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AMTS Vision Plan: 2035

Long term vision plan for bus operations in Ahmedabad

MAY 2021



Photo: AMTS

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LIST OF ABBREVIATIONS

AFCS	: Automated Fare Collection System
AJL	: Ahmedabad Janmarg Limited
AMC	: Ahmedabad Municipal Corporation
AMTS	: Ahmedabad Municipal Transport Service
AV	: Audio-Visual
BI	: Business Intelligence
BPL	: Below Poverty Line
BRTS	: Bus Rapid Transit System
CMUBS	: Chief Minister Urban Bus Scheme
CNG	: Compressed Natural Gas
CPKM	: Cost per Kilometre
DISCOM	: Distribution Company
DP	: Development Plan
DPR	: Detailed Project Report
e-Bus	: Electric Bus
EPKM	: Earning per Kilometre
ETM	: Electronic Ticketing Machine
FAME	: Faster Adoption and Manufacturing of Hybrid and Electric vehicles
GCC	: Gross Cost Contract
GIDC	: Gujarat Industrial Development Corporation
GMRCL	: Gujarat Metro Rail Corporation Limited
GoG	: Government of Gujarat
GoI	: Government of India
GSRTC	: Gujarat State Road Transport Corporation
GST	: Goods and Services Tax
HSR	: High Speed Rail
IMP	: Integrated Mobility Plan
INR	: Indian Rupee
ITMS	: Intelligent Transport Management System
KM	: Kilometre
LOS	: Level of Service
MaaS	: Mobility as a Service
MoUD	: Ministry of Urban Development
MEGA	: Metro-Link Express for Gandhinagar and Ahmedabad
MoHUA	: Ministry of Housing and Urban Affairs
MRT	: Mass Rapid Transit
MV	: Motor Vehicle
OD	: Origin – Destination

PPP	: Public Private Partnership
PT	: Public Transport
PTA	: Public Transport Availability
PTU	: Public Transport Unit
RTO	: Regional Transport Office
SLA	: Service Level Agreement
SLB	: Service Level Benchmark
SCADL	: Smart City Ahmedabad Development Limited
SOP	: Standard Operating Procedure
SPV	: Special Purpose Vehicle
STU	: State Transport Undertaking
TA	: Transport Authority
TCO	: Total Cost of Operations
TDR	: Transferable Development Rights
TOD	: Transport Oriented Development
TTMC	: Traffic Transit Management Centre
UBS	: Urban Bus Specifications
ULB	: Urban Local Body
UMTA	: Unified Metropolitan Transit Authority
UTF	: Urban Transport Fund
VGf	: Viability Gap Funding
WRI	: World Resource Institute

EXECUTIVE SUMMARY

1. Project Overview

This study develops a strategic vision plan for Ahmedabad to reform its bus based public transport operation, operated by Ahmedabad Municipal Transport Services (AMTS). The technical study considers the existing and future challenges to prepare a holistic long-term vision plan to ensure better preparedness, efficient operations and financially sustainable of public bus systems while delivering the desired level of services to commuters.

2. Bus Transport System in Ahmedabad

About City Bus Agency: Ahmedabad's city bus service is provided by AMTS - a subsidiary under Ahmedabad Municipal Corporation (AMC). The city also has a Bus Rapid Transit System (BRTS) named - 'Janmarg' operational since 2009 by Ahmedabad Janmarg Limited (AJL), SPV formulated under companies act under AMC. Over the last 15 years, AMTS services have reached a stage where they are facing survival challenges as ridership have reduced 39% since 2008, leading to accumulating financial losses. Annually, AMTS is adding losses of around INR 300+ Cr¹.

Public Transport Availability (PTA): Ahmedabad has only 18 buses per lakh population, i.e., PTA LOS 4 as on 2019. In 2013, GoG and AMC had set a target to achieve PTA LOS 2, i.e. 40 buses per lakh population. The fleet size with AMTS has stagnated at around 1100-1200 buses in past few years which is less than half of required fleet for desired target. The current average age of bus fleet with AMTS is 4.75 year. This indicates not only renewal of old fleet but also need to fulfill the gap for latent demand in next few years. The current trend in Gujarat considering operation viability is towards CNG midi buses.

Financial Performance: Declining ridership coupled with increase in staff and fuel costs has pushed AMTS to unsustainable financial operations with losses increasing every year. The gap between earnings and expenditure per kilometers has been increasing consistently. The operational deficit which was only INR 11 per km in 2008 has increased to INR 64 per km in 2020. AMTS had taken steps to increase bus fleet through Gross Cost Contract (GCC) thereby limiting financial liabilities. The share of GCC operated fleet has been around 50% in past few years.

Financial Support: Government of Gujarat has allocated a viability gap funding (VGF) of 50% of deficit or maximum of INR 12.50 per km and INR 25 per km for fossil fuel and electric bus operations, respectively through its Chief Minister Urban Bus Scheme (CM UBS). This operational VGF provides AMTS an opportunity to explore electric buses for its operations and reduces its financial deficit. While the CM UBS scheme provides VGF to city bus operators, there are financial gaps to recover operational costs.

3. AMTS Service Projections

Studies have suggested that the number of public buses required by a city is a function of the population, trip rate, public transport mode share, network length, average trip length, frequency of services, peak hour speed, vehicle utilization of public buses, and the average

¹ Source: Financial Data received from AMTS for 2019 & 2020.

occupancy on-board buses². Based on data collected from AMTS, AJL and other secondary sources, travel demand is extrapolated to align with projection of metro phase-1 DPR.

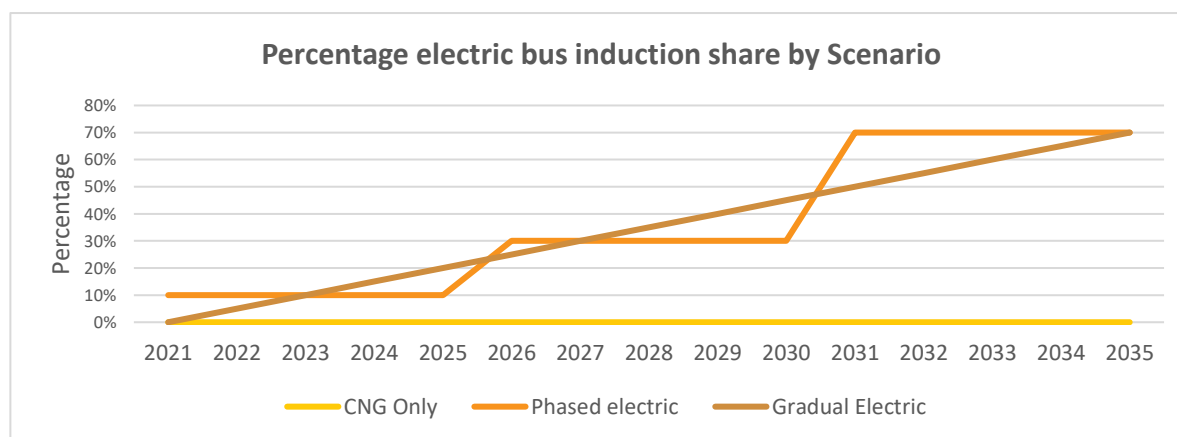
Estimated from the demand-based method, by 2030, AMTS need to increase its operational fleet from 1171 buses to 2378 buses (103% increase). The city bus fleet together with BRT fleet shall be 3253; i.e. LOS 2 considering BRT increases is fleet to 774 and 20% PTU supply is maintained by metro.

Following table represents estimated fleet requirement for Ahmedabad city. Fleet requirement is estimated for both AMTS and BRTS as they would together serve the urban bus transit demand. The projection has accounted to achieve PTA LOS 2 by 2030 and thereafter gradually increase share of fleet availability to achieve PTA LOS 1 by 2040.

Table 1: Estimates of bus fleet requirement

Fleet Projection Method	2020	2025	2030	2035
Trend Based (AMTS)	1171	1317	1474	1641
Demand Based (AMTS)	1171	1458	2378	3892
Demand Based (BRTS)	278	422	875	1510
Demand Based (City)	1449	1880	3253	5402
Supply Based (City) for minimum target of LOS 2 upto 2030; thereafter target of LOS 1 upto 2035. (considering 80% PT share with buses)	2579	2900 (City: 3625 PTU requirement for Public Transport)	3247 (City: 4059 PTU requirement for Public Transport)	5422 (City: 6777 PTU requirement for Public Transport)

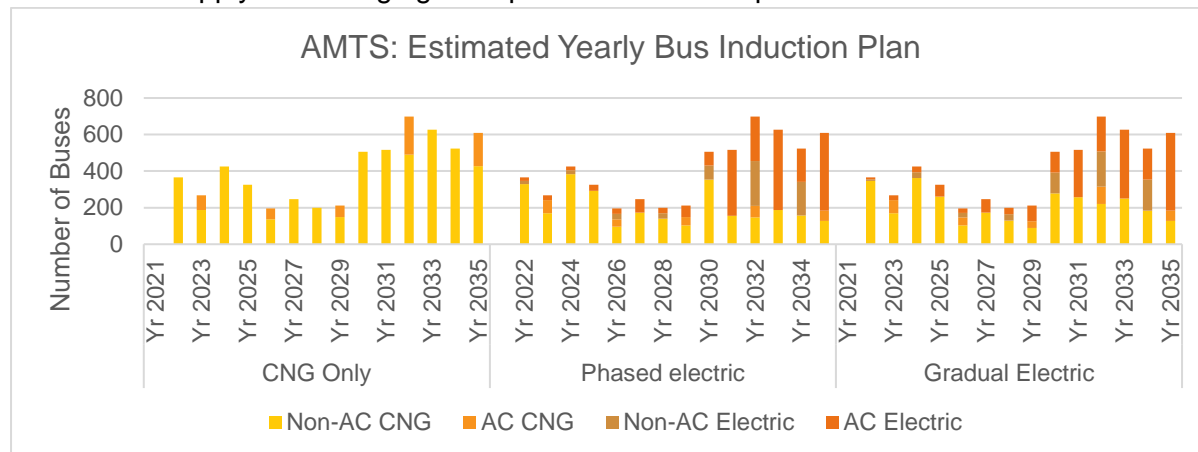
Considering the limited manufacturing capacities of electric buses in the country, and current cost of operations of electric buses, this report assumes two scenarios for the electrification of the bus fleet (a) gradual increase in share of e-bus procurement and (b) phased increase in share of e-bus procurement over the study period. The following figure highlights the scenarios:



AMTS fleet electrification scenarios

² Prashant Bachu, Bhubaneshwar on the move, Tools and guidelines for city bus operations, GIZ 2019

Calculating the two bus electrification scenarios indicated above, we have estimated the composition of electric and CNG buses AMTS would induct over study period. Initial phase, up to 2025, of bus fleet electrification is low at 10%-20% share of annual bus fleet induction as electric buses. This phase will build AMTS technical and operational capacities for e-bus planning and management. The fleet induction plan accounts for retiring fleet to maintain the bus service supply. Following figure represents induction plan for various scenarios:



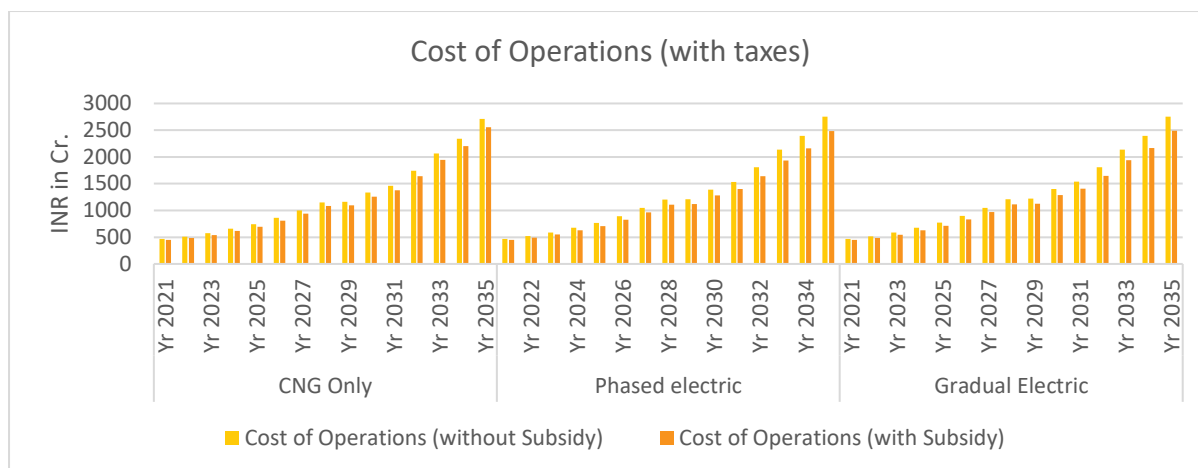
AMTS yearly bus fleet induction plan (by bus type)

The induction of fleet would require more space for bus depot parking and maintenance. The current depot infrastructure is insufficient to cater to growing demand of buses. Considering the average capacity of 100 buses for new depots, it is estimated that total of 29 and 37 depot shall be required by 2030 & 2035, respectively. Additionally, a total of 19 and 23 terminals is estimated to be required by 2030 & 2035, respectively. Terminal requirement is estimated considering average 200 buses allocated each terminal.

ITMS service includes monitoring of GCC service levels from ITMS vendor. The bus ITMS equipment is expected to be procured as part of bus. The ITMS service provider appointed by AMTS shall require integrating the bus ITMS with control center enabling monitoring and management of services.

Staff required for AMTS operations is recommended to be optimized to 4.05 staff per bus including management, administration, technical and bus crew. As AMTS role is expected to plan, manage, and monitor bus service the AMTS employee staff-bus ratio can be contained at 0.35 per bus while remaining staff can be appointed as contract staff directly by AMTS or through PPP.

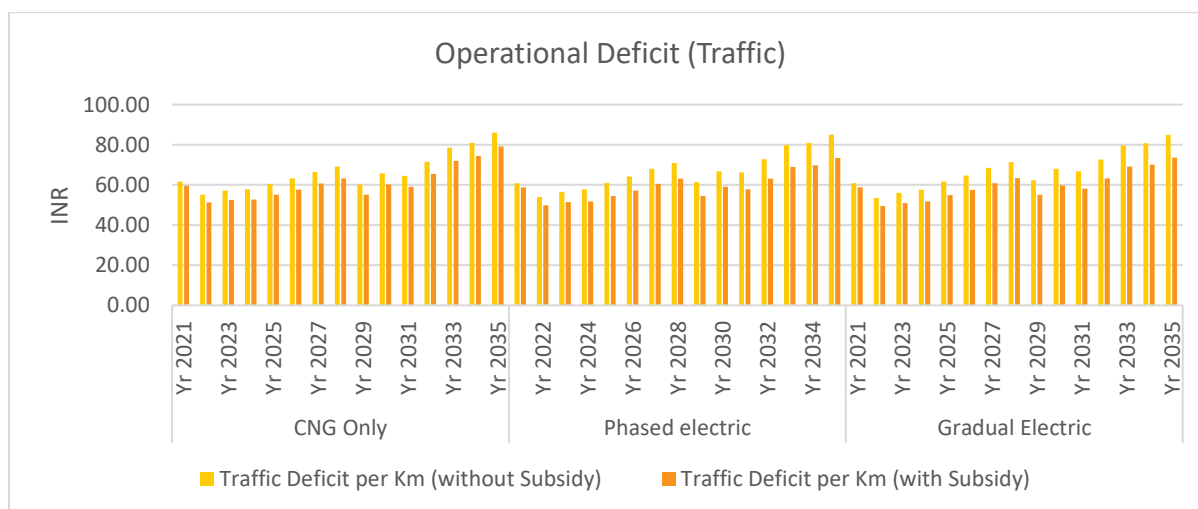
The comparison between the total annual cost of induction and operation of the buses in each of these electrification scenarios is presented in the following figure. It is observed that post 2027 the estimated cost of operations for CNG only scenario shall be more than phased or gradual electrification scenario. As illustrated in the figure below, the total cost of operations per annum is almost similar in both gradual and phased electric scenarios.



AMTS cost of bus operations (by scenario)

AMTS' non-farebox revenue resources have been limited to on-bus advertisement, stop/terminal advertisement, and revenue from bus scrapping. AMTS can widen its frame of advertisement revenue from other advertisement sources such as AV advertisement, on-board radio, revenue share from street advertisement display. Land value capture is also a major source of revenue which may be explored by developing transit hubs or TTMC at viable terminal locations. AMTS may also explore other form of non-farebox revenue like park & ride or data monetization.

The overall objective of AMTS is to contain the operational deficit within the viable limits. The intervention from study indicates that operational deficit can be contained within INR 62 upto 2030. AMTS therefore can manage its operations with available VGF and aligned UTF.



AMTS operational deficits by scenario

Additionally, comparing the current average annual cost of the electrification scenarios highlight the need for a mix of CNG and electric bus through GCC based procurement of services. Considering the costs proposed, and the rate of electric bus adoption, the phased electrification scenario seems to be the most economical. However, this data needs to be

further analysed and compared with scenarios with increasing mode share, and public transport service provision.

4. Setting a Vision for AMTS

AMTS key objective should be to make AMTS a preferred choice to commute. Commuters make mode choices based on accessibility, availability, affordability, convenience, journey experience, service levels as well as brand value of services. Hence, a commuter centric approach has a potential to revive AMTS ridership. Also, bus operations being flexible in nature and require periodic inputs for creating system efficiencies, the reforms in these areas of policy may be performance-based and adaptive in nature.

