



# Reimagining public transport in India

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# Executive summary

Propelled by several global mega trends, public transport is witnessing transformational changes across the world, and India is no exception. In the past decade, India has witnessed deep penetration of metro rails, highway infrastructure, ride hailing services and many such other innovations that mark a march to modernity. India's airports have turned world class in this decade and competition is vibrant in segments driven by the private sector. Inter-modal competition is picking up pace rapidly.

Yet deep deficits remain in the provision of public transport services in India. The extensive-but overburdened rail system has raised major operational and safety concerns. Bus transport, mostly dominated by state-owned transport corporations fails to match modern global standards. Inter-modal integration is largely non-existent. First mile and last mile connectivity challenges deprive users of a consistent experience.

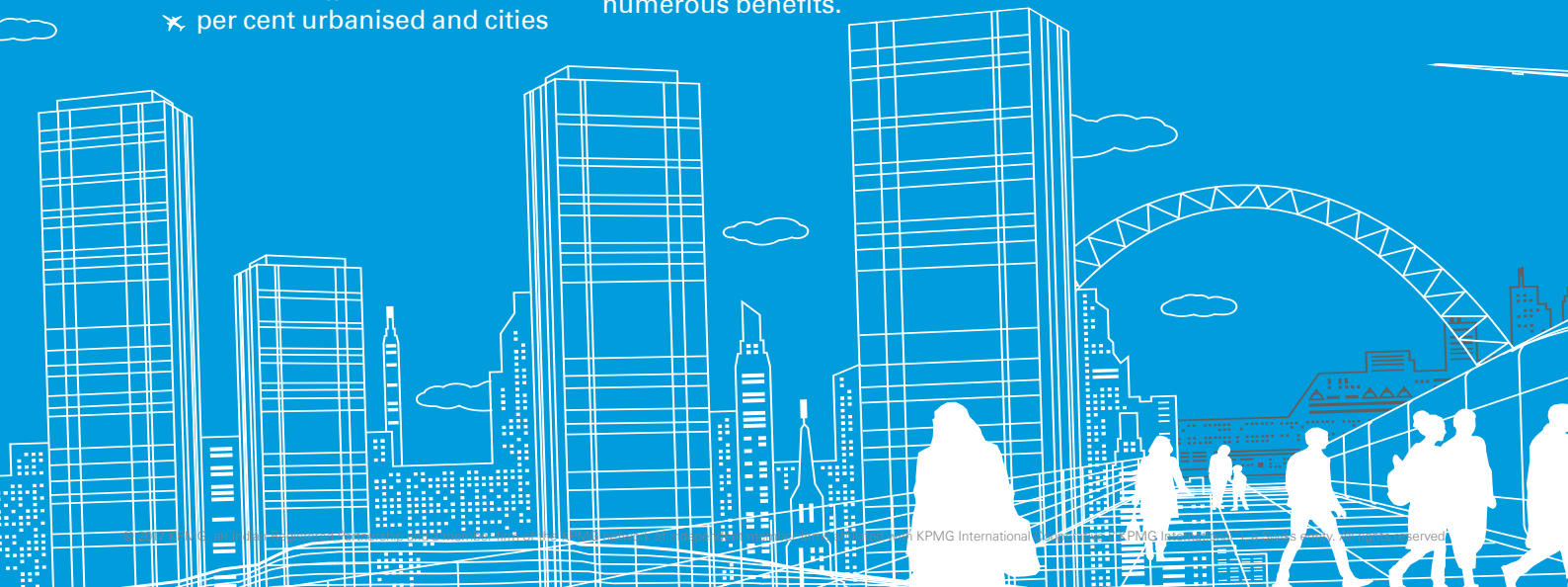
India's public transport needs are likely to grow rapidly as the country urbanises at a fast clip. As per Census 2011 (the population of India is 1.21 billion), India is about 31 per cent urbanised and cities

contribute almost 66<sup>01</sup> per cent to the Gross Domestic Product (GDP) of the country. It is expected that by 2030, 40 per cent<sup>02</sup> of population will call cities home and are also expected to contribute to 75<sup>01</sup> per cent of the GDP. The Ministry of Housing and Urban Affairs estimates that INR39,20,000 crore<sup>03</sup> (USD600 billion) needs to be invested during the period 2011-31 out of which 44<sup>03</sup> per cent is to be allocated to urban roads and 11.5<sup>03</sup> per cent to mass transit systems.

High levels of investments in roads without commensurate enhancement of quality public transport leads to more personal modes being adopted. This has several negative externalities in the form of fatalities, air pollution, congestion, etc. It is estimated that in India approximately 88 million trips (70<sup>04</sup> million by buses, approximately 18<sup>04</sup> million by railways and 0.23<sup>05</sup> million by air) are made on public transport on a daily basis which translates to 6-9 per cent of total trips being catered to by public transport as against 30-35 per cent<sup>06</sup> in most countries across the world. Clearly there is a need to provide more public transport in India as it has numerous benefits.

