

# Parking Management Strategy: Case of Udaipur



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## Introduction

Udaipur is a picturesque lake city, with undulating topography, heritage built form and narrow streets in the traditional part of the city. The city has grown in east and south directions, with planar geography. As per the latest data on mobility for the city, around 50% of trips are taken by foot and cycle. Despite the reliance on Non-Motorised Transport (NMT) modes, the east and south city areas experience traffic pressure, congestion and clogging due to uncontrolled on-street parking and lack of traffic channelization. The city lacks an efficient public transport system, and hence relies on private vehicles for movement. With time, there has been a marked increase in four-wheelers and two-wheelers, which are mobile only for an average of 45 minutes and are parked for the rest of the day. Ratio of vehicles to citizens is increasing at a rapid pace, where 0.53 was observed in 2011. Due to the near absence of any parking pricing and regulated parking infrastructure in the city, unorganised on street parking occurs.

Sustainable transport is not possible without efficient transport infrastructure design in the existing road network. In order to improve the mobility environment of the city, it is important to analyse existing land resources, traffic and transport demand and then recommend feasible solutions as per the local context.

The current report -- Parking Management strategy for Udaipur -- is an output under the project "Supporting Smart Urban Mobility and Built Environment in Indian Cities" under grant Grant Ref: G 15 SSEF-140 for the period of October 2015 to January 2017. The main objectives of the project were to broadly engage with state level officials in two states and carry out continuous on ground engagements with targeted authorities in two cities each in the project states towards implementing the Smart City Mission, with specific reference to urban transport and built environment. This included assessment of existing urban transport scenario in the identified cities for each state and providing handholding support to city teams for smooth initiation of the Smart City Mission.

The report highlights the summary of the parking management strategy and action plan developed for a pilot stretch in the walled city of Udaipur to deal with the problem of choked streets, junctions and informal activities such as informal parking and hawkers. Based on the success of the pilot initiative, the strategy can be scaled up to city level.

As is the case in most Indian cities today, in Udaipur, the traditional approach of providing options like flyovers, road expansion; multi-level mechanized car parks, and more, were being considered to address the increasing demand for infrastructure to accommodate private vehicles. To develop long-term solutions for parking management, it is essential to manage parking demand side as well, as uncontrolled parking supply will only lead to postponement of current saturation, and always create alarming situation for tomorrow.

To deal with the issue of choked streets, junctions and informal activities across the city, the project team from ICLEI SA recommended that Udaipur Municipal Corporation (UMC) develop a city focused parking management strategy based on a detailed study and analysis of selected stretches in the city.

In consultation with the UMC city team, a busy stretch was selected as the pilot corridor, with the intention of designing the selected area with minimal conflict and maximum balance between different road users, clearly classifying space utilization of different activities on the road such as street vending, on street parking and NMT infrastructure.

## Selection of Road Stretch for Developing and Pilot Testing the Parking Management Strategy

Under its smart city plan, the city wanted to develop multi-level car parks. Statistics, however, show that only 2% of the trips in the city are taken by cars while 36% is by two-wheelers and rest by others modes of transport including NMT and autorickshaws. Thus, multi-level parking structures cannot be a standalone solution, and must be integrated well with the existing on-street parking. Based on an initial meeting with the Municipal Commissioner, City Mayor, council and other city officials, it was decided that the stretch from Suraj Pole to Hathi Pole would be taken as the initial pilot site to develop a parking management strategy which could be further scaled up for the entire city. The selected area also witnesses major demand for parking as it is the main commercial centre of the city and the entrance to the walled city.

The entire road stretch from Suraj Pole to Hathi Pole via Delhi Gate is characterised by a variety of land use types where majorly commercial and public activities take place. This stretch has commercial areas, including shops and vendors selling vegetables, groceries, textiles, readymade garments, stationery, automobiles, jewellery, restaurants, hotels, travel agencies, property dealership, etc. It includes important institutions such as the local police *chowkis*, the Municipal Corporation, temples, banks and society *dharamshalas*. This road stretch also has a discontinuous right of way which varies from 16m – 33m and was selected for the pilot.

