
Innovative PPP models in urban mobility sector: A case study of three Indian cities: Amritsar, Kochi and Surat

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Abstract

Developing an economy requires evolving infrastructure needs and investments. Public Private Partnerships (PPPs) have been critical and have eased the government stress of investments in infrastructure by bringing in economic development with improved efficiencies and cost optimisations. The private sector participation in India's transport sector has been majorly focusing on capital intensive transport infrastructure developments like highways, airports or ports. It is still at an early learning curve of PPP in terms of less capital heavy projects or service delivery-oriented contracts. The lessons and learnings of decades of doing road PPPs is now being expanded to other sectors like water, solid waste, as well as urban transit.

The paper discusses the innovative PPP models in the mobility sector for the case cities of Amritsar, Kochi, and Surat in India. The E-Auto shift from diesel autos in Amritsar, private bus aggregation of individual operators to company in Kochi, and the women owned operator CNG auto in Surat; and the innovations undertaken by government entities by assuming the role of a facilitator, regulatory and contract manager to support private sector in filling the service gaps is documented in the paper. The paper also documents the need for a more demand responsive operation planning, better risk allocation, and balanced contract conditions to make the sector lucrative for the private sector players.

Keywords: *Urban Transit; Public Private Partnership; Contract Management; Risk Allocation; Efficiency; Cost Optimisation; Electric, Affordable, Climate, Aggregation, Buses, Para-transit, Gender*

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Introduction

Infrastructural investments in India would accelerate economic development and enhance citizens' quality of life. National Infrastructure pipeline (NIP) estimates USD4 1.5 trillion of investment needed in infrastructure [1] and would require at least 50% of the private sector contribution [2]. India has been ranked fourth with private investment commitments including the Foreign Direct Investment (FDI) of USD 84.17 billion, accounting for 2.98% of the GDP in the year 2021 [3] [4]. The private sector participation in the transport sector has been mostly in the transport infrastructure developments. The process of PPP (Public Private Participation) has eased the government stress of investments in infrastructure and has brought in economic development with improved efficiencies and cost optimisations.

NUTP (National Urban Transport Policy) adopted in 2006 had a reform-linked investment program, JnNURM covering funding support for urban transportation, including roads, highways, expressways, MRTS, and metro projects [5]. The NUTP recommends greater involvement of the private sector in schemes such as operation and maintenance of parking facilities, certification and repair facilities, construction and management of terminal facilities, etc [6]. The NUTP also encourages state governments to involve the private sector in providing public transport services, but under well-structured procurement contracts [6]. The investments included the promotion of PPP models for the projects undertaken under the JnNURM program. Owing to huge investment requirements and speed of construction the traditional infrastructure heavy part of the transport sector (like roads) had always leaned towards the PPP model, however, with time and India's decades of experience in PPP, the past few years witnessed increased inclination for PPP in other parts of the transport sector as well like waterways, metro rails, public bicycles, bus based public transit, etc. The paper aims to explain the innovative PPP models being tested in public transit in urban mobility (buses and intermediate paratransit) for three case cities of - Amritsar, Kochi, and Surat in India.

⁴ USD 1 = INR 77.72 as on (21st May 2022)

The PPP models discussed in this paper are recent developments in the mobility sector and the learnings on the formation, impacts, challenges, and gender-sensitive approach are expected to have scalable and replicable learnings for other cities in the developing economies.

Literature Review

Public-private partnership (PPP) refers to the procurement approach where the project is executed with a broader span of contractual relationships between the public and private sectors to provide an asset and/or a service [7].

The urban population in India accounts for over 34.4% of the total population of the country in 2021 and is expected to reach 37.5% by 2031 [8]. The increasing urbanisation trends put stress on the existing infrastructure and would require the need for better and more efficient expansion of infrastructure. PPPs are driven by rapid urbanisation, shortage of public funds, and inadequacies of public services in maintaining, building, and operating urban infrastructure [9]. Mobility infrastructure determines the access to job centres and streamlines the choices to reach various destinations. PPPs have received growing attention in many countries recently as an innovative approach for delivering transportation infrastructure [10] [11]. PPP is concluded to be a valuable procurement mode that can mobilise private capital inputs, efficiencies, and value additions [12]. An investment need of USD 50,075 million has been identified for the urban transport infrastructure of which 35% is envisaged from the private sector [13].

The road infrastructure projects in India have undertaken a Hybrid Annuity Model (HAM) as the PPP model from the year 2016. Under the HAM, the government will sponsor 40% of the project, and the remaining will be acquired by auctions, where the interested investors bid. The projects under HAM are acquired at a rate 20% higher than the estimated project cost [14]. HAM is a combination of BOT (Build-Operate-Transfer) and EPC (Engineering, Procurement, and Construction) models.

Cochin International Airport is operated by Cochin International Airport Ltd. (CIAL), a company founded in 1994. It is the first greenfield airport in India, built under public private participation models, and is a pioneer in the sector [15]. Shareholders of the CIAL are the Government of Kerala, financial institutions, non-resident Indians (NRIs), airport service providers of foreign countries, etc. [16]. The novel approach included state government funding, interest free loans and donations from NRIs, airport users, foreign countries, financial institutions, and airport service providers [16].

PPP projects can deliver successful projects by capitalizing on the private sector's ability and contracted incentives to provide efficient and sustainable transport services [17]. PPP in city bus operations has the government most responsible for planning, designing, identification of routes, fixing fares, and overall supervision and monitoring of the project. The private sector deploys and operates the buses on specified routes and frequency. In all the city bus PPP projects, operations and maintenance of buses are the private

sector proponent's responsibility, and other components vary depending upon the city-specific requirements such as procurement of fleet, operation, and maintenance of depot, collection of fare box revenue etc. [6]. The two broad forms of the contractual agreement between the extremes of public monopoly and private sector licensing are Gross Cost Contract (GCC) model and Net Cost Contract (NCC) model. Under a GCC model, the public authority assumes the revenue risk and pays a fixed premium to the private operator periodically to provide services, while under the NCC model, the public authority provides infrastructure and the private operator undertakes operation, maintenance, and revenue collection activities, retains fare box revenue and bears the revenue risk in providing bus transport services [6]. In addition to these, hybrid models also exist like in Germany and Sweden, wherein GCC contracts with an incentive to increase ridership are implemented [6]. PPPs in India have been implemented in many cities but for the model to work certain factors like ensuring financial support, improving the service planning and monitoring, strengthening tender and contracts, and technical capacity building are to be carefully crafted [18].

