

Local Area Shuttle Services for Pune:

Potential as an Intermediate Public Transport option



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SUM Net India
Sustainable Urban Mobility Network

CEE
Centre for Environment Education

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About CEE

Centre for Environment Education (CEE) was established in August 1984 as a Centre of Excellence supported by the Ministry of Environment and Forests, Government of India. CEE, a national institution with its headquarters in Ahmedabad, has a mandate to promote environmental awareness nationwide.

CEE's mission is to enhance understanding of sustainable development in formal, non-formal and informal education through its work with schools, higher educational institutions, policy makers and reaching out to youth and the general community. It is to integrate education as a key driver for change in demonstrating and advancing sustainable practices in rural and urban communities, and in business and the public sector, and in meeting challenges of global issues such as climate change and biodiversity conservation. CEE also promotes individual and collective positive Handprint actions that are environmentally sound, economically viable and socially beneficial.

CEE's work in the field of sustainable transportation includes promotion and outreach for Rainbow Bus Rapid Transit in Pune, facilitation of public engagement for the preparation of the Pune Cycle Plan, development and conduct of 'Streets for People' courses with architecture colleges, and advocacy for road safety. CEE's work in the domain of schools and sustainable transportation attempts to focus on learners as responsible citizens as well as the school itself to be a site for demonstrating sustainable practices. CEE is a member of SUM Net.

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The Sustainable Urban Mobility Network India (SUM Net) is a democratic, secular, membership-based coalition of individuals, voluntary organizations, and civil society networks and movements. SUM Net seeks to improve the overall quality of life for all by securing deeply democratic processes of decision-making to ensure that urban transportation systems are universally accessible, socially just, safe and secure, economically viable, and environmentally sound. SUM Net aims to

- Deeply democratise the processes of policy formulation and project level decision-making related to urban transportation at all federated governance levels
- Assist and support local communities to shape their urban transportation policies and systems
- Undertake public awareness initiatives and facilitate dialogue on transportation policies and projects
- Encourage cities to improve walking, cycling and public transportation facilities

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Introduction

The city of Pune has about 28 lakh registered personal motor vehicles for its population of about 35 lakhs, clearly an unsustainable trend. The main driver for this growth has been the poor quality of public transport. Pune Municipal Corporation (PMC) has recently undertaken a number of sustainable transportation initiatives. These include improved street design, preparation of a comprehensive bicycle master plan and public transport improvement.

Pune, like most other cities, has a range of intermediate public transport (IPT) services. It is generally acknowledged that IPT, such as taxis, auto rickshaws, six seaters, as well as more recent services of app-based auto aggregators, provide affordable mobility and connectivity in many towns and cities. It is also acknowledged that a clear policy and actions to strengthen IPT are needed, locally and nationally.

This paper documents the trial of a shuttle service in Aundh, Pune in October 2016 as part of a Smart City project. It also presents insights from interviews with drivers of three different types of IPT services in Pune, especially on the possibility of taking up shuttle service operations. Some options for institutional arrangements for the management of shuttle services are suggested.

This case study seeks to highlight the potential for well-organized local area shuttle services as an intermediate public transport option. Local shuttles can help to reduce short- to intermediate-distance private motorized trips within an area and provide first/last mile connectivity to public transport. Such services may, in combination with parking regulations, help to free up road space from motor vehicle parking for sustainable transport modes or other more important uses (utilities, trees). We suggest that such services be systematically introduced in selected areas of the city as a key element of the city's transportation system.

Para-Transit Scenario in India

Intermediate Public Transport (IPT) or para-transit in the urban context includes all modes of passenger transport excluding private vehicles and the formal Public Transport System.

Vehicle types: IPT includes low capacity mass transit modes like autorickshaws (metered and shared), small capacity vehicles like cars, jeeps, mini buses etc, and cycle rickshaws.

Types of services: One mode is taxi or contract carriage, that is, with no fixed route and the customer decides the destination. The other mode is share auto service or stage carriage, that is, a fixed route with multiple stops that may be linear or a circuit.

IPT operators in various cities have developed their own scheduling systems. A study of IPT in five cities suggest that two scheduling approaches are commonly used. The more common is one in which a queue of vehicles is formed, the vehicle at the top of the queue leaves when it has enough passengers. In the second approach, typically pro-actively managed by IPT unions, a fixed service frequency is maintained. (Kumar, Singh, Ghate, Pal, & Wilson, 2016)

Regulation: The regulation of IPT services is a part of the Motor Vehicles Act (Chapter V: Control of Transport Vehicles), in relation to permits for operation, and fixing of routes and fares (Motor Vehicles Act, 1988).

For taxis, the fares are generally fixed and regulated by Regional Transport Offices (RTOs). Share auto/ six seater/ jeeps/ maxi cabs etc., operate on fixed routes, authorized by the RTO, with fares that may or may not be formally regulated.

There may be variations within a city, with multiple types of services operating. There are IPT vehicles which operate as per the fares fixed by government notification and others that do not have any fixed fare (Ghosh & Kalra, 2016). Though the MV Act doesn't allow IPT to operate as stage carriage, states are allowed to form their own regulations on the topic and hence some cities amend their regulations to augment inadequate public transport services. (Arora, Anand, & Banerjee-Ghosh, January 2016).

Permit Caps: Some cities have a closed permit system: there is a cap on the number of permits to be given. In others, in the open permit system, there is no cap on the number of permits awarded.

The Motor Vehicles Act, 1988 empowers Regional Transport Authorities to decide on the nature of permits, numbers to be permitted. The RTOs may also fix fares and routes, keeping in mind the regional conditions and the intent of the Act.

Relevance

IPT services are prevalent across the country, while there is a lack of public transport or the lack of efficient public transport in many towns and regions (Gadepalli, 2016) (EMBARQ). As Table 1 - Mode share in different city categories, 2007 shows, cities that have a relatively low mode share of public transport have comparable share of IPT. While cities with a high share of public transport do not have a correspondingly high share of IPT. (Wilbur Smith Associates, 2008).

A study of Indore city shows that para-transit is important on the narrow core city lanes and in the areas which is not served by the public transport (EMBARQ).

IPT importantly provides first/ last mile connectivity and even function as the main public transport service especially in the small and medium towns where formal public transport is absent (Kumar, Sustainable Urban Transport Indicators, 2014).

IPT (mainly shared autos) is also the most convenient and affordable means of travel for the economically weaker sections of the society (EMBARQ).

A study of shared auto system in Kolkata finds that 'though auto-rickshaws are usually viewed as supplementary forms of transport that provide commuters feeder or last mile connectivity, they appear to be a predominant form of transportation in Kolkata'. Here, it is not the contract service autos, but the shared auto system that is widely prevalent and used by all segments of society. The study concludes that better integration and rationalization of IPT into Kolkata's transportation systems is needed. This would help the city maintain its low levels of private vehicle ownership (Arora, Anand, & Banerjee-Ghosh, January 2016).

While highlighting the need to provide good public transport systems, the National Urban Transport Policy 2006 (NUTP) acknowledges that where public transport is inadequate or non-existent, IPT/PTS plays a major role in providing intra-city mobility.

The revenue generated by IPTs is higher per trip than that of public transport due to lower occupancy capacity of the vehicle, operations mainly in peak hours, on high demand routes and the more profit oriented nature of the operators. Public transport on the other hand, has to operate in non-peak hours and on low demand routes as well. IPT is more responsive to changes in travel demands than conventional public transport systems (Gadepalli, 2016).

Table 1 - Mode share in different city categories, 2007

City Category	Population	Walk	Cycle	Two Wheeler	Public Transport	Car	IPT
Category-1 a	<5lakhs with plain terrain	34	3	26	5	27	5
Category 1 b	<5 lakhs with hilly terrain	57	1	6	8	28	0
Category 2	5-10 lakhs	32	20	24	9	12	3
Category 3	10-20 lakhs	24	19	24	13	12	8
Category 4	20-40 lakhs	25	18	29	10	12	6
Category 5	40-80 lakhs	25	11	26	21	10	7
Category 6	>80 lakhs	22	8	9	44	10	7
National		28	11	16	27	13	6

(Wilbur Smith Associates, 2008) [http://moud.gov.in/upload/uploadfiles/files/traffic_transportation\(1\).pdf](http://moud.gov.in/upload/uploadfiles/files/traffic_transportation(1).pdf)

Issues

In cities where public transport is present, IPT can act as a competitor as the routes of both the systems often overlap. For example, a study in Vishakhapatnam shows that the IPT competes with the public transport in the city (Gadepalli, 2016).

IPT vehicles are often not properly maintained, are old and have high emissions.

As a service, typically there is overcrowding - more passengers are accommodated in the vehicle, which leads to lack of comfort and safety for the passengers.

Many drivers of IPT vehicles are not actually owners of the vehicle. Like other informal sector workers, they do not have any social security systems.

Cities lack in providing infrastructure facilities to the IPT sector like proper stands for vehicles, gas stations, finance etc (Ghosh & Kalra, 2016) (EMBARQ). The Government's definition of Public Transport does not include these local and informal systems of mass transport (Gadepalli, 2016), and they are generally viewed as a mode to be tolerated, rather than one to be strengthened and integrated into the city's transportation system.

Need for strengthening

If properly regulated and planned, Intermediate Public Transport services can complement the public transport system (Ghosh & Kalra, 2016), (Arora, Anand, & Banerjee-Ghosh, January 2016) (Kumar, Singh, Ghate, Pal, & Wilson, 2016).

