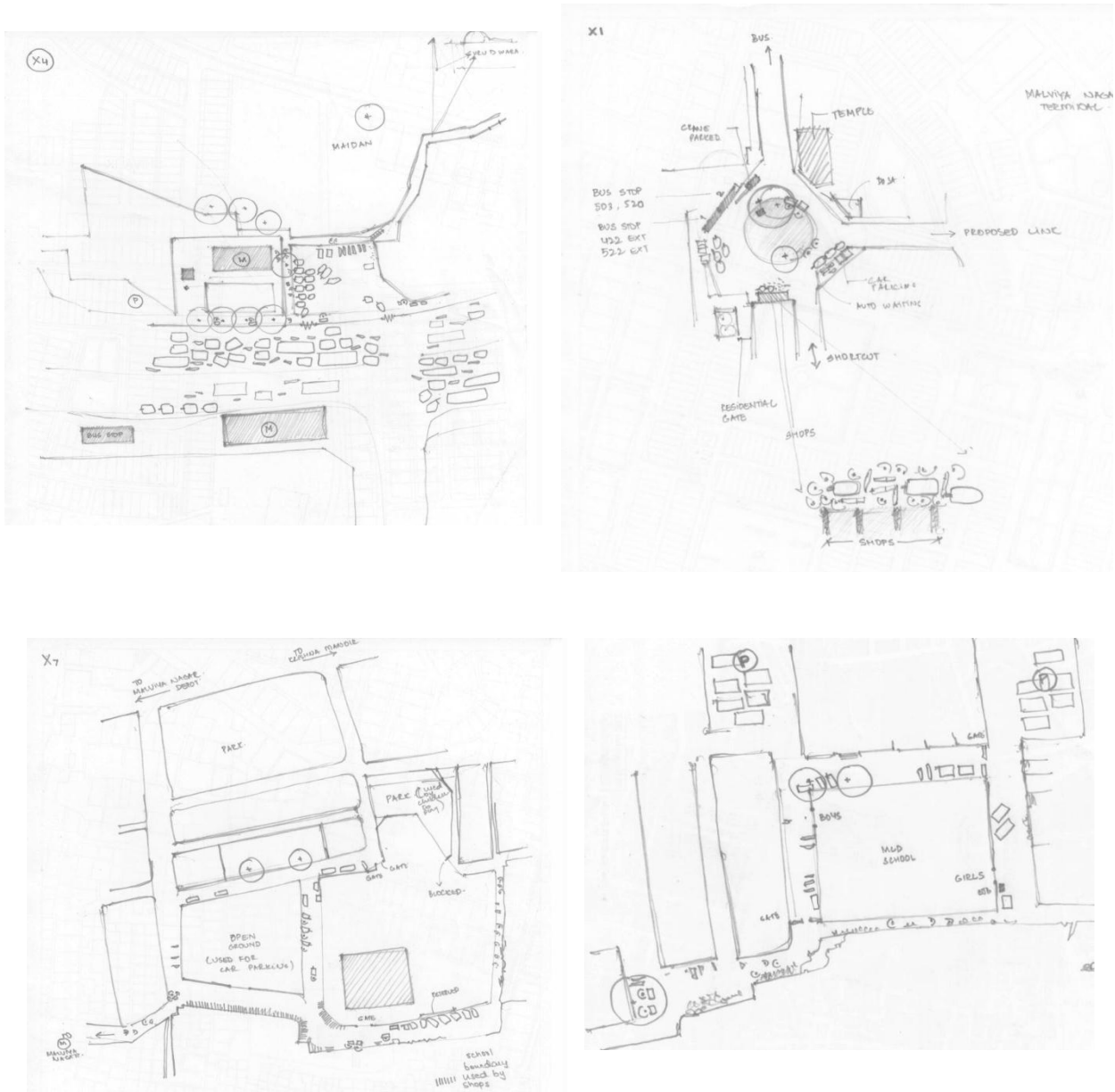


Figure 2 : Sample activity surveys conducted at critical junctions and school premises

Traffic and Accident Surveys

Traffic surveys provide an assessment of current vehicular (motorized and non-motorized) as well pedestrian traffic demand on the corridor. The data required are:

Motorized vehicle, non-motorized vehicle and pedestrian survey at identified intersection, classified as mode and direction wise data.

Parking Surveys – for both formal and informal parking (if not collected as a part of activity survey).

Pedestrian counts at identified locations.

Accident Data – The past accident data collected over past five years and classified as type (between different vehicles) and intensity (fatal or serious) can assist in incorporating design changes while working on details like identification of speed zones, traffic calming, material selection, etc. Accident data can also be compared, pre and post construction, and used for performance evaluation of corridor designs.

Annexure 7.2 shows the finding of the traffic survey conducted at 14 identified intersections.

5. Problem Analysis and Assessment

5.1 Existing Network

The site is bounded by principal streets of network of Delhi. With Press Enclave, Outer Ring Road and Lal Bahadur Shastri Marg carrying large amounts of traffic and people every day, the internal streets of the project area are used as thoroughfare routes to bypass certain stretches on main roads by vehicles to avoid congestions. This leads to undesirable traffic increasing noise and air pollution within the project area.

The area is quite active with key market places, active stretches, schools and places of worship like temples, masjid and gurudwaras that are used by many people from neighboring areas and this also leads to increased traffic load in the area.