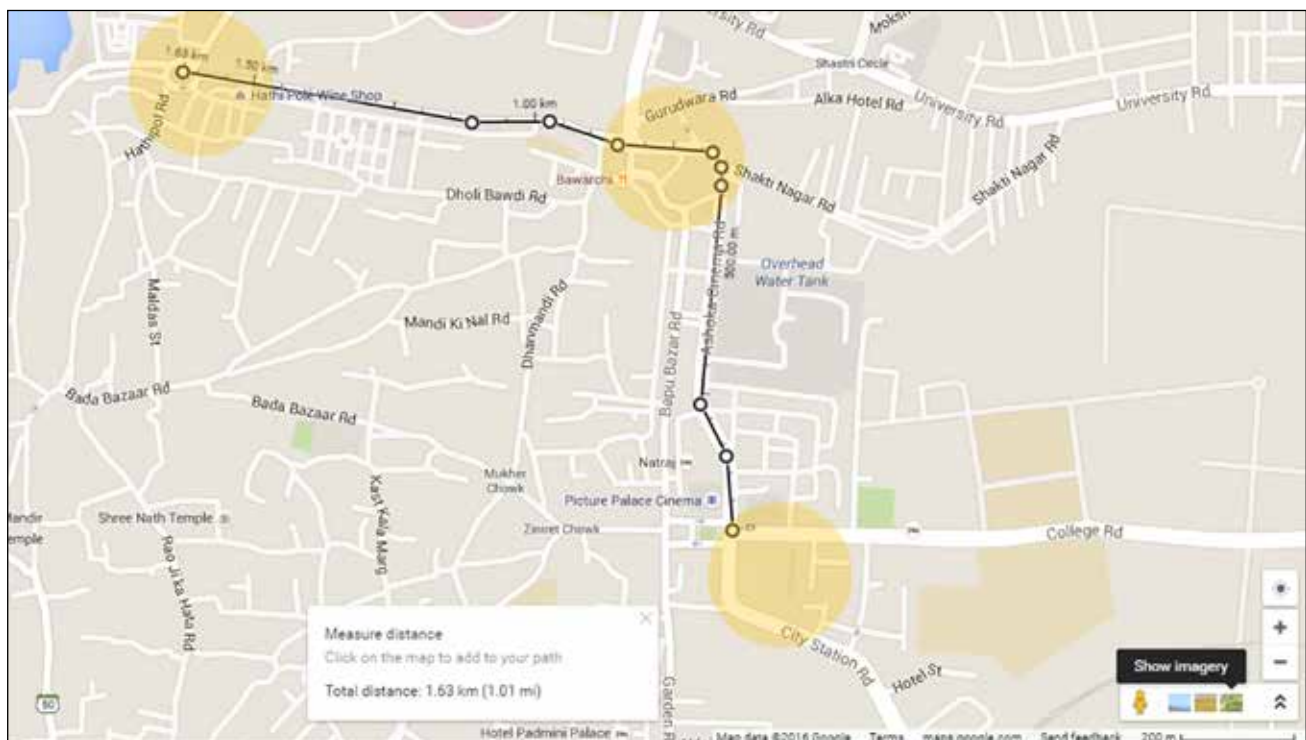


Figure 1.: Junction Location on Stretch

The road from Hathi Pole to Delhi Gate is Ashwini Bazaar road and the right of way varies between 17m-27m with the least width in the middle. There are two parallel roads connecting Delhi Gate to Suraj Pole i.e. Bapu Bazaar road and Ashok Cinema Road whose right of way remains uniform between 20m-22m until the junctions where it automatically increases upto 34 m - 35 m at many places, thus resulting in irregular encroachments and unregulated parking.



All these roads are connected by three major junctions that are located on a stretch of around 2 km, with an average mutual distance of 700 m. Hence, a comprehensive mobility solution is needed for the entire stretch. Figure 1 shows the location of the junctions along with the connecting roads.

## Parking Pressure

As the entire stretch is characterised by a variety of land uses and major markets, the street parking demand is high along the entire stretch, throughout the day, creating pressure on the traffic carrying capacity of road. Around seven off-street parking areas are provided in the market area at Hathi Pole Tanga Stand, Pannadhay Marg, in front of Taibiyah School, Bank Tiraha, Nada Khada, Ganga Gali and in front of Rajiv Eye Hospital. These parking areas are managed by contractors authorized by UMC and mainly cater to four-wheeler parking while the demand is primarily for two wheelers and therefore the entire stretch of Bapu Bazaar Road and Ashwini Bazaar roads is congested with these vehicles. The issue of irregular right of way along most of the roads is also leading to irregular encroachments resulting in a waste of space. The designated parking in total includes parking for 150 cars and 200 two-wheelers. (Refer to Figure 2 & 3).



**Figure 2.: No Universal Accessibility, thus putting NMT Users at Risk, Bapu Bazar Road**



**Figure 3.: Designated Off Street Parking-lot near Delhi Gate**

Parking capacity normally remains the same throughout the day but due to the increasing parking demand there is spill over onto the carriageway. Late at night and early in the morning, most of these spaces are empty. Currently, on street parking is not monetised, thereby encouraging haphazard parking.

Due to the limited parking spaces provided by the municipality, there is a spill over of two-wheelers onto the entire street that is already occupied on both sides. Land available in front of Taibbiya School is currently covered by unorganised hawkers and parking and is being considered by authorities as a potential parking lot. Other sites for multi-level parking are being proposed as well, keeping in mind the growing demand.