NUTP emphasizes the need for technological up gradation of IPT vehicles. The Report of the National Transport Policy Development Committee (2014) too highlights the potential of IPT services to provide improved and clean mobility in the city. It suggests a number of measures such as inclusion of IPT services in the overall multimodal integration efforts of cities, improvement of safety and convenience factors of these modes, and upgradation of vehicle technology to meet emission standards. It recommends low interest loans for attractive replacement schemes for operators. It recommends moving from 'closed' to 'open' permit systems, accompanied by strict training and maintenance norms (NTPDC, 2014).

Transportation Context of Pune: A turn around

Traffic and transportation has been identified as the top issue by citizens in the surveys conducted by PMC in 2015 for the Smart City Challenge. A turn-around from this situation is slowly being executed. The PMC's Comprehensive Mobility Plan (CMP), approved by its General Body in 2012, emphasizes non-motorized transport and public transport.

Over the last few years, and especially since 2016, the PMC is undertaking a number of sustainable transport projects:

- Expansion of the Rainbow Bus Rapid Transport network with 2 new corridors
- Procurement of 1500 buses for the public transport fleet
- Preparation and adoption of the Pune Urban Street Design Guidelines
- Re-design of over 100 km of roads to improve conditions for pedestrians, cyclists and public transport
- Preparation of a Comprehensive Bicycle Master Plan.

Under the Smart Cities Mission, a pedestrian walkway and street design project has been taken up. A draft Parking Policy has been created which seeks to organize and limit the extent of public parking available and to establish telescopic pricing of parking spaces.

Area-based improvements may be possible

With these types of policies and projects in place, it is possible to envision a move towards area-based improvements. These may include street design and mobility improvement projects to improve access, reduce the number of private motorized trips and demand for parking in the area.

Improvement of facilities for pedestrians and cyclists would encourage a shift from motorized trips to these modes for short trips. Improvement in public transport would help convert long trips by private motorized transport to public transit.

Need for Shuttle or Feeder

A crucial element is the intermediate length trips which are a bit too long to be completed by walk or cycle, and which are not serviced by mainline public transport. People with luggage, small children, elderly people and people with disabilities or illness may not be able to walk or cycle easily for short or intermediate distances either. While auto-rickshaws and auto aggregator services could meet this need, these modes are relatively expensive and also not easily available for short- to intermediate-length trips.

Further, the absence of first/last mile connectivity to public transport greatly increases the tendency to use a motorized vehicle for the entire trip. Public bus service connectivity of inner neighbourhood areas, where present, typically is of low frequency (wait times of over 40 minutes).

A motorized local area shuttle transport service could help avoid the use of private motor vehicles for local area trips, and provide connectivity to public transit.

For the purpose of this paper, what such a service may be like is described in Box 1 - Characteristics of a Local Circulator Shuttle Service.

Box 1 - Characteristics of a Local Circulator Shuttle Service

- The shuttle service, as envisioned for the purpose of this paper, would have the following characteristics:
- Local circulation, possibly operating in loops, distributing riders to various locations in a neighbourhood
- Connect to public transit stops, off-street parking lots, major congregation and commercial points, schools, clinics and residential lanes
- Operating at slow speeds, appropriate for inner neighbourhood lanes
- Assured, frequent service: 7 to 10 minutes in peak hours, 15 to 20 minutes in off-peak hours
- Stops at distances of 200 metres
- Free service or minimal fares, with options for MI Card¹ payments, membership etc
- Potentially branded for the local area (e.g. Aundh Shuttle or Kothrud Shuttle or Navi Peth Shuttle)
- Low floor, easy to board and alight from
- Low noise, low or zero emission (CNG or electric)
- Size and turning radius such that can be easily manoeuvred in neighbourhood streets and crowded areas

Trial of the 'Udaan' Shuttle Service in Aundh

(The material in this section is based on the voluntary engagement CEE had with Prasanna Desai Architects to prepare communication materials and public outreach for the shuttle service trials and the Aundh street design project.)

A week-long trial of a shuttle service was carried out in Aundh, in western Pune in October 2016. This was part of a traffic re-routing study and citizen engagement process for the Aundh Street and Pedestrian Walkway project, commissioned by the Pune Smart City Development Corporation Ltd (PSCDCL). The project consultants for the street design are IBI Group and Prasanna Desai Architects.

The street design project is planned on DP road, which is a 1.5 km stretch serving as one of the main collector for Aundh. A segment of it also functions as a sub-arterial road as it funnels through traffic between the main city and destinations in and beyond western Pune.

In one of the street design options prepared for the project, it was envisaged that of the 1.5 m length of DP Road, one 500 metre stretch would be changed from its current two-way traffic movement system to a one-way flow for motorized vehicles. The converse flow would be directed to a parallel road about 50 metres away. The road space thus freed up would be converted into a pedestrian plaza. On-street parking would be restricted to a great extent, and one or more off-street lots would be created. This design option is not being taken up for implementation; however, it was the context for the shuttle trial and traffic re-routing study.

For the convenience of customers and others connected to DP Road, as well as for the general public in the larger Aundh area, Prasanna Desai Architects suggested the creation of a shuttle service. The shuttle would connect off-street parking lots to shopping, healthcare clinics and offices on DP Road and the major residential areas in Aundh. Such a service may be expected to reduce local private motorized trips, as well as improve first/ last mile connectivity to public transit. The shuttle is not a formal element of the Aundh Street and Pedestrian Walkway project.

The idea of a local shuttle service has its roots in deliberations with citizens carried out in 2013. These were done in a 'Streets for People' workshop in Aundh by Prasanna Desai Architects, PVP College of Architecture and CEE. In early 2016, an informal shuttle service with 6 e-rickshaws has also started operating in Aundh. This service is described later in this paper.

*PMC facilitated the conduct of the shuttle service trial by sourcing electric vehicles from Kinetic Green Energy & Power Solutions Ltd, and drivers from the Pune Mahanagar Parivahan Mahamandal Ltd (PMPML), which runs the local city bus service. Prasanna Desai Architects developed the route plan, the 'Udaan' identity, route maps etc. They oriented the drivers about the routes, the purpose of the shuttle service and customer service aspects. CEE assisted in communication design for the outreach to citizens.

¹ MI Card, launched by Pune Mahanagar Parivahan Mahamandal Ltd in partnership with Central Bank of India, is an interoperable open standard contactless smart card. It will be usable in all modes of transit and para-transit in the city. From 'Smart Mobility' at <http://www.punesmartcity.in>, retrieved 10 April 2017



Figure 1 - A high demand for on-street parking means that a whole lane is used up.

One aim of the Smart City project in Aundh is to create unobstructed footpaths that comply with 'universal access' design guidelines, usable by differently-abled persons. For this, footpath width will have to be increased. If road space is allocated to parking, then little space is left for building the footpath.



Figure 2 - The shuttle would make space for footpaths by eliminating on-street parking.

The shuttle would link off-street parking to shopping areas and other destinations in Aundh.



Figure 3 - Four-seater electric vehicle used for the shuttle trial in October 2016

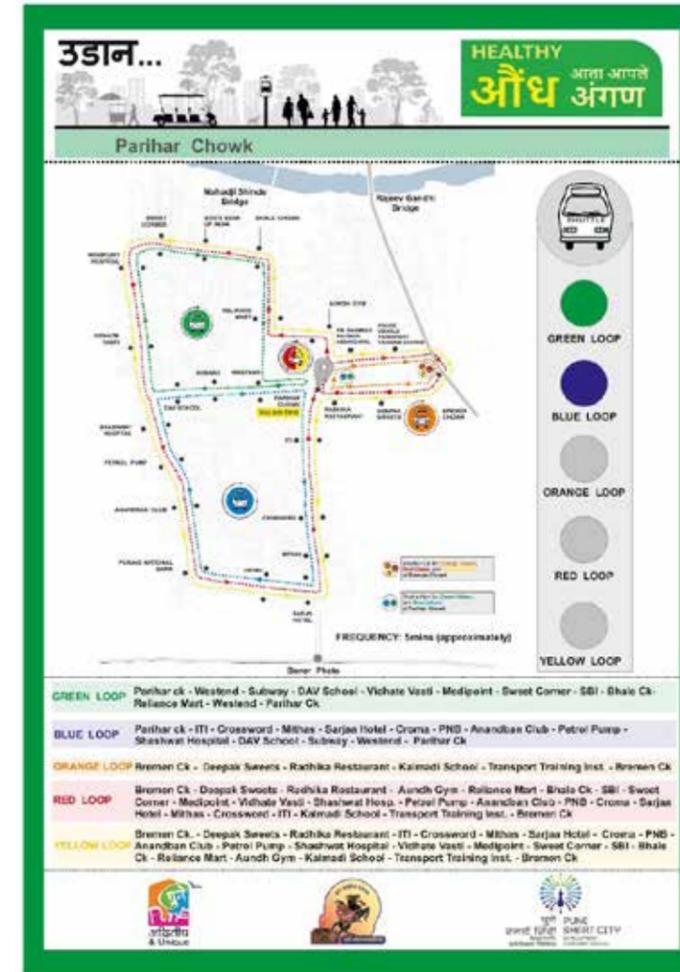


Figure 4 - Signage at Udaan shuttle stops

Image courtesy Prasanna Desai Architects

Photo by Nitin Warriar



Photo by Nitin Warriar



Photo by Nitin Warriar



Figure 5 - Pedestrian Plaza created as part of the shuttle and traffic re-routing trial, October 2016

Photo by Nitin Warriar



Figure 6 - Initial proposal for a Pedestrian Plaza in Aundh, by Prasanna Desai Architects