For sustainable development, a paradigm change in terms of avoid-shift-improve needs to be adopted in order to transition to public transport. Changing trends in consumer preferences, increasing awareness and sensitivity towards the environment, improvements in technology, thrust towards digital payments, electric vehicles and other renewable sources of energy are expected to usher in newer modes and models of transport much earlier than expected which can take public transport to the next level (international standards) in terms of quality, sustainability and efficiency for the end user. One of the greatest drivers of efficiency is the technology-enabled sharing economy and peer-to-peer networks that can enable real time alignment of demand and supply, thereby eliminating expensive underutilisation of assets and inventory of time.

01. Cities for all, National Institute of Urban Affairs, October 2014
02. Handbook of urban statistics 2016, Ministry of Urban Development, September 2017
03. Sustainable smart cities in India: challenges and future perspectives, Springer, Poonam Sharma, Swati Rajput, 2017
04. Review of Performance of SRTUs 2014-15, Ministry of Road Transport and Highways, Government of India, February 2016
05. Handbook on civil aviation statistics 2015-16, Directorate General of Civil Aviation, January 2017
06. KPMG in India's research and analysis 2017 based on research on public transport share in total trips across countries



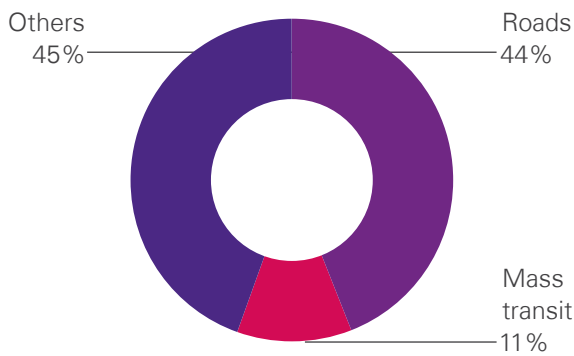


# Background



India is experiencing rapid urbanisation and the trend is expected to continue in the future as well. Hence, the focus on providing sufficient and quality public transport in cities is as critical as improving the inter-city connectivity. In order to sustain this growth, the Ministry of Housing and Urban Affairs estimates that during the period 2011-31 approximately INR21,75,600<sup>01</sup> crore (USD333 billion) needs to be invested in urban roads and mass transit.

**Figure 1: Allocation of funds for transport**



Source: Sustainable smart cities in India: challenges and future perspectives, Springer, Poonam Sharma, Swati Rajput, 2017

01. Sustainable smart cities in India: challenges and future perspectives, Springer, Poonam Sharma, Swati Rajput, 2017

02. Global Cost of road crashes, iRAP, 2013

However, as indicative estimates depict in Table 1, the adoption of public transport is quite low in India compared to a select few other countries. This translates into a greater use of personal transport modes, primarily cars and bikes. This has negative externalities of:

- Increased congestion
- Increased travel times
- Air pollution and consequent health issues
- More road fatalities whose costs on the economy are 1-3<sup>02</sup> per cent of GDP
- Loss of economic productivity.

**Table 1: Public transport share in total trips across select countries**

Country	Estimated Public transport share in total trips (per cent)
India	7*
Australia	17
U.S.	9
Singapore	86
Brazil	29

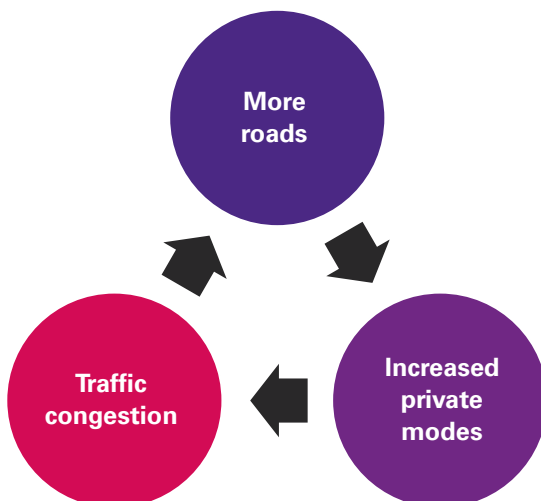
Source: KPMG in India's research and analysis 2017 based on research on public transport share in total trips across countries

\*Note: Indicative number



Further, as a majority of investment (44<sup>03</sup> per cent) is allocated to roads, it inevitably leads to an unending cycle as depicted in Figure 2:

**Figure 2: Consequences of investment in roads**



In order to circumvent this challenge/impending problem, there needs to be a paradigm change in the approach to urban and transport planning which effectively translates into adopting the Avoid Shift-Improve (ASI) framework:

**Avoid** - need for motorised travel which is possible by integrated land use transport planning and measures like tele commuting, work from home, etc.