Research Questions

- I. Details of the PPP models and innovations deployed in the mobility sector of case cities?
- II. What has been the influence of PPP in forwarding the affordable, sustainable, resilient, and climate-adaptive public transit agenda, in case cities?
- III. What is the impact of PPP models in case cities? What are the challenges in the process of project formulation? Learnings that could be applied to other developing cities across the globe?
- IV. Were the PPP models inclusive and gender-sensitive in their approach in case cities? If yes, to what extent?

The paper assesses the PPP models in the case cities by secondary data sources, stakeholder consultations and literature. The impact of the PPP models has been understood through stakeholder interviews and primary surveys and thereby articulating the challenges in the formulation of the mobility project. Gender sensitivity is one of the critical factors considered in the study and the paper analyse the approach and learnings.

Innovative PPP Models – Three Indian Case Cities

Amritsar, Punjab

Amritsar is the spiritual centre and a trading city in the state of Punjab. The study area considered for the city is Amritsar Municipal Corporation, with a population of 1.13 million spread over an area of 136 sq.km [19]. The key public transport modes in the city are city buses, BRTS (three corridors⁵), and auto-rickshaws (intermediate paratransit). The bus system involves 60 mini-buses operating as city bus, a 31km BRT and inter-city buses (which pass through the city, supplementing the urban transit needs) [20]. As per the MoHUA (Ministry of Housing and Urban Affairs) guidelines for LOS⁶ (Level of Service) the city ideally needs 678 buses as compared to the current fleet [21]. The city bus system has a mode share of 4.65% and has an average trip length of 23km [22].

The needs of captive public transit users (who are yet to shift to public transit) for intra-city movement; are majorly catered by the auto-rickshaws, having a 22% mode share and a trip length of 4.75km [22]. The main public transportation system within the city is thereby auto rickshaws with a maximum occupancy of 12-18 people [23], which are privately owned and predominantly run on diesel fuels. The auto-rickshaws account to approximately 40,000 vehicles within the city [20]. The auto-rickshaws are operated on a shared system with a flat fare of USD 0.13 per passenger for the trip within the corporation limits. Some of these autos are also e-rickshaws, however, most of these Intermediate Public Transport (IPT) vehicles are under individual ownerships.

Like a typical developing city reeling under the pressure of sudden burst of urbanization levels, and a huge supply - demand gap that it was impossible to meet through procurement and expansion of city buses; innovative PPP models involving private auto-rickshaw owners to service the gap were conceived. Promoting electrification of the auto-rickshaws in Amritsar through innovative fiscal incentives, financial security, and the formation of society. The project could be seen as an innovation in public private partnership to bring better, sustainable, and green services by engaging and facilitating private sector players.

⁵ The BRT system has a fleet of 93 AC buses operational along the three corridors.

⁶ LOS 1: 60 buses per lakh population

The **RAAHI** (Rejuvenation of Auto-Rickshaw in Amritsar through Holistic Intervention) project as part of the "City Investment to Innovate, Integrate and Sustain" (CITIIS) Program⁷ was launched in 2018. MoHUA selected 12 projects for special funding from 67 project proposals submitted by 36 cities across the country, in February 2019. Amritsar Smart City Mission (ASCM) RAAHI project was one of the twelve selected projects. Under RAAHI project, a subsidy of USD 965 is given to each beneficiary, with a total outlay of USD 13.9 million. RAAHI helped these individual auto owners to consolidate themselves under a society, so that cumulatively, the private sector had better financial standing and ability to apply and get financial assistance from the market. And in doing so, RAAHI also brought about the green shift by making these society participants to shift to E-auto instead of the traditional diesel vehicles.

The project involved a plan to replace around 12,000 old diesel autos in the city with cleaner fuel e-Autos. Three wheelers play a pivotal role in last mile connectivity and strengthening of the three-wheeler sector would not only improve first and last mile connectivity, pedestrian safety but also better air quality and livelihood opportunities. The PPP formation of the project involved the stakeholders as Amritsar Smart City Mission⁸ (ASCM), the auto-rickshaw drivers' co-operative society, State Bank of India (SBI) and empanelled OEMs (Original Equipment Manufacturers).

The project was initiated, financed, and institutionally integrated by ASCM. All beneficiaries are selected and scrutinised by the Amritsar Smart City Ltd team. Under the project, ASCM provided a one-time CAPEX subsidy of USD 965 per vehicle, to already registered diesel auto in the city, for the drivers registered under auto-rickshaw drivers' co-operative society; to procure an electric auto rickshaw (in confirmation with the vehicle standards prescribed by the government under the project). The total cost of the electric auto under the scheme ranged from USD 2,500 to USD 4,000, of which around 40% was covered as capital grant. Presently, 300 auto drivers have registered under the auto society to avail the subsidy for shifting to e-Autos [23].

Government has also tied up with a State-owned bank to provide loans for these vehicles at a subsidized interest rate of 9.9%. Banks are obliged because of supporting government guarantees and under the Priority Sector Lending⁹ mandate of Government of India (GoI) to promote electric vehicles. Capital subsidy from ACM and the reduced cost of capital from the Bank, allowed the vehicle to become more affordable, reduced down-payment and working capital requirements, in turn making the business model more viable. [24]

⁷ The CITIIS program is being managed by the National Institute of Urban Affairs (NIUA) Delhi and funding is being provided by the French Development Agency (AFD), European Union (EU) and Amritsar Smart City Limited

⁸ ASCM is a Special Purpose Vehicle (SPV) owned by the Municipal Corporation, State Government and set up by grant under Smart City Mission of MoHUA, GoI

⁹ As per the RBI circular released in 2016, there are eight broad categories of the Priority Sector Lending. They are: (1) Agriculture (2) Micro, Small and Medium Enterprises (3) Export Credit (4) Education (5) Housing (6) Social Infrastructure (7) Renewable Energy (8) Others

The private sector players, i.e. the project beneficiary in this case, could procure the vehicle on better financial terms, operate and charge fare at market rates. Though the revenue risks were still with the private sector operator, the risks were still lower because of high demand for such modes in the city and lower cost of operations.