During the activity survey carried out in September 2016, a maximum of 2,300 two-wheelers and 450 cars were parked at one time in the study area. About 30-40 per cent of the road space is occupied by on-street parking on these stretches in Udaipur, varying with the time of day. Thus, the area witnesses eight times more parking for two-wheelers and three times more for cars, than the legal limit. Almost all the curb sides encroached upon by parked vehicles parked on the curb sides along the pilot stretch (1000 ECS) occupying almost 15,000 sq. m encroached space as on street parking and 3,500 sq. m space for off street parking. (Refer Figure 4)

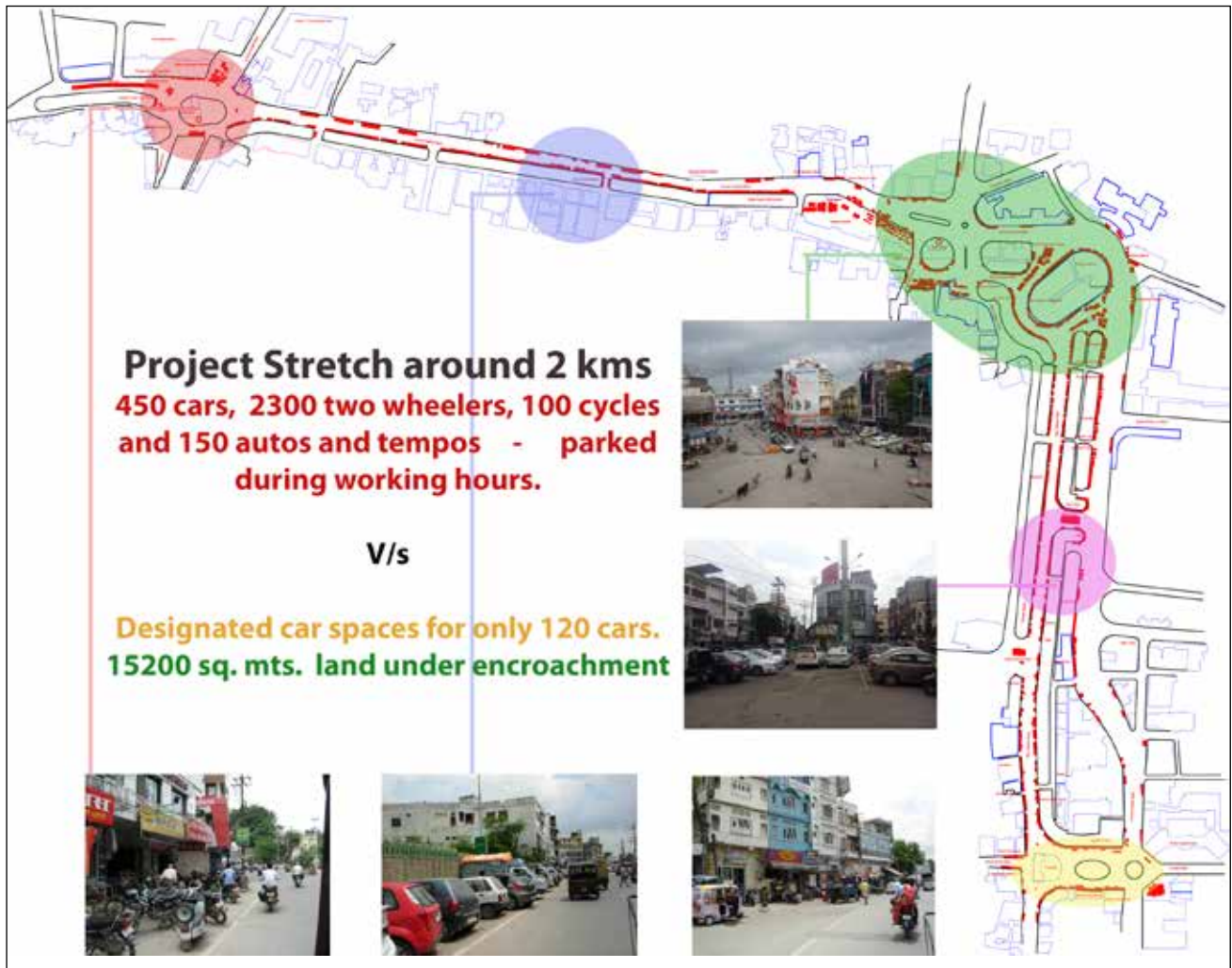


Figure 4.: Existing Situation on the Given Road Stretch

Parking demand was estimated based on an extensive parking survey done for the entire street stretch. Around 700 respondents were surveyed for the analysis. The respondents included shopkeepers and residents. During the weekends, Udaipur draws tourists from nearby cities, hence making it imperative to consider floating commuters while doing any analysis. The main finding of the survey was that rather than removal of on street parking, categorization and classification of road space would be more optimal solutions to the existing issues.

### Where People Come From

It is necessary to know the origin and destination of the trips to the market area. Origin is defined as the place where the trip begins and destination is defined as the place where the trip ends. The survey carried out showed that around 80% of the trip were within a 10 km radius. Therefore, the major trips majorly come from the nearby residential colonies. Around 85% of the trips taken to the market were by private vehicles.