This design option is not being taken up for implementation; however, it was the context for the shuttle trial and traffic re-routing study in October 2016

Image courtesy Prasanna Desai Architects

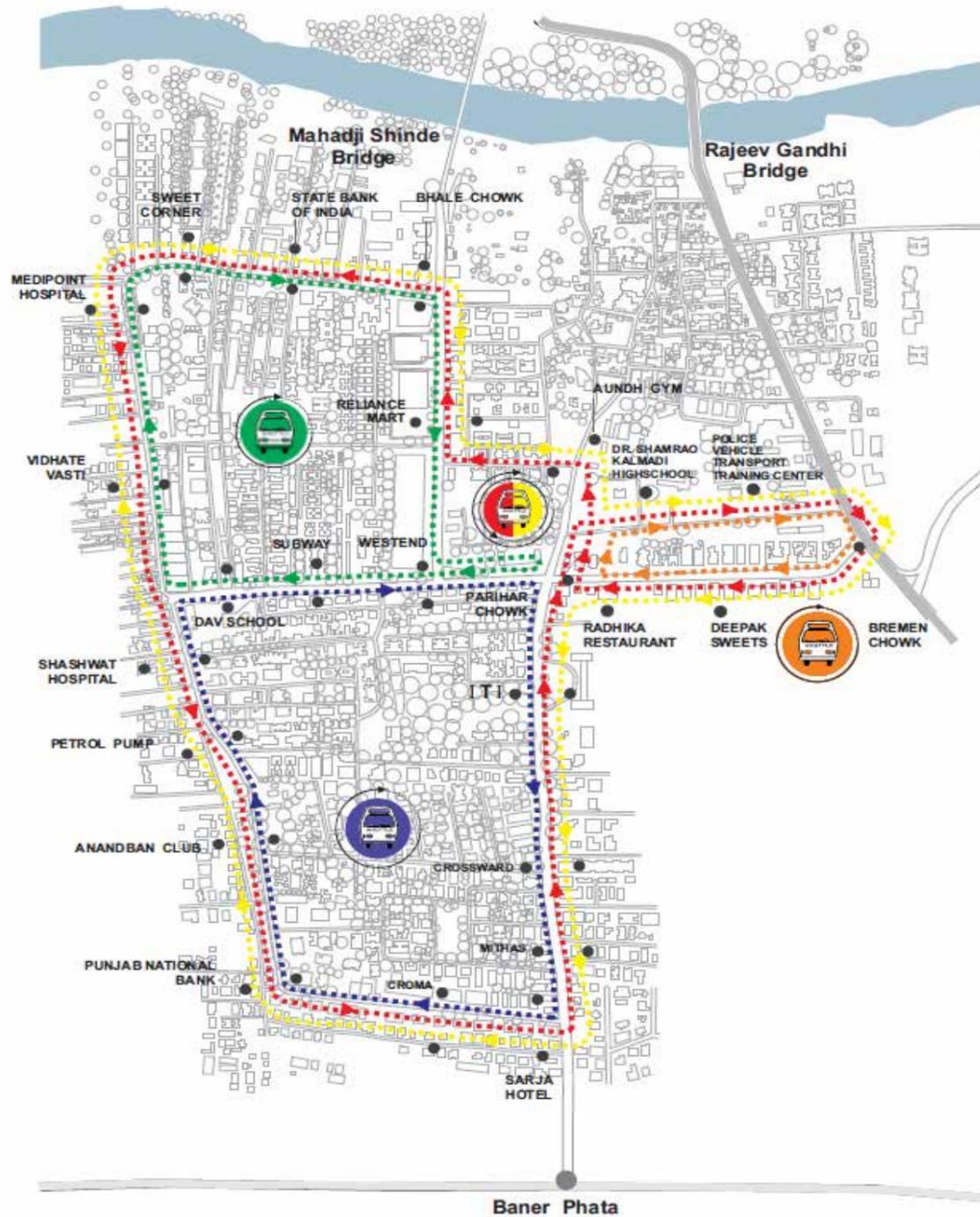


Figure 7 - Route map of the Udaan Shuttle during the trial in October 2016

The routes were designed to link the residential areas to public transit stops, potential off-street parking, and the main market places.

Image courtesy Prasanna Desai Architects

The shuttle service operated for 6 days, Monday to Saturday, from 10th to 15th October 2016. As per data collected and analysed by PSCDCL, on an average about 760 passengers used the shuttle every day. The usage was higher on the weekend and on 11th and 12th October which were holidays on account of Dusshera and Muharram. Of the people who used the shuttle service, and responded to a survey question on whether they found it useful, 60% responded positively. Letters were submitted by a local citizens' group supporting the shuttle service and requesting for it to be continued. A few comments and feedback about the shuttle service experience were also given on social media.

The 'Udaan' shuttle service trial in Aundh was thus fairly well received. This indicates an unmet need for such a shuttle service, at least in this neighbourhood.

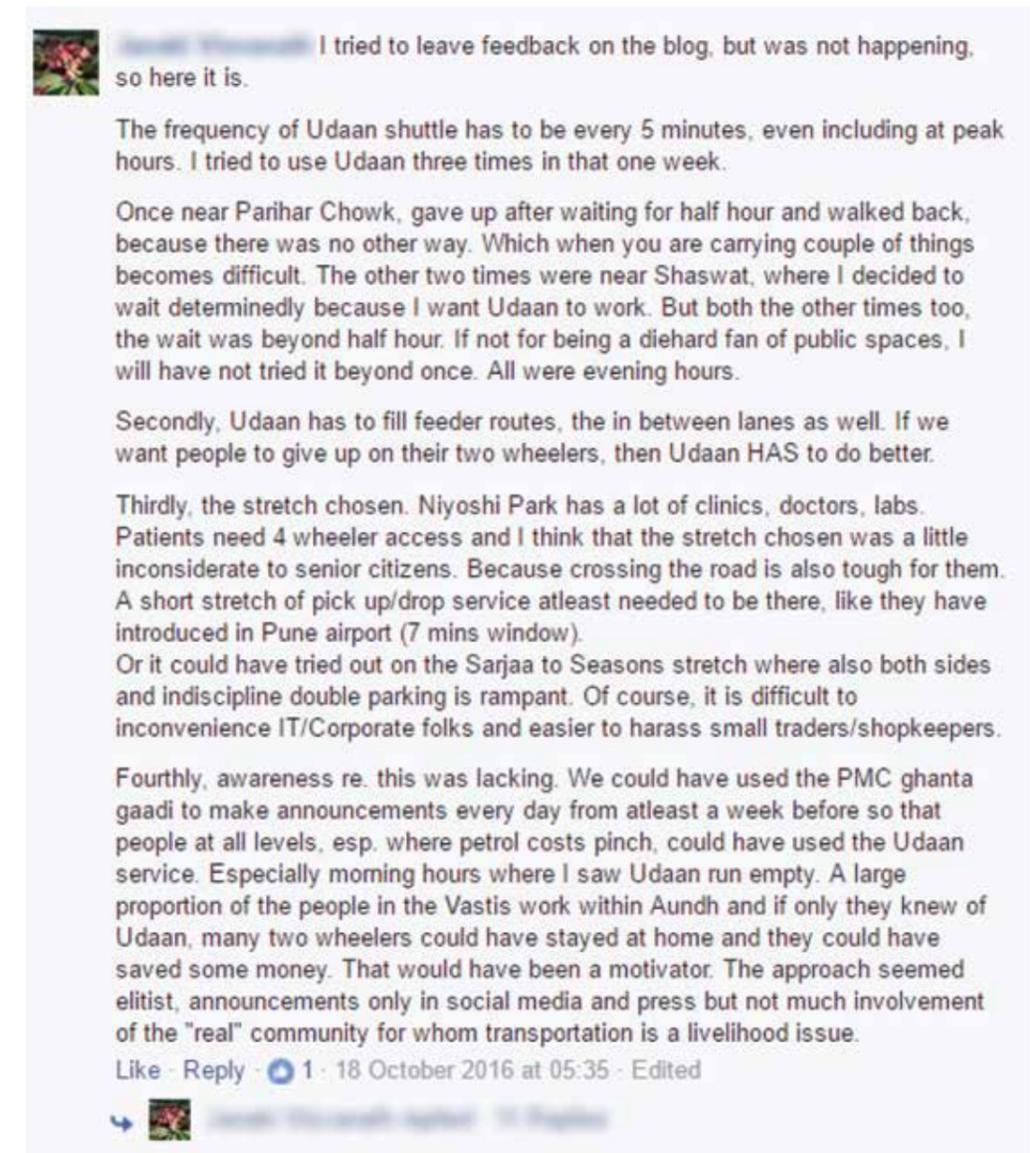


Figure 8 - Feedback about the shuttle on social media

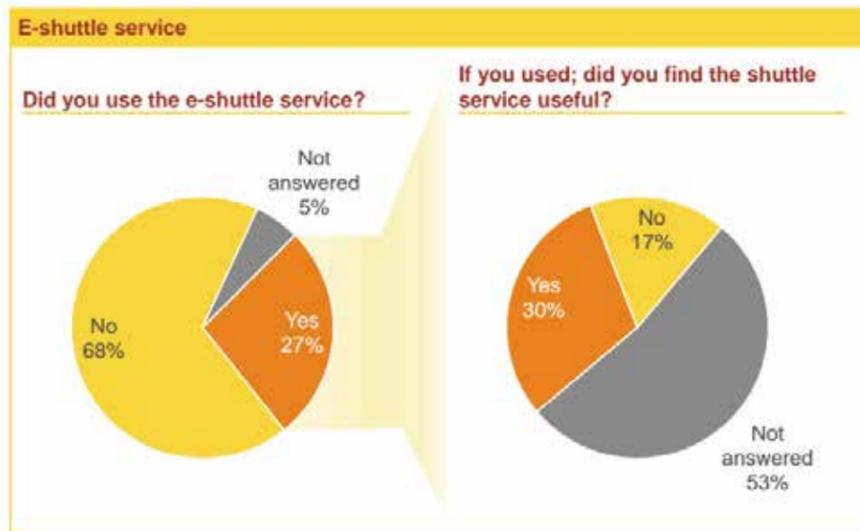


Figure 9 - Feedback about the usage of the shuttle (PSCDCL)