As a policy maker and regulator, Government has also put together a list of empanelled companies for the beneficiaries to procure the vehicle from as this allows for negotiated, standardized and pre-agreed specifications on sale under the scheme and reduces the possibilities of sub-standard vehicles and fraud. Further, to safeguard against other financial leakage, the process of transfer of the financial subsidy was also laid out clearly in the scheme document. For instance, if a beneficiary bought an electric auto, by paying upfront, the full subsidy amount was to be deposited in his/her account. For those opting to buy the e-auto on loan, USD 193 was credited in their accounts initially and the balance USD 772 would be adjusted in the loan amount. The remaining loan amount was to be paid by the beneficiaries over the loan tenure of 3 years. The auto society acted as the guarantor for beneficiaries while procuring the e -Auto.

Further, ASCM has developed strategic tie-up with a set of vendors for scrapping the older diesel autos. Beneficiaries will be eligible to a discount equivalent to the scrapped value. The old diesel autos are given a scrappage value of USD 155 by the OEMs and this value is reduced from the total amount of the E-Auto.

In 2009, the apex court of India had banned the diesel autos from the Amritsar corporation limits [25]. The order was followed with turmoil and over the years due to the lack of enforcement the diesel autos continued to ply in the city. The road tax for these vehicles was not able to be carried through the government portal, leading to rampant corruption and revenue loss to the government. The innovative component of the RAAHI project was thereby to effectively phase out the diesel autos before 2011 by assisting towards electric shift.

Affordability: The Government under RAAHI offered higher subsidy than offered by the Central Ministry, making the e-auto affordable to project beneficiaries. At the same time, the fare commuters used to pay for e-autos was lower than the regular diesel autos.

For a ride on diesel auto, commuters used to pay a flat fare (for shared rides) of USD 0.13, however post COVID (in year 2022) with change in fuel prices the fare for diesel autos has been increased to USD 0.26.

On the other hand, E-autos associated with RAAHI continued to charge the flat fare of USD 0.13 as before. The operational expense of these e-auto was barely USD 0.008 per Km compared to the diesel counterpart with USD 0.05 per Km [26], which allowed them to offer cheaper riders and still be profitable.

One of the key reasons that the E-autos could offer cheaper rides was lesser movable parts that have direct impact on the reduced maintenance cost of the vehicle. The RAAHI project is also envisioned to collaborate with the BRTS, providing feeder service to the system.

Sustainability: The typical occupancy of regular auto in peak hour could vary from 4 to 6 persons and though the e-auto operators initially continued the same occupancy. Over time drivers witnessed that overloading of the vehicle reduced the battery range. Eventually, forcing the E-auto drivers to maintain the loading within permissible limit, whereby indirectly bringing in the safety and caution also towards overloading compared to diesel counterparts. The passenger also appreciated lesser noise of the E-Autos [27]. Further, with the Government promoting electric vehicles, IRSDC (Indian Railway Stations Development Corporation) also as part of its Amritsar Railway Station Redevelopment plan, has proposed for permitting only E-Autos within the complex, hopefully to be implemented in near future.

Resilient: The formation of the auto-rickshaw drivers' co-operative society was a resilient initiative enabling the sustenance of the project. The formulated society would give them the greatest benefits, to improve organisation and communication, which has historically been a huge challenge with engaging the auto-operator community [28]. The society is in the process of issuing dedicated uniforms for the drivers and is expected to undergo driver trainings.

Climate Adaptive: Although driving speed, road condition, traffic heterogeneity etc. have a huge impact on the GHG emissions, even by conservative estimates, if a diesel auto emits 0.1322 Kg of Carbon Dioxide (CO₂) equivalent emission per km, and with a daily operational distance of around 70 Km per vehicle, one auto annually generates around 3,377.7 Kg of CO₂ equivalent GHG emissions [29] [30]. Whereas, the e-Autos have zero tail pipe emissions along with extremely low or no noise pollution. These e-autos being promoted under the scheme therefore were a significant step by the city towards climate mitigation and adaptation. Further, government at various levels is also putting in sincere efforts to bring in green electricity at source in the long run.

Gender Sensitive Approach: Further, the Government was, also hand-holding the project beneficiaries and undertaking capacity building like support in formation of society of rickshaw drivers¹⁰ or the free skill development for women family members of the beneficiaries, or women operators, like computer operator, tailoring, etc. The women family members of the auto-rickshaw drivers registered under auto society are being provided free skill development courses by ASCM. The female beneficiaries are also eligible to avail skill development courses.

Given, that project has been launched very recently, feedback on this is still awaited. Industry experts believe this to be a revolutionary step that will help improve social and economic lives of the beneficiary family members. The next phase of the project is being planned with focus on enrolling women drivers to improve asset ownership, access to concessional finance and provide economic stability to women in the city. The project is expected to contribute to the green mobility initiatives with improved public transit for commuters, with less impact on air quality and zero tail pipe emissions.

Challenges

- Identification of beneficiaries with willingness, proper records and paperwork including a pre-registered diesel auto was difficult because many diesel autos in the city had been operating on no or old registration papers. This helped city collate and improve enforcement as well.
- The e-autos as an impetus to the sector currently do not require registration and hence the city needs to be vigilant and better equipped to handle any safety security related issues involving e-autos.
- The market for e-auto models is still limited, making the shift for private operators slow.
- Promoting a habit of better vehicle maintenance and driving behaviour as e-autos and their performance are highly dependent on these parameters.