**Shift** from personal modes of transport to public transport and non-motorised transport

**Improve** - Make improvements in technology, cleaner fuels and vehicles, etc.

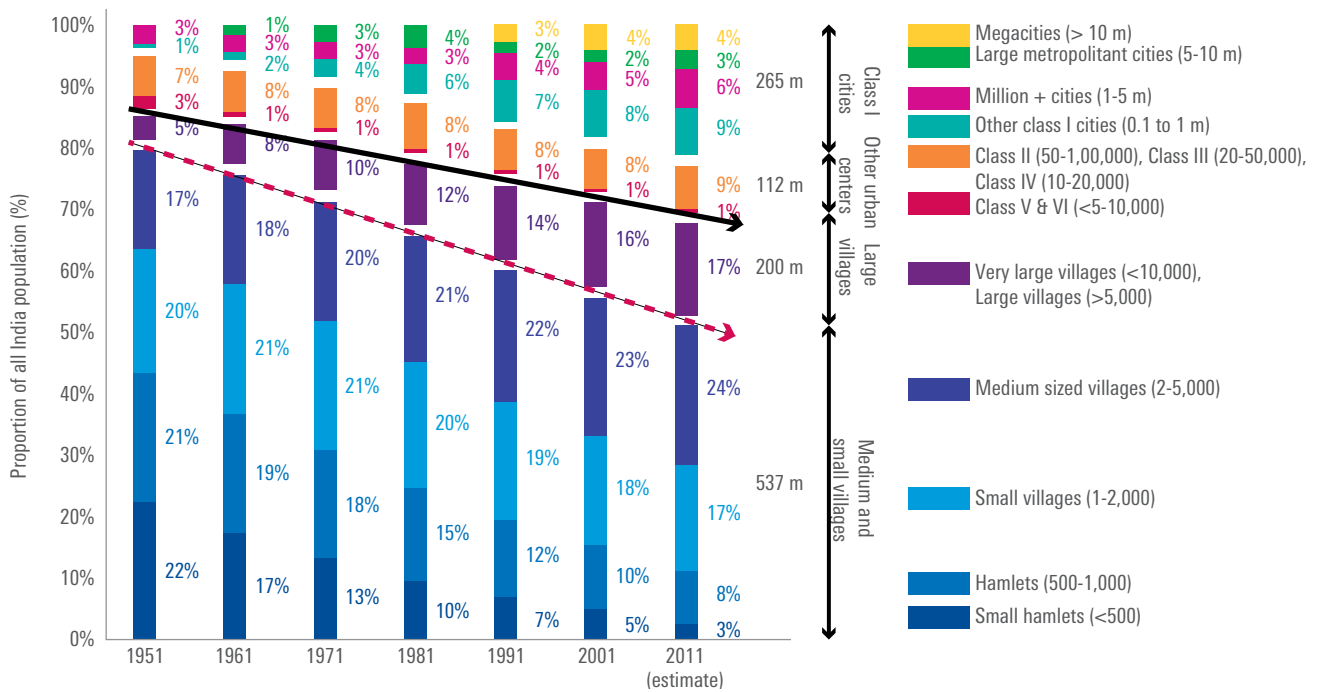
This ASI framework needs to be at the heart of a public transit system that needs to be customised to the needs of the area due to the large variance in India urban agglomerations.

03. Sustainable smart cities in India: challenges and future perspectives, Springer, Poonam Sharma, Swati Rajput, 2017

Approximately 377 million people live in the 7935 urban centres<sup>04</sup> of India (population greater than 5,000 is classified as an urban centre). In 2011, there were three cities<sup>04</sup> with more than 10 million population and 53<sup>04</sup> cities with more than 1 million population. As depicted in Figure 3, 42 per cent of the urban population lives in 53 cities (with populations of 1 million+) while the balance 58 per cent live in 7882<sup>04</sup>

urban centres with population ranging from 50,000 to 1 million people. Most of these (7882) smaller urban centres are still dependent on intermediate public transport (IPT) modes to satisfy their mobility needs viz. shared autorickshaw, jeeps, vans, etc. These forms of transport typically work in an informal or unorganised manner on a hail-and-ride basis. The payment mechanism is primarily cash.

**Figure 3: Urbanisation in India**



Source: Urban India 2011: Evidence, Indian Institute of Human Settlements, January 2012

As India aspires to become a middle income economy (Gross National income per capita ranging between USD1006-3955)<sup>05</sup> with very large urban agglomerations, the need to rapidly modernise and integrate its public transport is an imperative. However several challenges would need to be addressed in this endeavour.

04. Urban India 2011: Evidence, Indian Institute of Human Settlements, January 2012  
 05. The World Bank Group, 2017





# Challenges facing the public transport sector in India



While the current use/adoption of Public Transport appears lower for India compared to a select few other countries, there is an emergent need to enhance the capabilities and services of public transport to not only improve the adoption at current volume of passenger trips but also for the future demand.

The challenges for the Indian public transport sector are:

1. Institutional gaps
2. Inadequate supply
3. Poor customer experience
4. Lack of the use of technology.

## Institutional structure and capacity gap

The transport sector has a presence of many agencies such as bus operators, metro operators, regional transport authorities, auto-rickshaws, etc. that are governed by different agencies. In order for all these to work cohesively, an apex body dealing with all matters pertaining to the transport sector and especially public transport does not practically exist which leads to the different agencies operating in silos and without coordination. Moreover, the public agencies may lack technical expertise with respect to public transport which leads to inefficient operations and sub optimal performance.