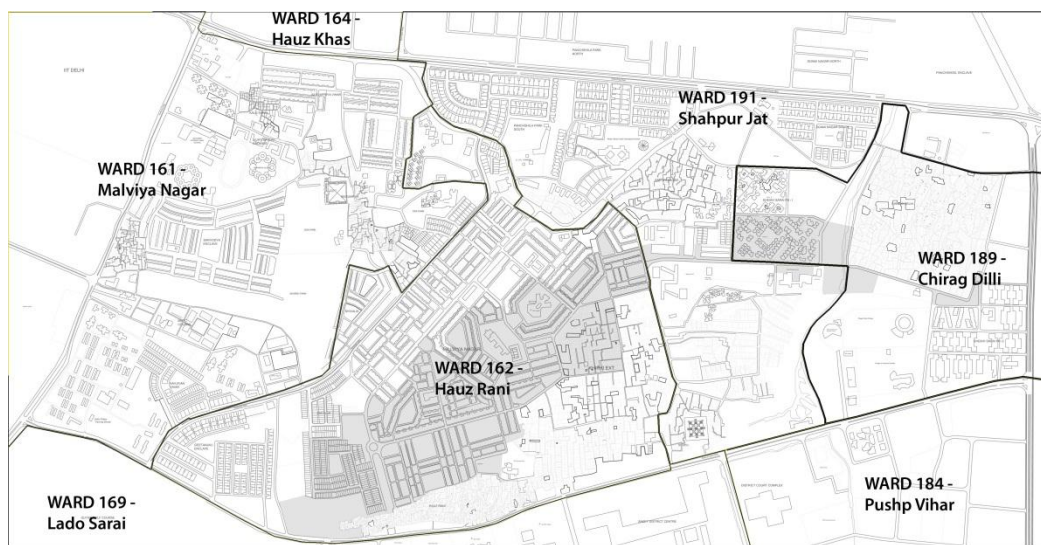


Figure 3 : Project Area highlighted in grey color crossing through different wards

1. The area is already characterized by a complex network of streets that make it a potential area for walkability and use of NMT infrastructure.
2. Already existing dense network of the streets within the project area crosses through ward 162-hauz rani, 191- shahpur jat and 189- chirag dilli.
3. Area houses different landuse like schools, active stretches, market areas, religious sites, places of heritage significance and has a considerable amount of green parks excluding the ratio of streets in the area.
4. Presence of freight traffic in the area that bring supply to the shops and commercial areas.
5. Right of Way varies from 3-6m upto 20 m at some points. Such narrow roads also accommodate school bus, school vans, goods rickshaw , auto rickshaws and street vendors at most stretches.
6. The presence of service providers makes the area active and provide safety as eyes on street.
7. The presence of metro and bus stops has given residents choices of transit, however lack of proper pedestrian infrastructure limits its access.



Figure 4 : Landuse in project area with green open spaces, location of transport infrastructure, schools, hospital, religious sites and heritage buildings.



Figure 5 : The network of roads

Two type of traffic are analysed as **thoroughfare traffic** and destined traffic. The thoroughfare uses the project area as shortcuts and increase load on the roads. Figure shows the routes predominantly used by the thoroughfare traffic to connect to the principal periphery streets. Also the presence of Saket Malls and Max Hospital attracts the traffic to use the project area as a short cut for coming from Geetanjali Marg.

Certain impediments are the node/intersection design itself that encourages vehicle users to not main roads but enter the project area. For eg, The traffic coming from adchini to getanjali marg can take the Malviya Nagar Police station road but due to compulsory left turn do not take a U-turn to enter the neighborhood and use the inner streets to reach press enclave road. Also the surface condition of the Malviya nagar road needs improvement.

Similarly, the traffic passing the neighborhood to reach chirag delhi intersection use the local road adjacent to chirag delhi creating a bottle neck at 120m on the BRT Corridor (near side of the chirag delhi intersection) since the median at sheikh sarai is blocked and traffic coming to neighborhood has to take a compulsory left to outer ring road in other direction of the chirag delhi intersection.