AMTS vision to provide commuter centric services while improving its performance requires a comprehensive approach focusing various domains of delivery of sustainable public transport services. To achieve its vision AMTS can leverage planning, technology, management, and fiscal tools for creating system efficiencies and promoting AMTS mode share through delivery of reliable and affordable services.

Vision Statement: Achieve 20% mode share by providing commuter centric urban bus services while improving operational as well as financial performance utilizing planning, technology, and fiscal tools.

A roadmap to achieve a long-term vision requires to build a short-term timebound goals and targets. Following are few customer specific and operator specific goals to be achieved by AMTS periodically to attain financial sustenance:

Customer Specific

- Improved accessibility for 90% of commuters within 500m from bus stop by 2025
- Waiting time for 80% of commuters ≤ 15 min waiting by 2030
- Seamless transfers for 80% of commuter ≤ 1 for integrated journeys
- Real time information accessibility for commuters by 2025
- Achieve overall public transport service level of LOS-2 or better throughout services.

Operator Specific

- To serve atleast 15% mode share by 2030 and 20% mode share by 2035.
- Achieve PT Availability of LOS 2 by 2030; and LOS 1 by 2035.
- Ensure Fleet Utilization of 92%+ with depot management system and fleet health management system.
- Ensure Vehicle Utilization of 175km+ for AMTS by adopting strategies for maintaining journey speed & asset utilization.
- Achieve improved occupancy ratio to 75% for AMTS with data-based planning & scheduling.

- Increase share of digital revenue to >25% by 2025; >50% by 2030; >75% by 2035.
- Improving non-farebox revenue share to >25% by 2025; >30% by 2030; >35% by 2035.
- Limit operation CPKM within INR 85 upto 2025; INR 100 upto 2030; INR 120 upto 2035 including staff cost, ticketing cost, monitoring cost, GCC value, insurance, and taxes.
- Align innovative financing options to UTF for managing deficit by 2025.
- Establishing an UMTA for coordinated operations and planning of public transport in Ahmedabad by 2025.

5. Roadmap for Implementation of Vision

AMTS vision with a commuter centric approach outlines various strategies to ensure public transport availability, access for all, and service choices for commuters. A holistic perspective in policy reforms is provided through planning, operational, digital, institutional, and financial strategies. A time bound approach for implementation of strategies shall pave the way for AMTS towards operational sustainability.

Planning for COVID19 recovery: This phase focuses on 'build back better public transport'. Creating service efficiency while increasing accessibility should be a prime objective aim of Covid recovery phase. AMTS should be able to provide more accessibility and service more commuters per revenue-km. This can be achieved by developing a priority network, leveraging technology for reliable transport, ensuring hygiene and communication and ensuring sufficient fleet supply. AMTS vision to adopt customer centric approaches to serve the city commuter better, with focus on improving service levels shall reinstate commuter trust within the system.

Planning Strategy: AMTS must aim to be the backbone of the transport system in Ahmedabad. As AMTS is expected to support 50% PT ridership it requires a rational planning strategy to increase its service accessibility. AMTS must also focus on improving internal efficiencies by providing accessible network development, creating service hierarchy, ensure availability of public transport with mix of fleet type allowing operational flexibility and strategic development of transit infrastructure.

Operations Strategy: AMTS need to build internal efficiencies in the system to make itself sustainable. The provision should be focused on ensuring service performance levels as well as encourage potential commuters to adopt AMTS as preferred choice to commute. Creating service reliability, planning for service optimization, periodic monitoring of services and building operational efficiencies are recommended adopted.

Digital Strategy: Public transit agencies need to adopt fast paced technology changes to compete with other modes. To achieve its vision, AMTS can leverage the matured technology to improve its operations, monitoring and management creating efficiencies with rational decision making. It is recommended that AMTS to create a tool for data-based planning & scheduling; scaled-up with BI for bus-km optimization empowering rational decision making. Information accessibility, ease of payments and Mobility as a Service will draw more people to use public transport. Transition to digital fares shall allow possibilities for ticketing crew optimization as well as reducing fare leakages.

Institutional Strategy: Efficiencies in the public transport system can also be achieved by adopting mature management processes. Creation of an umbrella organization like UMTA for public transport services in Ahmedabad will ensure coordinated decision making, eliminating duplication of services and provide users with seamless journey experience. It is recommended that the two bus systems may eventually merge as 'one system one institution' to eliminate system inefficiencies.

Financial Strategy: Financial support offered to buses by the GoG as operational VGF is commendable. Support through VGF and other incentive may continue over the study period. However, AMTS need an additional sustainable source of revenue to bridge the prevailing gap between earnings and expenditure to improve their services. Besides, AMTS may explore revenue from non-farebox resources and innovative financing. It is recommended to develop UTF and align dedicated revenue resources for reliable funding. Additionally, it is advised that GoG must align performance based dedicated fund to implement reforms and strategies over next three years.

6. Way forward

The study indicates an evident need of reforms and strategy to be adopted to achieve sustainable bus operations. The AMTS Vision Plan 2035 has been developed with an outcome specific approach. The Ahmedabad public transport is expected to achieve PTA of LOS 2 by 2030 and LOS 1 by 2035. The vision is to serve 20% mode share by AMTS by 2035 by implementing various recommendations adopting planning, technology, and fiscal tools. AMTS needs to plan for specific strategies and reforms aligned with defined outcome. In addition to goals mentioned in section 5.4, following are few outcome based strategies to priorities and implement:

- Improvement in public transport availability to LOS 2 to reduce operational deficit by INR 2 per km by distributing fixed cost, and auxiliary infrastructure costs.
- Data-based route and service optimization along with demand management measure like on-street parking charges would increase ridership up to 30% per bus and achieving occupancy of 75% reducing operational deficit by INR 6 per km.
- Conversion of existing diesel fleet to cleaner fuel CNG buses to reduce operational deficit by INR 9 to 12.
- Gradual conversion of 50% fleet to electric would provide additional VGF support of INR 12.5 per km.
- Converting bus crew to contract staff to reduce operational deficit by INR 1 per km.
- Digital fare reducing fare leakage reduce operational deficit by INR 1 per km.
- Efforts to improve non-farebox revenue share to 35% to 40% would reduce operational deficit by INR 8 to 10 per km.
- Reforms for innovative financing through UTF may compensate for excess deficit of INR 10 to 15 per km.

Reforms required to catalyze the recommended initiatives are possible to be implemented over 2-3 years. This would continue to provide support to AMTS for sustainable operations for study period. A time bound approach for implementation of strategies shall pave the way for AMTS towards operational sustainability.

1 Project Overview

With over 70 million passenger trips serviced daily, bus-based public transport systems form the backbone of the mobility systems in India³. The 'National Sample Survey' conducted in 2016 reported that buses are the most frequently used mode of transport across both rural and urban areas, with close to two-thirds of respondents reporting travel by bus. Even in cities with extensive metro systems such as Delhi, the mode share of public buses is higher than that of the metro. In Delhi 64% of all public transit trips completed in the city are by bus and 34% are by metro⁴. Buses form a cornerstone of the Indian mobility system and are unlikely to lose relevance.

Road based passenger transport, in India, is the responsibility of the State Government. Accordingly, bus systems are operated by government-owned State Transport Undertakings (STUs) to provide safe, affordable, and accessible services for all. Public bus systems in the country are operated through 1.4 lakh buses, owned and hired by STUs. While the services account for almost 75% of all the public transport trips⁵, cities across the country are burdened with extreme traffic woes. STUs do not operate on purely commercial terms. They continue to provide services on all routes, including low demand areas, and offer concessional passes, ensuring accessibility & equitable transit opportunities for citizens. At the same time, with rising fuel prices and staff costs, STUs have high operational costs with limited possibility to alter fares to meet their financial needs. In short, STUs do not earn enough revenue to cover the costs of operations leading to financial stress and thereby a heavy dependence on State and Central Government support. As of 2016-17, 47 STUs together incurred combined losses of up to INR 16,404 Cr⁶.

Losses over extended periods have resulted in disproportionate growth in the number of buses procured for public bus operations in cities. While road passenger traffic has grown at a rate of 15.4%⁷, bus fleet has grown only at 7%⁸. Despite guidelines prescribed by the MoHUA on the number of buses required for cities of different sizes, public buses account for only 0.74% of the total registered vehicle population across the country⁸. Over the years, this trend has initiated a transition to the use of private vehicles rather than public transit modes.

The study looks forward for conducting technical assessment of bus operations in an Indian city, here Ahmedabad. The study expects to develop a strategic vision plan for city to reform its bus based public transport operation. The strategies developed for city as part of vision plan shall not only support the city but would set a benchmark for its peer cities and urban public transport entities to adopt sustainable reforms.

1.1 Ahmedabad Context

Ahmedabad is one of the major socio-economic hubs of India. The city has made continuous efforts in improving mobility as well as providing affordable public transit accessibility to

³ Review of the Performance of State Road Transport Undertakings (Passenger Services) for 2015-16, MoRTH.

⁴ Promoting Low Carbon Transport in India, Rahul Goel, and Geetam, 2014

⁵ Fiscal Policies and Taxation Incentives for Improved Public Bus Systems in India, WRI India, 2019

⁶ State Transport Undertaking Profile and Performance (2016-17), Central Institute of Road Transport (2018).

⁷ India Transport Report, Moving India to 2031 Volume 1, National Transport Development Policy Committee (2014).

⁸ Annual Report 2018-19, Ministry of Road Transport and Highways, Government of India (2019).

socio-economic activities. While its efforts, the city has witnessed a PT mode share of only 10.3%⁹ (reduced to 7.8% by 2019) which is significantly low compared to cities of similar size like Bangalore, Hyderabad and Pune. Along with the BRT ridership has stagnating over past few years, AMTS ridership has also dropped from 8.5 lakh to 5.1 lakh passenger per day between 2013 and 2019. The low ridership trend has led to increasing financial deficits. The accumulated losses of AMTS have reached INR 2854 Cr. and continues increasing by about INR 300 Cr. per year. The pandemic induced impact on operations compounded the financial issues for AMTS, which was already witnessing financial stress. The city needs to take immediate measures to support and strengthen its public transport.

If public transport growth and resilience is not planned for, the resultant increase in financial losses will not only burden transit agencies but also due to commuters transition away from public transit to more low occupancy private modes, the city shall witness increased levels of congestion and air pollution, severely impacting the quality of life. Considering the existing and future challenges, it becomes imperative for State and AMTS to prepare a holistic long-term vision plan to ensure better preparedness, sustainable and efficient operations of public bus systems. As a way forward, AMTS has an opportunity to plan and revive itself by allowing structural, operational, and financial reforms.

With this aim, this report presents a long-term vision for the scaling of the bus systems for one public bus agencies and an action-plan for implementation of this vision.

1.2 Structure of the Report

The report will follow the following structure:

1. **Project Overview:** This section describes the necessity of buses and their role as the backbone of urban transit services, the cause of financial stress and the impact of the same on transport availability and poor performance of transit system.
2. **Introduction to Ahmedabad Public Transport System:** This section outlines the public transport scenario in Ahmedabad. It is highlighted that while Janmarg BRTS have adopted or are in process of adopting progressive reforms, AMTS is still yet to achieve sustainable operations would require policy reform to revive the system.
3. **Historical Assessment of AMTS Services:** This section evaluates AMTS trends over past decade to gauge the technical and financial performance. The assessment provides an insight on AMTS strengths and challenges.
4. **AMTS Service Projections:** This section estimates the fleet requirement for AMTS by capacity of bus and bus type (AC/non-AC). The section details out fleet requirement and cost estimates for two bus electrification scenarios: (a) phased and (b) gradual. The estimates are also made for staff and transit infrastructure requirement. The section also estimates revenue resources and available grants for system operations. The section concludes evaluating financial deficit of bus operations in various scenarios.

⁹ Source: MRT phase 1 DPR

5. **Setting a Vision for AMTS:** This section recommends a commuter centric approach to be adopted by AMTS and outlines a framework to achieve citizen centric, eco-sensitive and sustainable services. Based on current challenges, commuter centric approach and framework AMTS Vision statement is framed.
6. **Roadmap for Implementation of Vision:** This section outlines the strategies to be adopted for implementation of an AMTS vision plan. A holistic perspective recommends implementation of adaptive strategies to suit to flexible nature of operation requirement. An outline is provided for strategic roadmap for covid recovery. These recommendations are framed around strategic resumption of bus services, promotion of cashless payments, safety and hygiene and fleet management under financial constraints. The section also outlines strategies for planning, operational, digital, institutional and financial interventions to achieve sustainable operations.
7. **Conclusion:** The study concludes with a brief of outcome oriented approach and tentative timelines for implementation of vision plan.

2 Introduction to Ahmedabad Transport System

2.1 Urban Bus Services

City bus passenger transport, in Ahmedabad, is provided by Ahmedabad Municipal Transport Service (AMTS), a subsidiary under Ahmedabad Municipal Corporation (AMC). AMTS is providing urban transport services since 1947. In year 1997, AMTS delivered ridership with over 8 lakh passenger per day¹⁰. Due to increasing cost of operations and aging buses AMTS was not able to deliver reliable services and by 2005, AMTS witnessed a ridership decline to 3.5 lakh passengers per day. During this time the Government of Gujarat (GoG) had declared 2005 the 'year of urban development'. Under the development initiative AMTS received INR 100 Cr loan from GoG via AMC, to help restructure the organization, at that point burdened by a high staff cost (considering a staff to bus ratio of 10-11 and additionally including pension commitments).¹¹ The loan also supported subsidies for procurement of new Compressed Natural Gas (CNG) fleet. The initiative helped the services revive its lost ridership patronage and image.

Over the last 15 years, AMTS services have again reached a stage financial stress and are again facing a survival challenge. Currently, the AMTS has compounded losses of about INR. 300+ Cr¹². In year 2019 - 2020, 87% of AMTS expenses are attributed to staff costs. Services have witnessed a steady ridership decline since 2008 from 8.4 lakh to 5.2 lakh passengers per day.¹³ The recent decline can be attributed to lower reliability of AMTS buses, higher waiting time, increased private vehicle ownership and availability of affordable informal paratransit (autos) system.

The Ahmedabad city also operates 'Janmarg' Bus Rapid Transit System (BRTS) public transit services for its citizens since 2009 operated by Ahmedabad Janmarg Limited (AJL), a subsidiary under AMC. AJL offers premium bus services for its commuters with high-quality buses, stations, bus priority, comfort, ease of transfer and reliability. Initially, Janmarg BRTS witnessed a positive response, by 2015 the BRTS added 96 km BRT network (89 km dedicated corridor) with a ridership patronage of 1.3 lakh passengers. Over past few years, the network has not been extended and ridership has plateaued at around 1.5 lakh passengers per day. In 2020, AJL operated about 230 diesel buses & 48 e-buses and plans to electrify its entire fleet to reduce operational deficit. The services are delivered under a Gross Cost Contract (GCC) model and monitored through advanced bus ITMS system. The ITMS & AFCS system enabled analytics have supported AJL in delivering improved service levels and operational efficiency. Additionally, AMC had developed an Urban Transport Fund (UTF) along with aligned non-farebox revenue to support financial sustainability of BRT services. Janmarg lost 40% of its ridership due to restrictions imposed by Government to contain COVID19 spread. Janmarg BRTS network has over time become a transit lifeline of city. AJL (along with AMC) will need to plan for COVID phase recovery as well as its long-

¹⁰ Source: Level of operations of AMTS (1948-2005); BRTS Ahmedabad report; GIDB GoG.

¹¹ Source: Bus Karo Case Study; WRI.

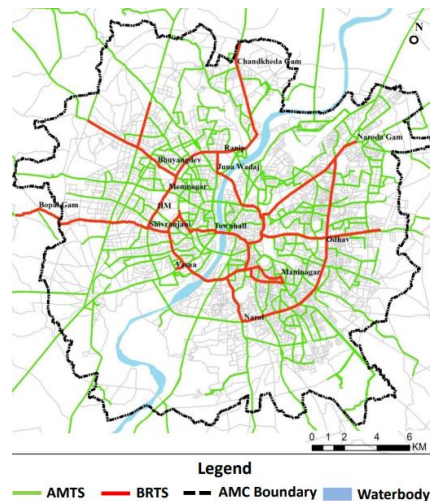
¹² Source: Financial Data received from AMTS for 2019 & 2020.

¹³ Source: Financial Data received from AMTS for 2019 & 2020.

term financial sustainability. The following table represents summary of AMTS and BRTS transport characteristics:

Table 2-1: Summary of AMTS and BRTS transport characteristics¹⁴

Service	AMTS	BRTS
Operator	AMC	AJL, AMC
Coverage to Urban Area	92%	19%
Transit Network	549 km	89 km
Number of Routes	204	16
Headway (peak)	5-180 min	3-6 min
Waiting <=15min (% of passengers)	36%	81%
Ridership	5.1 lakh	1.4 lakh
Total Bus Fleet	1171	278



2.2 Metrorail Ahmedabad

Other than AMTS and BRTS, the city is implementing 38 km of metrorail corridor in phase-1. 6 km Metrorail is operational and entire phase-1 network is expected to be operational by 2022/2023. AMTS and BRTS needs to plan and restructure itself for future with respect to upcoming Mass Rapid Transit (MRT) and changing commuter's transit origin-destination (OD) pattern. All three modes can together deliver an integrated transit services to citizens while improving individual system efficiency.