With individuals exercising their preference for work-place mobility, flexible occupations, and choice of type and nature of places to stay, city traffic patterns are becoming more dynamic. The concept of Central Business Districts may be fast disappearing as people work from home, children spend time in extra-curricular activities or tuitions after school hours and start-ups/entrepreneurs travel far and wide to access business. In summation, point-to-point transits at certain peak times for various segments of residents may no longer hold true leading to more dispersed movements. In such scenarios, fixed circuit systems may be either unutilised or require even higher degree of first and last mile connections to provide commuters the desired level of flexibility akin to personal modes of transport.



## Multimodal transport planning and integration: Land Transport Authority- Singapore

### Intervention

The Land Transport Authority was established on 1 September 1995, after the merger of four public sector entities:

- Registry of Vehicles
- Mass Rapid Transit Corporation
- Roads & Transportation Division of the Public Works Department
- Land Transportation Division of the Ministry of Communications.

It is a statutory board under the Ministry of Transport, which heads land transport developments in Singapore. It is the agency responsible for planning, designing, building and maintaining Singapore's land transport infrastructure and systems. It uses technology to strengthen public transport infrastructure.

### Impact

Nearly 80 per cent of trips (4.24 million) in Singapore are performed on Public Transport comprising of bus, MRT, LRT, Taxis. The supply of public transport per capita is one of the highest in the world, due to which there is high usage of public transport, which coupled with travel demand restraint measures, like area licensing system, vehicle quota system, congestion pricing etc. has resulted in decreasing registration of private cars.

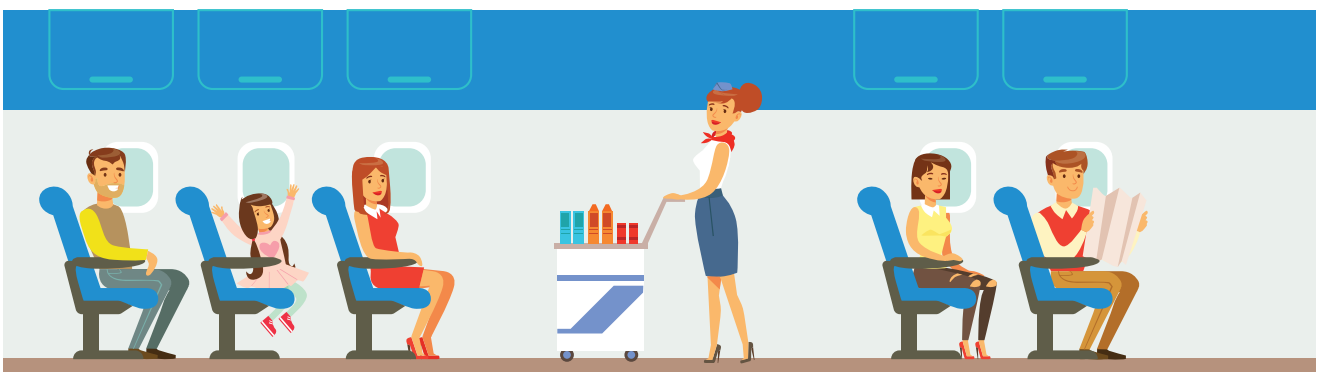
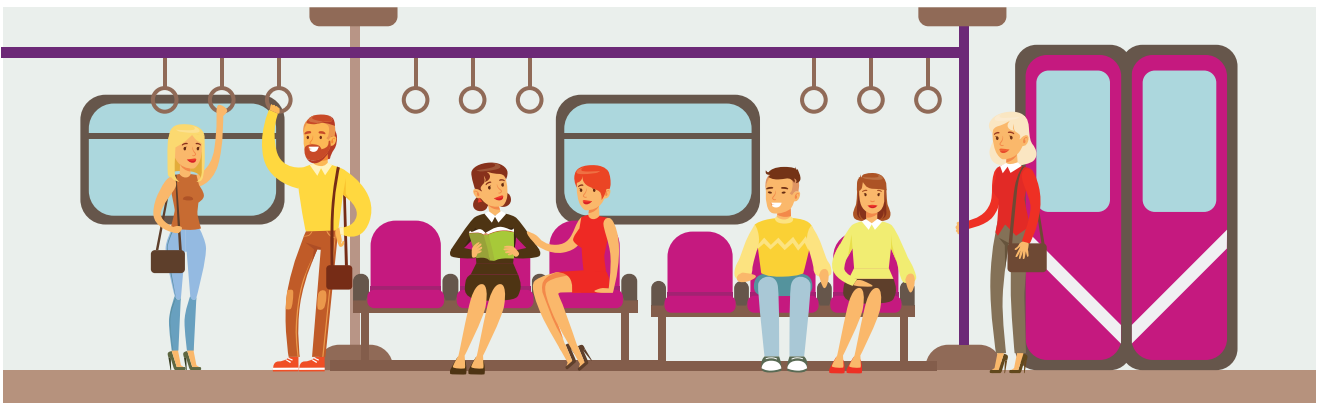
Source: 1. Our History. Land Transport Authority. Retrieved 26 September 2013.  
2. Singapore Land Transport Statistics in brief 2015, Land Transport Authority, September 2017

Existing cities either do not have space at grade or have load centres of economic activity that have grown around personal transport modes due to a lack of public transit options. In both cases, it becomes difficult to plan an alignment for a mass transit mode that can cater to the maximum demand or it becomes prohibitively costly to use elevated or underground options. Thus, traditional modes of transport need to be re-looked at with more flexible options that can align to the varying demand to avoid expensive redundancies and under-utilisation.