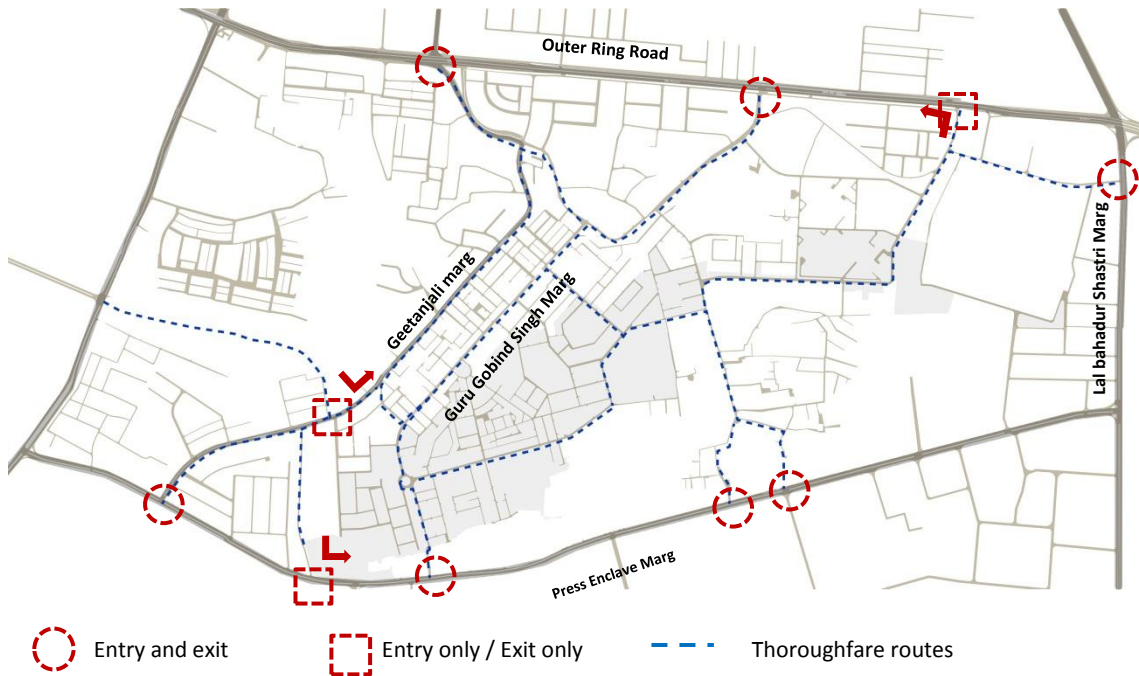


Figure 6 : Current openings and predominant routes for thoroughfare traffic

Added load on neighborhood roads lead to undesirable pollution – air and noise, affect social and environmental concerns and the community at large.

The other traffic using the area is the **destined traffic** i.e. the residents living in this area. Due to availability of metro and bus transit stops (at a walkable assistance), it is assessed that the neighborhood has a great potential. However, due to changes in landuse and density pattern, there has been an increase in the ownership of private vehicles in the area, consuming road space making pedestrians of all age groups vulnerable to moving traffic.

5.1.1 Location of bus stops

Press Enclave Road and Gitanjali Marg have bus stops with routes connecting important destinations around the city. In addition bus stops are ocated along the Malviya Nagar Market Road and the Malviya Nagar Roundabout

The roundabout aka gol chakkar is not only a landmark for the area but also serves as a terminal for routes 422 , 503, 520 , 522EXT, plying along the malviya nagar road. This space not only serve as terminal but also as idle parking for buses.



Bus Parking



Shops parking

Figure 7 : Malviya Nagar Terminal

Presence of temple, a commercial strips and parking of autorickshaws makes the area lively during the day, however at the night it is mainly used as space for parking of buses and cranes.



Figure 8: Current location of transit stops – Bus Stops and Metro Stations and BRT stops

5.1.2 Associated Issues

With identified network in the area, there are considerable problems associated with the neighborhood. They are:

1. Parking: As discussed earlier, parking is a big issue in the neighborhood. Lack of space to park has made people park their cars on footpaths and space for NMT users making them vulnerable to unsafe environments. Parking in front of commercial activity /active stretches has also been seen in the area.
2. Spillover of shops onto the footpath: The shop owners use the footpath as an extension of their shops by placing signboards, shop articles or even personal vehicles that are seen as barriers and force the pedestrians into vulnerable conditions.

3. Cars and two wheelers parked on sidewalks: the area is dominated by cars and nuisance of parking has consumed the rightful area of pedestrians.
4. Insufficient or missing footpath affects the continuity of NMT infrastructure and makes it unusable.
5. Vertical hindrances like trees and light poles in the walking path.
6. Street vendors are seen as obstacles hindering the roadway movement. However they are eyes on the street. Their presence ensures safety. However, they need to be integrated in the infrastructure design to be service providers for the community.
7. Lack of Public facilities like public toilets
8. Use of parks for parking.
9. Haphazard Parking of private vehicles and para transit modes.
10. Improper management of freight carriers in terms time and services (Logistics)
11. Property entrances like steps and ramps on footpath
12. Underutilization of the proposed metro exits with no direct accessibility for the residents
13. Poor lighting conditions
14. Limited choices for NMT users to use the neighborhood hence leading to unsafe neighborhood.



Parking in market areas



No space to walk

Figure 9 : Parking activities consuming road space and space for NMT users



Figure 10 : Extension of the shops onto the streets



Hawkers

Service Providers

Figure 11 : Street vendors in the area – potential safety for the streets



Figure 12 : Missing or inadequate footpaths



Figure 13 : Parks being used as parking areas (Hauz rani)



Property Entrances on Footpath



Vertical Obstructions

Figure 14 : Obstruction/Impediments on footpath

6. Proposal for Mobility

6.1 Broad Mobility Guideline

The broad principles of the mobility plan for the selected site has been developed based on the analysis of the context and related problems as discussed in previous chapters. These principles can be defined as following:

1. Addressing access and mobility issues based on the categorization of roads into two broad categories, i.e. streets with through traffic and streets with destination traffic.
2. Strategizing demand management approach for unsustainable modes and capacity enhancement for sustainable modes.
3. Identification of public transport and IPT nodes and strengthening of pedestrian/NMT access to the same.

The following sections explain the development of broad mobility plan under each of the two approach strategies or principles listed above.

6.1.1 Through and Destination Streets

As discussed earlier the study area has a number of internal roads which carry through traffic between major arterials, primarily between Press Enclave Road to Outer Ring Road and BRTS Corridor. The traffic exits on to these roads at Press Enclave Intersection and Chiragh Village T Junction (on BRTS corridor) leading to additional load on internal primary and secondary distributor roads which are not designed for such functions. This leads to the requirement of additional links between Press Enclave Road and Outer Ring Road, which can offset the demand on internal roads. In addition critical intersections such as node no. 1 and 2 in *figure 15* need to be restored as signalized intersections for vehicles to allow even traffic distribution and avoid additional trips and trip lengths due to detours forced on to internal roads.