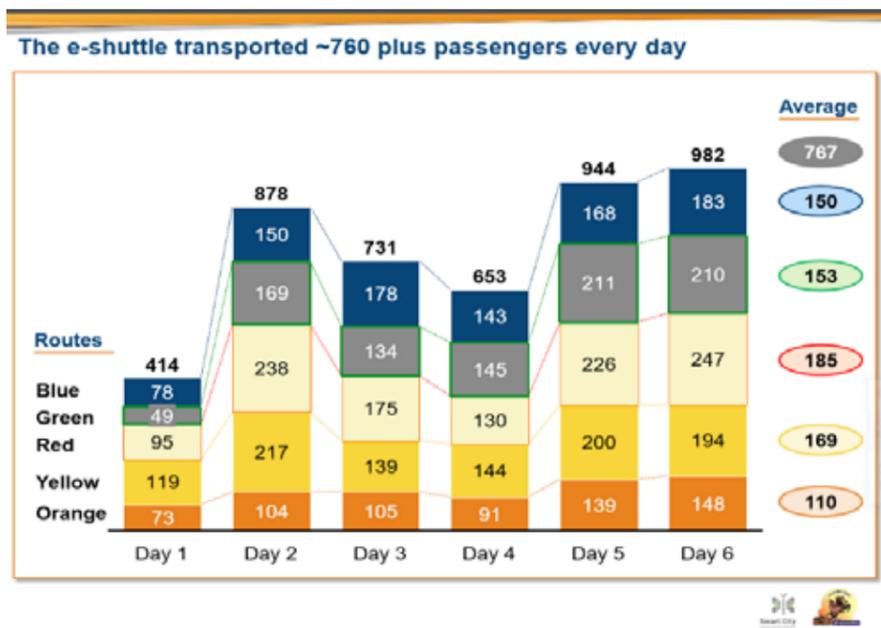


Figure 10 - Usage of the Udaan shuttle in the trial in October 2016 (PSCDCL)

Potential for Shuttle Services in other Locations in Pune

The need for a shuttle service is becoming evident in relation to recent initiatives of the PMC in a few other locations as well.

Core city

There have been discussions over the last few years to pedestrianize Laxmi Road, a major shopping area in the heart of Pune. This requires severely limiting or eliminating on-street parking and encouraging the use of existing off-street multi-storey parking lots that are currently under-utilized. A high frequency easily available shuttle service that links off-street parking lots and public transport stops to the commercial district has emerged as a potential solution.

A rough plan for shuttle routes in the core city has been worked out by HCP Design Planning and Management Pvt Ltd, urban design consultants for PMC's 'Pune Streets Programme' that aims to improve facilities for walk, cycle and public transport in 2017-18.

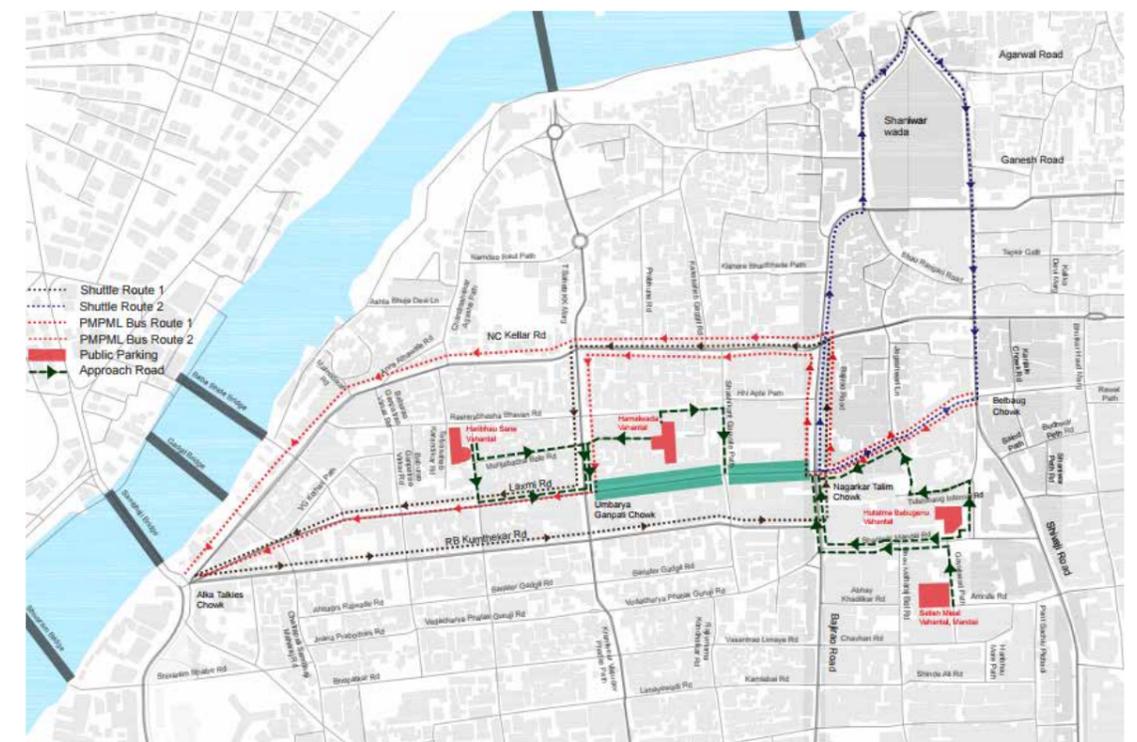


Figure 11 - Rough route plan for a core city shuttle

Photos by HCP Design Planning and Management Pvt Ltd



Figure 12 - Undertutilized off-street parking lot in the core city area

In Conjunction with Place-making and Mass Transit Projects

New projects being developed or proposed in the city such as pedestrian plazas, no-vehicle zones, such as riverfront areas, and introduction of mass transit systems such as Metro and BRT etc. would be even more attractive and successful with smart new shuttle services. These shuttles could be co-branded for the area or project they are introduced with.



Figure 13 - Examples of local area shuttle branding

Rainbow Bus Rapid Transit corridors

A survey was conducted by CEE and IBI Group in August 2016 which indicates a stated willingness to use BRT if a rickshaw feeder service is available within 5 minutes of journey origin points. About 29% of BRT non-users in the survey sample in a 3 km catchment around the Yerwada Wagholi corridor in Pune responded positively to this question. (IBI Group & CEE, 2016).