Kochi, Kerela

Kochi is known as the commercial capital of state of Kerala in India. Greater Cochin Development Authority (GCDA) and the Goshree Islands Development Authority (GIDA) jointly known as Kochi, is spread over an area of 632 sq. km with a population of 2.1 million [19] [31]. The city accounts for 2 million passenger trips per day [31]. The public transport modes present in the city are private cum state-run buses, ferry system and metro system. The motorised trip rate is 0.86 and the average trip length for the public transport system is 10.64km [31]. The demand for public transport is 8.87 lakh passenger trips per day with an average trip cost within public transport of USD 0.22 [31].

The public transport bus system in Kochi largely operated by private sector players [32]. These private buses get licensed by the Government (department of transport, Government of Kerala, GoK) for operating on fixed route, certain days and during pre-agreed timings.

These buses are mostly owned by individual operators - who procure, operate, collect fare, and maintain these buses. The fares, however are as regulated by the Government. As per the Motor Vehicles Act (MVA)-1988 and its liberalisation policy, the operators can approach the Regional Transport Authority (RTA), the competent authority from government for the issuance of permit along the desired route. The process of permit allocation over the years has resulted in the concentration of permits on profitable routes leading to “penny war” amongst the operators. This has also resulted in the supply and demand mismatch of the bus system within the city as observed in Figure 1. The varied allocation of bus system has social and economic impacts with more choice passengers shifting to the private vehicle modes; resulting in the city being attributed with the highest vehicle population share of 14.3% within the state [33].

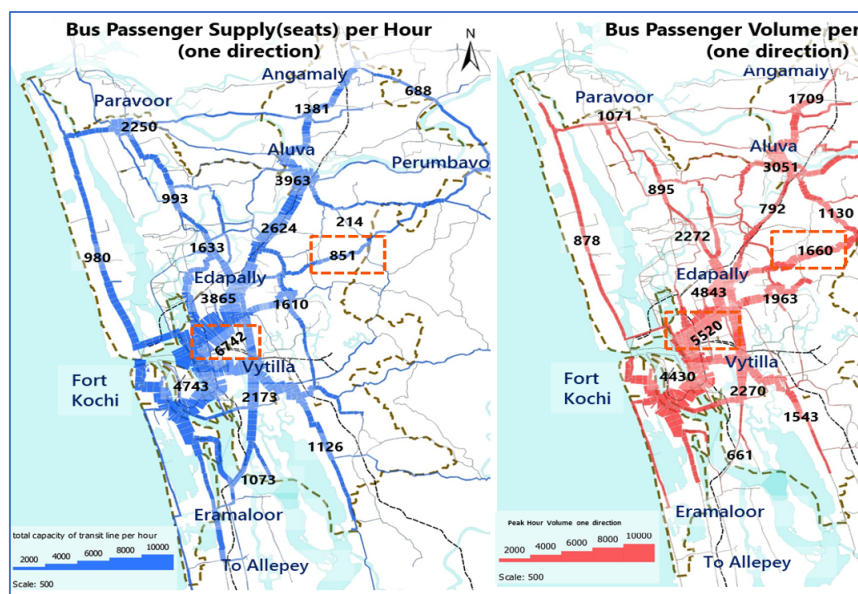


Figure 1: Supply-Demand mismatch of the bus system in Kochi [32]

As the city grew, there was a need to develop high capacity, better speed, and predictable transit corridor and Kochi Metro Rail Limited (KMRL), the thus Government entity responsible for planning, owning and operating metro system in Kochi, initiated its operations in June 2017.

The 24.8km metro corridor pass along the high-density passenger corridor of the city where historically, the private bus system has been operational. This introduction of metro, overlapping with the bus resulted in the need for re-organization of the bus routes in the city to make it work-able not just for the city but also for the private sector operators. KMRL decided to support and build capacity in the overall sector. They initiated the process of aggregation of the private bus operators of 987 buses in the city which were aggregated into 7 companies with 5 LLPs (Limited Liability Partnerships), 1 private limited and 1 co-operative society. Out of these 987 buses, operators of 193 buses further aggregated into a single company called KLeen Smart Bus Limited (KSBL).

Recently few electric buses were procured by the KMRL on Gross Cost Contract (GCC) basis. In this type of PPP contracting the Concessioneing Authority (in this case KMRL) would pay the operators (e-bus service provider) a fixed per km charge against a pre-agreed conditions and performance parameters like route length, hours of operations, availability, cleanliness etc. The revenue risk rested with the Concessioneing Authority and the Concessionaire / Operator(s) was responsible for bringing in the asset and manpower to provide the service.

The innovation component of PPP here was that the Government's vision to shift to cleaner technology and recognising well in advance that the shift would be difficult without a mature market. The sector dominated by individual players had low entry barriers, suffered from low capacity. The ability and incentive for these players to shift to cleaner - expensive technology and better service delivery levels were not there. These buses historically were operated by the private sector operator on Net Cost Contracts, wherein the operator provide the service as well as bear the revenue risk. To transition from that to a more sophisticated performance based contracting models, the market and players had to be re-organized. Many of these individual bus operators were brought under a registered society and company, which gave them size and scale to negotiate with the manufacturers, financial institutions, etc. Under this initiative government also did capacity and consensus building for these operators, supported them in identifying non-fare revenue streams and introduction to new technology.

The pioneering component of this PPP model is the different Government departments while playing the role of a regulator (licensing of buses and fare setting,) and concessioneing authority (finalizing bus routes, contracting services and are collection), also helped these small operators in scaling up and responding to latest trends in the sector. Formation of society helped these operators get access to cheaper finance, bulk procurement, and economies of scale, etc.