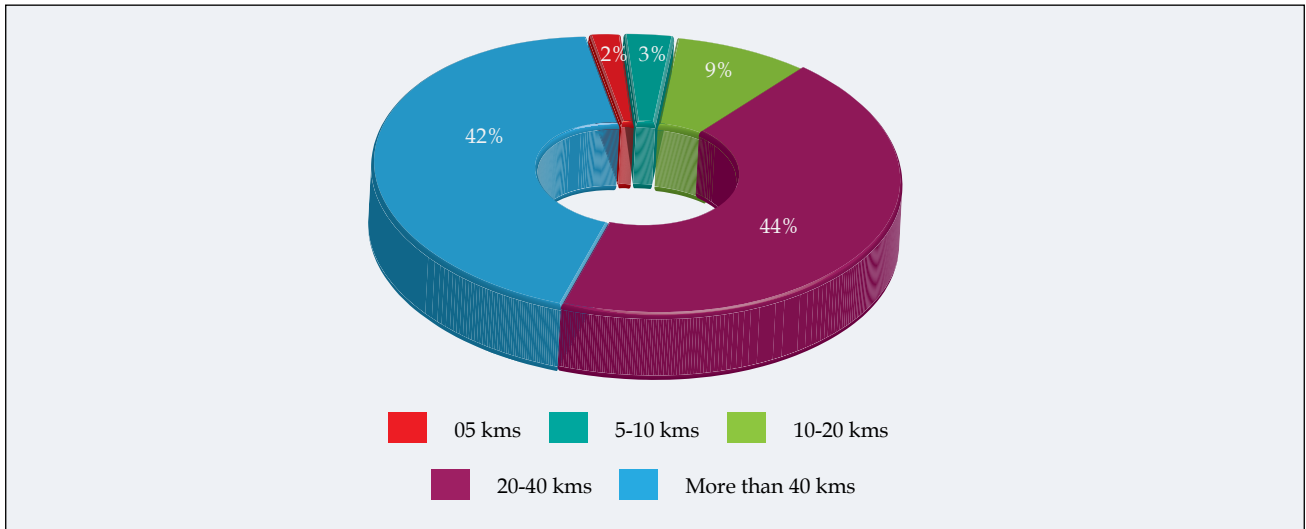


Figure 5.: Percentage Share of Trip Length of Visitors to the Market Area

### Parking Demand

There are around 900-1000 shops within the entire market area. Most of the shopping trips (made by visitors) – approximately 42 per cent – are made by car, 44 per cent by two-wheelers and the rest by auto rickshaws. If we consider work-related trips, (made by shopkeepers/owners) approximately 70-80 per cent are made by two wheelers and the rest by cars. This shows the enormous potential of converting most of these short distance motorised trips to non-motorised trips or at least shift them to intermediate para transit (IPT) services such as autos or rickshaws. This, combined with an effective pricing strategy, can reduce the parking pressure significantly. The peak hours normally range between 11 am - 2 pm in the day and 4 pm - 6 pm in the evening.