Comprehensive transport planning and operations has to go beyond the backbone systems like rail and road to encompass all modes that permit a seamless experience for the user from door to door. This involves modes that are not necessarily owned or operated by public agencies, but nonetheless have to become a part of the integrated transport experience. Further, this experience is coming to be enabled by technology

in various forms that not only provide information for the user, but can go on to provide a seamless user experience. Many of these are outside the remit of the way in which transport services have been hitherto provided in India, in which the State has played an overwhelmingly dominant role.

Considering the above shifts and the new possibilities occurring rapidly it has become imperative to reimagine public transport as the transportation system for public at large and not necessarily being provided by public sector enterprises. This change in approach would require authorities to consider the user and his/her preferences at the centre of the new age service and design the entire transport ecosystem. Accordingly we propose that the definition of public transport should cover the entire door-to-door travel span of the user involving third party infrastructure or resources and thus should cover all non-self-owned, motorised or even non-motorised transport means.



## Inadequate public transport supply has to be dealt with inventively

Bus is the predominant mode of public transport both in intercity as well as intra city travel in India. As stated earlier, India is 31 per cent urbanised currently which is expected to increase to 40 per cent by the year 2031. Currently, about 70<sup>01</sup> million trips per day are being catered to by 140,000 government run buses in the country. With a vision to cater to 50<sup>02</sup> per cent

of the urban transport trips using public transport (assuming public transport shall be provided by buses primarily), at the current passenger ridership per bus, it is estimated that an additional 460,000<sup>02</sup> buses shall be required to cater to the urban public transport demand in the year 2031 in addition to various other modes of public transport.

**Table 2: Benchmarking of public transport systems across the globe**

City	Metropolitan area		Bus		MRT		Bus Fleet/1000 persons	MRT Km/1000 persons
	Population ('000)	Area (km <sup>2</sup> )	Fleet Size	Daily Ridership (mn)	Km	Daily Ridership (mn)		
Beijing	20186	16411	21628	13.8	554	6.7	1.07	0.03
Hong Kong	7184	1104	5743	3.8	178	4	0.80	0.02
Shanghai	23475	6341	16235	7.6	588	6.2	0.69	0.03
Singapore	5312	716	4212	3.5	167	2.2	0.79	0.03
London	8302	1572	7500	6.4	402	3.2	0.90	0.05
New York	8337	790	4344	1.8	370	4.5	0.52	0.04
Seoul	10442	605	7512	4.6	327	6.9	0.72	0.03
Tokyo	13277	2189	1462	0.6	305	2.2	0.11	0.02
Delhi	16788	1483	5942	4.8	215	2.7	0.35	0.01

Source: Key transport statistics in world cities, Pan Di, September 2013

It is evident from Table 2 that Indian cities appear to lag behind in the physical coverage of public transport network to most of the cities across the globe.

The government has been driving the provision of bus and rail based mass transit systems through organised and well planned models. While the Jawaharlal Nehru Urban Renewal Mission (JNNURM) sanctioned 23,000<sup>03</sup> buses at a cost of approximately INR11,000 crore<sup>04</sup> (USD1.69 bn) in 141 cities, nine<sup>05</sup> cities have adopted BRT system with cumulative length of 174<sup>05</sup> km carrying 340,000<sup>05</sup> passengers on a daily basis. The Green Mobility Scheme of the Government of India envisages 1300+<sup>06</sup> km of BRT in 28 cities across the country underscoring the importance of BRT. Currently there are ten<sup>07</sup> cities which have an operational metro

system in India. However another 537 km<sup>07</sup> are planned over the next few years. The other cities that are constructing metros are Hyderabad, Nagpur and Ahmedabad<sup>07</sup> which shall be operational by November 2017, 2018 and 2020 respectively. By 2019, the total number of cities with Metro Systems is expected to be 12. Other rail-based modes are Tramways or light rail transit (LRT) as a medium capacity mode of mass rapid transport and monorail systems. LRT has been planned in Delhi (47 km) at a capital cost of INR100-160<sup>08</sup> crore/km. As depicted in figure 4, there are a variety of options in terms of capacity and unit capital costs that India can consider given its large variance of urban centres.