Affordable: Bus fares are set by the Transport Department - GoK, ensuring affordability for captive users. As per the preliminary survey of the public transport passengers, 29% of the people had direct access by the bus system; the bus-to-bus transfers was observed to be 58%, bus to metro to be 26% and bus to ferry to be 16% [32]. Thereby, bus as a mode remains an integral part of the public transport passenger movement articulating the accessible and affordable character of the system. At the same time, in March 2022 KSBL in collaboration with KMRL also re-designed the bus routes to connect with metro stations and demand centres. Eight electric buses (9 m length) have been deployed on five routes connecting to metro stations in Kochi at a rate of USD 0.44 per km and the revenue per bus per day is estimated at around USD 83.6 per bus per day [34].

Sustainable: The smart buses under KSBL are equipped with National Common Mobility Card (NCMC) based ticketing system, passenger information system (PIS), two-night vision surveillance cameras per bus, women ticket checkers, five panic buttons per bus and an online operator monitoring app for the operator. The NCMC enabled ticketing system to ensure the technical and fare integration between different public transport systems in Kochi. The PIS helped bringing in non-fare revenue of USD 1.03 per bus per day from advertisements displayed on-board and at bus stops. The NCMC helped reduce the revenue pilferage [35]. The panic button system has been linked with the SURAKSHA-MITRA command and control centre of the Kerala State, helped add a layer of safety. These features make bus transit – a sustainable mode of transit, more attractive to commuters. At the same time these features increase the financial viability of the business making it sustainable for the operators.

Resilient: Buses in Kochi operated on an average distance of 200 - 270 kms per bus day however after COVID-19 pandemic, a 25-30% reduction in the buses on road was witnessed [36]. With increase in fuel prices and reduced ridership, bus operators were hit significantly and KSBL became the saviour. The revenue sharing mechanism, non-fare revenues, bulk procurement of fuel/ spare parts, etc were the USPs of KSBL which helped many operators stay afloat and so many new individual operators now came forward to join the company. KSBL formation gave a platform for the private bus operators to raise the issues and was able to achieve the State Road Tax exemptions during the pandemic.

Climate Adaptive: Across a wide range of conditions, the electric bus reduces petroleum use by 85–87% compared to a diesel bus and achieves a 32–46% reduction in fossil fuel use and 19–35% in CO₂ emissions from a life-cycle perspective [37]. The average age of the buses in Kochi is 8 to 10 years. Further, the city enhanced its climate response with the E-Buses being charged with solar power at CIAL Airport. The other regular buses under KSBL, as a response to climate mitigation, have also been retrofitted to CNG fuel.

KSBL also envisions to operate the Hydrogen buses in future [38]. The flexibility and vision to adopt alternate fuel vehicles is expected to attract more operators and interested financiers to the company.

Gender Sensitive Approach: Some of the buses operating under KSBL also hired women conductors- 20% of the workforce under the KSBL are women. Having women conductors along with panic buttons and other safety features on the buses, create a safe environment increasing the commuter confidence in the services. The women passengers have traditionally constituted more than 50% of the public transport passengers and such approach would enhance and attract more passengers to the system [39]. The government plans to eventually scale up this initiative to all the 1380 buses running in Kochi both state and private operated.

Challenges

- Organization of individual operators into companies or society has been very difficult, because this requires transition and mind set change of operators from being independent to integrated operations. Which is why, such capacity building and stakeholder sensitization initiatives have a long gestation period and need consistency, time, and efforts of Government.
- The aggregation of few operators under the society or company with consensus building by the Government requires dedication and will of officials involved. However, with frequent transfer of officials, such initiatives become difficult to scale.
- Another major challenge is the mind set shift of government entities in designing balanced conditions and contracts that incentivise performance; its upsides are yet to be fully uncovered and will need a lot of hand-holding to materialise on ground.

Surat, Gujarat

Surat is the second-largest city both in terms of area and population, and a textile hub in the state of Gujarat. The city houses a population of 4.5 million under an area of 1351 sq. km and has a decadal population growth rate of 63.3 per cent between 2001 and 2011 [19]. The city is home to about 41.76 lakh migrant labourers, constituting about 58 per cent of its total population [40]. The public transportation system before 2014 was largely by the extensive shared auto-rickshaws' constituting about 38,000 registered after the year 2006 [41]. In 2014, the BRTS started operation with a network length of 102 Kms and in 2016 the city bus service was initiated with a network coverage of 73% of the road network [41]. The public transport system has physical, technical and fare integration between the modes and has a ridership of 0.13 million. The auto-rickshaws has a great role in the public transport sector of the city with a motorised mode share of 17% but has safety concerns due to provision of shared service and frequent over-loading most noted during peak-hours [41].

Surat Pink Auto project was initiated in 2017 by Urban Community Development (UCD) Department of Surat Municipal Corporation (SMC), as part of the initiatives to empower the women. This project involved the Government as a facilitator with women (only) as beneficiaries, undertaking the E-rickshaw operations. Historically, SMC has been actively involving women across different government projects to improve their skills in turn financial status by providing access to self and/or skilled employment opportunities. Thus, the project was conceived around deployment of women-owned and operated / driven (CNG) auto rickshaws in the city. The aim of the Pink Auto project is 'For the Women, By the Women' [42].

The project was initiated, financed, and institutionally integrated by the SMC. PPP model involved stakeholders including SMC, Regional Transport Office (RTO), a renowned Bank and its Rural Self-Employment Training Institutes (RSETIs)¹¹, empanelled OEMs all working towards making the business viable for the private sector (in this case) represented by Women owners and operators. Women beneficiaries were encouraged to apply for the project and were registered under the UCD department of SMC. RTO implemented the issuance of driving license, registration and specific colour code approval for the auto rickshaw at the administrative stages of the project. The driver training including the basic computer skills were carried out by the training institute to assist in the online RTO test for driving license. Bank provided a loan for the beneficiaries at a concessional interest rate (7% instead of standard rates).

SMC supported the beneficiaries with (a) subsidy of USD 645 per vehicle; and (b) cost of USD ~64.5 expensed on providing computer training, learning license, driver's training, and obtaining a driving license. The SMC helped women further by bringing down the initial investment costs, which is a huge barrier for women in most cases by becoming the guarantor to the beneficiaries. This allowed for concessional interest rates being made available to the beneficiaries for a shorter tenure and to cover higher % of total vehicle costs as loan (loan amount covered 94% of the vehicle cost, as compared to traditional 80%). The down payment amount of USD 129 was also made possible as EMI. All these steps enabled the women to purchase the vehicle with very little upfront capital required, get trained and access formal employment opportunities.