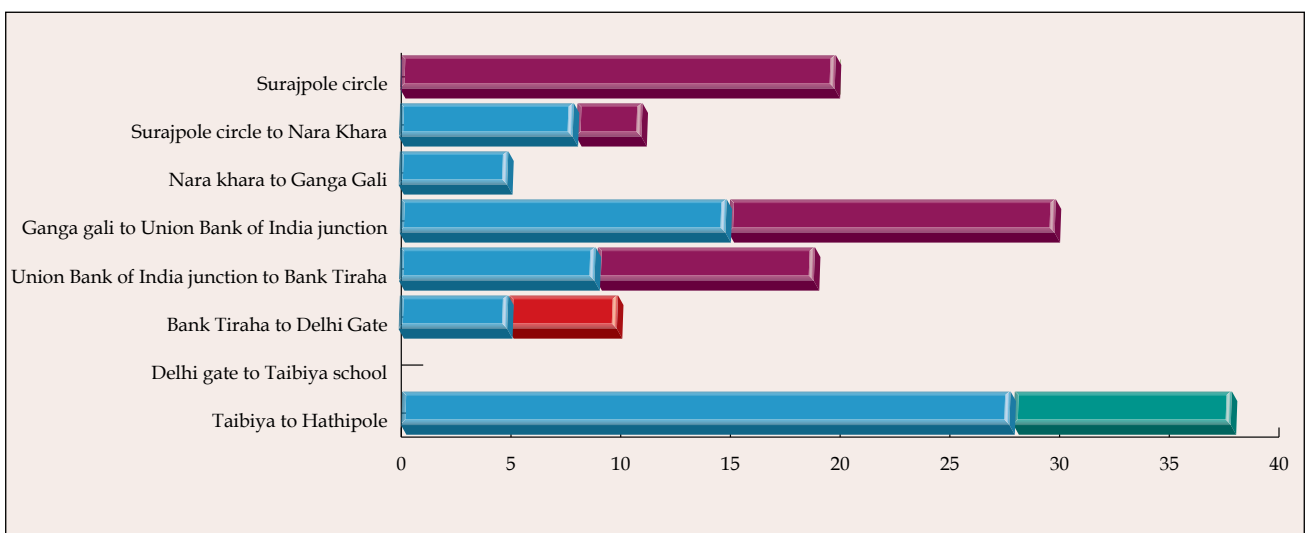


Figure 6.: Parking Demand at Non-peak Hour



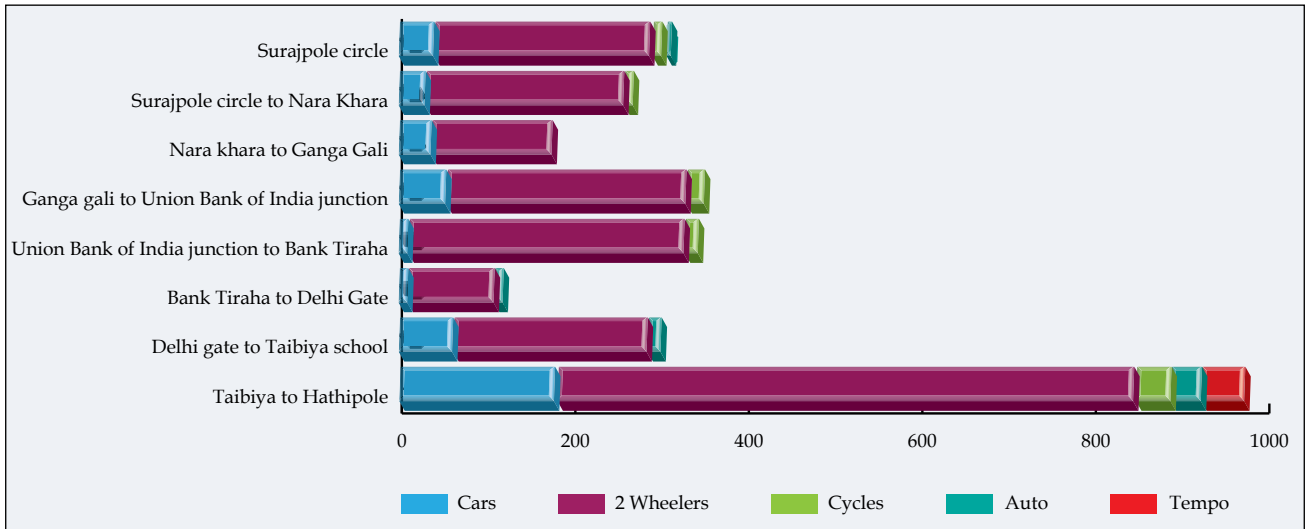


Figure 7.: Parking Demand at Peak Hour

### Parking Demand in Non-Working Hours

Survey and site visit results showed a stark difference in parking demand during day and night hours. During the early morning and late night hours, the number of parked vehicles drastically reduced to almost none, along the stretch, implying a lack of local residential demand for the spaces.



Figure 8.: No Demand of Parking (Early Morning and Late Night)

### Parking Pricing

UMC charges a fixed rate of Rs. 5 per day for parking at the seven legal parking areas along the market which have a provision for accommodating 150 cars and 200 two wheelers only and rest of the on street parking is free. Limited spaces at such low prices with poor enforcement lead to these locations filling up quickly.

Eventually, the pressure shifts to road sides where no regulation or charges exist. Without introducing regulatory mechanisms, it will be impossible to implement solutions and control congestion in the area as in the city.

## Unregulated Parking Inconvenience for Both Motorized and Non-motorized Users

Chaotic and mismanaged parking also adds to the hassle of unorganised on-street parking. About 85 per cent of the survey respondents park their vehicles inside and adjacent to the market, and about 15 per cent at a distance from the market. As many as 75 per cent of the respondents said they are not satisfied with the parking situation and 80 per cent said the parking facility should improve. Chaotic parking and unregulated traffic affect non-motorised transport the most. Absence of a designated footpath creates friction between pedestrians and motorized users, thus increasing safety risks and causes accidents.



Figure 9.: Absence of Footpath Increase the Risk of Accidents for Pedestrians

## Key Stakeholders in Implementation

- Udaipur Municipal Corporation (Initiator)
- Udaipur Smart City Corporation
- Urban Improvement Trust
- Udaipur Traffic Police
- Elected representatives of the city
- Local Residents
- Stakeholders such as shop owners and traders along the identified junctions and road stretches

## The Way Forward: Parking Management of the Street

The congestion in the market area has already started to reach a tipping point. If business as usual continues, then this crisis will only worsen, leading to congestion and covering major road space with on street parking.