01. Review of Performance of SRTUs 2014-15, Ministry of Road Transport and Highways, Government of India, February 2016

02. KPMG in India's research and analysis 2017 based on analysis of bus patronage and industry

03. Annual Report 2011-12, Ministry of Urban Development, 2012

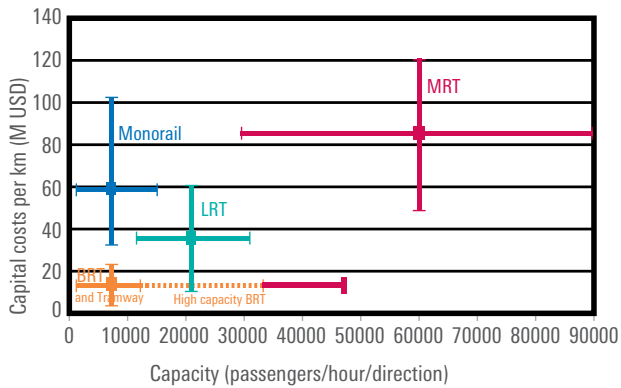
04. Letter to Principal Secretaries from Director UT, Ministry of Urban Development, July 2015

05. BRT data, Across Latitude and Cultures, SIBRT, September, 2017

06. Proposed Green urban mobility scheme, Ministry of Urban Development, February 2017

07. New metro rail policy in India unveiled to promote private participation, UITP, August 2017

08. Modern Trams for cities in India, Institute of Urban Transport, September 2013

**Figure 4: Cost and capacity of mass transit systems**

Source: International experiences with bus rapid transit, Northwestern University, Gerhard Menckhoff, November 2010

While much is being done, there is significant creation of physical infrastructure required. Mass transit systems are fixed infrastructure with dedicated/committed resources (in terms of space for depots, stations, terminals etc.) and rolling stock. Moreover, with fixed routings, the transit capacity also tends to get fixed whereas demand is variable, both in terms of time and locations. Moreover, as cities expand to the peripherals, residential areas are being developed in erstwhile suburbs that are self-contained and characterised in certain cities as new satellite cities with mobility requirements restricted to those areas itself with malls, schools, colleges, hospitals etc. mushrooming across cities. Overall, trends indicate commuting is moving away from peak hour traffic demand to and from Central Business Districts and select regions to more dispersed movements at a city level and to extremely localised movements at the other end.

In such a scenario, fixed capacity systems may become expensive and inefficient with rapidly dropping utilisation and risk of non-alignment to commuter needs. The transport sector also has seen attendant issues of delayed project execution, financing issues, improper contractual frameworks that typically accompany infrastructure projects. Undoubtedly, there is a clear need to address these issues in order to create the physical assets and capacity to cater to the absolute demand. However, the nature and models for developing these require a fresh approach given the recent innovation in

transport technology such as Electric Vehicles (EVs) and Autonomous Vehicles (AVs). These offer new opportunities for transportation planning in a more efficient manner while also necessitating creation of aligned assets such as charging stations for EVs or sensors and dedicated lanes for AVs to navigate. Public Authorities need to be cognisant to design their public transit systems with these in mind, including planning for recycling/disposal of batteries as EVs proliferate. While globally there is a movement towards making the transport infrastructure amenable to EVs and also aligned to the needs of AVs, the planning paradigm in India is yet to evolve. There are a range of issues from road construction, parking facilities, traffic management infrastructure, contingency management, etc. that would require the attention of public authorities.

A persistent issue with transit systems is the relative rigidity and retro-fitment into existing urban areas that do not have a clear right-of-way as they were not traditionally designed with a mass transit backbone. In fact, this forms an important hindrance while developing modern public transport systems and requires a comprehensive view on providing alternate modes for mobility to customers

## Using appropriate technology for a better customer experience

Customer experience of public transport in India is largely poor due to i) absence of seamless intermodal travel ii) absence of a feeder system for first and last mile connectivity iii) poor quality of modes of public transport especially feeders iv) absence of integration of schedules of mass transit and feeders v) absence of integrated ticketing vi) unreliable services.

One of the forms in which this manifests itself is in terms of less reliable operations with public transport modes being operated at fixed frequencies throughout the day, irrespective of the time and passenger demand or poorly-designed routes which are not in sync with passenger travel patterns.

# Insight in schedule and occupancy of public transport- case study: Netherlands

## Background

A regional public transport company utilised data related to the occupancy of metro's, busses and trams. Based on this information, the transport schedule for providing sufficient capacity to serve the demand of the traveler can be enhanced while reducing maintenance needs. It also provides insight in possible capacity issues in the transport network when the number of travelers increases.

## Intervention

Through Big Data analytics on the KAVE platform, data was combined, and the occupancy of vehicles was calculated on 'journey-level' and analysed for different situations (e.g. rush hours during the year, large events, different stations). This required:

- Coupling public transport chip card data to vehicle data (EBS)
- Calculating the occupancy on 'journey-level'

- Providing valuable insights for different dimensions (rush hour, holidays, specific stations, shared line segments)
- Data sources: one year of public transport chip card data and vehicle data
- Duration (develop phase): Six weeks.

## Impact

The vehicle occupancy calculated for different circumstances is used directly as input for decisions regarding the number of carriages and driving frequency. Multiple insights were obtained with this information. For example, the impact of costly vehicle and bus stop modifications on halting time of vehicles was measured, including influence of the number of 'on-boarders' and external factors, as road infrastructure on these halting times. Moreover, bottlenecks for increasing number of travelers are identified to prioritise network improvements.

Source: KPMG N.V. Analysis, 2017

Consequently, this results in poor customer experience and patronage of transit. Moreover, the integration of various public transport services in operational and financial dimensions is severely hampered due to non-application of technology that can unify different platforms and applications.