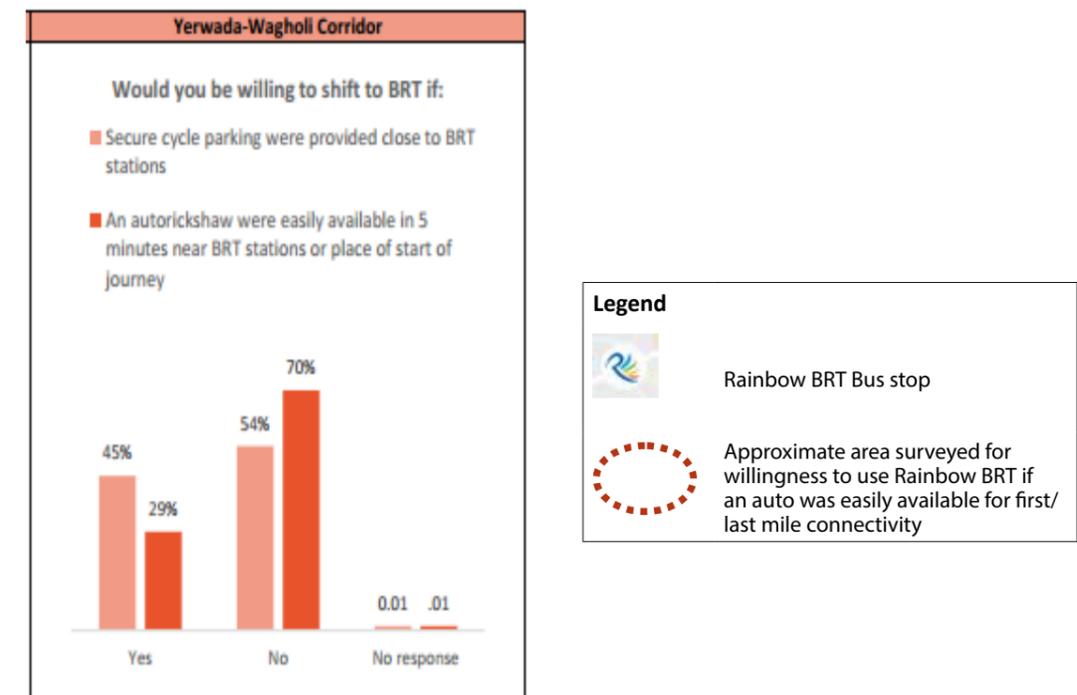
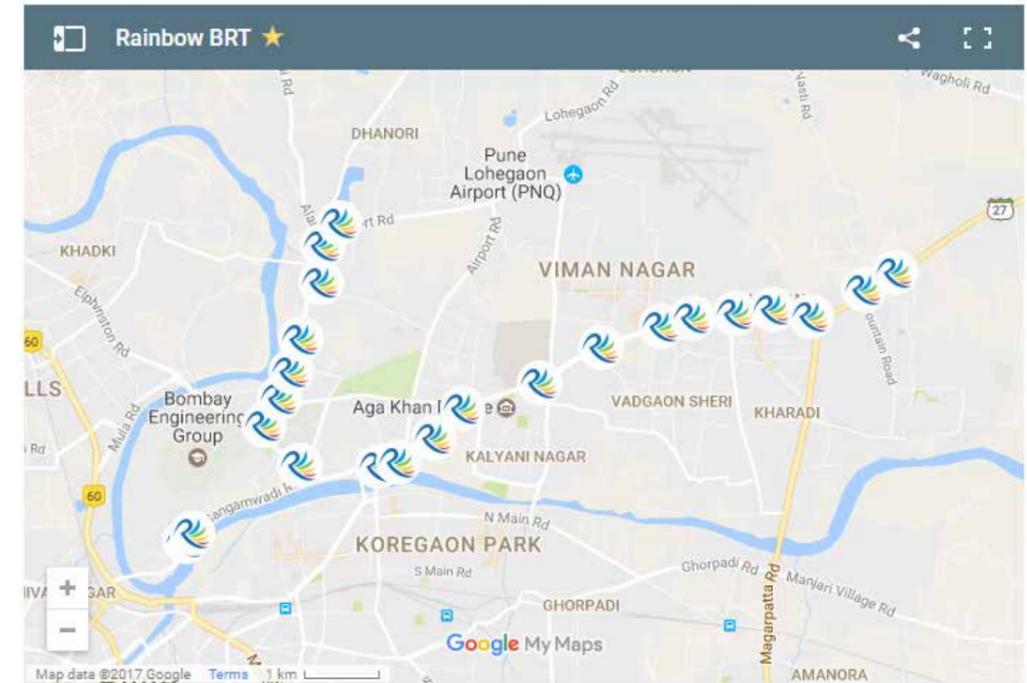
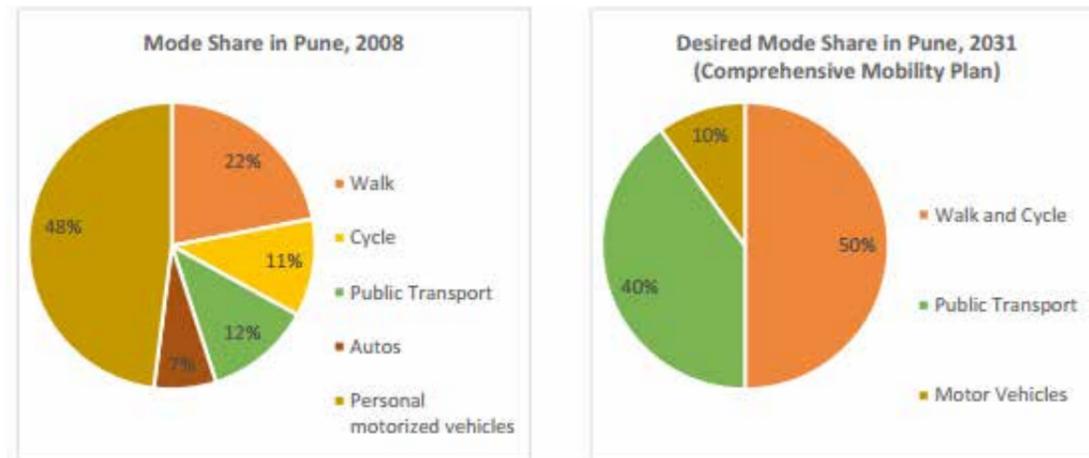


Figure 14 - Willingness to use Rainbow BRT with easy first/ last mile connectivity

Should Shuttles be an Element of Pune's Comprehensive Mobility Plan?

The Vision for mobility in Pune, as articulated in the CMP is "Moving people safely and economically by emphasizing public transport and non-motorized transport." (Wilbur Smith Associates, 2007)

The target it sets is to move from a mode share of 12% of public transport (excluding IPT) to a mode share of 40% of public transport (excluding IPT). It seeks to enhance the share of non-motorized modes to 50%.



For IPT services the Pune CMP suggests the following:

1. Considering 'IPT vehicles per lakh population' as one of the indicators in performance measures of Pune's CMP, it suggests a target of up to 1000 autos per lakh population. (CMP: Table 7.1: Definition, formulation, evaluation and targets for the indices)
2. One of the elements of the CMP strategy is: Identifying feeder systems that connect different pockets and wards in the city to the most convenient point in one or more of the mobility corridors (CMP: Section 7.5, CMP Strategy)
3. For different scenarios, the share of peak hour trips that are assigned to autos are as follows
 - 13% under 'Do nothing' Scenario (CMP: Table 8.1)
 - 12% under 'Augmentation of PMPML Buses' Scenario (CMP: Table 8.2)
 - 4% under BRT based Public Transport/ MRTS/ Ring Road (CMP: Tables 8.4, 8.5, 8.7)

The fact that the CMP acknowledges the role of IPTs, and considers that IPT will continue to play a role in mobility services in Pune, is appreciable. However, the approach adopted follows a 'closed permit' thinking, with a suggested target of 1000 number of auto rickshaw vehicles per lakh population. This is in contrast with the recommendations for IPT in the NTPDC 2014 report.

Feeder systems for public transit are seen as essential in the Pune CMP. However, it is not clear whether IPTs would be the primary mode of feeder services.

The CMP does not mention any local area shuttle systems.

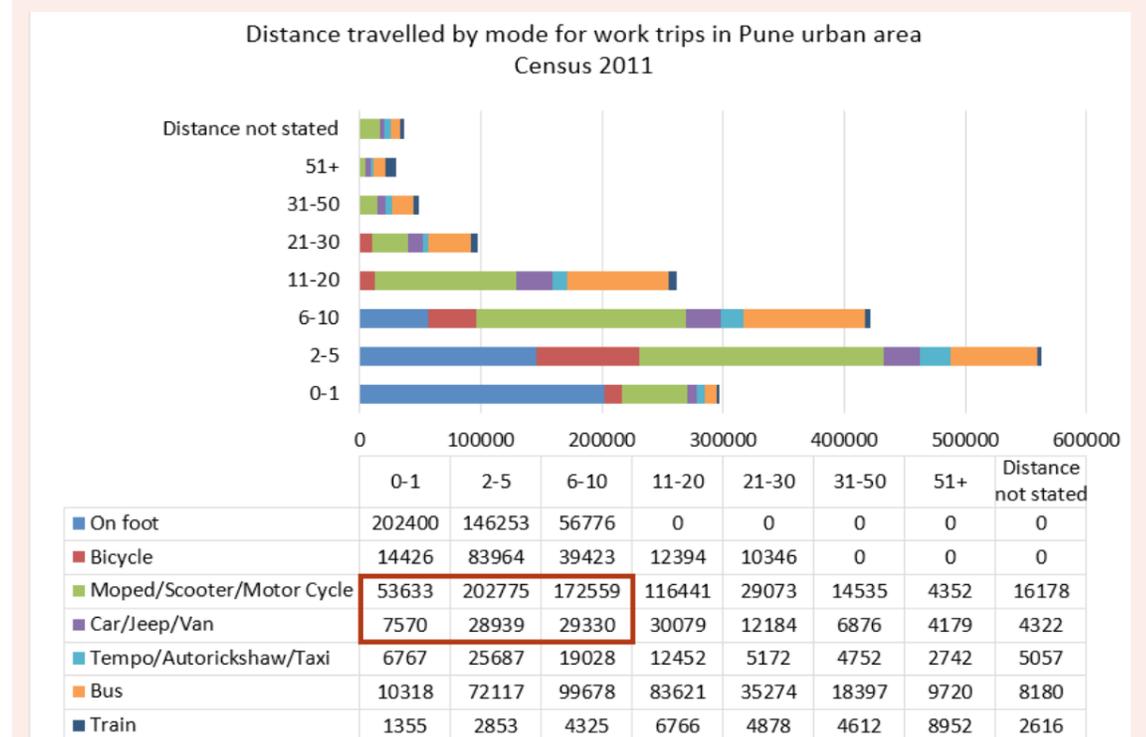
Given the experience in Aundh and the potential with new projects presented in the previous section, **we suggest that the role of Local Area Shuttles as an essential element of Pune's Comprehensive Mobility Plan should be explored in more detail.**

Further, with the Census 2011 data on modes for work trips and trip lengths becoming available, **a reimagining of the future transport scenario may be done.** (See Box 2 - Trips by Private Motorized Mode Suitable for Conversion to Shuttle). Of course, not all of these trips would convert to shuttle services, but it is this length of private motorized trips that may be sought for conversion to shuttle trips.

In the next section, we suggest some options for instituting shuttle operations.

Box 2 - Trips by Private Motorized Mode Suitable for Conversion to Shuttle

The chart below uses the Work Trips data from Census 2011 for Pune city. The number of two-wheeler and car trips in the 0 to 10 km range, almost 4.3 lakh and 65000 trips respectively, are the major segment that is sought for conversion, city wide.