At the local level, there is considerable scope to change the design of the road and reorganise street activities to streamline flow of traffic in the area. Simultaneously, action is needed at the city and zonal level for introducing public transport connectivity, traffic dispersal, and restraint measures like parking policy and taxation to reduce current and anticipated overall volume. Hence, off street parking interventions were also explored. The identified road stretch was redesigned using the following design principles:

- The carriageway to be designed with uniform width of two lanes on both the sides
- The space left after defining carriageway to be used as a footpath, public space and for hawkers
- Vending pockets to be carved out of vacant pockets near parking, creating a pedestrian plaza. Their scattered location in front of shops and minor junctions will be limited
- Proposal for off-street parking in existing parking lots, restricting space consumed by parking.
- UMC proposed multi-level parking will be considered, without proposing new parking lots.
- Parking space efficiency to be maximized by classifying parking lots into long- and short-term parking area, with reflective tariff plan.
- Raised pedestrian crossing to be provided, facilitating safe crossing on entire network.
- Provision of auto rickshaw stands near junctions.
- Introducing a phase wise implementation plan for city wide scale up.

### Key Highlights of the Proposed Design

Simple steps can help to cut the present clutter and chaos in the city. Presently, there are no footpaths along the entire market area. It was demonstrated that even without disturbing the current width of the carriage way, it is possible to have a minimum of 2m-3m wide footpath inclusive of a multi-utility zone. Additionally, by organizing the on-street parking of a few stretches, the carriageway can be freed up for traffic. The carriageway width has not been changed, but the rest of the space has been reorganised to accommodate maximum features. The width of the footpaths has been kept between 2m-3m, with the height of 150 mm for most of the corridor. In conjunction, signalised raised table crossings are provided at junctions as well as mid-block locations so that users can cross safely every 80m-150 m. All crossings are signalised and synchronised to make pedestrian crossing safe. All essential infrastructure such as bus stops, toilets, seating areas, IPT parking, street trees and vending zones have been located within a multi-utility-zone (MUZ) that abuts the footpaths to ensure ease of access as well as safety. Parking areas for IPT have been given priority, locating these within the MUZ, close to junctions and activity hotspots such as the market front.

All parking for private vehicles within the public realm is proposed on a pay-and-use basis. In order to maximise parking turn-over parking capacity, short-term paid parking has been prioritised to accommodate the vehicles of visitors and shoppers. Three dedicated locations for high capacity stack parking are proposed within the market area near Suraj Pole, Hathi Pole and Delhi Gate junctions which act as major nodes.

The proposal allows for short-term parking of 200 cars and 500 two-wheelers within the and around 100 car parking spaces and 400 parking spaces for long-term off-street parking, proposed as stack-parking within the market area as a long-term solution.

## Proposed Design for Redevelopment of Street

The proposed design for the entire stretch included a major reorganisation of the parking along the market and surrounding areas with the larger aim of reclaiming public space from private vehicles to provide safe, comfortable and convenient streets for all modes and deliver a delightful place. The proposal attempts to provide comprehensive facilities for all transport modes, including private vehicles in a well-planned manner, located as per the needs and convenience, functionally integrated with the location and provision of all essential street activities. The initial design proposal for the given stretch was discussed with the corporation and market association members in December 2016. The members were on board with the broad design concept of the proposal. During the given meeting, it was decided that the proposal will be developed in phases to understand people’s perception and involve them in the design proposal. The stretch from Delhi gate to Hathi Pole i.e. Ashwini Bazaar road will be developed in the first phase and rest of the road stretch will be taken once the concept has been accepted by the public and officials.