In addition the mobility plan proposes differing strategies for addressing planning and design issues on the through and destination streets. It is proposed that though destination streets which are the local and access roads in the study area be treated as internal neighborhood streets with built in wider role and ownership of the immediate community. However primary and secondary distributor roads which have been identified as carriers of traffic between the study area and the arterial roads, should have a higher scope of an integrated plan where space allocation between dynamic and static function would need to be rationalized through a broader engagement with the study area residents, as clearly the stakeholders here are more than the immediate residents.

6.1.2 Sustainable and Unsustainable Modes

Another dimension of the development of broad mobility strategy is the identification and addressing of issues concerning sustainable and unsustainable modes. As discussed earlier, sustainable modes such as walk, cycling and public transportation would be addressed through a capacity enhancement strategy while unsustainable modes such as private motorized modes would require a demand management approach. Under this strategy the broad mobility plan perceives augmentation and densification of NMT network through addition of links and provision of shortcuts. A majority of such links re proposed along main access routes to public transit stations. It

is proposed that the current bus terminal be shifted to the Malviya Nagar Metro station, which shall also host space for idle parking of buses and other commercial vehicles. This will allow removal of intrusion by public transport buses on neighborhood roads without adversely affecting the access to public transport. This also allows the release of Malviya Nagar Roundabout from vehicular domain to a public space which can be used to develop a vibrant local landmark.

Unsustainable modes are seen as encroachers on to public space as they occupy streets, footpaths, and even parks for parking. It is assessed that the parking demand in this area has reached saturation levels and enhancement of capacity (either paid or unpaid) would lead to additional parking demand without much success in releasing the occupied road space for sustainable modes. The strategy is thus to treat neighborhood roads to allow safe and convenient sharing of space between Non-motorized and motorized modes. One way is to develop streets as low speed pedestrian priority streets where car is clearly identified as an intrusion. However this strategy may not work on distributor roads where certain width for through movement of motorized and non-motorized modes would need to be reserved through different strategies and stages of discussion based design evolution.

6.1.3 Strengthening of NMT Links

It is understood that the primary feeder to public transport is walk while other non-motorized modes such as cycles and cycle rickshaws can also serve as an effective link for certain segment of commuters. Thus the mobility plan for the study area proposes development of four dedicated links to bus stops and three dedicated links to the Metro station. The three dedicated links to the metro station shall also serve as links to the bus terminal proposed to be shifted to the Metro station as a part of this plan. In addition it is proposed that internal NMT network should be made more cohesive, direct, safe, attractive and comfortable by removing barricades such as gates and general improvement of walking environment achieved by surface improvement, drainage improvement, lighting improvement, etc. Also, based on the land use, special zone should be identified such as hospital, school; recreational areas, informal markets etc and key methods should be taken into practice such as traffic calming measures, signage, etc.

6.2 Broad Mobility Plan

Following sections highlight the details of the mobility plan based on the principles and strategies explained above

6.2.1 Proposed Network and hierarchy of roads

An identification of road hierarchy has been done that govern the design speed of the area. The design speed governs the allocation of lane width, design of the cross section and traffic calming measures as per the available road width. Also, certain potential links have been suggested which can be crucial and lead to reduction of use by thoroughfare traffic in the neighborhood.

The design of the ROW depends upon the nature and the function of the ROW. Figure 15 shows a clear picture of the allocated design character.

Road Typology	ROW	Max. Design Speed
Arterial	24-80m	50km/hr
Distributor	12-30m	30 km/hr
Access	Upto 12m	15km/hr

Based on ROW and the use – the categorization of the roads as a function of use and design speed is indicated in the following map.