Box 3 - Pune's Comprehensive Mobility Plan

The National Urban Transport Policy (NUTP), 2006 seeks to transform the current urban transport system into a safe, convenient and efficient transportation system across all urban areas in India. The Ministry of Urban Development has sought to ensure that the various urban transport projects that are being developed by the cities are coherent with the NUTP. Towards this, the Ministry in March 2007 issued a circular indicated that a "Comprehensive Mobility Plan (CMP) be prepared that focuses on mobility of people rather than vehicles and accordingly give priority to pedestrians, Non-Motorized Transport (NMT), all modes of public transport and IPT."

The Pune Municipal Corporation (PMC) commissioned Wilbur Smith Associates and IL&FS Urban Infrastructure and Services Limited to prepare the Comprehensive Mobility Plan for Pune. A draft of the CMP was presented to PMC in February 2008 and after a period of public comments, it was approved by the PMC General Body on 12 May 2012.

(The following is an extract about the CMP from the PMC website)

Major Elements

The CMP seeks to make public transport facilities available to all residents within a reasonable distance from their homes, work places and other destination points. It also seeks to encourage greater use of non-motorized modes by making their use safer. Recognizing that Pune is a rapidly growing city and travel demand will continue to grow, there is no escape from having to decongest some of the highly choked areas and intersections in the city. This is being suggested because long idling of motor vehicles at crowded junctions and corridors adds to pollution and unnecessary use of an imported fuel as also global warming. Measures have also been suggested to discourage the use of motor vehicles and attract a large part of the growing travel demand towards public transport and non-motorized modes.

The above strategy is sought to be implemented through the following broad approach:

- Identification of a number of trunk mobility corridors along which high capacity public transport systems such as BRT/Monorail/LRT/Metro, etc would be considered based on a scientific and detailed alternatives analysis.
- Enhancing the capacity and quality of the public transport so that people are willing to use it instead of moving towards personal motor vehicles
- Providing alternative routes for those having to enter the core city area even when their journey does not begin or end in this part of the city. For this purpose, ring corridors have been suggested to enable the core city area to be bypassed.
- Providing bypass routes for long distance commuter and truck traffic so that they do not have to travel through the city roads.
- Identifying feeder systems that connect different pockets and wards in the city to the most convenient point in one or more of the mobility corridors
- Providing a network of dedicated cycle tracks, footpaths and pedestrian crossings
- Pedestrianizing important portions of the core city area and linking them with strategic parking places to encourage people to walk in such areas
- Providing flyovers in a few heavily congested junctions/intersections to reduce idling traffic
- Special attention towards road safety
- Introduction of physical and fiscal measures that would discourage the use of personal motor vehicles
- Reform and strengthen the institutional arrangements for managing and regulating the transport system in the city

From <http://www.punecorporation.org/en/comprehensive-mobility-plan>

Some Options for Institutional Arrangements of Shuttle Operations

Where and how to introduce local area shuttles

PMC should commission studies to assess where in the city a shuttle will

- Substantially reduce private motorized trips or/ and
- Increase public transit access.

Origin-destination and 'willingness to use shuttle' surveys may also be conducted to estimate area-wise demand more accurately, establish baselines of traffic patterns, and on-street parking demand.

A committee consisting of PMC, Traffic Police and RTO could review the results of such studies and pro-actively and systematically introduce shuttle operations in such areas. In addition, the committee should ensure the conditions for effecting the shift from private motorized trips to shuttle, walk or cycle. These are:

- Strict curbs and regulation of on-street parking and provision of limited off-street parking
- Suitable physical infrastructure for shuttle stops, signage, shuttle vehicle parking areas etc. and improved pedestrian infrastructure to make the area more walkable.

After introducing shuttle services, suitable periodic studies should be commissioned to monitor the shift to IPT from private motorized modes, and the quality of service and customer satisfaction.

Managing Shuttle Operations

Shuttle operations as envisaged in Box 1 - Characteristics of a Local Circulator Shuttle Service would be categorized as a 'stage carriage' service under the MV Act 1988. The Pune Regional Transport Office would be the agency to issue the permits for such shuttle operations.

Currently, stage carriage operations are provided by Pune Mahanagar Mahamandal Limited (PMPML). This is the bus utility company owned by Pune Municipal Corporation and Pimpri Chinchwad Municipal Corporation. It provides bus-based public transport services in the Pune region. The Pune Smart City Development Corporation Ltd (PSCDCL) is also constituted to have the ability to make available e-rickshaws and lease out to private operators.

As such, shuttle operators could manage their services themselves in a 'free-market' operation. The need for regulation and management arises with the need to provide:

- Assured quality of service, requiring adherence to schedules, routes, fares
- Customer interface and information availability
- Systematic infrastructure support for the shuttle operations
- Systematic, supportive interface between the operators and the regulator
- Meet objectives of multi-modal transport integration
- Grievance redress

Some options are presented in Table 2 - Some Institutional Options for Shuttle Services in Pune.

Institutional Option	Advantages	Disadvantages/ Considerations
1. PMPML operated with full ownership of shuttle vehicles and staffed by PMPML employees, at fixed fares	<ul style="list-style-type: none"> • High assurance of service • Higher level of organizational control possible • High possibility of integration with PMPML's bus services and improved bus ridership • Model could be expanded to entire Pune metropolitan area where PMPML has services 	<ul style="list-style-type: none"> • Potentially a high cost option; a larger public subsidy may be needed to keep shuttle fares low • Weak institutional capacity, though long experience in stage carriage services
2. PMPML provides oversight and engages cooperatives/ companies (Section 71 of the Motor Vehicles Act mentions preference to be given to co-operative societies and ex-service-men, in granting of permits for stage carriage services), at fixed fares	<ul style="list-style-type: none"> • Assured service likely • Can provide a livelihood option for existing IPT, or new enterprises preferentially of urban poor, including women • Model could be expanded to entire Pune metropolitan area where PMPML has services 	<ul style="list-style-type: none"> • PMPML would have to meet oversight costs • The revenue model will need to be worked out so as to be viable for operators while affordable for commuters • Weak institutional capacity, though long experience in stage carriage services
3. PMC or PSCDCL provides oversight, and the rest as in option 2 above	<ul style="list-style-type: none"> • As above 	<ul style="list-style-type: none"> • As above, and PMC / PSCDCL would have to meet oversight costs (even in the case of PMPML meeting oversight costs, it is partly from PMC that such costs may be ultimately recovered) • No history of managing a public transport service
4. PMC or PSCDCL may publish a notice seeking Expressions of Interest from entities such as cooperatives or companies to run shuttle operations in selected areas, and after selecting suitable entities, make a provisional recommendation to Pune RTO for permitting selected entities at fixed fares	<ul style="list-style-type: none"> • As above 	<ul style="list-style-type: none"> • Regulation and oversight may be more lax • The revenue model will need to be worked out so as to be viable for operators while affordable for commuters
5. PMC or PSCDCL may publish a notice stating that shuttle services may be run in selected areas, and individuals may then seek permits, on their own from Pune RTO (where needed) without fixing fares	<ul style="list-style-type: none"> • Simple, market driven mechanism • Potentially higher adaptability • Potentially lower management costs 	<ul style="list-style-type: none"> • Regulation and oversight may be more lax • Potentially lower levels of service • Potentially disruptive/ unorganized movement of shuttle vehicles

Could current IPT operators provide an option?

Discussions on the possibility of shuttle operations by IPT providers were done with Kashtakari Panchayat, an organization set up for the welfare of informal sector workers, and Rickshaw Panchayat, one of the unions of auto rickshaw owners and drivers in Pune. These discussions have thrown light on several important social and economic aspects of IPT in Pune. Discussions were also done with individuals and groups of auto rickshaw drivers and six seater drivers for their insights on services currently provided by them, their views on the possibility of shuttle services, and interest in participation². A number of share auto and six seaters operate in Pune, some of which were mapped for this study (see Figure 13 - Google Map of some share auto/ six seater routes in Pune).

Overall considerations

- Permits for share auto type services would be the simplest, market driven operation
- The introduction of e-rickshaws which may not need permits or require to pay fees/ license charges would be a distortion of the market, placing auto rickshaws at an unfair disadvantage. Similarly, the regulations for auto aggregators seem much more lax compared to the license- permit-penalty regime imposed on auto rickshaws
- If the PMPML itself operates shuttle services as an extension of its current public transport services, that would be a welcome step, though it would probably imply very high costs. If shuttle services are to be opened to private players then a level playing field must be provided
- Auto rickshaw owners were earlier required to change their petrol or diesel vehicles to LPG or CNG, and now if they are again asked to change to another vehicle type (such as electric rickshaw), it is an enormous financial burden that unions are likely to protest against
- While electric vehicles are being promoted, CNG / LPG vehicles may have lower environmental impacts in comparison to electric vehicles, as electricity is primarily coal generated in India.
- Cooperatives of urban poor, especially of women, may be a good idea, and it could be a new livelihood option in a segment that has been occupied by men
- It may be worthwhile exploring a combination of user fee/ fare box collections and fixed subsidy from PMC/ PMPML like in the case of the Swachh waste collectors' cooperative
- Individual auto rickshaw owners /drivers may be interested in running shuttles; however, they may not be fully aware of issues and implications for the city or the IPT sector – the city may not benefit with a general influx of shuttle vehicles, and there may be adverse impacts on many auto rickshaw drivers of introducing a service without adequate checks or a level playing field.