¹¹ Bank of Baroda Rural Self-Employment Training Institutes (BOB – RSETI)

Government had also envisaged an intense competition for the new pink autos in the city from the existing autos being operated (mostly by men) and hence they undertook stakeholder consultation sessions with schools and parents about the soon to be launched Pink Auto initiative. This helped the city and women auto-drivers tap in a niche market segment of school going children specially girl child. The parents of school children have started using the Pink Auto service for their children's school pick-up and drop-off, which has helped generate a fixed income of USD 103 to USD 129 per month for the drivers [43]. SMC is also working to connect these auto owner / drivers with aggregators in the sector to access markets during lean/ off hours.

The number of autorickshaws under the initiative initially were limited. Thanks to higher acceptance and positive feedback from female commuters, parents of girl children going to school in these autos, over time the uptake has been phenomenal. The initiative allows to fill a niche service gap and synergy - with commuters and families feeling more secure having women drivers to drive them around and women drivers and their families with female commuters riding with them.

Affordable: Some of these women owner drivers were earning a maximum of USD 103 per month after a 10 hour work every day, and now are earning almost twice (USD 232 per month) with flexibility of working hours. The flexibility in working hours was a major USP (unique selling point) for all the women, as it allowed them to handle family responsibilities and household work as well. SMC is now planning to broaden the initiative to serve as feeder and last mile to city bus and BRTS in the city.

Sustainable: The pink auto project is expected to expand - 80 women drivers displayed their eagerness to join after training and more than 500 women have already enrolled for the auto rickshaw driver training [44]. The passengers feel safe and secure while they are traveling in Pink Auto, and they are now able to travel even late at night [45]. The SMC has banned the entry of other auto-rickshaws except pink autos to the highly dense old city area, to reduce traffic congestion during the morning and evening peak hours. This initiative in addition to the increased revenue enhancement have also increased the awareness about the project to the public.

Resilient: Other urban transit modes in the city like the BRT and city bus resumed full operations after the pandemic but in the initial few months saw considerable decline in ridership. However, these autos with captive and loyal users, took much less time to reach the pre pandemic level revenues. The project has also received consistent support by media channels, and civil society organisations – adding to its resilience.

Climate Adaptive: The project expansion is planned with the purchase of electric auto rickshaws in collaboration with the Gujarat CSR authority with a vision to achieve sustainable urban mobility through E-mobility. Gujarat CSR Authority is expected to provide 20–30% of the financial assistance to beneficiaries for the procurement of E-Rickshaw. Under this project, E-autos are also expected to be provided on daily rent to the urban poor, who cannot afford to purchase the E-auto.

Gender Sensitive Approach: The pink auto project as a whole has been structured and implemented as a gender sensitive approach to the transportation sector. The initiative has received immense support from the families as they prefer to send their children by pink autos to the schools, implying the safety and security assurance from the system. The increased revenue for the women drivers has a direct impact on their family structure; with the money spent on the education of their children, increased family savings, taking their children to social trips in the city and most importantly brought the independent dignity of life in their families [42].

Challenges

- Women in most Indian households barely have access to fixed income and hence savings to be able to invest in alternate sources of income. Further such decisions and asset creation is done in the name of “men” in the household – so to get women to enroll for a project, help them not only buy but also operate the autos was a huge challenge for the city.
- Traditional mind-set of family members was a hindrance for the women owners and drivers to enroll; as the service is perceived to be a tough, challenging, and insecure profession (for women), by the society.
- The designated auto stands in the city, initially did not accommodate the pink auto drivers, and government interventions were sought. The government plans to have designated auto stands and application-based rides for pink auto drivers in the future.
- Lack of gender sensitive infrastructure like public conveniences along the routes and near the auto-stands acted as a barrier for women drivers initially.
- The skill development of the women drivers was a challenge as women typically did not have a prior understanding of traffic rules; driving, computer or mobile operation skills.

Discussion

Cities exist, and prosper because they take advantage of economies of scale, yet most developing economies also suffer from stressed infrastructure, unplanned growth and inefficient transport systems. Balancing the growing demand for infrastructure with its supply is often difficult with cities lacking funds to expand and maintain urban transit infrastructure [46]. Public-private partnerships (PPPs) have been proven to catalyse both investments, for bridging investment gaps and improving efficiencies in delivery of services [47].

Cities especially in developing countries could achieve multi-fold growth with more than the sanctioned budgets by thought-through initiatives around private capital mobilization (PCM). A PPP thus may be able to mobilize previously untapped resources from the local, regional, or international private sector which is seeking investment opportunities [48].

India's elaborate experience of PPP for roads, has helped develop the economy and access to opportunities in rural areas. The lessons and learnings of the initial PPP are now being expanded to other sectors like water, solid waste etc. and variations being tried in urban transit. Improvements in urban transit are imperative for enhancing the quality of life and increasing productivity. The typical PPP structures prevalent in city bus operations in India are – Net Cost Contract (NCC), Gross Cost Contract (GCC), Cost Plus Contract, Licensing Contract as seen in cities of Ahmedabad, Navi Mumbai, Aurangabad, etc. Variations of DBFOT and BOT have also been tested for Metro Rail projects in Hyderabad, Delhi (Aerocity), Mumbai mono-rail, Gurgaon Rapid Rail,

Urban Transit is a state/ city subject and given the limited funds available with the city, PPPs are better equipped for the implementation. PPP allows for faster deployment, expansion of service, efficient delivery keeping pace with technological advancements and proper asset maintenance. PPP in service delivery and operations bring efficiencies of the private sector with proper planning, limited staff, incentivizing delivery, as compared to the government sector that suffers from legacy issues, higher gestation period and increasing staff costs.