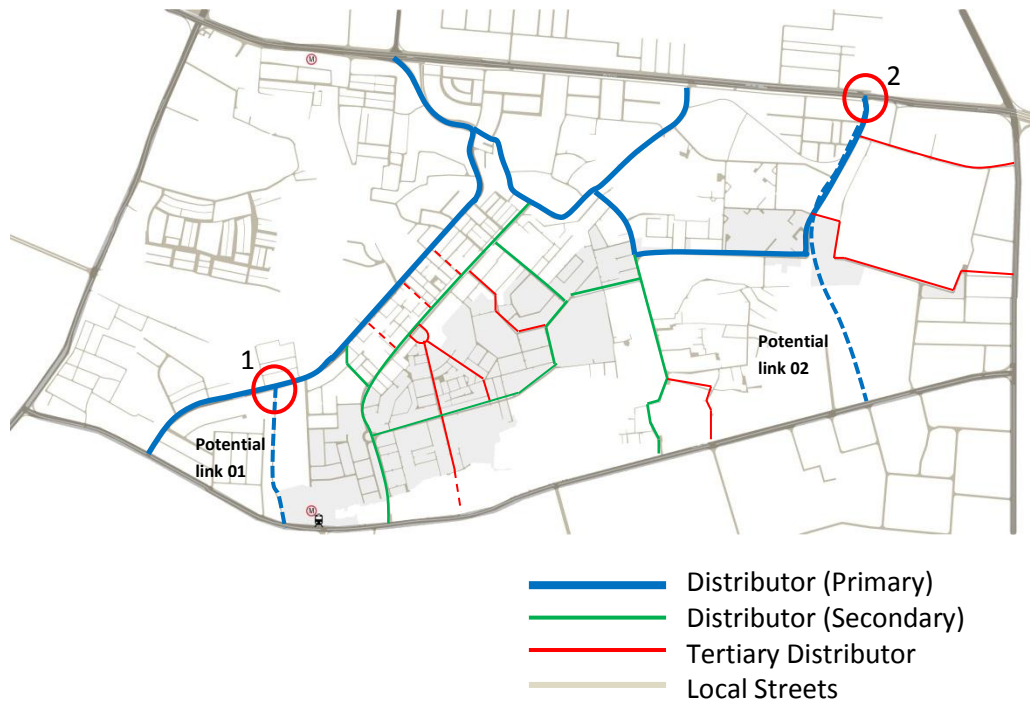


Figure 15: Road Hierarchy in the network

It is highlighted that the category of the distributor streets has been further categorized as primary, secondary and tertiary distributor streets. Typology cross-sections of the distributor road is shown in Figure 16. It indicates two different zones in the ROW – a dynamic zone which includes 2 lanes for the vehicular traffic . Painted cycle lanes are marked onto primary distributor. A static zone is where the negotiations between various side activities happen. This includes pedestrian path, spaces for vendors, parking. The detail is to be taken up as per the activity and land use on each of the street keeping in mind the principles of the broad mobility plan.

Figure 17 indicates the use of the neighborhood streets which are mainly access streets. Mainly as observed in the area, two particular scenarios have been identified. One scenario is the internal street with houses along both sides of the street or the house facing an open area, local parks. A 2.5m -3.0m moving lane is required. In the second scenario, the design of the edge is crucial where the footpath (mainly recreational) can be accommodated within the right of way or also as an extension into the open area.

In both cases, distributor and local streets, traffic calming measures like raised crossings play an important role to regulate the speed in the neighborhood.

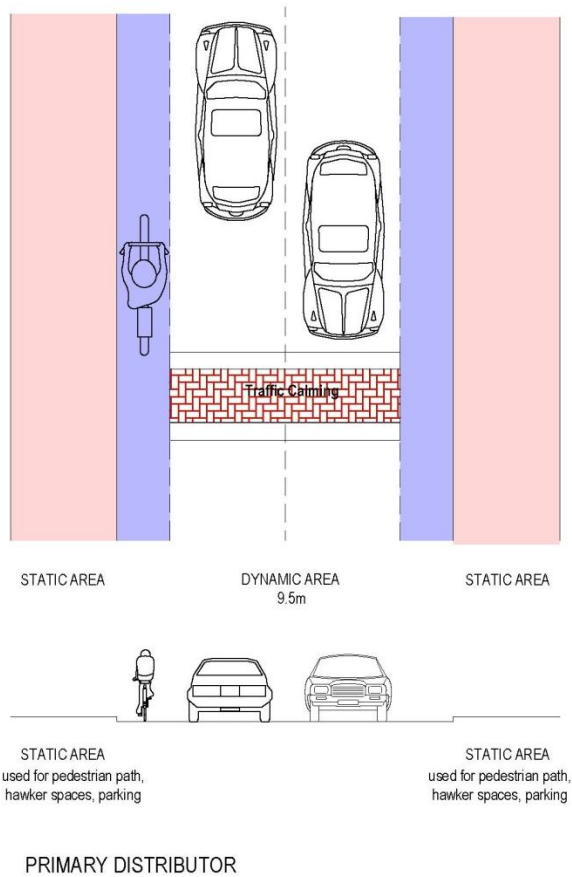


Figure 16 : Proposed Cross section for Distributor Street

To deter the thoroughfare traffic to use the neighborhood two potential links have been identified. Link 02 has already been proposed by government organizations for capacity enhancement in terms of the larger network. Refer (Annexure 1). A brief description of the two are :

LINK 1 : Connecting Geetanjali Marg to Press Enclave Road along the Malviya Nagar Metro Station.

This involves junction improvement at entrance of road from Geetanjali Marg to Malviya Nagar Police station road leading to the Malviya Nagar Metro Station. The junction needs to be redesigned to facilitate traffic coming from Adchini to enter this link to prevent entering the project area. A signalized intersection at that intersection could be a solution.

LINK 2 : Proposed LINK ROAD connecting Press Enclave Road and Outer Ring Road

The link road has been proposed to offload congestion (a capacity enhancement measure) from Lal Bahadur Shastri Marg and take people to Chirag Delhi Intersection. This will make it more attractive for thoroughfare traffic to

The above are long terms strategies that are already proposed capacity enhancement strategies that may look attractive for thoroughfare traffic to prevent them from bypassing the area. For short term

strategies, one way options might be looked as options to avoid using the neighborhood as shortcuts and better circulation of destined traffic in the neighborhood.