2.3 Ahmedabad Public Transport Service Levels

The service levels of public transport (PT) in Ahmedabad have been same over past few years. The concerns have been primarily in the areas of '**Availability of PT**' and '**Average Waiting Time**' for commuters which are key factors influencing service reliability and preference to use services.

Lack of reliable services is a major concern for Ahmedabad public transport system. The city is serving with equivalent of only 18 buses per lakh population instead of the required 40 buses per lakh population, i.e. the city is serving its population at PTA LOS 4 compared to PTA LOS 2. Lack of fleet availability has led to poor route frequencies and increased waiting time. The decreasing service levels have resulted in loss of ridership and low mode share of public transport in Ahmedabad.

¹⁴ Source: (a) AMTS 2021; (b) BRTS 2020; (c) Student research work - 2016, Divya Dhok, CEPT University, Ahmedabad, (d) Student research work - 2016, Divya Dhok, CEPT University, Ahmedabad

Table 2-2: Ahmedabad's Public Transport Service Levels

PT Parameter	Preferred for Ahmedabad	2015		2019 (estimated)	
Presence of organized PT	LOS 1: >= 60%	100%		100%	
Availability of PT	LOS 2: >= 0.4	0.15		0.17	
Service Coverage of PT	LOS 1: >=1	1.03		NA	
Average waiting time of PT	LOS 2 on Trunk network: 4 to 6 min LOS 3 on Complementary network: 6 to 10	6-10 mins		16-20 mins	
Level of Comfort in PT	LOS 1: <= 1.5	1.9		1.4	
% Fleet as per UBS II	LOS 1: 75% to 100%	94%		100%	
Legend for LOS:		LOS 1	LOS 2	LOS 3	LOS 4

Note: Refer <http://utbenchmark.in/> for PT parameter calculation method. The latest publicly available SLB for Ahmedabad Public Transport are for year 2015. The SLB for 2019 was estimated based on calculation method provided by MoHUA and available data.

2.4 Timeline of Transit Initiatives adopted by Ahmedabad

Ahmedabad city has always been a front-runner in progressive transport policies. Over the years, city had made significant contribution in adopting transport reforms and strategies. Few of the key transport initiative adopted by Ahmedabad is listed below:

- **Since 1947:** AMTS provides public transport bus services
- **Year 2005:** Reforms for revival of AMTS City Bus Services with Rs 100 Cr. support under GoG's 'Urban Development Year' initiative
- **Oct 2009:** AJL initiates its BRTS operation (first successful BRTS in India)
- **Jan 2012:** Janmarg launches Closed Loop Smart Card for BRT ticketing
- **Feb 2013:** First report on Service Level Benchmark for Urban Transport Ahmedabad
- **Mar 2014:** Notified Ahmedabad Revised Development Plan 2021 aligned with Land-use Transport Integration
- **Oct 2017:** Ahmedabad launches 'Janmitra - Common Payment Card'
- **July 2018:** CMUBS announces VGF of 50% or Rs.12.50 per km for non-electric buses
- **Mar 2019:** Ahmedabad Metro initiates operations on 6.0 km corridor (+33.3 km under implementation)
- **June 2019:** 1st Electric Bus inducted in Janmarg BRTS (inaugurated in Aug 2019)
- **Sept 2019:** CMUBS extends VGF of Rs. 25.0 per km for e-buses
- **Dec 2019:** 48 e-buses inducted in Janmarg BRTS fleet for operations
- **Jan 2021:** Janmarg BRTS launches 'Mobile Paytm Ticketing'

2.5 Changing Role of Urban Buses in Ahmedabad

AMTS has been augmenting its service area with growth in city. The core route network has not unchanged over past few decades while new routes are added to its core network. Over

the study period, Ahmedabad city is expected to witness a significant change in role of urban buses. Few observations in changing role of urban buses are listed below:

- **Changes in OD Pattern:** City is witnessing growth towards Northern and Western periphery of the city. Ahmedabad Municipal Corporation **added 39 sqkm of area in administrative limits** in Aug 2020. Also, city has witnessed **redevelopment of textile mill land** in past decade. This has **induced changes in the travel OD pattern** in the city.
- **Intensifying Development along PT Corridors:** Development plan 2021 of Ahmedabad promote high density development along BRT and metro corridor. The FSI has been increased in range of 3 to 4.8 along BRT and Metro network. PT mode share is expected to increase.
- **Expansion of Metrorail Services:** Ahmedabad metro is expected to operationalize its entire phase-1 38 km corridor by 2022-23. This would induce a need for integrated mobility & last mile connectivity for specific user group.
- **Connectivity to Regional Transit Hubs:** Changing need of **mobility pattern of regional commuters** is to be aligned with recent decentralization of GSRTC operations and upcoming High-Speed Rail.
- **Rapid motorisation is a cause for concern:** Since 2013, registered private vehicle have more than doubled indicating increased mobility dependency on private modes. This has led to increase in traffic congestion, travel time and traffic pollution.

AMTS vision study plans to augment AMTS fleet, infrastructure, and service levels as well as initiate state level reforms to contain current challenges, changing nature of city & transforming mobility requirements.

3 Historical Assessment of AMTS' Services

AMTS is one of India's largest Municipal Transport Service. The transport undertaking is managed by Ahmedabad Municipal Corporation (AMC). AMTS carries a major share of public transport services in Ahmedabad. However, there has been a consistent decline in number of people using AMTS buses since 2008. Following are some operational and financial trends indicating challenges faced by AMTS for sustainable operations.

3.1 Declining trends of AMTS Ridership

Post reforms adopted in 2005 and inducting new fleet, AMTS ridership had peaked to 8.5 lakhs per day in 2008. Since 2009, AMTS has been witnessing a consistent decline in ridership from 8.4 lakh passengers per day in 2008 to 5.2 lakh in 2020. While initial shift could be attributed to migration to a better bus service like BRT, the post 2013 decline may be attributed to declining service levels due to aged fleet, reduced supply and growth of affordable informal transit options like shared autos as well as fare increase adopted in 2013. AMTS minimum fares were retained at INR 3 while it was increase by INR 2 and INR 4 for average trip length and maximum trip length. This increase was in order of 22% and 19% respectively. During this fare increase corresponding drop in ridership was 15-17%.

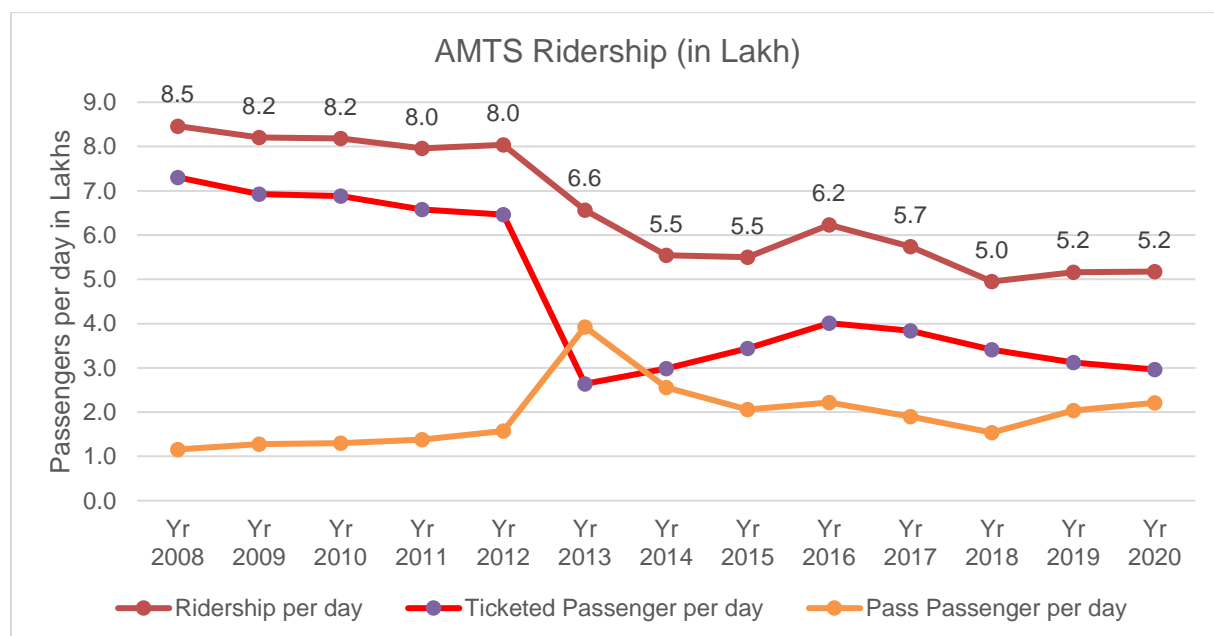


Figure 3-1: AMTS ridership trends

Pass passengers are mostly seen as dedicated users of public transport system. Between, year 2013 to 2020, AMTS has been able to increase small share of pass passenger. During same time, AMTS has also witnessed a significant drop in ticketed passenger who were not bound by affordability but by choice of service. Pass users are mostly associated to educational and work trips where information accessibility, trip adherence, schedule adherence and time saving are major parameters. The decline in pass ridership was also witnessed post fare revision which increased pass values by 50%. ¹⁵

¹⁵ Ahmedabad Municipal Transport Service: Ahmedabad Municipal Transport Service, BRTS fares to increase from April 1 | Ahmedabad News - Times of India (indiatimes.com)

To regain its ridership levels, AMTS needs to deliver a commuter centric service as well as promote specific user passes and/or smart card usage.

3.2 Fleet Availability

AMTS fleet size reduced from 967 to 509 between 2008 and 2013. Leveraging the financial support from Centre and State government schemes, AMTS increased its fleet more than 1000 by 2016. While passenger trips have been growing steadily in Ahmedabad, the fleet size has stagnated at around 1100 to 1200 buses in past few years. Average age of current fleet is 4.75+ years. AMTS would need to induct more buses fleet in next couple of years.

AMTS, with an intent of delivering services to city commuter, has ensured induction of fleet time to time. It is noticed that the fleet induction has been aligned with financial support received from Government of India (GoI) and GoG schemes. A financial support from GoI, GoG and AMC shall support AMTS in improving fleet availability.

3.3 Declining Service Supply of AMTS

3.3.1 Vehicle Utilization

The effective yearly fleet utilization has been in range of 80%-88% in past few year. This is lower than desired fleet utilization of 90%-95%. AMTS fleet which were earlier delivering 238 kilometers per bus per day during 2008 are now only being utilized for 200 kilometers per bus per day. This could be attributed to internal inefficiencies, high breakdown rate with aged fleet and rising traffic congestion levels in the city.

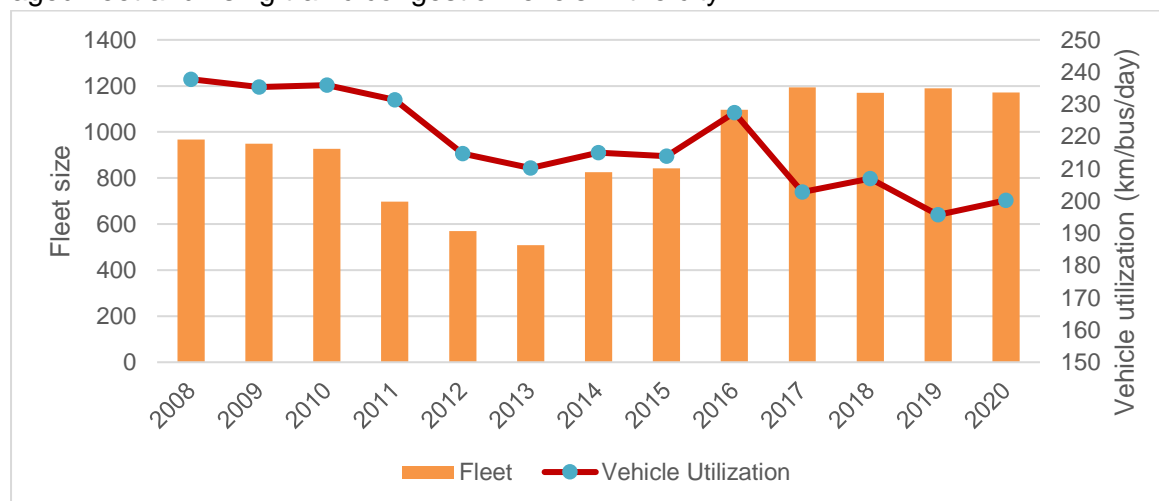


Figure 3-2: AMTS bus fleet and vehicle utilization

3.3.2 Revenue-km

While there has been a consistency in fleet availability in the past few years, supply of services has been reducing with buses delivering fewer kilometers per day every passing year. The revenue-km operated has reduced from 1.7 lakhs per day in 2016 to 1.2 lakhs per

day in 2019, i.e. 30% less revenue-km even with increase in AMTS fleet. Following figure indicates the drop in ridership has been in proportion to drop in bus revenue-km in past few years.

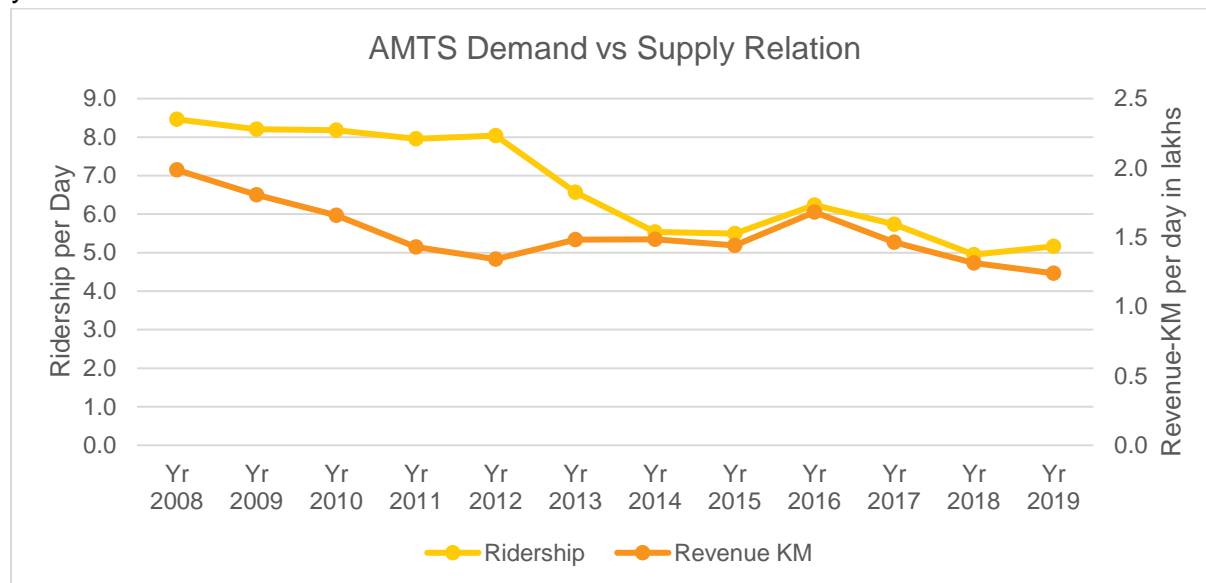


Figure 3-3: Relation between AMTS bus supply & ridership

3.4 Declining Trends in AMTS Service Level – Average Waiting Time

Waiting time at stops for bus services is a sensitive parameter for bus users. The Service Level Benchmark (MoHUA) has adopted waiting time as one of the critical parameters for public transport operations. In 2013, 32% routes were operating with headway below 20 minutes while such routes reduced to 8% by 2020, leading to undesirable increased waiting time. Additionally, during this term, there is a loss of 8%-12% planned bus trips. The waiting time assessment of AMTS (figure 3-5) indicates only 36% user having a waiting time less than 15 minutes. The waiting time level of AMTS service in 2019 is estimated as LOS 4, i.e., average waiting of more than 10 minutes.

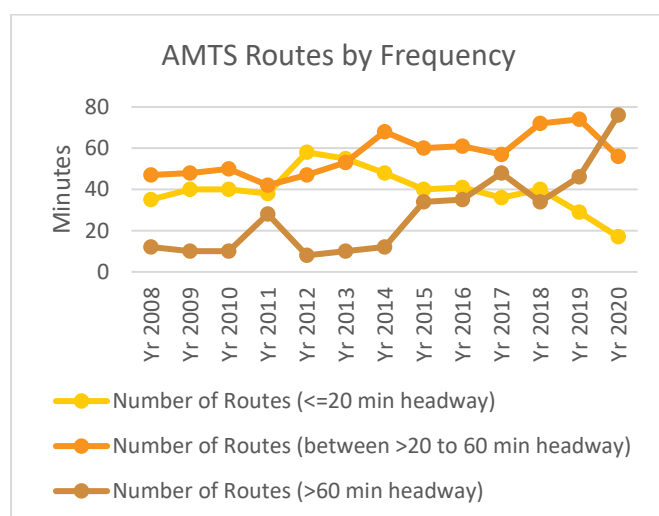


Figure 3-4: AMTS routes by frequency

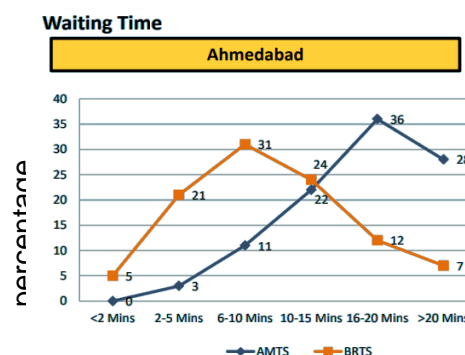


Figure 3-5: Waiting time of AMTS commuters

Since 2013, there has been a decline in number of routes have frequency below 20 minutes. This term also witnesses a decline of 35% passengers. This indicates Ahmedabad commuters are sensitive to waiting time. AMTS shall require inducing more fleet to the system and align itself with service hierarchy mapped to accessible high frequency network.