Yet, the efficient use of scarce public resources is a critical challenge for governments—and one in which many governments fall far short of goals. The reason is that the government typically has few or no incentives for efficiency structured into its organization and processes and is thus poorly positioned to efficiently build and operate infrastructure. Private sector operators, however, enter into an investment or contracting opportunity with the clear goal of maximizing profits, which are generated, in large part, by increased efficiency in investment and operations [48].

In these three cases, however, we saw that the Government for various reasons like promoting better technology, safer commuter, faster deployment of smaller vehicles, and employment generation used PPP as an effective tool to improve service delivery and operations. PPP in these cases was also a catalyst also to bring in larger sector level reforms of re-defining roles of policy maker, regulator, contracting authority and service provider.

The experience from these case studies also highlights the need for effective financial, economic, institutional, contract management, policy, regulatory and capacity building arrangements. Other cities could learn from these experiences and can pilot some of these examples with stakeholder consultations and commitment of government champion. Further, since most projects need an external source of funding and cost of funding for the Government would typically be lower, it helps if the private sector can be aggregated and organized into groups to reduce their risk profiles and access cheap capital.

Policy Recommendations

In the case of urban transport, given that the sector is very diverse, fast evolving and extremely critical for sustainable economic growth, public institutions are best suited to play the role of a facilitator, regulatory and contract manager for the overall mobility services being provided. Government should ideally develop understanding and plans for demand responsive services, subsidy for operations to non-profitable routes. Further, it should aim to play fair to facilitate efficient, affordable, and safe service delivery that is well regulated. Government should build capacity to develop balanced contract conditions to make the sector lucrative for the private sector players and internal ability to monitor and manage those contracts.

Public institutions need to provide a coherent policy response to include integrated urban policies, sustainable funding sources with increasing efficiency and profitability and innovative public transport services that offer high quality mobility solutions. Delivery of urban transport projects, arguably more than any other sector, requires a strong public body with authority to achieve inter-jurisdiction coordination across the urban conurbation, ensure rights of way, take charge of project delivery, monitor contract compliance, and enforce service standards [17].

Also, at the same time, realise that it is the third P in PPP i.e “Partnership” which is of utmost importance and hence treat the private sector accordingly. Government must consider reasonable and balanced bid terms and conditions, such that private sector participates in bids. Only when the conditions are favourable and meets the business objectives of the firm, would they participate in the bid. No good and credible agency would want to assume the overall project's risk, to in turn increase internal financial exposure, company losses or reputational risk. Therefore, having fair understanding of the risks being transferred to the private sector and considering those, support through sufficient revenue and reimbursement to make the contract lucrative is also very important. On concessioning or contracting agency's part - absence, or poor understanding of this results in less suitably choices being made while selecting a private sector partner. A recent experience with E-bus procurement in India saw a significant reduction in service charge quoted by the private sector players, due to balanced contracts (government

taking on responsibility to provide land for depots and charging stations), better defined risks and allocation (like guarantee of service charge payments, private sector taking on technology risks) with favourable operations conditions and controlled flexibility.

Supporting in market creation with well-equipped and suitable private sector partners is equally important for PPP to be successful in the sector. It is a well-known fact that the quality of the private sector player in a contract is highly dependent on the ability and capabilities of the public institution on the other side. Hence, in case of niche and new markets like urban transit, the government would have to assume a larger role of building capacity and community sensitization at both ends – public as well as private for the sector and market to evolve. For instance, like we saw with cities like Amritsar and Kochi focusing significantly on capacity building for the private sector as well.

The other important aspect that could be important for other cities is to ensure that these projects and tender adopt a life cycle assessment and gender sensitive approach rather than the traditional least cost-based selection modes. Understanding the impact of the tenders on the overall environment in current times of climate crisis and factoring in life cycle impact of a decision and technology, and selecting a private sector partner based on the quality of delivery including sustainable solutions (even if not the cheapest solution) would go a long way. Similarly on gender inclusion, the example of Surat earlier highlighted the impact of concessioning authority bringing in women entrepreneurs and training women beneficiaries / family members.

References

- [1] The Economic Times, "To achieve \$5 trillion GDP by FY25, India nee spend about \$1.4 trillion on infra: Eco Survey," 31 January 2022. [Onlin Available: <https://economictimes.indiatimes.com/news/economy/infrastructure/to-5-trillion-gdp-by-fy25-india-needs-to-spend-about-1-4-trillion-on-inf-rvey/articleshow/89243854.cms>.
- [2] E. Ghani, "How India can maximise infrastructure investment," 20 Jan 2022. [Online]. Available: <https://www.thehindubusinessline.com/opinion/how-can-india-maxim-structure-investment/article64926854.ece>.
- [3] The World Bank, "Private Participation in Infrastructure (PPI) - Half Report," The World Bank, Washington D.C, 2021.
- [4] PIB, Ministry of Finance, 31 January 2022. [Online]. Available: <https://pib.gov.in/PressReleasePage.aspx?PRID=1793805>. [Accessed 292022].
- [5] Jnnurm.nic, "JnNURM," December 2015. [Online]. Available: <http://jnnurm.nic.in/wp-content/uploads/2011/01/UIGOverview.pdf>.
- [6] Shakti Sustainable Energy Foundation, "Public Private Partnership M Development of Sustainable Urban Transport Systems," Deloitte, New 2016.
- [7] L. Tang, Q. Shen, M. Skitmore and E. W. L. Cheng, "Ranked Critical F PPP Briefings," Journal of Management in Engineering, vol. 29, no. 2, pp. 2013.
- [8] Census of India, "Report of Technical Group on Population Projection National Commission on Population , New Delhi, 2020.
- [9] J. F. M. Koppenjan and B. Enserink, "Public–Private Partnerships in U Infrastructures: Reconciling Private Sector Participation and Sustaina Public Administration Review, vol. 69, no. 2, pp. 284-296, 2009.
- [10] Z. Chen, N. Daito and J. L. Gifford, "Data Review of Transportation Infrastructure Public–Private Partnership: A Meta-Analysis," Transpor vol. 36, no. 2, pp. 228-250, 2016.
- [11] A. K. Sinha and K. N. Jha, "Dispute Resolution and Litigation in PPP Projects: Evidence from Select Cases," Journal of Legal Affairs and Disp Resolution in Engineering and Construction, vol. 12, no. 1, 2019.
- [12] N. Jayasena, D. W. Chan and M. Kumaraswamy, "A systematic literatu and analysis towards developing PPP models for delivering smart infrastructure," Emerald Publishing Limited, Hong Kong, 2020.