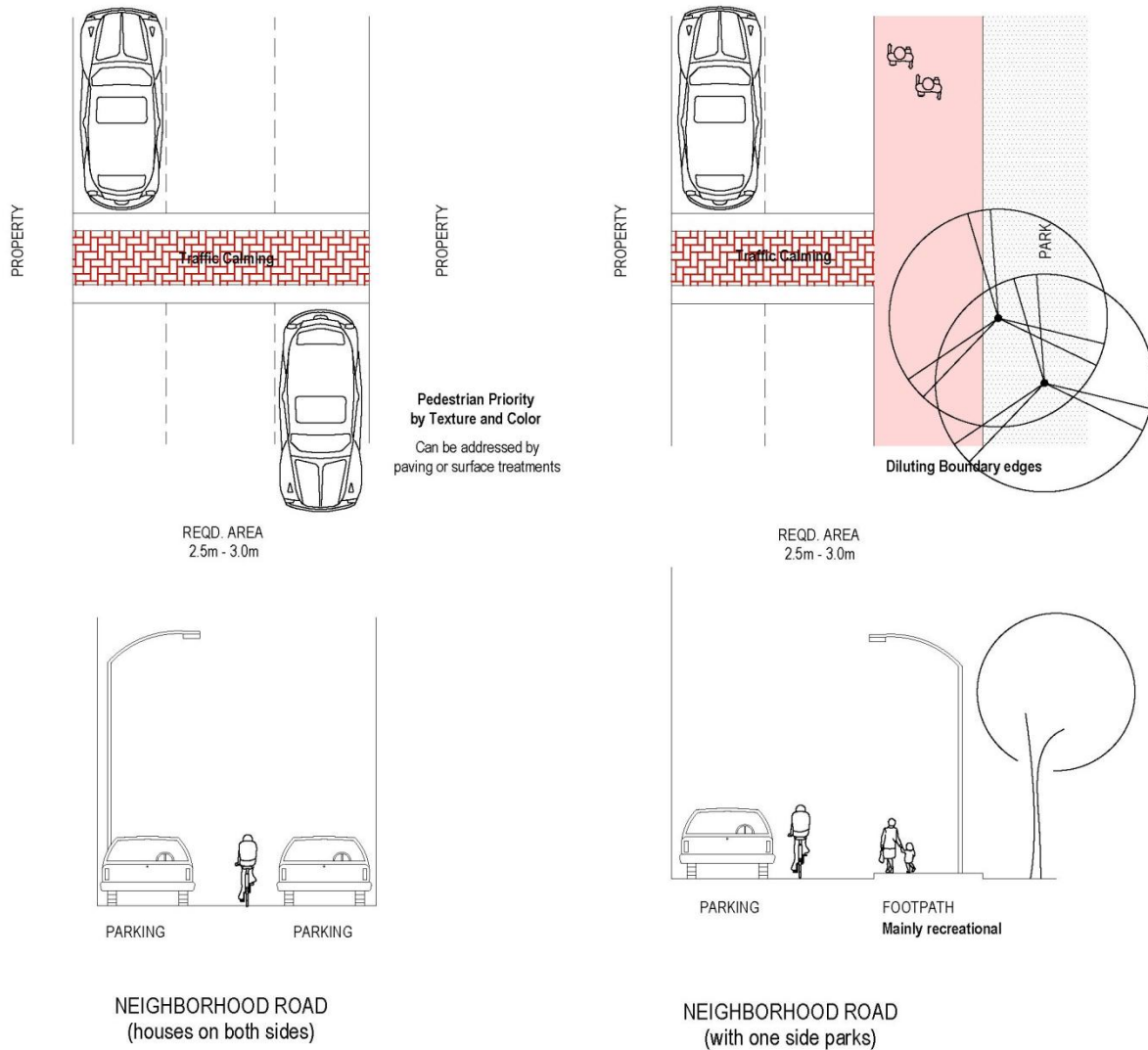


Figure 17 : Proposed Cross section for Local Streets

6.2.1.1 Components

1. Potential links (long term)
2. Use of one ways may be considered (short term to reduce thoroughfare)
3. Road hierarchy and identification of link typologies.
4. Integration of Para transit and Service Providers for accessibility
5. Allocation of parking areas for public buses and Feeder infrastructure.
6. Integration of the Malviya Nagar Terminal with the DMRC station with provision of DTC bus parking and Idle bus parking
7. Reclaiming public space – use of dead spaces
8. Promoting NMT and accesible street infrastructure design

6.2.1.2 Proposed Public Transportation linkages and stops

The gol chakkar i.e. the Malviya Nagar Terminal is mainly a dead space in the neighborhood used for parking buses at night and cranes and other vehicles throughout the day. Currently the use of the Guru Gobing Singh Marg by the buses plying is only to end at the terminal that facilitates them to turn.

Integrating the terminal with the metro station will create a nodal hub for multi modal transit and also provide adequate parking for DTC buses as well as other chartered buses. This will definitely provide space in the neighborhood which can be reclaimed as open areas/ green spaces for the project area. The strategy here is to eliminate these stops and move them onto the Geetanjali Marg which is on a parallel distance of 150 m. This is within the walkability radar. The circulation of the buses ending at the terminal shall use the Geetanjali Marg and end into the integrated hub through Malviya Nagar Police Station road.