Technology is transforming public transport. From increasingly ubiquitous app-based information systems to the more advanced ones like Hyperloop, technology is set to inevitably change the way we derive value from transport infrastructure and services. Development of un-manned vehicles/Autonomous Vehicles/Pods and rapid growth of ride sharing, peer-to-peer networks and bus/taxi aggregators provide options for individualised transport while eliminating the cost of under-utilised capacity by sharing the vehicles or re-deploying the same for another

customer or peer. This has significant implications on reducing cost of transport while also reducing job opportunities for trained drivers/chauffeurs. These first/last mile options whether through cars/vans or mini-buses, monorails/LRTs etc. can be carefully planned to develop an 'amorphous' transit system that can be flexible while complementing the backbone Metro or BRT. Also, depending on nature of the space and the population density, such modes can actually go on to be the most efficient or principal means of conveyance for a particular set of circumstances (beyond traditional first/last mile roles).

At the basic level, these technological innovations can bring about rapid efficiency improvements and provide information to users that can help plan out their journeys better on an everyday basis. At another level, the new mass transport technologies and systems can change where we live and how we commute. Technology thus has a bearing at every step in a public transport journey. However in India at this time the adoption of technology for public transport services is low. Minimal use of technology results in poor integration- operational and financial and also unreliable services which manifests itself in the form of bunching and overcrowding of public transport modes, longer waiting times for passengers, poorly designed routes which are not in accordance with passenger demand. Passenger safety and security is another issue which is emerging as a deterrent to the patronage of public transport.

India has inherent strengths in technology, especially information technology that is a key enabler. The challenge is that at this time the core infrastructure works in silos and technology has had limited play in enhancing user experience. This leads to a preference for personal transport where the user can today time the journeys (even if expensive and inefficient) with the help of technology. If this has to change then transport planning has to start ab initio with the twin paradigms of (a) enhancing user experience and (b) adopting technologies like Internet of Things (IoT) for enhanced customer experience and also back end usage for asset management, Artificial Intelligence-based predictive analytics, etc. The possibilities are indeed immense, but the key would be to avoid rigidities and silos and instead focus on the utility that the customer can derive from such applications of technology. The overwhelming focus has to be on enhancing customer experience.

# Way forward

## Redefining the roles of public authorities in transport

As this paper has earlier asserted, with so many modes and options well beyond the traditional choices commuter transit is being enabled by technology in a myriad of ways. This is making new forms of services and business models possible, including more recently the mass innovation on ride sharing for cars and bikes. This also brings to the fore new challenges in regulating these businesses, especially since there are emerging concerns around efficient use of public spaces, safety and also core issues of fairness of regulations governing one mode versus another. This necessitates two changes in the roles of public authorities managing the transport system. Firstly, the authorities have to devise regulations that encourages innovation while providing a level playing field for all players who want to further such innovation in the interests of the user. Secondly, public authorities need to de-emphasise their roles in owning and providing transport services as compared to the first role of providing an enabling environment. We consider this role shift essential for several reasons including the challenges that public authorities face in technology adoption and modernisation, to run competitive businesses profitably and ensure high levels of customer service.

India exhibits both ends of the spectrum- on the one hand, we have Indian Railways providing the assets and services, including fixed and rolling stock under a common institution for technical, commercial and safety regulations whereas on the other hand, we have the aviation sector wherein airports are private or under a separate authority (AAI) and service providers are both public (Air India) and private that follow an independent regulatory regime (DGCA, BCAS, AERA). The sector structure in aviation is such that inter-operability is ensured while providing enterprises to follow divergent business models. Lessons from the aviation sector can be usefully applied to other segments – and with technology and financial innovation, the transformation can be expedited.



While the role of public authorities in asset creation and operation would not conceivably go away in the foreseeable future (and indeed may not be desirable), it should be limited to essential enabling the infrastructure on which third parties can bring about service innovation. Indeed, in India, a large enhancement of fixed infrastructure is required. However, these need to be designed wherein mass transit systems can form a backbone complimented by amorphous first mile/last mile modes as an integrated end-to-end system with special focus on the differently abled, senior citizens and other needy persons. Similarly, the promotion of Non-Motorised transport coupled with Transit Oriented Development can reduce the demand for vehicular movement and hence pollution. India has had a history of using cycles for commutes that has diminished in cities as distances have increased and cycling conditions deteriorated. There is a need to create dedicated cycle lanes, bicycle stops etc. so it is safe, secure and allows all weather commuting even for longer distances.

In summary the role of the public transit authorities could entail the following:

1. Take an integrated view of comprehensive mobility for the city/metropolitan areas and/or national/ regional geographies
2. View the entire eco-system (and not only the transit system) as a 'black-box' to ascertain overall viability and act as a financial intermediary between different commercial models
3. Provide inter-operability between transport modes in terms of quality, schedule alignment and integrated ticketing
4. Make the public transport system amenable to technological innovations that can enhance user experience and make transport safe and efficient
5. Facilitate the inter-connect between different service providers and modes
6. Specify standards and deliverables on each parameter related to customer experience for any/all service providers and monitoring the same
7. Provide a mechanism for grievance redressal for both customers and service providers with options for modifying in light of changing business conditions
8. Promote research, development and innovation.