3.5 Lack of Transit Infrastructure

Terminals and bus stops are the interface between buses and passengers. The city has continuously invested in city bus stop development and maintenance. During 2008 to 2020, number of bus stops have increased from 3735 to 5165. While there has been a consistent improvement in bus stop availability, no terminal facility have been added in last 25 years. The city has only nine bus terminals and has planned for adding three more terminals in future for which land is allocated.

Availability of depots ensure periodic maintenance of buses increases bus performance. For a city with 505 sq.km of serviceable area and about 1171 buses, AMTS has only eight depots. It important to note that only one depot have been added to AMTS since 2000. The available depots can only support 37% of its existing fleet. The lack of depots has reduced the efficiency of bus system lowering fleet utilization. The depots are concentrated towards inner city. This has increased share of low revenue-km and share of dead km, which is currently at 6.5%.

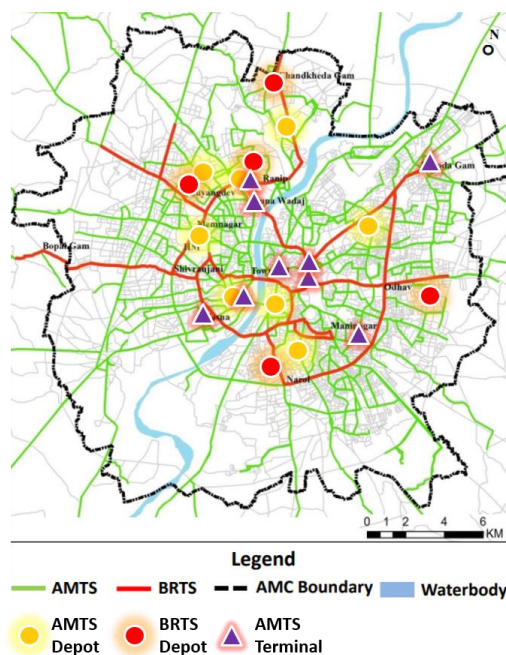


Figure 3-6: Public transport infrastructure in Ahmedabad

3.6 Increasing Financial Debt

3.6.1 Accumulating Losses

Declining ridership coupled with increase in staff and fuel costs has pushed AMTS to unsustainable operations with losses increasing every year. The gap between earnings and expenditure per kilometer has been increasing consistently. The operational deficit which was only 11 rupees per km in 2008 has increased to 64 rupees per km in 2019. Yearly operational losses have increased from INR 85 Cr in 2008 to INR 302 Cr in 2019. In 2019, AMTS's accumulated losses were INR 2854 Cr.

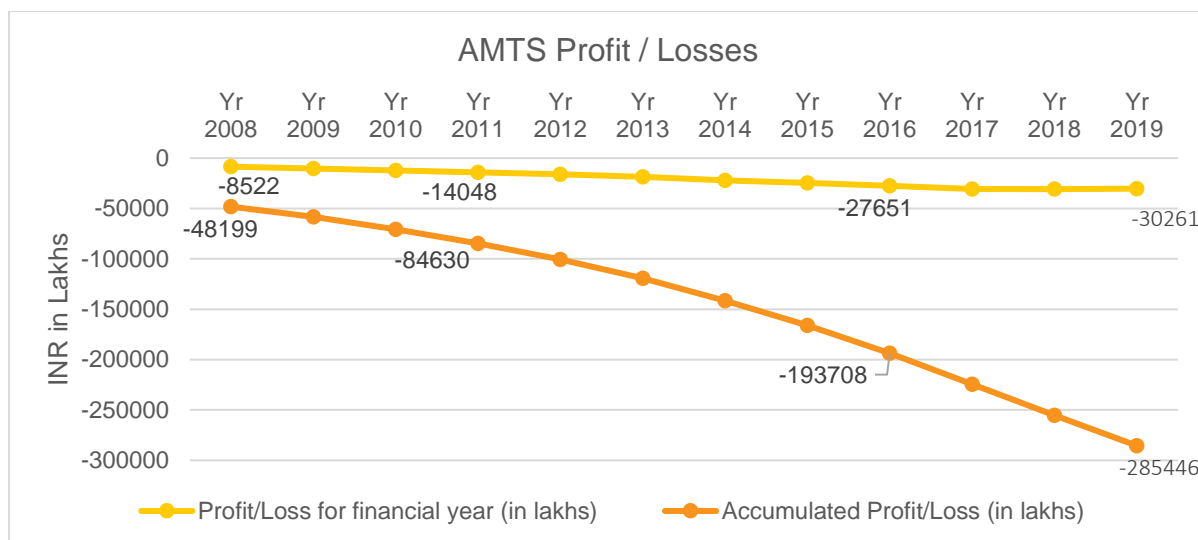


Figure 3-7: Accumulating financial losses at AMTS

3.6.2 High Financial Liabilities with Staff

AMTS staff costs account for 48% of its expenditure even with 52% fleet on GCC operations. This is also due to high proportion of pensioner staff as AMTS is an old organization. In 2008, AMTS had one pensioner staff per working employee which has increased to two pensioner staff per employee by 2019. The same period witnessed increase in staff expenditure share from 27% to 48% in operations cost. The liabilities of staff expenditure is high and increasing. This cost towards staff is expected to increase consistently unless reforms like 2005 initiatives are not adopted to optimize staff bus ratio and/or share of AMTS employees to total staff including contract staff.

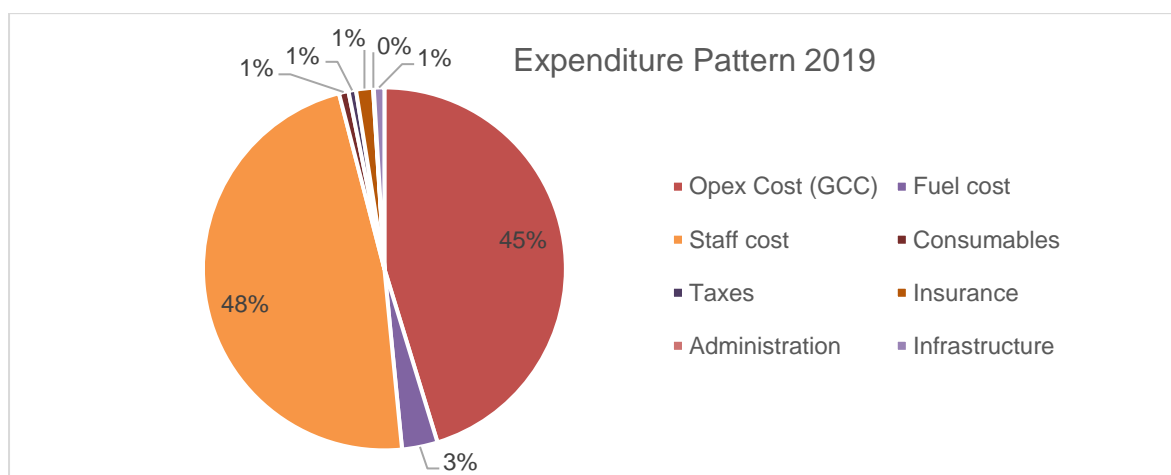


Figure 3-8: Components of expenditure at AMTS, 2019

AMTS had already taken steps towards increasing bus induction through GCC as well as deputation of staff to other departments thus containing its financial liabilities associated with staff. The share of GCC has been around 50% in past few years. AMTS needs to plan transition to 100% GCC and/or GCC Hybrid models.

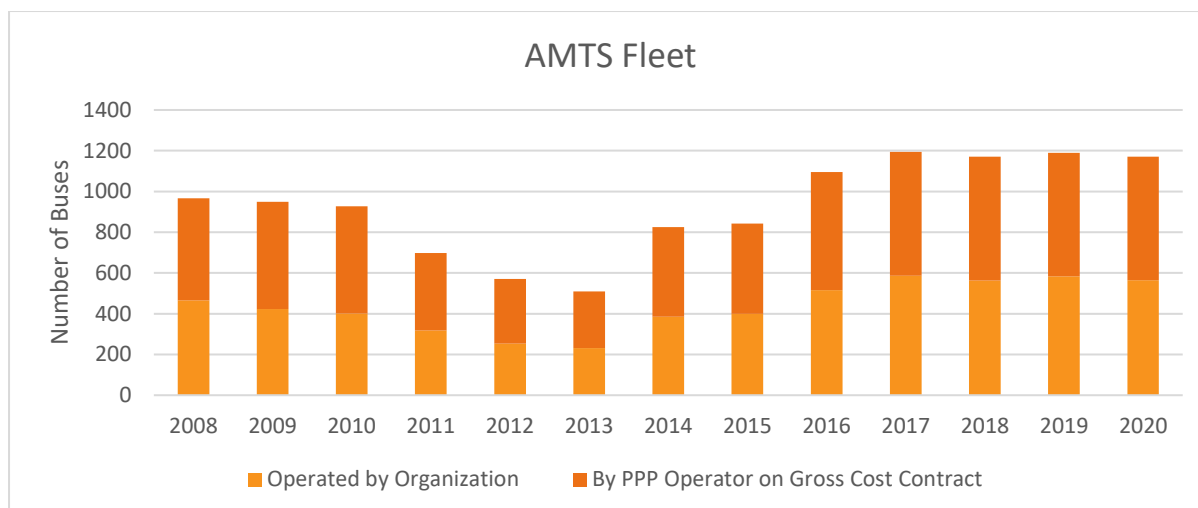


Figure 3-9: AMTS fleet by operator

3.6.3 COVID19 Impact

The AMTS system which was already burdened with financial challenges was further hit by COVID19 pandemic induced operational losses. Post-lockdown 2020, AMTS deployed 66% of its operational fleet while ridership recovered only to 22%. During this phase the EPKM dropped from INR 28 to INR 11, i.e., recovered to only 39% while the expenses were still at 62% of pre-COVID levels. AMC had paid 30% of GCC cost to operators for lockdown period, i.e., for of about 6.5 months, without realizing bus operations. COVID19 has increased the operational deficit. Now, AMTS needs to rationally plan for its future growth to achieve its operational sustainability and build back better public transport system.

3.7 Policy Initiatives

3.7.1 Aligned Operational VGF

State Government of Gujarat under its CM UBS has provided financial support to AMTS for bus procurement and operations. The progressive reform adopted to provide operational VGF is commendable. The state government provides an operational VGF of 50% of deficit or maximum of Rs. 12.5 per km for non-electric buses operated under GCC. Further, Government of Gujarat have also aligned a VGF of Rs. 25 per km for electric bus operations. The equivalent amount is expected to be provided as grant from AMC to AMTS. This level of operational VGF provides AMTS an opportunity to explore electric buses for its operations and reduces its financial deficit.

While the CM UBS which aims to provide VGF to city bus operators has been of great support, still there is a financial gap to recover operational costs. AMTS needs to find alternative sources of revenue to invest in infrastructure, fleet expansion and operational sustainability.

3.7.2 Push for Gross Cost Contract

Compared with other cities, AMTS has been at the forefront in transitioning to buses with cleaner fuels and exploring innovative business models to finance capital investment and to deliver customer-oriented bus services. As illustrated in the chart below, the proportion of buses operated under GCC model has been increasing steadily at AMTS. The city plans to phase-out existing owned buses and operate bus service under 100% GCC and/or GCC hybrid. This has been factored into fleet calculations with gradual phasing out of AMTS' own buses.

3.7.3 Integrated Planning

'Development Plan 2021' and 'Integrated Mobility Plan' propose inclusive land-use transport integration as well as locations for potential terminals/interchanges. The city needs to adopt integrated mobility recommendation and deliver an integrated transit services to its citizens.

3.7.4 Digitizing Fare

AMC adopted an open loop citizen payment card in 2019 which can serve as common mobility card, while its transit utility popularity is low. Despite 80% users are daily commuters share of smart card is low. AMTS can leverage the existing system to digitalize its fare and passes. This would ensure dedicated commuters as well as reduce fare leakages.

3.8 Inference

AMTS is facing severe financial challenges. It has witnessed a continuous decline in operational performance parameters since 2008. AMTS needs to provide a more reliable service supply and regain commuter trust and patronage to recover ridership. The current trends indicate need for operational, institutional, and fiscal reforms to support sustainable operations.

In above context, it is evident that there is a need for AMTS to establish a long-term plan to attain sustainable operations by minimizing operational deficits through increased ridership and efficiency optimisation. Public transport sustainability can be achieved only with adoption of strategies for ensuring reliable supply, creating system efficiencies, and diversifying revenue resources.

AMTS needs to increase its supply to meet the rising latent demand and rationalize its services to increase public transport accessibility and in turn gain ridership while creating system efficiencies. The transition of fleet to electric buses will provide AMTS with additional VGF aligned by GoG for e-bus operations. Also, AMTS need to reduce its dependency on farebox by exploring alternative sources of revenue. City can develop an urban transport fund aligned with dedicated revenue resources providing reliable revenue resource for operations.

The city also needs to reform the institutional structure of AMTS and AJL to eliminate duplication of services, infrastructure, and resources. The institutions may be redrawn in concept of UMTA or MATA to have coordinated and resilient decision making for public transport in Ahmedabad.

A holistic long-term vision plan is thus critical for improving public transport accessibility, improving quality of life and the reduction of the negative environmental externalities associated with transport in the city.

AMTS requires immediate reforms to revive and survive. This study has been developed to formulate Vision and Strategies for AMTS to achieve efficiency and sustainable operations.

4 AMTS Service Projections

4.1 Methods for Fleet Estimates

Studies have suggested that the number of public buses required by a city is a function of its population, trip rate, public transport mode share, service network length, average trip length, frequency of services, peak hour speed, vehicle utilization of public buses, and the average occupancy on-board buses¹⁶. Following methods of fleet estimation are adopted for AMTS Vision Plan 2035.

Method 1: Supply-based estimates

This method recommended provides a thumb rule to assess fleet required for city. It estimates the supply-side parameter 'public transport units' (PTU) for a city based on its population. PTU indicates units of public transport required by a city for desirable mode share to achieve sustainable mobility. It is desired that the city must operate a fleet equivalent to 60 PTU per lakh population to achieve LOS 1 or operate a fleet equivalent to 40 PTU per lakh population to achieve LOS 2¹⁷. Current PTU of Ahmedabad is 18; i.e. LOS 4. Ahmedabad city had aimed to achieve LOS 2¹⁸. Therefore, PTA requirement for Ahmedabad is calculated as:

$$\text{Required Public Transport Units (for LOS 2)} = 40 \times \frac{\text{Population of City}}{100000}$$

A city may be served by multiple modes of transport, mode are assigned with equivalent PTUs. 1 bus is equivalent to 1 PTU and 1 metro coach is equivalent to 3 PTU¹⁹. Since, as per Metro Phase 1 report 20% of PT ridership shall be serviced by metro service, the factor is accounted for assessing future fleet requirement. The supply-based fleet assessment is calculated as per following equation:

$$\text{Fleet Requirement (for LOS 2)} = 40 \times \frac{\text{Population of City}}{100000} \times \text{percentage PT Mode Share with Bus}$$

Method 1 is more suitable to consider for benchmarking city's service level target for 'public transport availability'. As this is a supply-based strategy, city needs to aggressively plan for demand management strategies and promote public transport. Cities may benchmark their service LOS for public transport availability and plan its investment accordingly.

Method 2: Demand based estimates

This method evaluates travel demand characteristics to estimate bus fleet requirement of the city. The public transport travel demand is related to motorised trips, public transport mode share and average trip length. Demand based method considers three main parameters that can be altered based on AMTS' vision and goals for the long term. These include the average daily revenue distance per bus (vehicle utilization), bus size (passenger carrying

¹⁶ Prashant Bachu, Bhubaneshwar on the move, Tools and guidelines for city bus operations, GIZ 2019

¹⁷ Working group recommendation on 12th five year plan, MoHUA, GOI

¹⁸ Service Level Benchmark for Ahmedabad City, 2013

¹⁹ Service Level Benchmark, MoUD, 2012-13

capacity of the bus), and the average occupancy ratio. This method considers the following equation:

$$\text{Operational Fleet} = \frac{\text{Motorized trips} \times \text{PT mode share} \times \text{Avg trip length (km)}}{\text{Avg. daily revenue km of a bus} \times \text{Passenger capacity of bus} \times \text{Occupancy}}$$

$$\text{Total Fleet} = \frac{\text{Operational Fleet}}{\text{Percentage of Spare Fleet}}$$

Total fleet is estimated considering 92% fleet utilization, i.e. 8% buses of entire fleet shall be allocated as spare bus fleet.

4.2 Process Adopted for AMTS Fleet Estimation

The projection of fleet requirement for AMTS vision planning, as part of this study, is being estimated through demand-based method, i.e. method 2 is selected for the analysis. The base projection for trip rates, AMTS mode share, ridership and trip length is aligned projections of 'Gradual Scenario' of metro phase-1 DPR. It is understood that due to COVID-19 pandemic induced restrictions and economic impact city shall witness limited investments in high density development. Hence, the gradual scenario of MRT is considered.

Data has been collected from AMTS on required operational, infrastructure and financial parameters to assess past trends and to establish as-is scenario for base year. The population projection data available from 'United Nations' estimates has been considered. Based on the data collected on the trip rates, AMTS mode share, ridership and trip length for public transport from metro phase-1 DPR, these parameters have been estimated over the next 15 years, i.e., for project horizon year of 2035.