- [13] Working Group on Urban Transport , "12th Five Year Plan - Faster, M Inclusive and Sustainable Growth," Planning Commission, Gol, New 2013.
- [14] PIB, "Hybrid Annuity Model for National Highways," Ministry of Roa Transport and Highways, New Delhi, 2019.
- [15] CIAL - Cochin International Airport Limited, "About CIAL: A Brief [Online]. Available: <https://cial.aero/contents/viewcontent.aspx?linkIdLv12=51&linkId=51>. 23 March 2022].
- [16] ICAO - Economic Development, "Public Private Partnership - PPP," J [Online]. Available: https://www.icao.int/sustainability/PPP%20Case%20Studies/PPP_Airp.pdf. [Accessed 20 May 2022].
- [17] PPP Knowledge Lab, "Urban Transport," 2014. [Online]. Available: <https://pppknowledgelab.org/sectors/urban-transport#lessons--analysi> [Accessed 20 May 2022].
- [18] S. Kharwal and U. Khandelwal, "Making Public Private Partnerships (City Bus Services in India Work," WRI India, 29 June 2021. [Online]. A <https://www.wri-india.org/blog/making-public-private-partnerships-p-us-services-india-work>. [Accessed 20 May 2022].
- [19] Census, "Census of India," Office of the Registrar General & Census Commissioner, MoHUA, Gol, New Delhi, 2011.
- [20] CITIIS, "Project Preparedness Framework - Sustainable Mobility," NI Delhi, 2019.
- [21] MoUD, "Service Level Benchmarks for Urban Transport at a Glance," Government of India, Gol, New Delhi, 2009.
- [22] Punjab Municipal Infrastructure Development Company, "Comprehe Mobility Plan for Amritsar City," Department of Local Government, P Amritsar, 2012.
- [23] J. A. Kheraluwala, Interviewee, Junior Urban Transport Specialist. [Interv May 2022].
- [24] The Tribune, "RAAHI Project: Subsidy on replacement of diesel autos electronic ones in Amritsar," 30 September 2021. [Online]. Available: <https://www.tribuneindia.com/news/amritsar/raahi-project-subsidy-on-ment-of-diesel-autos-with-electronic-ones-in-amritsar-318188>.
- [25] Chandigarh Tribune, "Auto operators go on strike - Commuters bear as protesters oppose ban on diesel- run three-wheelers," 31 October 2 [Online]. Available: <https://www.tribuneindia.com/2014/20141031/cth1>.
- [26] The Tribune, "RAAHI Project to improve air quality index of Amritsa December 2021. [Online]. Available: <https://www.tribuneindia.com/news/amritsar/raahi-project-to-improve-ty-index-of-city-356535>.

- [27] N. Singh, Interviewee, RAAHI Beneficiary. [Interview]. 18 May 2022.
- [28] S. Singh, Interviewee, RAAHI Beneficiary. [Interview]. 18 May 2022.
- [29] C. Chandrashekar, P. Chatterjee and D. S. Pawar, "Estimation of CO2 emissions from auto-rickshaws in Indian heterogeneous traffic," *Tran Research Part D: Transport and Environment*, vol. 104, no. 103202, 2022.
- [30] India GHG Program, "Indian Specific Road Transport Emission Facto GHG Program, Mumbai, 2015.
- [31] U. CMP, "Comprehensive Mobility Plan for Greater Kochi Region, Vo KMRL, Kochi, 2017.
- [32] D. Jose and H. M. S. Swamy, "Integrated Transit System: Case of Koch University, Ahmedabad, 2018.
- [33] Kerala State Planning Board, "Economic Review 2021 - Volume 1," Go of Kerala, Thiruvananthapuram, March 2022.
- [34] K. M. Navas, Interviewee, Partner - Kochi Wheelz. [Interview]. 13 April
- [35] N. Ravindran, Interviewee, CEO - Technovia Info Solutions Private Limit [Interview]. 12 April 2022.
- [36] G. Joseph, Interviewee, Greater Cochin Bus Transporter. [Interview]. 13 2022.
- [37] B. Zhou, Y. Wu, B. Zhou, R. Wang, W. Ke, S. Zhang and J. Hao, "Real-w performance of battery electric buses and their life-cycle benefits with to energy consumption and carbon dioxide emissions," *Energy*, vol. 96, 603-613, 2016.
- [38] KLeen Smart Bus Limited, "Detailed Project Report," KSBL, Kochi, 20
- [39] B. J. Antony, Interviewee, Senior DTC - MVD (Retd.). [Interview]. 12 Apr
- [40] D. V. Patel and K. C. Behera, "Indian Institute of Management Bangal May 2020. [Online]. Available: https://www.iimb.ac.in/turn_turn/diamond-city-surat-informal-labour-hp.
- [41] CoE-UT, CEPT University, "Comprehensive Mobility Plan 2046," Sur Municipal Corporation, Surat, 2018.
- [42] G. Jariwala, Interviewee, Deputy Municipal Commissioner, SMC. [Intervi May 2021.
- [43] H. M. S. Swamy, S. Sinha, G. P. Hari and D. Jose, "Gender Sensitive M Policies: Case Studies from Two Indian Cities, Kochi, and Surat," *Tran Communications Bulletin for Asia and the Pacific*, vol. Article 1, no. 91, p 2021.

[44] Aashishbhai, Interviewee, Urban Community Department, UCD. [Intervi May 2021.

[45] Jayaben, Interviewee, Pink Auto Beneficiary. [Interview]. 22 June 2021.

[46]

[47]

[48]