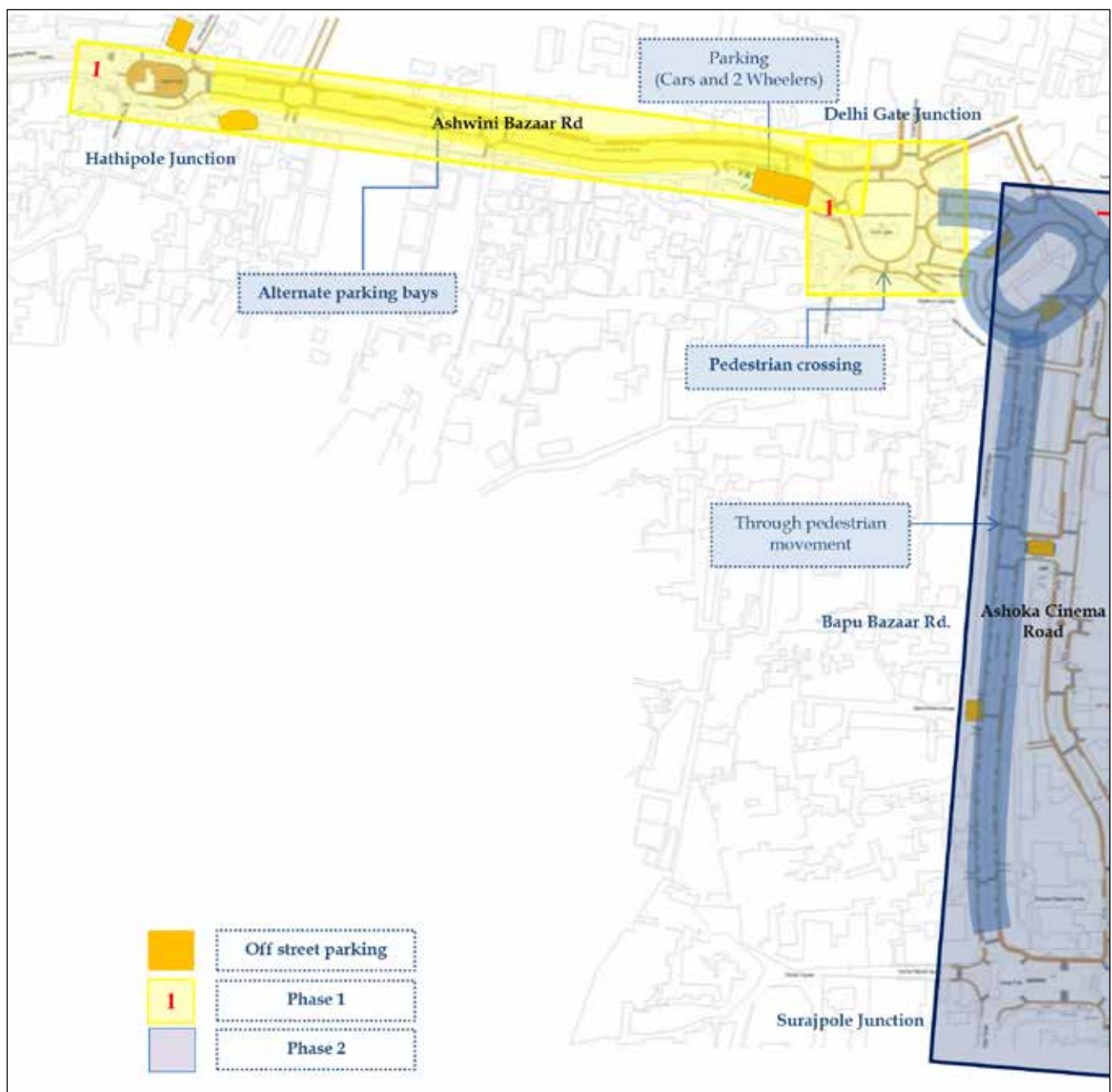


Figure 10.: Parking Management Plan Proposed for the Market Area



## Ashwini Bazaar Road

Ashwini Bazaar Road is a sub-arterial street, connecting Delhi Gate to Hathi Pole with heavy commercial activities on one side and a dead boundary wall on the other against which cars are parked during the day, and transport vehicles at nights. Complete removal of on street parking is not a solution, hence, after calculating parking demand based on an extensive survey, alternate on-street parking has been proposed, along with the incorporation of existing off-street parking lots, putting good use to underutilized expensive resources.

Currently, free parking is provided all along the roads. However, a parking pricing has been introduced in the proposal to make parking monetarily feasible to city managers, reducing unnecessary parking, which otherwise would be used without realizing associated opportunity costs. Material classification has been suggested for clear segregation of various activities such as footpaths, hawker spaces, bus stops, auto parking and seating spaces. For providing the requisite parking, the following arrangements are suggested:

1. The existing parking lot at Samudaik Bhawan to be converted into a renewed parking lot.
2. Alternate parking bays on the entire market street as alternate parking reduces two-way traffic. It will also serve as traffic calming measure, chicanes for automobiles.
3. Transformation of brick masonry dead wall to transparent iron fence, interspaced by facility kiosks.
4. Clear pedestrian designed walkway with designated vending areas and shading tree canopy.
5. Provision of auto rickshaw stand and bus stops on road stretch near Delhi Gate Junction.

Parking for around 50 cars and 200 two-wheelers has been provided along the stretch. Footpaths ranging in width between 1.8m-2.5m have been provided along both the sides of the road. There are designated parking spots for auto rickshaws close to Hathi Pole and Delhi Gate junctions depending on the current requirement. Multi-use facilities such as seating benches, toilets and shopping kiosks have been provided. All the junctions have been given treatment with table top crossings designs matching the height of the footpath i.e. 150 mm.

## Bapu Bazaar Road

Bapu Bazaar Road is a major commercial sub arterial street which connects Suraj Pole to Delhi Gate through one of the parallel streets of varying right of ways, housing several shops like stationery, garments, accessories and a few eateries. The street is characterised by G+3 structures, having commercial activities. Two-wheelers and some cars are often parked in front of the shops and Nara Khara



Figure 11.: Parking and street redesign for Ashwini Bazaar road

Chowk which has approximately 8-10 parked cars. These vehicles are owned by shop keepers and left on Bapu Bazaar Road for the entire day. The parking solution should therefore be one which is accepted by the public and does not involve the removal of parking spaces.