Assessment of yearly ridership for estimating fleet requirement has been extrapolated using projections from metro phase 1 report. The assessment considers procurement of midi bus services aligned to GoG's initiative of operational VGF which make TCO of midi bus viable for urban public transport services. Hence, the average passenger capacity of the bus has been considered as 42 (seating + standing). Based on the data, assumptions and bus service patronage mentioned in the metro phase-1 DPR, parameters such as mode share, trip rate and occupancy ratio were calculated as follows:

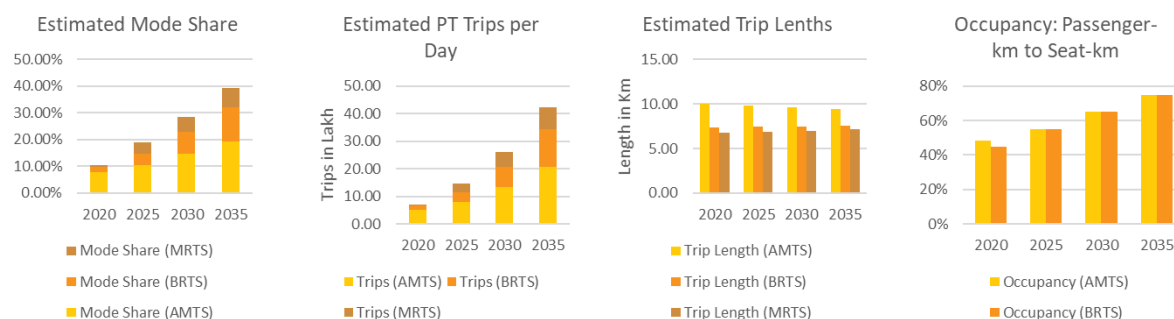


Figure 4-1: Estimated (a) PT mode share, (b) PT Trips, (c) average trip lengths and (d) bus occupancy.

Following observations have been considered as base for fleet estimation and strategy development:

- Expected potential increase in mode share indicate need to improved PT Availability and Accessibility. AMTS is expected to serve 50% of PT trips in Ahmedabad.
- AMTS ridership is expected to increase to 2.5 times by 2030 and 4.0 times by 2035. AMTS needs to ensure supply of city bus services with desired service levels.
- Decreasing trip lengths of AMTS services indicates mode shift of long-distance trip away from AMTS. This indicates changing role of AMTS to serve as feeder to higher order services including BRT and upcoming metro services.
- Both AMTS & BRTS need to improve their occupancy ratio to attain financial sustenance. This may require measures like service/route optimization with data analytic approach, and demand management measures. This study aims for AMTS to gradually improve its occupancy rates up to 75% by 2035.

4.2.1 Impact of COVID-19 pandemic on fleet estimates

Public transport has been one of the major sectors that have been impacted due to the COVID-19 pandemic and the subsequent restriction of movement within cities. While cities have embarked on the “unlock” journey, movement in public transport in major cities continues to be restricted resulting from the increased adoption of work-from-home practices and the perceived safety concerns of public transport commuters. This has resulted in the reduction in trip rates, trip lengths and changed the mode share in major cities. Additionally, public transit services have also reduced. This impact is expected to continue unless herd immunity is achieved towards pandemic. The projections considered pre-covid AMTS mode share recovery in next two years, i.e., upto 2022.

As there is a lack of conclusive data on the impact of the pandemic, due to varied gradation of lockdown restrictions, this study assumes an average of 40% reduction in the passenger demand and bus supply for 2021, gradually increasing to pre-COVID levels by 2022. Reinstating supply of AMTS is important to build commuters trust in the bus services. Since, the buses are on GCC, it is desired that post-COVID the supply should be achieved for minimum assured km, while the mode share and ridership may gradually increase.

4.3 AMTS Fleet Requirement

Ahmedabad had aimed to achieve public transport availability of 40 buses per lakh population, i.e., LOS 2. This study sets a goal for Ahmedabad to achieve public transport availability of LOS 2 by 2030, i.e., availability of 4059 PTUs or minimum of 3247 urban buses required considering 80% PT ridership on buses. It is understood that metro shall provide necessary supply to cater to 20% public transport ridership as projected in metro phase-1 DPR.

Based on the current trends of bus procurement, the current deficit of desired fleet size to achieve PTA of LOS 2 for the city shall increase from 1408 buses to 1773 buses. The lower

supply would reduce system reliability and induce loss in ridership which shall further impact financial sustenance of AMTS as well as city accessibility. A rational approach is adopted as discussed in demand-based method to estimate the fleet requirement of AMTS.

4.3.1 AMTS Fleet Estimates

Demand based projections for AMTS transit characteristics and fleet requirement to achieve target of PTA LOS 2 by 2030 are as follows:

Demand Based Projections from 2020 to 2030:

- AMTS Mode Share: 8% to 15% (87% increase)
- AMTS Ridership: 5.1 lakh to 13.4 lakh (158% increase)
- AMTS Occupancy: 48% to 75% (56% increase)

Demand Based Projections from 2020 to 2035:

- AMTS Mode Share: 8% to 20% (150% increase)
- AMTS Ridership: 5.1 lakh to 20.8 lakh (303% increase)
- AMTS Occupancy: 48% to 75% (56% increase)

Estimated from the demand-based method, by 2030, AMTS needs to increase its operational fleet from 1171 buses to 2378 buses (103% increase). The city bus fleet together with BRT fleet shall be 3253; i.e., LOS 2, considering BRT increases is fleet to 875 and 20% PTU supply is maintained by metro.

Following table represents estimated fleet requirement for Ahmedabad city. Fleet requirement is estimated for both AMTS and BRTS as they would together serve the urban bus transit demand. The projection has accounted to achieve PTA LOS 2 by 2030 and thereafter gradually increase share of fleet availability to achieve PTA LOS 1 by 2035.

Table 4-1: Estimates of bus fleet requirement

Fleet Projection Method	2020	2025	2030	2035
Trend Based (AMTS)	1171	1317	1474	1641
Demand Based (AMTS)	1171	1458	2378	3892
Demand Based (BRTS)	278	422	875	1510
Demand Based (City)	1449	1880	3253	5402
Supply Based (City) for minimum target of LOS 2 upto 2030; thereafter target of LOS 1 upto 2040. (considering 80% PT share with buses)	2579	2900 (City: 3625 PTU requirement for Public Transport)	3247 (City: 4059 PTU requirement for Public Transport)	5422 (City: 5647 PTU requirement for Public Transport)

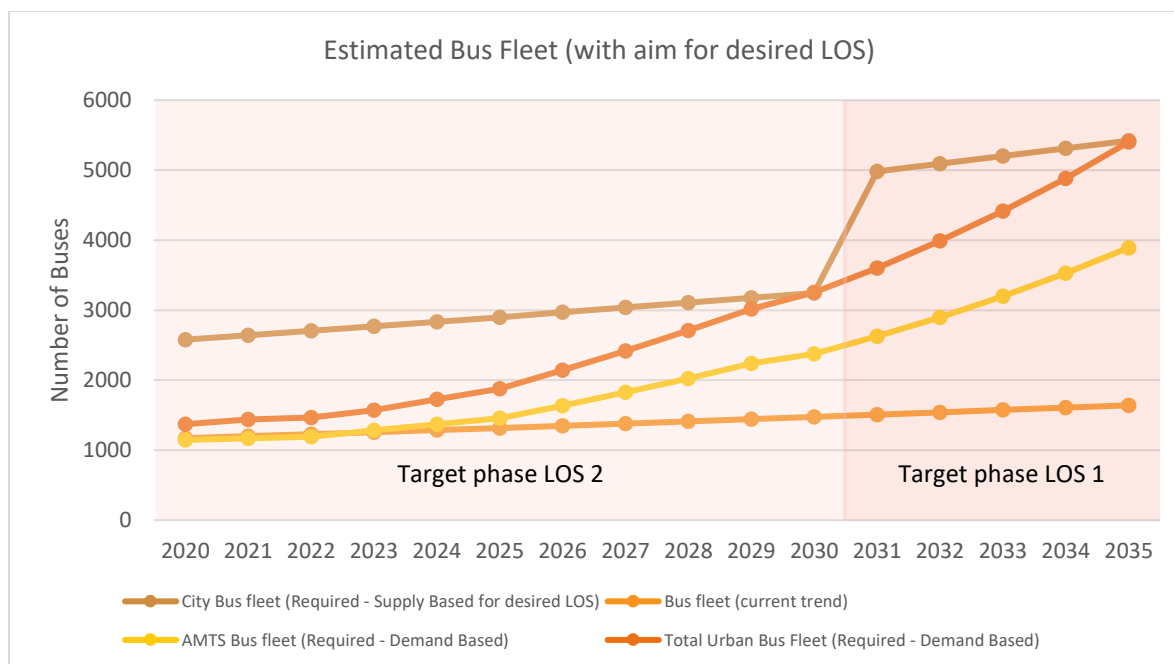


Figure 4-2: Estimated trends of fleet requirement

Considering the impact of ongoing pandemic, the study assumes there will be small increment in overall fleet held by AMTS till 2022. The induction of new fleet is considered to cover the supply of retiring fleet and achieve pre-COVID AMTS mode share. Post 2022, the mobility of city is expected to increase with socio-economic activities getting normal to pre-covid levels as well as the metro services are expected to expand increasing expectation with AMTS and BRT as access mode. AMTS will need to increase the bus induction rate post 2022 to meet commuters' demand as well as to compensate the retiring fleet. An average increment in fleet in order of 140 to 160 buses per year would be required to achieve the PTA LOS 2. This is significantly higher as compared to the current trend.

4.3.2 Clean Fuel Fleet Adoption Plan for AMTS

Transit agencies across the country have been developing roadmap for decarbonise public transport either through clean fuel buses or electrifying public transport. The clean fuel technology for buses available are CNG, electric, hydrogen fuel and hybrid buses. CNG buses are more popular in Gujarat for its lower operational costs. The finance support provided under CM UBS programme of GoG. The capex subsidy provided by GoI under the FAME 2 scheme has supported viability e-buses. Additionally, adoption of electric fleet is encouraged through operational VGF by GoG reducing operational deficits. The financial support from GoI and GoG have made Total Cost of Operations (TCO) of e-buses competitive with non-renewable powered buses. As the scale of economy is changing, e-buses are expected to get cheaper over time and become more viable. Also, the power costs offered by DISCOM(s) are more stable than fluctuating prices of diesel making e-buses less sensitive to world economics and achieve financial sustainability. Bus technology of hydrogen fuel and hybrid are also being developed while currently operational cost of these technologies is high. As the scale of economies improves, these technologies would

get cheaper and may be considered for induction in AMTS. For current estimates of AMTS fleet, a mix of CNG and electric buses are considered.

Considering the limited manufacturing capacities of electric buses in the country, and current operational cost of electric buses, this report assumes two scenarios for the electrification of the bus fleet:

- phased increase in share of e-bus procurement of bus services, and
- gradual increase in share of e-bus procurement of bus services over the study period

Electrification scenarios:

- **Scenario 1: Phased Electrification** – where in the short term, i.e. till 2025, only 10% of the annual bus fleet induction is considered electric; in the medium term, i.e. from 2026 to 2030, 30% of the annual bus fleet induction is considered electric, and in the long term, i.e. from 2031 to 2035, 70% of the annual bus fleet induction is considered electric.
- **Scenario 2: Gradual Electrification** – where the share of electric buses for yearly induced fleet increases by 5% annually.

The following figure highlights the scenarios:

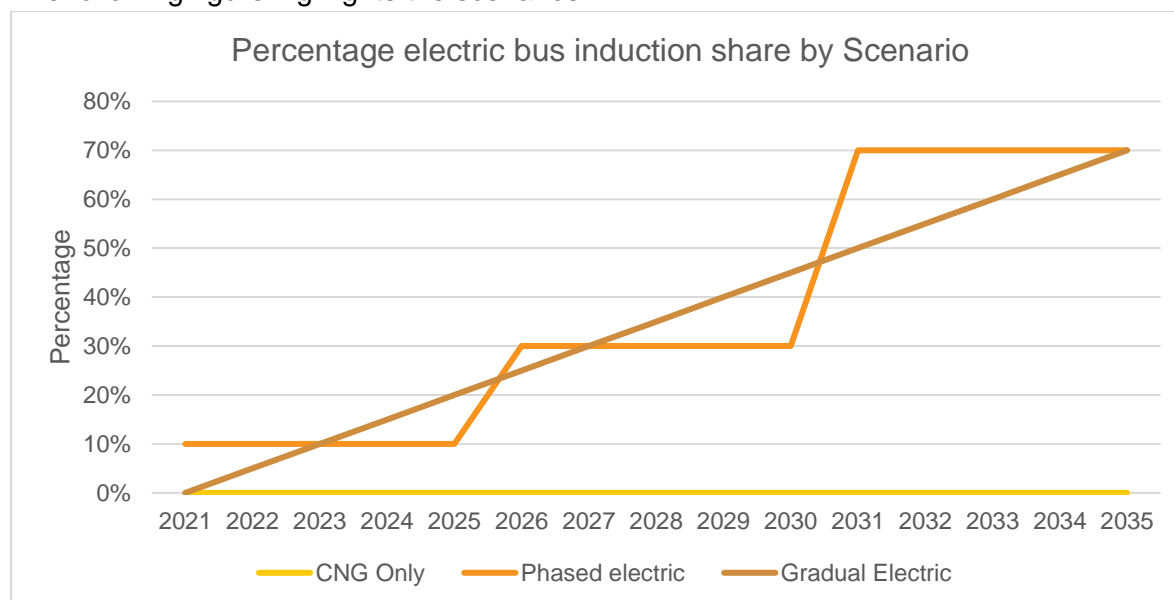


Figure 4-3: AMTS fleet electrification scenarios

Benefits of adopting cleaner fuel buses for AMTS are estimated by comparing the two bus-electrification scenarios to 'CNG only' scenario which considered no electrification of AMTS bus fleet.

4.3.3 Fleet Induction Plan Scenarios

The induction of buses has accounted for mix of electric and CNG buses allowing flexibility to plan operations suitable for operational range management and efficient utilization of charging infrastructure. The buses to be inducted have also considered share for adoption of AC fleet to encourage captive users who prefer convenience and comfort. These AC services may be aligned to brand AMTS ring-radial trunk network as well as feeder services to metro riders.

Calculating the two bus electrification scenarios described above, we have estimated the composition of electric and CNG buses AMTS would induct over study period. Initial phase, up to 2025, of bus fleet electrification is low at 10%-20% share of annual bus fleet induction as electric buses. This phase will build AMTS technical and operational capacities for e-bus planning and management. The fleet induction plan accounts for retiring fleet to maintain the bus service supply. Following figure represents induction plan for various scenarios:

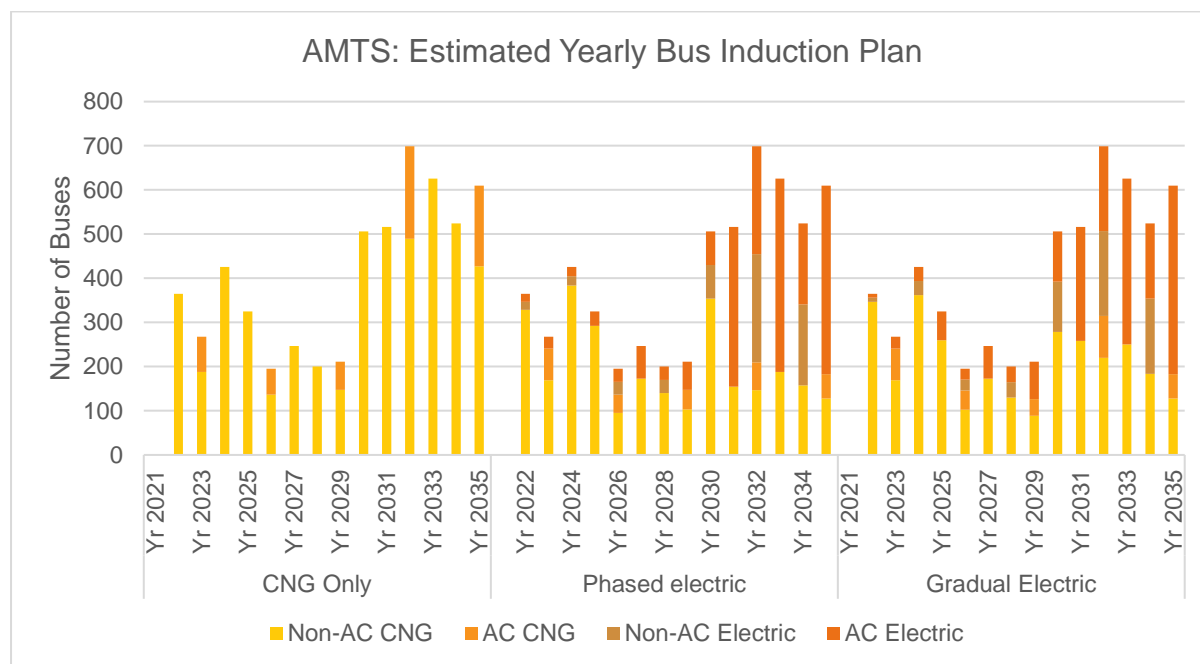


Figure 4-4: AMTS yearly bus fleet induction plan (by bus type)

By 2025, AMTS needs to induct 1384 buses to compensate the retiring fleet as well as to cater to growing passenger demand. AMTS needs to build back reliable services for gaining commuter's trust in the system to make it preferred choice for commute. This phase is also important to build system's image considering reopening of activities post covid and expected new passenger group expected to be served by last mile to upcoming metro. About 10.0% to 12.5% of fleet in this phase is recommended as electric. Additional 1359 buses shall be required to be inducted in fleet between 2026 to 2030.