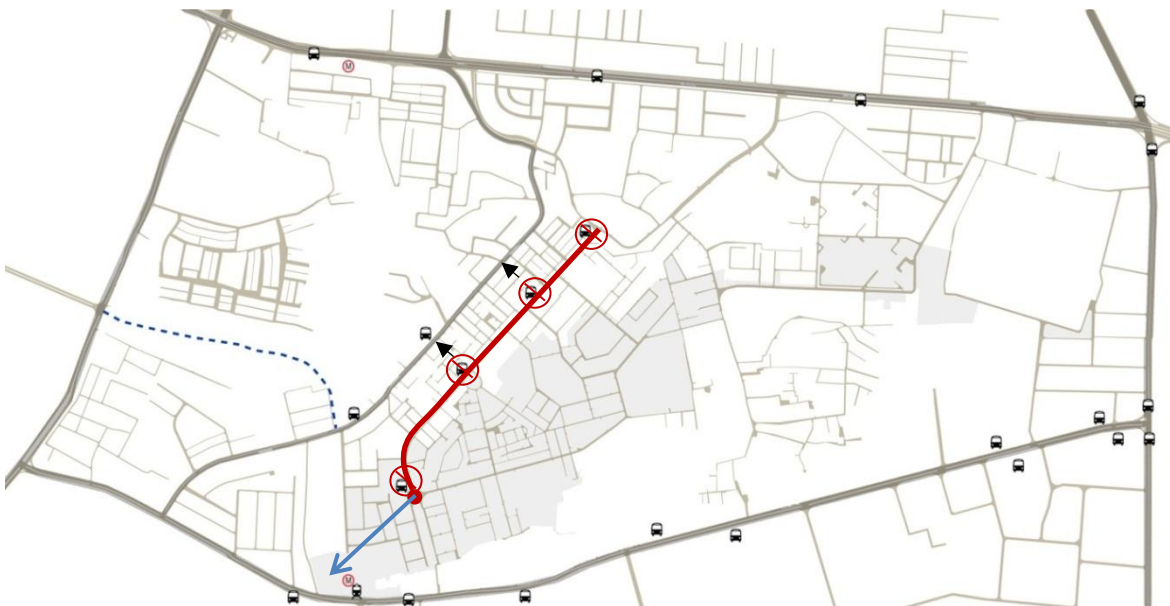


Figure 18 : Shift of Malviya Nagar Terminal with the Metro station and use of Geetanjali Marg



Figure 19 : Final location of bus stops in the area – on periphery

The Malviya Nagar roundabout/ gol chakkar can be redesigned integrating the activities around as an active public realm and continuing as a landmark for the area.

6.2.2 Primary NMT Feeder Links to Public Transportation

It has already been mentioned that dense pedestrian network is required to provide choices to the NMT and the pedestrian. However, it is observed that there are key links that act as feeder to public transportation stops. A proper design based on the principles of NMT should be taken up for these Primary NMT Feeder Links that will promote accessibility throughout the neighborhood.

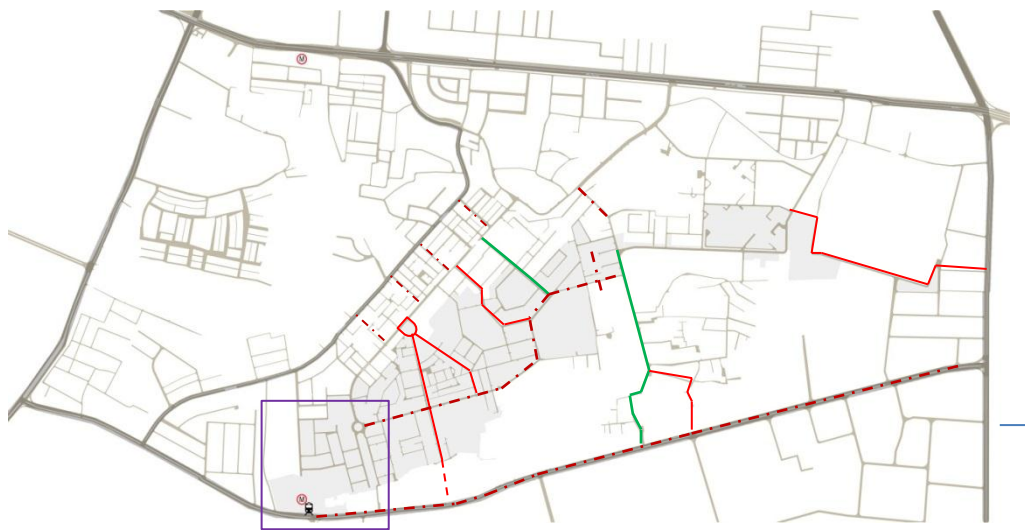


Figure 20 : Primary NMT Feeder Links to Public Transportation stops. (See Figure 11)



Figure 21 : NMT Primary Links from the metro station

Other key stretches include access to market places through internal streets connecting the neighborhood with the peripheral transit connectivity. The role of feeder/ para transit becomes key within the neighborhood and some capacity enhancement for sustainable modes can be done to offer alternatives to the residents. (It should be reminded that walkability is the fundamental feeder for the neighborhood).

It has been observed that Malviya Nagar Metro station has three exits , Gate no. 1 along the multi speciality hospital (under construction), Main malviya nagar metro station exit located at press enclave road , and one behind shivalik A block which is currently closed. There is currently no provision of access to the third gate.

With reference to the Malviya Nagar Metro station(now also the main bus terminal / integrated hub), there are choices available to the pedestrian

1. Press Enclave road : this might include use of para transit/ public transport to cover the last mile based on the walkability radar . Distributor in character, the pedestrian infrastructure can be improved along the periphery of the entire project area as well as could be taken up to Lal Bahadur Shastri Marg.
2. Internal road along the Hauz Rani Village : Only NMT specific
3. Internal road along – Only NMT specific.

6.2.3 NMT Network requirement

NMT Network requirement includes the bicyclist as well as the pedestrian. Captive riders accept road network and infrastructure as suo-moto bicycle network and infrastructure. They find the road network, cohesive, direct and comfortable (in terms of riding quality) but not safe and attractive. Both safety and attractiveness are based on individual's perception.

There are 5 key principles that should be carefully looked into are :

Cohesion – The dense network proposed should be cohesive and legible. A network is cohesive when NMT user have a variety of routes between his or her point of departure and destination and NMV users can access bicycle specific routes or corridors in the network with minimal detours in their journey

Directness - Directness of NMT infrastructure has to do with the amount of time and effort required by a cyclist to undertake a journey. The lower the time taken higher is the directness.