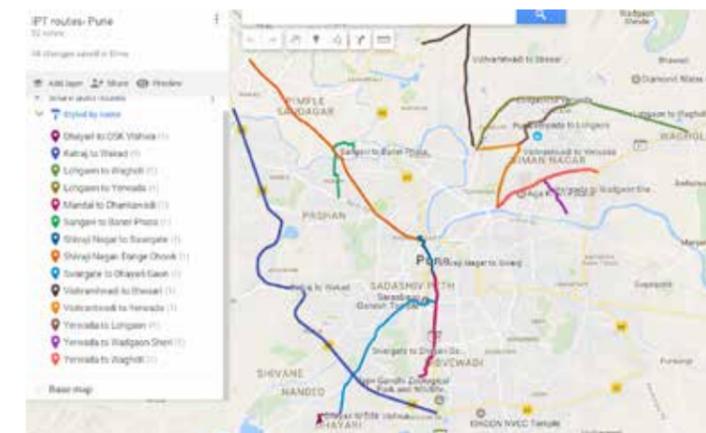


Figure 15 - Google Map of some share auto / six seater routes in Pune

<https://tinyurl.com/pune-shareauto-routemaps>

² These interviews were conducted by Samrat Dubey and Khyati Singh, interns at CEE, from TISS, Tulajapur Campus

Responses from auto rickshaw drivers in Aundh

25 persons were interviewed in various locations in Aundh, in small groups.

Currently, a cap of 45000 permits exists for auto rickshaw, though there may be a few thousand more operating without permits



Figure 16 - Auto rickshaws in Pune

Issues faced

- Ola and Uber have led to a perceived 45-50% reduction in auto rickshaw usage
- Average wait time for an auto rickshaw driver to get a customer at an auto rickshaw stand is about an hour
- The increase in congestion has increased travelling time and fuel consumption.
- Insurance has increased from Rs 6000 to Rs 9000 from 1st of April 2017. However, if they have to file a claim, it takes a long time to recover the amount, so they prefer to manage the losses on their own instead of claiming the amount to avoid loss of working time. Other taxes and penalties have also increased such as there is now a Rs 50 per day penalty for delay in obtaining verification certificate and a penalty of Rs 1000 per day in case of delay in license renewal.
- Daily income on an average is about Rs 300 to Rs 400

Perception about auto rickshaws

- If passengers opt for shorter distances then to make up for the loss of their turn or time, some auto drivers may charge Rs 5 to Rs 10 extra though for longer distances the charges are as per meter. The minimum fare is Rs 18 so autos are relatively more expensive for shorter distances.
- Auto rickshaws are much safer for women

Advantages of auto rickshaws

- Auto rickshaw as a vehicle is more manoeuvrable so it is an appropriate vehicle for local shuttle services
- Auto drivers have considerable experience of driving anywhere in Pune in various conditions, and so they are familiar with routes, and have low accident rates

Views about shuttle services

- Auto rickshaw drivers would like to explore shuttle services, especially share auto services
- Such a shuttle service will not impact regular auto operations very much as customers who want privacy will book an auto, especially for long distances.
- There are a few unions in Pune and it would be useful to have a discussion among them to arrive at suitable options
- Average work hours could be 8-12 hours; base fares could be Rs 10 for up to 2.5 km. Permits of 4 passengers would be useful to make a reasonable profit; Frequency could be 15-20 min on peak hours and on half an hour in off peak hour and one person can make up to 10 rounds
- Elderly drivers may not want to go for long distance runs because of health issues and shuttle operations may be a suitable option. Trip allocation can be done keeping in mind that drivers who are elderly or have health issues could preferentially take up short distance routes
- Allocation of autos can be done as per area and demand. For short distances of 2 kms about 10 autos may be appropriate; for circuits of more than 4 km about 20-25 autos may be appropriate.
- Current auto rickshaw stands can also be used as shuttle stands
- Earlier, an informal rickshaw service used to operate between Shivaji Nagar and Aundh

Responses from six-seater drivers

Six seaters are operational on several roads and areas, mainly in the outskirts of the city. About 22 persons driving six seaters, operating on the following routes, were interviewed in March 2017:

- Baner Phata - Parihar Chowk - Sanghvi
- Aundh corner - Balewadi Stadium
- Parihar Chowk - Dange Chowk
- Yerwada - Vishranwantwadi - Lohgaon
- Yerwada - Kharadi, Wadgaon Sheri and Wagholi

The observations were:

- About 4 to 8 trips with 6 to 9 passengers, done daily
- Daily average fare collection is about Rs 500 to 600
- They are not much impacted by Ola and Uber
- They may be interested in operating as an organized shuttle service, they would like to understand the models being proposed
- The vehicles need to be upgraded as most of the six seaters are about 20 years old and may not get permission for operation any more
- Investments of Rs 2 to 3 lakhs are possible for many of those interviewed



Figure 17 - Old six seater vehicle in Pune



Figure 18 - New CNG six seaters in Pune

E Rickshaw Call Service in Aundh

E-rickshaws are operating in some locations in Pune, including in Aundh. An E-rickshaw service was initiated in Aundh area by Mrs Archana Musale and Mr Madhukar Musale and has been in operation since early 2016. Mrs Musale has been elected as a Corporator for Ward 8 in the February 2017 elections. The service is managed by Mr Mayur Munde. The local residents had been talking to them about the inconvenience of reaching bus stops, and the high charges and general reluctance of auto rickshaws for local trips. The idea of a local e rickshaw was mooted seeing the service operate in Delhi.



Figure 19 - E-rickshaw in Aundh

Operations

- A fleet of six vehicles procured from Reflex Control System Pvt. Ltd (model ASHV ZX) is operational
- The service provided is on-call taxi
- Time of operation is 8 am to 8 pm
- Ferry 4-7/8 people in the e rick at peak times.
- More popular with senior citizens, women and school children going to local schools
- There is no peak time, they receive calls all throughout the day. In the morning, the passengers are mostly office goers, while in the afternoon most calls are for school pickups. The distances are about 1.5 km, and typical popular rides are: Bremen Chowk to Ambedkar Chowk; Medipoint to D-mart; and Season's hotel to Baner Phata
- The charge is Rs 10 per trip per person

Vehicle Charging

- It takes about 8 hrs to charge fully
- Once charged it can run 150 Km
- Daily run is about 120 Km
- Electricity bill is about Rs 6000 per month, at commercial rates.

Maintenance

- If the vehicle stops running then it has to be wheeled to the charging station, or towed by another vehicle
- Spare parts are not easily available and expensive in nearby areas.
- Currently, it is preferable to obtain spares from Delhi
- Trained mechanics are not available
- Axles are very delicate, wear out fast and spares are not available locally or are three to five times more expensive.
- Battery has to be replaced every six to seven months and is a recurring cost

- It would be useful to combine solar panels to continue charging the battery while the rickshaw is running (like a dynamo) or some way of harvesting solar power for this. Requested for any CSR grants that can be used to expand this network.
- The cost of maintenance per month for the fleet of six is about Rs 25000 to Rs 30000.

Drivers

- Six persons are employed, some are youth and some elderly persons, all from Aundh
- No training was felt to be necessary for driving the e-rickshaw; it is like driving a two-wheeler, which they are familiar with

Earnings/ Revenue

- The e rickshaw service is reportedly being run as a social service/ not-for-profit work
- The service did generate considerable good will among the citizens prior to elections
- Other party candidates too have bought e-rickshaws but could not continue the service, mainly due to the high maintenance costs
- Each driver earns about Rs 500-600 per day

Udaan Impact

This e-rickshaw service was asked to be stopped during the Udaan trial.

Expansion possibility

- According to the drivers, a fleet of 10 e rickshaws will be good for Aundh area.
- The network could be extended to Balewadi or other areas, however if the vehicle develops a fault then towing it to a service station is difficult

Challenges and Constraints

- Lack of waiting spaces / E rickshaw stands at various convenient locations
- Lack of charging points

New CNG cab service

Very recently, a door to door pick up and drop AC car service has been started within Aundh, which will ferry people anywhere in Aundh for Rs 20.



Figure 20 - New 'Aundh Local' CNG cab service

Table 3 - Technical Specifications of E-rickshaws Operational in Aundh (Model ASHV ZX, Passenger E-rickshaw)	
Aspect	Specification
Max speed	25Km/hr
Seating capacity	4+1+40 Kg luggage
Average Per Charge	Approx 100 Km
Motor Max Power	1.9kW
Battery Rating	100 amps
Battery	Okaya OW ER – 100
Wheel base	2070 mm
Overall length	2630 mm
Overall width	990 mm
Overall height	1780 mm
Minimum ground clearance	140 mm
Gross vehicle weight (In Kg)	318
Chassis	CRC Sheet & Pipe
<i>From http://cwsdesigns.org/upload-ashv1/tech-specification.html retrieved 30 April 2017</i>	

Box 4 - Permits not needed for E-rickshaws, but where may they operate?

As this paper is being finalized, discussions are on about the allocation of roads and areas where e-rickshaws will be allowed to ply in Pune. As per the Gazette Notification of 30 August 2016 of the Ministry of Road Transport and Highways, e-rickshaw operators are not required to seek permits for operating as transport vehicles, though State Government can restrict where they may ply.

E-rickshaws may provide share-rickshaw services as well as taxi services.

As per the Motor Vehicles Act, "e-cart or e-rickshaw" means a special purpose battery powered vehicle of power not exceeding 4000 watts, having three wheels for carrying goods or passengers, as the case may be, for hire or reward, manufactured, constructed or adapted, equipped and maintained in accordance with such specifications, as may be prescribed in this behalf.