**Figure 12.: Street Design: Bapu Bazaar and Ashoka Cinema Road**

The design solution for Bapu Bazaar is:

1. Alternate paid parking bays along the entire road.
2. Regularized parking lots at Nara Khara Chowk, Ganga Gali , Delhi Gate Bank Tiraha.
3. Clear and constant footpath as suggested, on the street
4. Safer pedestrian crossing

## **Second Phase Intervention (Multi Level Parking)**

The proposed intervention includes a phase-wise parking management for the market area. Initially, the intervention could begin by reducing the number of parking spaces and introducing hourly differential (for two and four wheelers) pricing. Referring to the willingness to pay survey, the price introduced can be Rs. 5/ hour for two wheelers and Rs. 10/hour for four wheelers. For the first phase, Ashwini Bazaar road has been selected for pilot implementation as per the discussion with the city stakeholders and the market association. The aim was to demarcate parking spaces for both the transport modes with designated spaces for vendors, pedestrians and bus stops. Parking areas will be marked as long-term and short-term parking, with parking pricing based on demand with a supply cap for the given area. The strategy is to increase parking turnover with hourly higher pricing for more than one hour in a progressive manner to discourage long-term occupation of parking and freeing up of on-street parking spaces for more customers. This will further be supported by a traffic management plan, testing the benefits based on user feedback as well as improvement on all aspects. All demarcated parking sites will be managed to prevent traffic overspill and impediments to traffic movement. After the successful trial implementation, the same experiment would be applied to connected roads such as Bapu Bazaar Road and Indira Bazaar Road.



Figure 13.: Multi Level Parking Site along Suraj Pole

During the second phase, the long-term parking sites would be designed as stack parking, which can either be a manual or a mechanical one depending on the cost and area. The aim is to introduce a park and ride system by developing three multi-level parking sites along the main road and integrate it with the newly to be introduced bus services and integrated para transit modes. A detailed plan was prepared for a multi-level parking site near the Suraj Pole junction, the site is on the south west corner of the junction with dimensions of 28.8 m by 29.49 m.

Three design options of multi-level parking to fit the given space were proposed with a capacity of 100 cars.

Table 1.: Cost and comparison of different stack parking models

	Ramp Parking	Mechanised Parking - Puzzled	Mechanised Parking - Robotic
Area/Floor in SQM	3004.85	3601.8	4438.3
Number of Floors	7 (Above ground 5 + 2 Basement)	5	9
Cost/SQM(Basement) in Rs	18000	0	0
Cost/ Car Per Floor in Rs	12000	40000	40000
Total Estimated Cost in Rs	5 crores Approx.	14 Crores Approx.	17crores Approx.

## Outcomes

Current urban mobility issues have become a topic of discussion for city officials as well as citizens. It may be noted that this proposed concept of parking is governed by the principles of the National Urban Transport

Policy stating that private vehicles must be parked on “a fully-paid rented or owned” space, based on the “user pays” principle. Parking management must be effectively used as a tool to reduce overall demand for parking space. Pricing and enforcement will be key drivers to eliminate or reduce long-term on-street parking demand for private vehicles. Planning and design of public parking facilities in an area need to provide for all modes and include creation of pedestrianized areas/public spaces in the area with the necessary amenities. Parking spaces should be adequately provided on a priority basis for IPT, pick and ride and feeder systems.

This requires a well thought out pricing policy to control the demand for parking and the city accepts the need for such a policy. Building public support for this parking plan is critical to address the issue. Public support can be stronger if people understand the benefits of parking management. Reliable and predictable information about parking availability reduces cruising time, fuel cost and pollution. Efficient billing makes payment more transparent and accurate. This will decrease traffic chaos due to indiscriminate on-street parking. Both car and non-car users will benefit as this will protect footpaths and allow barrier free walking; and free up public spaces for walking, auto-rickshaw-parking, play grounds etc. This will also improve access to bus-stops, safety of children, women and elderly people; visibility of shops, shopping experience and throughput of customers; the overall environment, green areas and public recreational spaces. This will make it easier for emergency vehicles like ambulances, fire trucks, police, etc. to transit quickly in and out of the area. Improved walkability can cut down short vehicular traffic. Even the urban local body will benefit as eventually more revenue can be generated for local area development, through a citywide pricing strategy.

## Way Forward

UMC, with support from ICLEI SA and SG Architects, will continue to support the implementation of the parking management plan and develop future parking restraint strategies for the city. The project team also intends to build the capacity of engineers and planners towards sustainable urban transport. As per the recent discussion with the city stakeholders and market association heads, Ashwini Bazaar road was suggested for pilot implementation. Based on the pilot implementation in this stretch and lessons learned, similar solutions can be scaled up across the city.