Attractiveness - Attractiveness in the network refers to the visual and spatial experience of the NMT user. These experiences are vastly different from those of driving, as the speed at which the user experiences the surrounding is different. One may choose to include elements such as activity centers (such as small hawker spaces or kiosks), trees, fountains, planters, seating, plazas, etc to break the monotony of the route and introduce visually and spatially attractive elements more apt to walkability and cycling in the area.

Safety - NMVs are as vulnerable road users as they are not designed for any protection to the occupant in case of crashes. Though this is also true for motorized two wheelers, their safety is partially taken care by legislations enforcing helmet use and speed limits. Moreover, their speed is

much more similar to the car speeds and often it is the difference in speed which is causing the accidents. Factors affecting safety on the NMT network would include the following:

1. Provision of segregated path if permitted by ROW
2. Speed reduction by design on roads where NMVs mix with motorized vehicles.
3. Reduction of speeds of motorized vehicles at crossings and intersections.
4. Combining shortest and safest routes.
5. Discouraging encroachment by motorized modes such as two wheelers on NMV path/track.
6. Improve visibility for both NMV and motorized modes, especially at intersections.

Comfort - This requirement is concerned with the nuisance and effort or the exertion undergone by the NMT user during his or her journey. The lower the nuisance and effort, higher the comfort level of infrastructure. Factors adversely affecting the comfort of user by choice are: traffic bottlenecks, steep gradients or slope of travel way, nuisance caused by traffic noise and emissions, bad riding/walking quality, presence of obstructions resulting in frequent braking or slowing down, etc.

There are certain key areas that enhance the user experience :

Use of Street lighting : Adequate street lighting ensures safety and use of the neighborhood .

Use of surface treatments : It is very important to select the appropriate material available for different surfaces to contribute to the workability and usability of NMT infrastructure. The materials used for bicycle infrastructure construction should meet the requirements of being theoretically sound, validated experimentally and capable of reasonable testing and comparison. The materials should also have the desired level of workability, economy, strength, durability, volume stability, wear resistance & impermeability.

Use of Signages and Marking for information or regulations (wherever necessary)

In the project area all internal roads should be NMT friendly to create a dense network and therefore need to follow the key principles outlines above. Based on these principles,

1. Barriers , impediments in the movement of the NMT user need to be removed. At detail plan level, key missing requirements needs to be identified and included.
2. Integration of service providers like hawkers and vendors is essential. An allocated space makes it a vibrant and a safer place as they serve as 'eyes on the street'
3. All infrastructure should be designed for the differently abled and should be inclusive in nature.

6.2.4 Parking

6.2.4.1 Public Bus Parking

With the proposal of shift of the bus depot as an integrated project with the metro – it is easier to find bus parking space for DTC and also other commercial vehicles. Assistance with marking and signages could help enforce reserved spaces for public bus parking, anywhere in the neighborhood.

6.2.4.2 *Integration of Feeder Parking Areas*

As discussed, the need of para transit might increase within the neighborhood. All Primary NMT Feeder links should have allocated parking areas for feeder like cycle rickshaws to facilitate ease of access and better connectivity with the network. These can be provided every 200-300m.

6.2.4.3 *Private Car Parking (based on policy guidelines)*

Private car parking has to be seen in line with the parking policy for the city where the following has been highlighted :

The parking policy in no way proposes removal or eviction of vehicles from the street. It is a policy which is primarily directed towards extracting the actual price of occupation of public land from cars, and in that manner discourage the rampant mis-use of public space. In this manner the government or the authorities are completely avoiding the need for transition in the current use of physical space. The idea is to remove the available subsidy to car owners in the form of free parking. Thus the current cars can very well remain where they are however they will need to pay a charge and the government is in the process of finalizing the road-map for collecting that charge.

Parking policy is not recommending multilevel car parks as a universal solution and there is no mention of the same in residential areas (commercial areas yes). Further, multi level car parks need some minimum area to be successful and efficient. For example, a passive multilevel car park uses a minimum of 400sq.m. to provide ramps, and any additional space requires 30sq.m. per car (for low capacity parking) and 25 sq.m. per car (for high capacity parking). Hence a 500sq.m. 6 level car park will provide only 20 car effective car parking spaces, while a 1000 sq.m. plot will provide 120 effective car parking spaces. Mechanized or automated car parking lots can do with less space, but require high maintenance which only makes sense when the capacity is high (more than 500 to 1000 cars). This is why multilevel car parks are only suitable in commercial areas, with high demand concentration and low turnover time.

We need to rationalize parking along the common thoroughfare and the same number is impossible to accommodate. But this is because we are looking in the domain of formal solutions. The current car parking is based on stacking and is in layers. This is facilitated by the understanding between locals, and a blocking car is promptly removed and put back or they may have a hired caretaker. A formal solution will look into formal standards, which means that each car is independent of the other and thus space requirement increases many fold. Thus the solution may lie between the boundary of formality and informality. One has to explore options of retaining some form of parking informality within defined static zones. This also extends to other functions in static zones such as hawkers and service parking, and some kind of a space sharing agreement without physical restriction may need to be achieved. This is something that may be considered to be taken up in a participatory format when we engage the residents along these thoroughfare roads.

Specific to certain areas, unauthorized parking by cranes, heavy vehicles in the area can use the proposed integrated hub for parking and pay the allocated fee to the responsible authorities..

7 Annexure

7.1 Proposed Link - Press Enclave to Outer Ring Road (DIMTS Ltd)