## Institutional integration: Transport for London (TfL)

### Background

TfL was created in 2000 by the Greater London Authority Act 1999.

### Intervention

TfL is a government body (statutory corporation) in charge for the transport system in London. It is responsible for London's roads, for various rail networks including the London Underground, Docklands Light Railway and Rail, for London's trams, buses and taxis, for cycling, and river services. The services are provided by a combination of wholly owned subsidiary companies private sector franchisees and by licensees. TfL is controlled by a board whose members are appointed by the Mayor of London. The Commissioner of Transport for London reports to the Board and leads a management team with individual functional responsibilities.

### Impact

Thirty one million passenger trips are performed across London on a daily basis. The payment mechanism is through a smart card which works across all modes in London and also through contactless payment cards.

Source: 1. Company information. Transport for London. 2013. Retrieved 10 August 2013.  
2. Our role. Transport for London. Retrieved 29 January 2016.

# Action agenda

## Financing follows form

As mentioned in the previous section, as an integrator the core form and role of a public transit authority would be to ensure the provision of transport services to public at large that is safe, secure, affordable and reliable. The authority needs to focus on bringing different service providers on a common framework and be an all-encompassing agency that is not only focused on transporting commuters but also on facilitating the economic development of the region and creation of infrastructure. This necessitates a financially viable eco-system that is sustainable to support innovation and commercially sound principles for service providers to operate regularly.

Three aspects stand out for immediate attention—restructuring PPP contracts through an objective process, broadening and deepening access to long-term credit and tightening procurement processes and timelines. It has become impossible to foresee factors that would significantly impact performance over a long term contract period. Without recognition of this fundamental aspect we are unlikely to attract long term investment on the scale required and ensure smooth contract operations. The Kelkar Committee's recommendations in 2015 are worth reflecting on and the capacity of our institutions needs to be significantly enhanced to address the disruptions, both visible and yet to come.

The dearth of bankable projects has contributed partly to the financing challenge but the inability of project development and procurement agencies to adopt fairer risk sharing principles and take on contingent financing obligations has contributed equally. Also, while project preparation has improved, there are still substantial improvement possibilities. High project risks, poor entity ratings and regulatory uncertainties also make yield based structures difficult to implement.

Elongated timelines due to a lack of institutional capacity in the project award process has been hurting the implementation of projects. Single window clearance has rarely worked. It has been further challenged by a consistent lack of discipline in enforcing project timelines and inability to resolve disputes during the implementation stage quickly. These are big deterrents for foreign investors and tends to weaken the competition as well.

In summary, improving the capacity and form of institutions as well as reliability of revenues are critical

to improve financing for this sector that can be enabled through two thrust areas:

1. Bring the unorganised segment into the umbrella of the formal transport system
2. Create new and innovative revenue streams to complement the basic fare-box.

An integrating role can assist the transit authority in bringing in the informal service providers into the organised segment that is expected to ultimately improve the financial health and attract investments. Organised systems can forecast demand more accurately (due to reliable and recorded underlying data on traffic), plan for it, provide resources adequately (and possibly timely) to respond to demand and prevent revenue leakage. The improved predictability of cash flows in turn improves revenue recognition, reduces project risks and project financing costs. Organised and large players or aggregators / integrators can raise resources more effectively and cheaper than unorganised, distributed service providers.

Core footfalls support a range of allied revenues that can finance fixed infrastructure and leveraging property development and real estate is a fairly established method for fixed passenger infrastructure. However, monetisation through the relevant City Master planning regulations and institutional mechanisms that can channelise the value capture from land appreciation into infrastructure needs to be rigorously and enthusiastically followed. Allied options such as advertising, kiosks and leasing of assets may be explored in greater detail.

One of the most potent sources of value is data and going beyond merely collecting data for monitoring performance but churning it with analytical models for enhancing operations, dynamic pricing, and other models for data monetisation can provide a wide range of potential financing sources. As integrators, the public authority can then channelise and cross-subsidise the different segments of transit within the total price to the consumer and enable various business models in each segment.

Finally, as transport costs come down through effective deployment of rolling stock aligned to the demand by making the transit systems more flexible or 'amorphous', it can not only make the cost of business lower, but reduced pollution can improve the living conditions and make it attractive for people to settle in. A better social and environment ambience can help attract investment into the city and has to be seen as a strategic investment by city authorities.

# Conclusion

The Indian public transport sector has significant distance to cover in terms of provision of quality and affordable services to the public. Currently, it appears that in addition to the government and organised segment, there is a proliferation of the unorganised segment and personal modes to cater to the demand as seen by the significant growth of sales of cars and taxi-aggregators. However, the opportunity is now available to leap frog the development of the sector through deployment of new technologies in transport and IT as well as revenue mobilisation using innovative means.

By providing a deep and sharp shift in policy and perspective on outcomes of deliverables, the ideas presented herein can be considered to take a generational leap and transform the public transport services and radically improve user experience. With the right enabling environment and proper structuring, private sector investment, innovation and efficiency can be brought onto a common platform to plug gaps in service delivery. The opportunity is now to make our cities more mobile, enhance the infrastructure of our public transport and boost its customer experience.

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