2	THE GAZETTE OF INDIA : EXTRAORDINARY	[PART II—SEC. 3(ii)]
MINISTRY OF ROAD TRANSPORT AND HIGHWAYS		
ORDER		
New Delhi, the 30th August, 2016.		
<p>S.O. 2812(E).—In exercise of the powers conferred by clause (n) of sub-section (3) of section 66 of the Motor Vehicles Act, 1988 (59 of 1988), the Central Government hereby orders that the provisions of sub-section (1) of section 66 of the said Act shall not apply to any transport vehicle of the category e-cart and e-rickshaw as defined in section 2A of the aforesaid Act used, or to be used, for the purpose of carriage of goods and passengers with their personal luggage respectively :</p>		
<p>Provided that the State Governments may impose restrictions under appropriate traffic laws on plying of these vehicles in specific areas or specific roads.</p>		
<p>[F. No. RT-11036/80/2012-MVL] ABHAY DAMLE, Jt. Secy.</p>		

Retrieved from <http://morth.nic.in/showfile.asp?lid=2423>

The concern or criterion, as reported in the media in Pune, for deciding where e-rickshaws may operate is that they should not obstruct the flow of traffic. The contribution that they may have in reducing local air pollution is acknowledged, as also the need to allocate stand spaces.

However, the fact that a systematic introduction of shuttles could, or should be done with the aim to, reduce motorized traffic flow is not being clearly recognized. We suggest that this should be the primary criterion in the allocation of areas and roads where e-rickshaw (or other vehicle) shuttles may operate, and should go hand in hand with restraints on private motorized vehicles. Without a plan for demand management, the potential value e-rickshaw (or other vehicle) shuttles may have for effecting traffic reduction will not be fully realized.

Apr 28 2017: Mirror (Pune)

Battery-run e-rickshaw service to be launched soon

Pune Mirror Bureau punemirror feedback@gmail.com
TWEET @ThePuneMirror

Traffic police are studying 15 routes for the new facility, after which RTO will launch it

At a time when the problem of rising air pollution is only taking the city's breath away, transport authorities seemed to have devised a small way to contribute to curbing the menace.

Now, an e-rickshaw service is to be introduced in Pune, for which traffic police are ready to carry out a survey to finalise 15 routes on which the facility can be launched.

A meeting regarding the e-rickshaw service was held at the Pune regional transport office (RTO) on Thursday, attended by transport officials along with representatives of Pune traffic police.

Pune's regional transport officer B I Ajri said, "This step is being taken to reduce air pollution -it will be eco-friendly as well as provide a new option to commuters on our roads."

While the RTO has already taken steps to convert petrol rickshaws to compressed natural gas (CNG), these new e-rickshaws will run on batteries.

Ajri added, "Traffic police will be carrying out a survey of routes and submit a report to us about where stands for these e-rickshaws should be set up. We will also need to set up charging points for these battery-operated vehicles so that they do not break down and create hurdles for traffic. Once the report from police comes to us, we will go ahead with this project."

Transport officials also clarified that drivers operating e-rickshaws will not require regular driving licences or a badge. Any person above 18 years of age can drive these vehicles, and will be given e-rickshaw cards as licences to do so. Interestingly, drivers will be given the liberty of deciding on fares for their services, as transport officials feel once the service is introduced, competition among the drivers will take care to regularise the rates, while improving rickshaw services across the city.



This step is being taken to reduce air pollution — it is eco-friendly and provides a new option to commuters on city roads

— B I Ajri, RTO, Pune

Figure 21 - Media report about e-rickshaw routes in Pune
(Battery-run e-rickshaw service to be launched soon, 2017)

Vehicle Choice for Local Area Shuttles

The criteria for choice of vehicle for local area shuttles, as also mentioned earlier, may include:

- Low floor, easy to board and alight from
- Seating capacity as per need of the area
- Low emission (CNG or electric)
- Low noise
- Engine capability for start-stop movements
- Size and turning radius such that can be easily manoeuvred in neighbourhood streets and crowded areas

CNG auto rickshaws and six-seaters and battery-operated e-rickshaws may be appropriate vehicles.

Service centres and systems for safe management of batteries will be needed for e-rickshaws.

CNG autos and six-seaters need fuel stations. Long queues at the few CNG filling stations are a frequent site in Pune. On the other hand, e-rickshaws can have great flexibility for charging points.

While the permit exemption is an advantage for e-rickshaws, it is not an inherent advantage of vehicle capability. Conventional auto and six-seater drivers point out that they have been saddled with the need for a permit while e-rickshaws are exempt. They suggest that the permit requirement be removed all together.

From environmental considerations, at least a couple of questions have arisen in the course of discussions for this paper:

- is it better to replace the stock of CNG autos and six seaters with battery-operated rickshaws?
- Given that electricity in India is produced primarily from coal, a vehicle running on CNG has lesser emissions than an equivalent electric vehicle. However, is this true also for start-stop type operations?

A more detailed life-cycle and systems analysis as well as actual vehicle assessment and testing may be needed to decide these question.

If e-rickshaws are better on environmental impact counts, there may be a case for replacing the stock of auto rickshaws and six-seater vehicles. Certainly, petrol and diesel vehicles may be phased out over time. However, appropriate schemes will be needed for buy back, recovery of usable parts and scrap, and soft loans for vehicle replacement.

Conclusions

The experience with Udaan in Aundh, the status of existing IPT systems, traffic patterns, and the new transportation projects underway or planned in Pune indicate the need for developing well-organized and integrated shuttle services as an element of the city's sustainable mobility planning. The major gain expected is the space freed up due to reduced parking demand on highly congested streets for facilities for pedestrians, cyclists and public transport. This measure for controlling or reducing parking demand would go hand in hand with pricing and regulation of parking as well as making available off-street parking lots.

- The IPT segment can potentially run organized shuttles. The larger issue to be addressed is the asymmetry of regulations for different modes within the IPT segment. The specific concern expressed is the excessive regulations of auto rickshaws as compared to regulation of auto aggregators and e-rickshaws.
- Further deliberations will be needed on institutional models and financial arrangements for organized shuttle operations. The participation of current IPT operators in the development of options is highly desirable as a way of adapting their livelihood to changing travel conditions, technologies and evolution in mobility planning.
- From the one-to-one and group interviews conducted, the general indication is that individuals currently engaged in driving auto rickshaws would like to explore shifting to shuttle services, in the 'share auto' mode. The idea of a different vehicle was not discussed with auto rickshaw drivers, and so their views on this topic are not known. Six-seater drivers may be willing to operate as more organized shuttles. They show a readiness to change vehicles as their vehicles are nearing the end of their roadworthiness certification.
- There is a need for locale-specific experimentation on which type of vehicle is suitable for the different services envisaged: share auto or stage carriage type organized service.

Way Forward

Implications for Pune

PMC, the Regional Transport Authority, Traffic Police and other stakeholders should recognize the potential of local area shuttle services in reduction of private motorized vehicle usage. More importantly, it should be recognized that this potential will be more effectively realized when shuttles are combined with on-street parking curbs, facilities for shuttles, and supportive management for high quality services. Introduction of new shuttles should be done with the specific aim of multi modal transport integration and reduction of private motorized vehicle usage. The following next steps are suggested:

1. Convene an 'IPT and Shuttles Committee' consisting of PMC, RTO and Traffic Police, and knowledgeable NGOs and citizens as members.
2. Allocate funds for undertaking the steps outlined below, through appropriate professional agencies; PMC may be the appropriate institutional entity to make such a budget allocation.
3. Commission studies to identify areas where shuttles will substantially reduce private motorized trips or/ and increase public transit access.
4. Arrange multi-stakeholder meetings to introduce and develop the idea further at the city level.
5. Develop options of institutional and financial arrangements in discussion with the institutional stakeholders as well as IPT operators.
6. As suggested by the NTPDC 2014, develop support systems including loans and training for IPT operators to upgrade vehicles and develop or strengthen their own organized enterprises.
7. Conduct further trials of shuttles, including with branding, designated stops, signage etc - in discussion with local area stakeholders; gradually introduce parking restrictions; especially in areas where street design work is proposed or underway promoting pedestrian and cyclist facilities, in conjunction with place-making projects, and new public transit corridors (both BRT and Metro), etc
8. Undertake an assessment of vehicle types for appropriateness of use as a shuttle, with criteria including passenger and driver safety and comfort, manoeuvrability, capital and operations cost, sturdiness and environmental performance.
9. Undertake public education and engagement programmes for city-wide and area level improvements in mobility planning and monitoring, to reduce use of private motorized modes and encourage non-motorized modes, intermediate public transport and public transport.
10. In the medium-term, review the Comprehensive Mobility Plan for (among other aspects) integration of local area shuttle services.

Regional and Country-level Suggestions

Several studies are available on the status of the IPT sector in India, as evidenced by the literature review. The NUTP 2006, and the more recent NTPDC 2014 have also clearly stated the need for strengthening the IPT sector. Considering the suggestions made in these, the following steps may be useful more generally or at the national scale:

1. Conduct regional and national deliberations that capture the diversity of views of different stakeholders, the physical situations of IPT systems, and existing and potential institutional structures that may facilitate strengthening of this segment of public transportation, with a view to creating detailed policies.

2. Develop detailed policy and guidance materials/ tool kits for strengthening the IPT segment in a participatory manner.
3. Especially recognize and address the differences in institutional approach and support for different IPT systems and vehicle types, that is, e-rickshaw, aggregators, and the older six seater or auto-rickshaw type services, including through creation of schemes for replacement of vehicles, entrepreneurship development, social security etc with the concerned stakeholders.
4. Support experimentation/ pilot projects to develop well-organized and well-integrated shuttle services in different cities, and sharing of learnings from such efforts.
5. Support stakeholder and public engagement and awareness efforts, and ancillary studies that should go hand in hand with area level traffic planning improvements, especially demand management efforts.

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