4.3.4 Fleet Composition Scenario

The induction of fleet shall influence composition of fleet held with AMTS over life cycle of bus. As the initial phase recommends higher share of CNG buses, these buses shall continue over its life cycle of 7 years. It is observed from the graphs below, with the adopting of recommended phased or gradual electrification scenario, proportion of electric buses will exceed CNG buses post 2032 and 2034 respectively. Following figure represents scenarios of fleet held with AMTS over the study period:

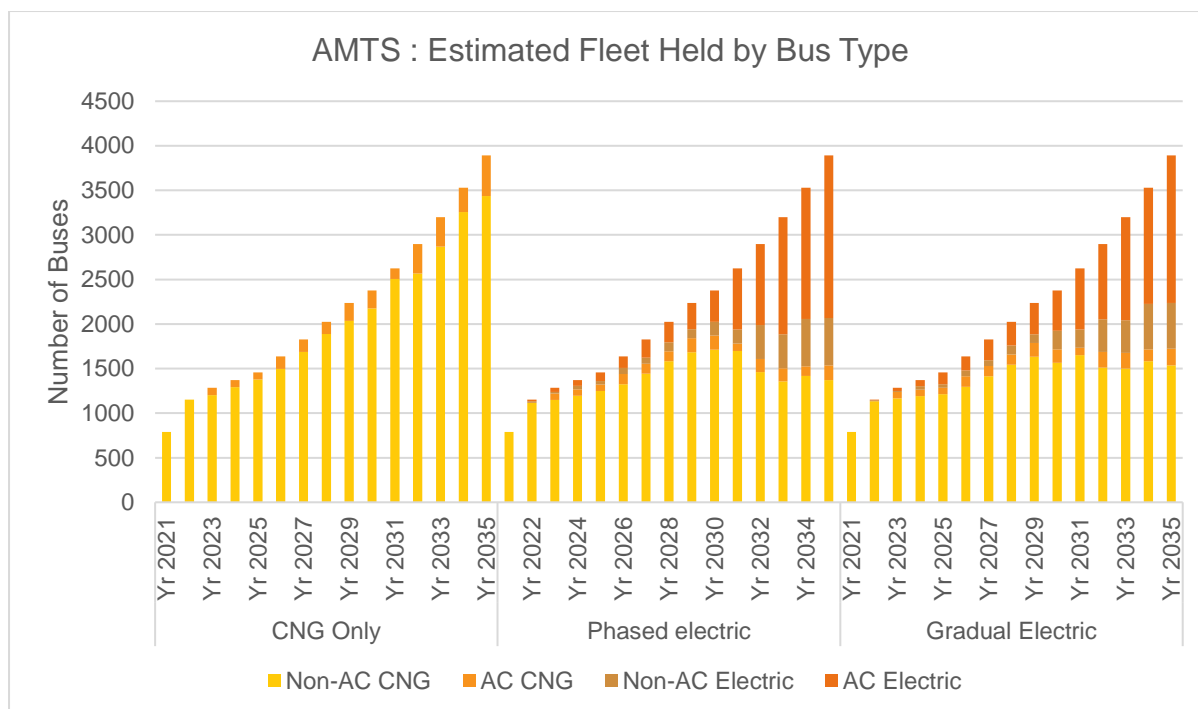


Figure 4-5: Estimates for AMTS bus fleet (by bus type)

The fleet mix will provide AMTS an opportunity to flexibly deploy the fleet on selective routes based on vehicle utilization to maintain TCO, passenger demand, and availability of charging infrastructure. The combination of AC and non-AC services can also be planned for routes with better paying capacity of commuters, thus improving EPKM. The fleet mix shall provide AMTS with scope of optimization of operational finances.

4.4 Transit Infrastructure Requirement

4.4.1 Depots Requirement

The induction of fleet would require more space for bus depot parking and maintenance. The current depot infrastructure is insufficient to cater to growing demand of buses. Considering the average capacity of 100 buses for new depots, it is estimated that total of 29 and 37 depot shall be required by 2030 & 2035, respectively (figure 4.6).

The current gap of depot requirement is estimated at 7 depots. Since the land availability and investment capacities of AMTS are limited the development of initial 7 depot is staggered over 3 years and thereafter the depot development shall be incremental as per yearly requirement (figure 4.7).

4.4.2 Terminal Requirement

The city is currently operating with 9 terminals. Considering the growth of city, changes in land use pattern and need to develop urban interchanges for integrated mobility, a total of 19 and 23 terminals is estimated to be required by 2030 & 2035, respectively (figure 4.6)

spread across the city activity nodes. Terminal requirement is estimated considering average 200 buses allocated each terminal.

It is recommended that AMTS may develop the required terminals adopting TOD and TDR measures to develop transit hubs based on location requirement. The transit hubs shall densify the captive users' accessibility as well as these hubs will provide additional revenue resource to AMTS operations.

Following figures represents the transit infrastructure requirement and plan for incremental development of the facilities.

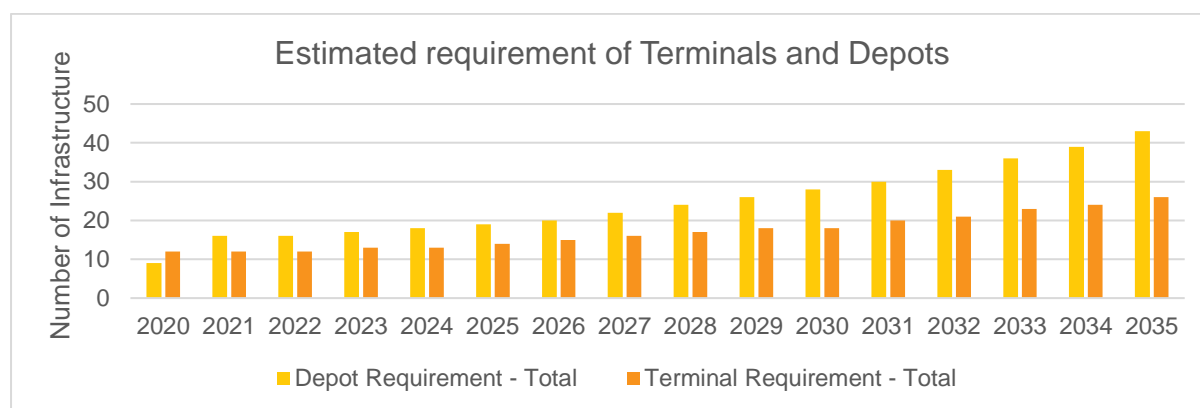


Figure 4-6: Estimated requirement of AMTS terminals and depots

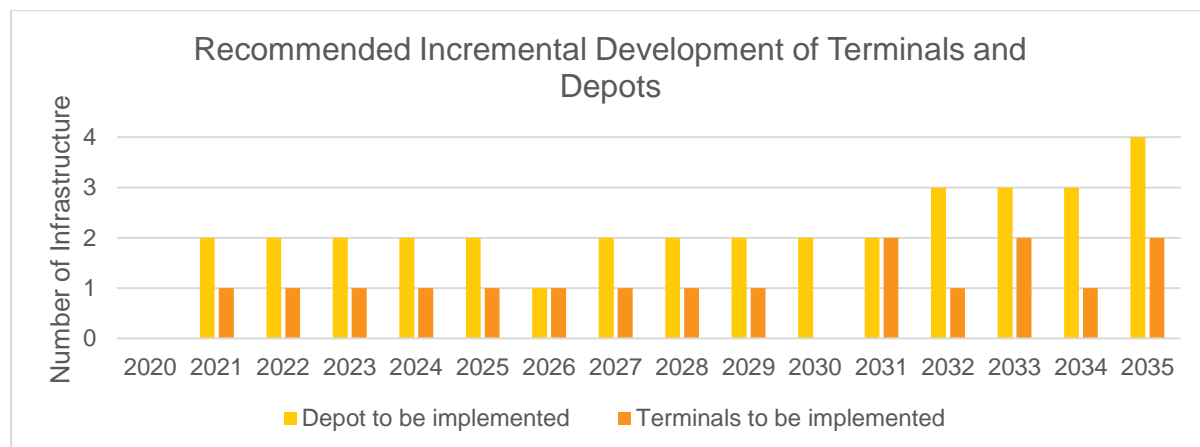


Figure 4-7: Recommended incremental development of AMTS terminals and depots

4.4.3 ITMS Service Requirement

ITS service includes monitoring of GCC service levels through on-board ITMS. The bus ITMS equipment are expected to be procured as part of bus. The ITMS service provider appointed by AMTS will be required to integrate the bus ITMS with the control center, enabling monitoring, maintenance of ITMS equipments and management of services.

4.4.4 Ticketing Service Requirement

Unlike BRT, AMTS has on-board ticketing. This requires deployment of ETM units and on-board digital payment devices. Option for appointing digital ticketing services through PPP can also be explored. The monitoring of ticketing staff can also be done through on-board cameras. Over the period, the cost of ticketing service can be reduced by increasing share of digital fare and aligning conductor-less services based on OD patterns of digital pass user.

4.5 Staff Requirement

The staff required for delivering AMTS bus services is estimated for the following categories: (a) management staff, (b) monitoring staff, (c) conductors, (d) drivers and (e) depot staff. The bus crew staff, i.e. conductors and drivers, is estimated based on yearly crew shift requirement to achieve 90% fleet utilization and paid leaves available to each crew staff. The crew shift is estimated considering maximum of 60% of the fleet shall operate with double crew shifts. About 1.75 conductors and 1.75 drivers are required per bus held with AMTS. Management staff ratio is considered as 0.15 staff per bus in line with Janmarg staff-bus ratio. Staff-bus ratio for monitoring staff and depot staff is considered as 0.2 staff per bus. Maximum of 4.05 staff per bus is sufficient for AMTS bus services.

It is to be noted that staff required for AMTS operations may be appointed as AMTS employee or contract staff. As AMTS role is expected to plan, manage, and monitor bus service the AMTS employee staff-bus ratio can be contained at 0.35 per bus while remaining staff can be appointed as contract staff directly by AMTS or through GCC. This strategy shall contain the expenses and liabilities towards staff. The current staff appointed as employee of AMTS is high and AMTS tighter with AMC requires to plan of reorganizing this excess staff. Few initiatives have been taken by AMC in past to contain staff-bus ratio. Such initiatives may be revisited to contain the expenditure on staff.

4.6 Cost Estimates for Bus Services

4.6.1 Estimates for Cost of Operations

The cost of operation accounts for a major share of expense related to public transport. The cost of operations is calculated accounting for AMTS staff costs, contract staff for ticketing, costs towards GCC operations, administration costs, bus insurance and taxes. The comparison between the total annual cost of induction and operation of the buses in each of these electrification scenarios is presented in the following figure. It is observed that post 2027 the estimated cost of operations for CNG only scenario shall be more than phased or gradual electrification scenario. As illustrated in the figure below, the total cost of operations per annum is almost similar in both gradual and phased electric scenarios.

The cost of operations is estimated considering GCC rates of INR 44 and INR 48 per km for non-AC and AC services. The GCC value of the operations is expected to rise with a yearly inflation of 4% calculated as weighted average of 6% yearly rise in salaries, three-year

average WPI for fuel and maintenance referred from RBI report. Cost of operations also considers insurance and taxes associated with operations. Current MV tax in Gujarat is 6%.

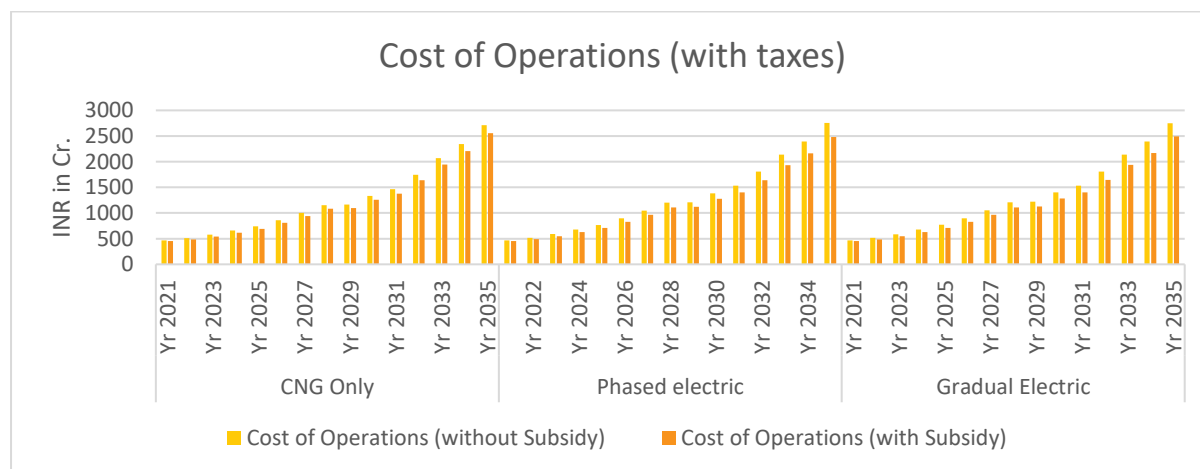


Figure 4-8: AMTS cost of bus operations (by scenario)

The estimates for cost of operations are presented with and without bus capex subsidy (table 4-5). In case of subsidy, the capex subsidies are estimated to be equivalent to those offered by Gol under current FAME-II and new MoHUA schemes. The difference in annual cost of operations for with and without subsidy cases is about INR 45 Cr, 110 Cr, and 260 Cr by 2025, 2030 and 2035 respectively.

Table 4-2: Cost of AMTS operations

Scenario	Cost of Operations in Cr. (without subsidy)				Cost of Operations in Cr. (with subsidy)			
	2022	2025	2030	2035	2022	2025	2030	2035
CNG Only	512	740	1335	2713	485	694	1256	2556
Phased Electric	519	768	1393	2773	489	712	1285	2504
Gradual Electric	515	773	1410	2768	487	715	1294	2509

It is evident that a significant saving in overall life cycle of bus operations is in case of bus capex subsidies. However, availability on bus capex subsidy depends on CM UBS program instituted by Government of Gujarat and bus procurement scheme initiated by Government of India. AMTS must take advantage of these scheme to improve its operational finances.

4.6.2 Cost Estimates for Transit Infrastructure Development

The city will also have to invest on transit infrastructure development for desired service levels. Development of depot and terminal account for major cost. AMTS may explore avenues of tapping funds from Gol/GoG schemes, investments through PPP and low interest funding through multilateral organisations. The estimated invested requirement is represented in following figure.

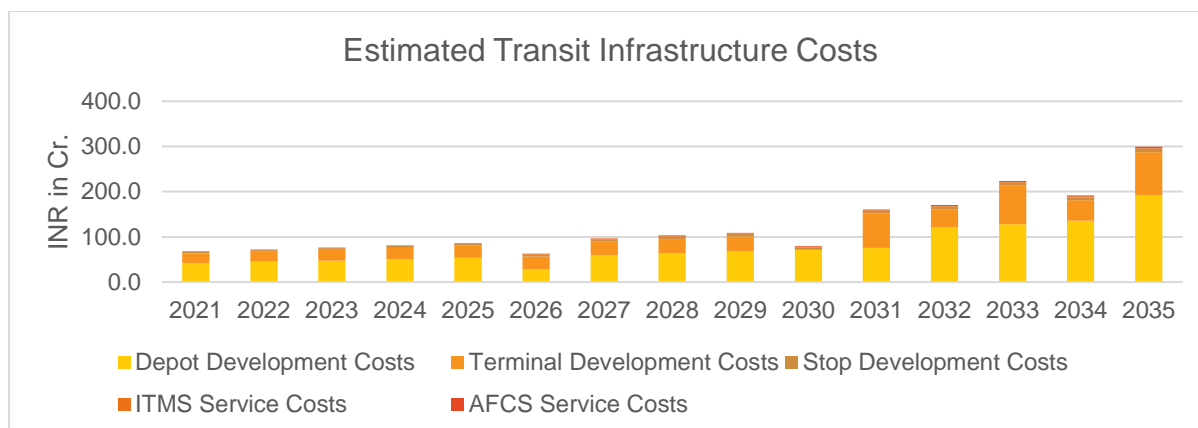


Figure 4-9: Estimated AMTS transit infrastructure costs

4.6.3 Cost Estimates for Staff

The staff cost for AMTS bus operations is represented in following figure considering cost towards AMTS employee staff and ticketing staff on contracts. Bus operations in GCC are recommended as it significantly contains the liability of fixed cost to AMTS.

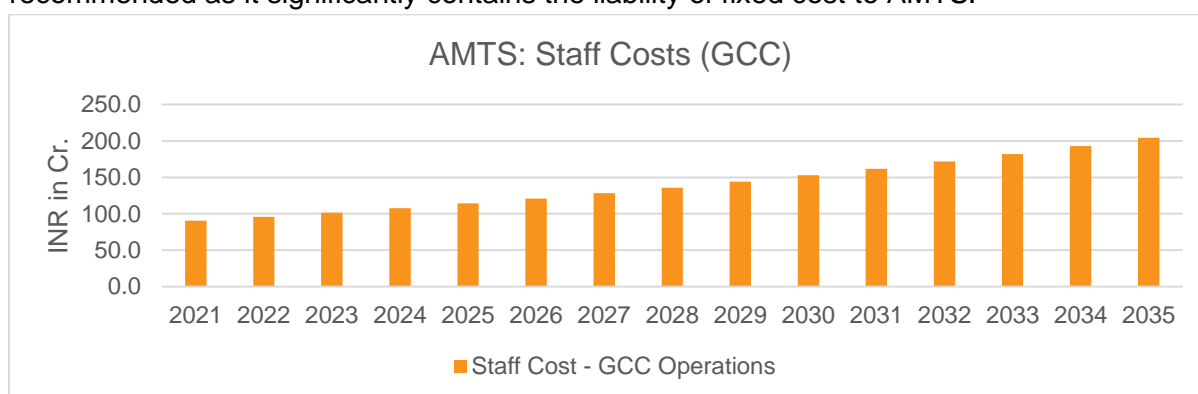


Figure 4-10: Estimated AMTS staff costs

4.7 Revenue Estimates for Bus Services

4.7.1 Farebox Revenue Estimates

AMTS services have high dependency on farebox revenue at the same time the commuters in Ahmedabad are price sensitive. In 2013, the fare increased from INR 9 to INR 11 for average trip length, i.e. INR 2 (22% increase) while reduced the AMTS ridership by about 15%. Hence, it is recommended to keep incremental periodic revision strategic to gain more ridership. AMTS is recommended to restructure its fare to attract short trips. The fare structure may also vary from service type and service hierarchy, e.g. different fare for regular, express and AC services. Currently, the average fare for ticket and pass is INR 7.34 & INR 1.54 only. The estimate for fare is considered with an average annual increase of 1.5% only. Following figure indicates estimated revenue collection through farebox as ridership increase over study period.

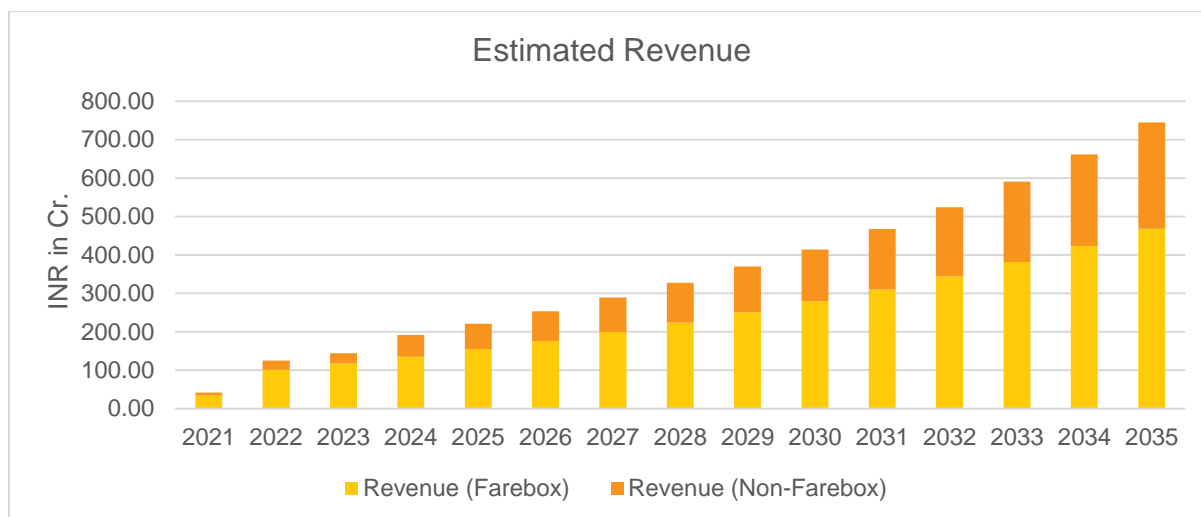


Figure 4-11: Estimated AMTS revenue (Farebox + Non-Farebox)

Farebox revenue collection for AMTS is expected to reach to INR 155 Cr, INR 279 Cr and INR 468 Cr. by year 2025, 2030 and 2035 respectively, if effective measures are taken by AMTS and AMC to provide reliable services and adopting demand management measures.

As observed from recent initiatives to improve accessibility, public transport operator also provide free public transport to selected section of society like for women, senior citizens, labours, etc. Given the need for ensuring accessibility through such initiatives and limited farebox revenue to meet overall operational costs, AMTS will have to reduce its dependency on farebox revenue and explore new avenues of non-farebox revenue for long term sustainability.

4.7.2 Non-Farebox Revenue Estimates

AMTS non-farebox revenue resources have, till date, been limited to on-bus advertisement, stop/terminal advertisement, and revenue from bus scrappage. AMTS can widen its frame of advertisement revenue from other advertisement sources such as AV advertisement, on-board radio, revenue share from street advertisement display. Land value capture and property rentals for commercial activities are also major sources of revenue which may be explored by developing transit hubs with commercial activities at viable terminal locations. AMTS may also explore other forms of non-farebox revenue sources such as parking revenue or data monetization as well as possible branding rights for its bus stops and interchanges.

It is estimated that AMTS may explore more avenues of non-farebox to increase its share gradually from current share of 20%-25% to 35%-40% of total revenue by 2035. This may also require initial investment on development of terminals as transit hubs with commercial potential. Such development investments may also be explored on PPP basis.

4.8 Operating Finances of Bus Services

4.8.1 Tax & Insurance

Taxes & insurance represents a small proportion of expenditure made by public transport operator. On actual value these represents a significant contribution to government treasury. The direct taxes for electrification scenario are slightly higher than CNG only scenario while CNG only scenario would be contributing more cost to GoG through indirect tax collection which are in form of central exercise duty.

4.8.2 Aligned Grants

Government of Gujarat have announced operational VGF of 50% of deficit or maximum of INR 12.5 per km for buses operating on non-renewable fuel and INR 25.0 per km for electric bus operations. An equivalent amount is expected to be provided as a grant by AMC to AMTS as a VGF. This indicates an aligned grants of INR 25 & INR 50 for non-electric and electric powered buses. This implies available VGF per km to AMTS shall increase with increase in electric bus operations. This strategy shall be more viable if difference between GCC cost of CNG bus and electric bus operations is less than INR 25. Current VGF is available for 7 years period while this report considers AMTS will continue to receive viability gap funding from the Government of Gujarat on renewal of this funding scheme. Following figure indicates grants received in various scenarios for bus operations.

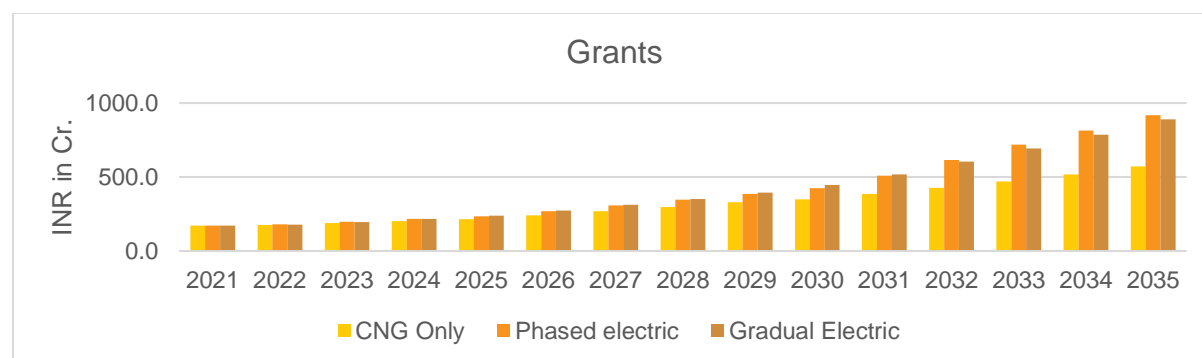


Figure 4-12: Estimated grants for projected AMTS operations

4.8.3 Earning per Kilometre (EPKM)

Earning per km is a critical parameter for bus operations. It indicates availability of finances for bus operations. The earning from farebox and non-farebox shall be of similar value for each scenario, as it is independent of bus fuel technology. The farebox EPKM for the buses shall be around INR 20 considering limited fare increase. AMTS will have opportunity to explore non-farebox revenue resources to increase overall EPKM to INR 35-40.

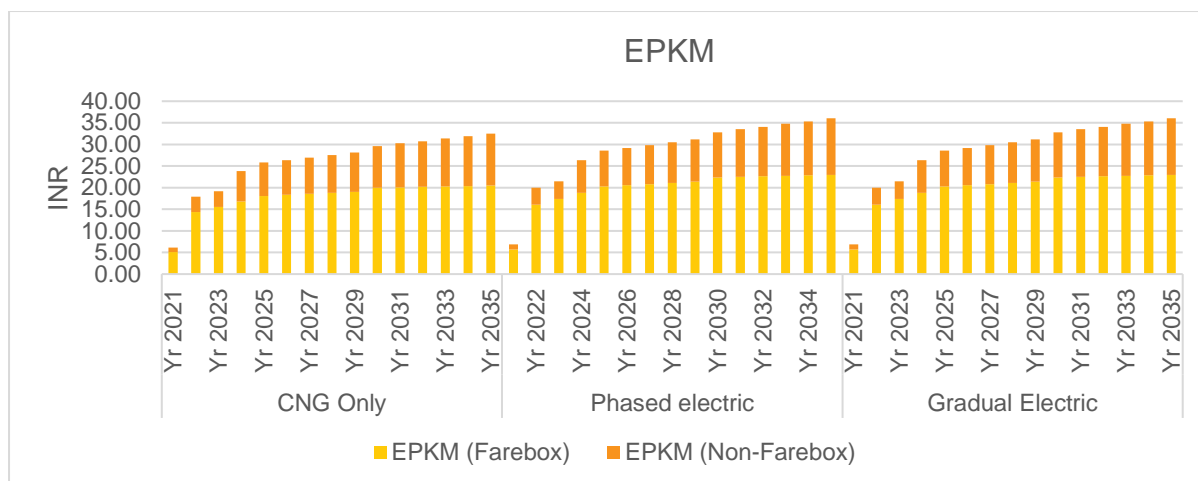


Figure 4-13: Estimated AMTS EPKM (by scenario)

4.8.4 Cost per Kilometre (CPKM)

Cost per km for bus operation indicate expenditure levels of bus services. To attain financial sustenance, public transit service operator must contain the CPKM levels. The trends in AMTS have observed threefold increase in CPKM in past decade. Such trends can make system unviable in future. The study indicates that the increasing trend of CPKM can be contained by outsourcing the bus crew (drivers and conductors) and transiting to electric powered buses. In 2019, CPKM for AMTS was 91. This may double if corrective reforms are not adopted. It is estimated that the operation related CPKM can be contained between INR 74 to INR 102 with proposed measures. Availability of subsidies on bus capex through GOI & GOG schemes can reduce CPKM by INR 4 to INR 12. Following figure indicates estimated stabilised CPKM with adoption of recommendation of this study.

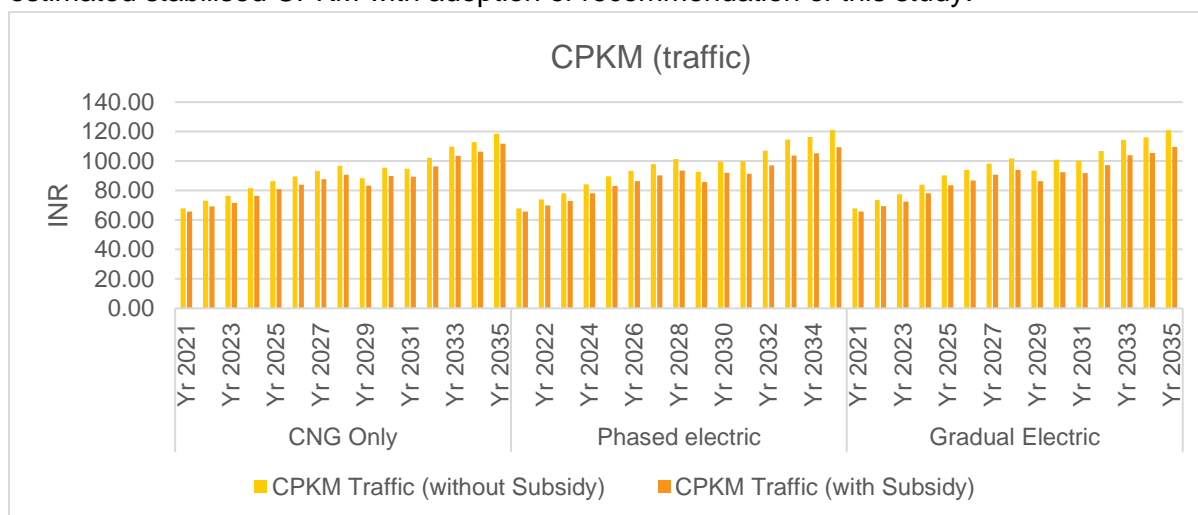


Figure 4-14: Estimated AMTS CPKM (by scenario)

4.8.5 Operational Deficits

The operational deficit has grown from INR 11 to INR 64 between 2008 and 2019, i.e. more than five-fold. This may continue to increase with increase in fuel price, increase in staff costs and inflation on other operation components. The estimates indicate that efforts made

to deliver customer-oriented services, explore non-farebox revenue resources, and transition to electric bus can contain the increasing financial deficits below INR 60 upto 2030 and even reduce the annual financial deficit by 15% to 25% by 2030. The following figure indicates the deficit in various scenarios.

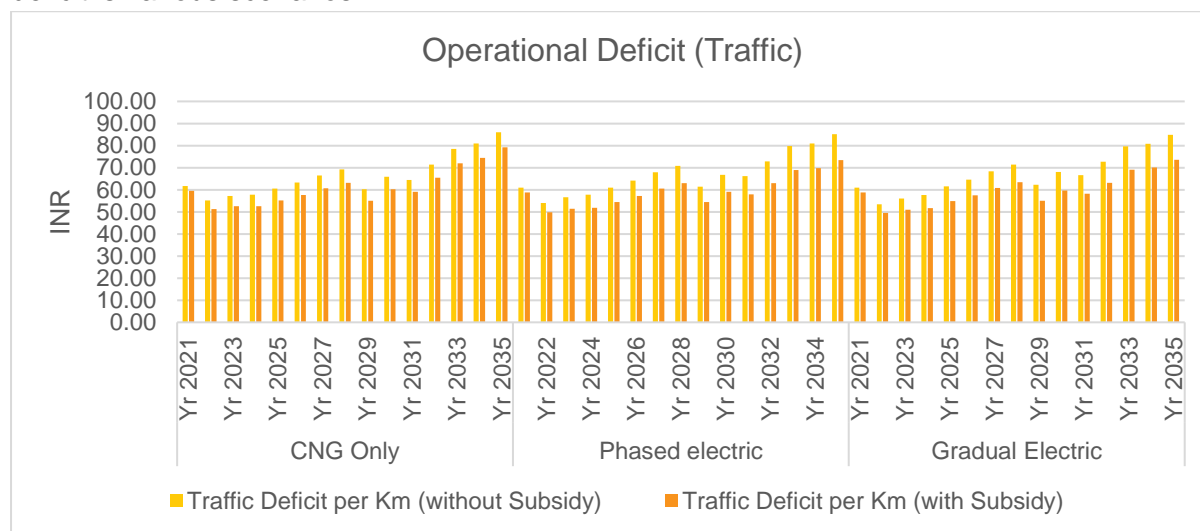


Figure 4-15: Estimated AMTS operational financial deficit

4.8.6 Operating Value Composition

Planning for bus operation finances require an understanding of composition of revenue resources to cost. The understanding of operating value provides an insight on financial tools to be leveraged to attain financial sustenance. Earnings from farebox and non-farebox revenue only account for about 30% to 35% of operational costs. The current VGF share can support additional 35% to 40% of operational costs with increase in electric bus fleet. Direct taxes and insurance accounts for 4% to 6% of costs over the study period. Further, 10% of deficits can be curtailed leveraging bus capex subsidy schemes and additional 3% to 5% with subsidies to associated with transit infrastructure development schemes. Following figures indicate the estimated operational deficit can be contained with efforts to reduce farebox dependency.

The study indicates that with appropriate methods are adopted for financial management the deficit can be contained below INR 60. Further, VGF and innovative financing can reduce losses of AMTS below INR 12 per km.

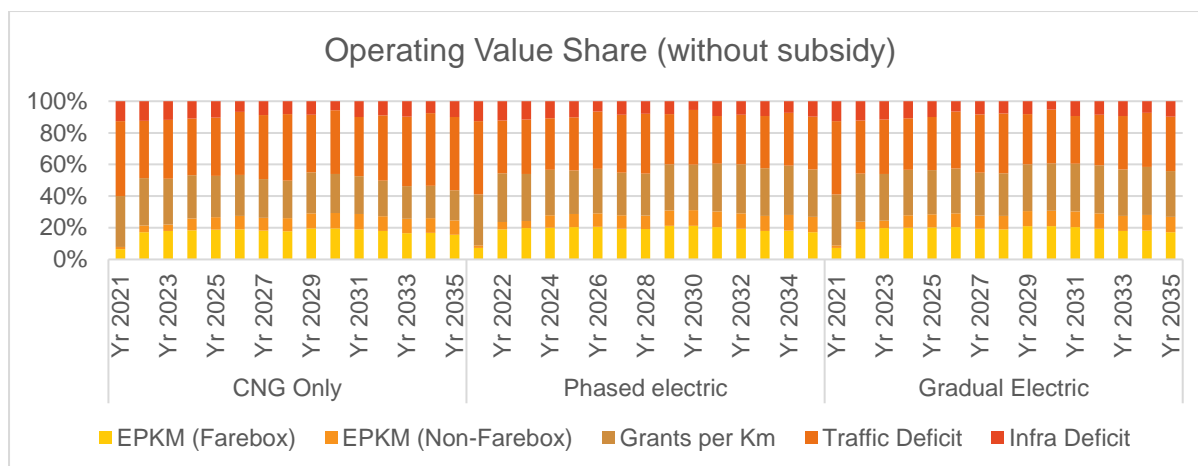


Figure 4-16: Estimated operating value composition (without subsidy)

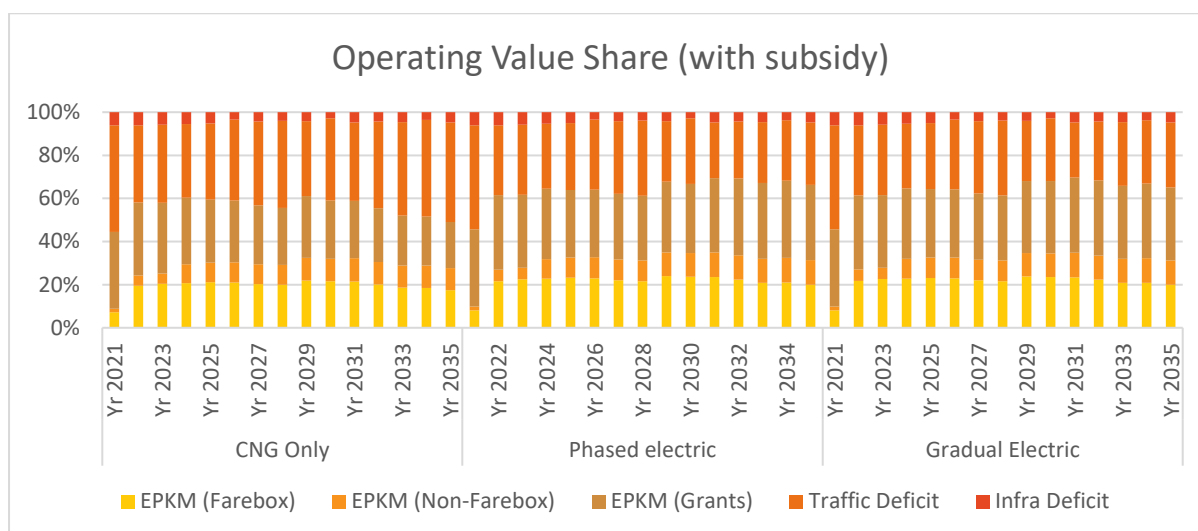


Figure 4-17: Estimated operating value composition (with subsidy)

4.9 Inferences

Currently, AMTS has two critical aims to ensure existence of system (a) increasing ridership while delivering efficient services and (b) pursuit for financial sustenance. These aims can be achieved by progressive reforms in operation planning, system management and through innovative financing.

Metro phase-1 DPR has identified AMTS as a major mode serving 50% of PT ridership across study period. A ridership of 13 lakh and 20 lakh is estimated for 2030 and 2035 respectively. This reflects a latent demand ready to be served by AMTS. Hence, AMTS has potential scope to ensure public transport availability by gradually increasing its fleet to 2378 by 2030 and 3892 by 2035. AMTS services shall also need to deliver bus services suitable to changing nature of transit patterns, user expectation and affordable service to gain mode shift from shared IPT services and private vehicles. AMTS need to ensure accessibility and reliability to gain the potential ridership as estimated by MEGA.

Contemporary trends indicate that cost of operations of non-renewable fuel powered buses is increasing while with increasing scale of economy the cost of electric powered buses is decreasing. This indicates a steady transition towards electrification of AMTS fleet will be financially sustainable. As presented above, the analysis of financial deficit of electrification scenario are better than CNG as even with all other reforms the deficit in CNG only scenario will increase by 55% over the study period while deficits shall be contained within existing limits with phased or gradual electrification of AMTS fleet. The AMTS needs to make its choice to move towards more sustainable bus technology options.

Additionally, comparing the current average annual cost of the electrification scenarios highlight the need for a mix of CNG and electric bus through GCC based procurement of services. Considering the costs estimated, and the rate of electric bus adoption, the phased electrification scenario seems to be the most economical. However, this data needs to be further analysed and compared with scenarios with increasing mode share, and public transport service provision.

AMTS has already looking forward for moving towards 100% GCC bus service operations. Recently, few initiatives have been adopted in exploring non-farebox revenue resources. Also, support from GoG through dedicated operational VGF have provided AMTS time to take corrective measures to attain sustainability. While these efforts are adopted in right direction, more reforms shall be needed to restructure AMTS operations and management.

The following section presents long term vision for AMTS bus service operations and framework of strategies to be adopted to attain financial sustenance.

5 Setting a Vision for AMTS

5.1 Commuter Centric Approach

Commuters are direct beneficiaries of transit services. Commuters make mode choices based on accessibility, availability, affordability, convenience, journey experience, service levels as well as brand value of services. Hence, AMTS needs to restructure its approach to bus service planning and delivery. The services should provide commuters choice for journey experience. A good journey experience can gain trust and confidence of commuters to use transit services.

AMTS key objective should be to make AMTS a preferred choice to commute over paratransit and private vehicles. This would require a well-planned approach framed with commuters at center of its bus service planning exercise. A commuter centric approach has a potential to revive AMTS ridership. Following figure represents parameters for commuter centric approach.

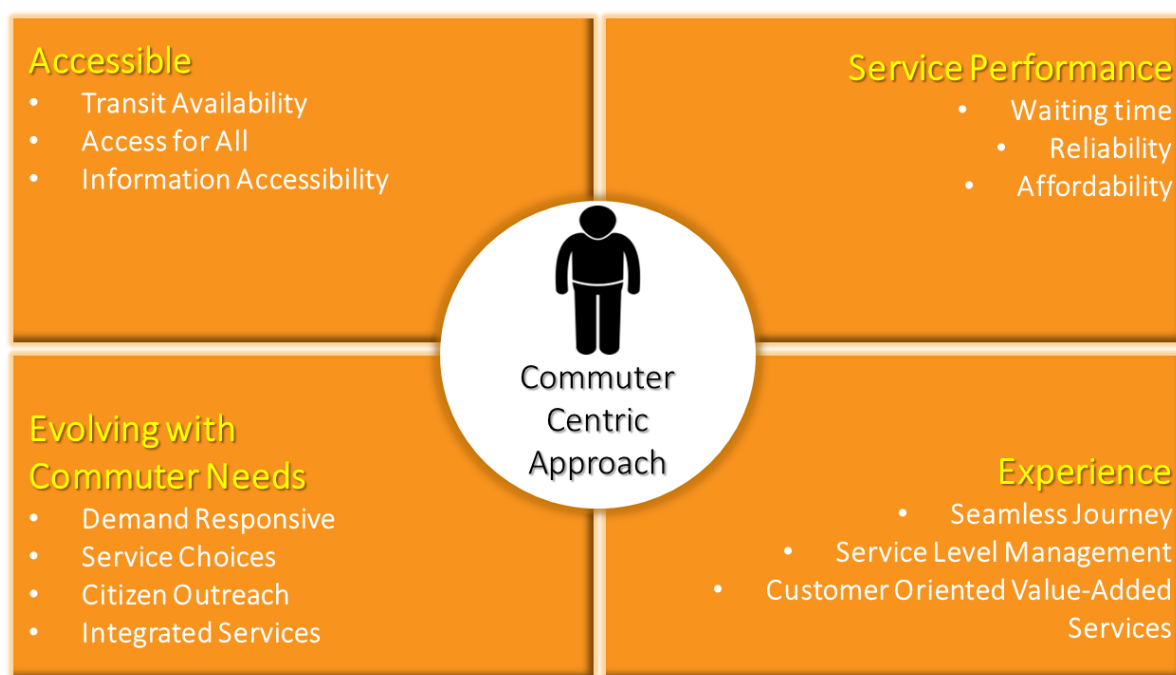


Figure 5-1: Commuter centric approach for urban bus services

5.2 Framework for Ahmedabad Public Transport

Planning for bus services requires a balance of operational efficiencies while delivering desired service levels. This would require a holistic view across policies related to operations, technology, institutional management, and finances. Since, bus services are of flexible nature and require periodic inputs for creating system efficiencies, the reforms in these areas of policy may be aligned to performance-based services. Thus, reforms related to AMTS ecosystem should be adaptive in nature with an outcome-oriented approach.

A framework for creating an adaptive eco-system for sustainable AMTS bus services has been developed (figure 5-2) considering planning inputs for customer centric approach and policy input for balancing service levels and system efficiencies.

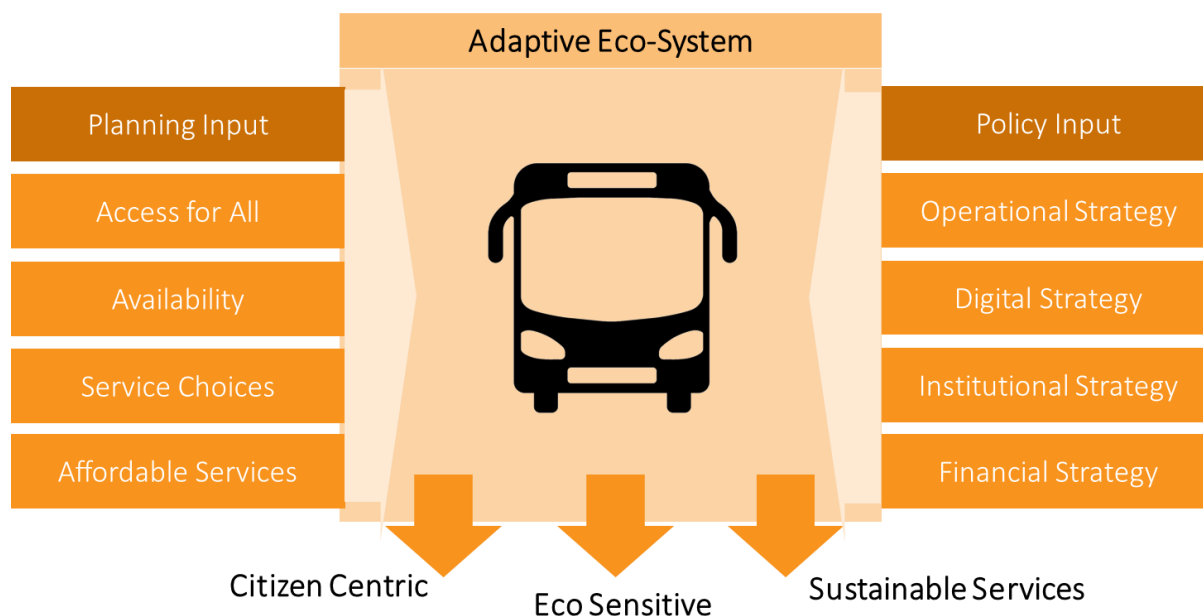


Figure 5-2: Framework of AMTS Vision

5.3 AMTS Vision Statement: 2035

VISION STATEMENT | 2035

Achieve 20% mode share by providing commuter centric urban bus services while improving operational as well as financial performance utilizing planning, technology, and fiscal tools.

5.4 Benchmarking Performance Goals to Achieve AMTS Vision

A roadmap to achieve a long-term vision requires to build a short-term timebound goals and targets. Following are few customer specific and operator specific goals to be achieved by AMTS periodically to attain financial sustenance. The proposed goals are achievable if technical, management and fiscal reforms are adopted with timebound approach.

Customer Specific

- Improved accessibility for 90% of commuters within 500m from bus stop by 2025
- Waiting time for 80% of commuters ≤ 15 min waiting by 2030
- Seamless transfers for 80% of commuter ≤ 1 for integrated journeys
- Real time information accessibility for commuters by 2025
- Achieve overall public transport service level of LOS-2 or better throughout services.

Operator Specific

- To serve atleast 15% mode share by 2030 and 20% mode share by 2035.
- Achieve PT Availability of LOS 2 by 2030; and LOS 1 by 2035.
- Ensure Fleet Utilization of 92%+ with depot management system and fleet health management system.
- Ensure Vehicle Utilization of 175 km+ for AMTS by adopting strategies for maintaining journey speed & asset utilization.
- Achieve improved occupancy ratio to 75% for AMTS with data-based planning & scheduling.
- Increase share of digital revenue to >25% by 2025; >50% by 2030; >75% by 2035.
- Improving non-farebox revenue share to >25% by 2025; >30% by 2030; >35% by 2035.
- Limit operation CPKM within INR 85 upto 2025; INR 100 upto 2030; INR 120 upto 2035 including staff cost, ticketing cost, monitoring cost, GCC value, insurance, and taxes.
- Align innovative financing options to UTF for managing deficit by 2025.
- Establishing an UMTA for coordinated operations and planning of public transport in Ahmedabad by 2025.

6 Roadmap for Implementation of Vision

Since its peak performance in 2008, AMTS service levels have dropped significantly. The drop in service levels triggered lower ridership levels widening of financial deficit which in turn further lead to drop in service quality. To break this cycle of lower performance levels under constrained finances AMTS shall need to undertake sets of reforms at earliest. Similar initiative was undertaken by Government of Gujarat during 2005 reforms which were made to contain AMTS financial losses and bring back lost ridership.

AMTS vision to provide commuter centric services while improving its performance requires a comprehensive approach focusing various domains of delivery of sustainable public transport services. To achieve its vision AMTS can leverage planning, technology, management, and fiscal tools for creating system efficiencies and promoting AMTS mode share through deliver of reliable and affordable services.

The study has focused on development of adaptive strategies in six areas as follow:

- Planning for Covid Recovery
- Planning Strategy
- Operations Strategy
- Digital Strategy
- Institutional Strategy
- Financial Strategy



Figure 6-1: Adaptive strategies

6.1 Planning for Covid Recovery

COVID 19 Pandemic has impacted public transit significantly. AMTS services which were facing financial stress and highly dependent on farebox revenue were further impacted by COVID 19 lockdown. Post-lockdown 2020, AMTS reinstated 66% of its operational fleet with ridership restriction. The ridership dropped from 5.15 lakh per day to 1.12 lakh per day, i.e. recovered to only 22%. The EPKM dropped from INR 28 to INR 11, i.e. recovered to only 39% while the expenses were still at 62% of pre-COVID levels. This has widened the operational deficit. This widening financial deficit has challenged the survival of AMTS. Before AMTS could recover from this loss, the second wave of COVID (beginning March 2021) and subsequent lockdown added to its financial stress. AMTS has planned to resume 50% of its services since June 2021.

Resumption of AMTS services in old format may not be relevant as the pandemic has changed the commuters' OD travel pattern and mode choice. The study has made recommendation to recovers from the impact of the prevailing pandemic, aiming to bring back the lost mode share by 2022. To achieve this aim and achieve financial sustenance, AMTS must ensure they build trust with existing users. There

**Build back better
urban bus services**

should also be changes in service planning and operations to build system efficiencies. Following strategies are recommended to be adopted by AMTS to regain lost ridership levels:

1.1	Realigning & Operating Priority Routes as Hierarchy Services <ul style="list-style-type: none"> Establish Ring-Radial (non-BRT routes) as AMTS trunk network Operate Terminal to Terminal services as AMTS Hub Connectors Initiate hire-a-services in collaboration with institutions/industries 	Creating efficiencies through high demand network
1.2	Leverage Technology for Reliable Transport <ul style="list-style-type: none"> Use pre-covid ETM data and primary survey data for assessing major OD pairs, & realigning/prioritizing secondary routes. Encourage use of cashless payment for transit. Temporal incentives can be provided on use of smart cards. 	Optimizing operations and encouraging smart cards to retain assured ridership
1.3	Ensuring Hygiene & Communication Strategy <ul style="list-style-type: none"> Understand commuters concerns to shift to new mode Adopt communication strategy through various media (newspaper, TV, radio, ITMS, social media, citizen app, etc) to gain commuters' trust. Adopt regular fleet/stops sanitization policies & user SOPs. 	Trust building with captive users to bring back pre-covid AMTS mode share
1.4	Fleet Supply Strategy <ul style="list-style-type: none"> 30% of existing fleet is retiring by 2022 . AMTS require additional fleet of 367 buses to regain lost mode share. New fleet service procurement process to be initiated. Prefer to deploy GCC fleet on priority routes for utilization of assured-km 	Optimizing bus service finances for year 2021 & 2022

6.1.1 Development of Priority Network

Creating service efficiency while increasing accessibility should be a prime objective of COVID recovery phase. AMTS should be able to provide more accessibility and service more commuters per revenue-km. This can be achieved by developing a priority network.

AMTS may leverage pandemic to realign its services to hierarchy based efficient and integrated route network. AMTS may strategically resume its services post lockdown with staggered opening for hierarchy-based routes. AMTS may introduce its ring-radial services as trunk network and transit hub connectors between terminals through which it will be able to serve higher share of demand with optimum supply. This will improve system efficiency while providing higher accessibility. Following figure illustrates a conceptual trunk network and transit hub connectors.

Assessment of new OD demand for priority routes may be done through field survey or by circulating commuter travel need survey over digital platform. Additionally, AMTS may offer special hired services for dedicated user group in collaboration with institution/industries like GIDC Vatva, GIDC Naroda, GIDC Odhav, Gujarat University and Gujarat College as well as VS Hospital, etc.

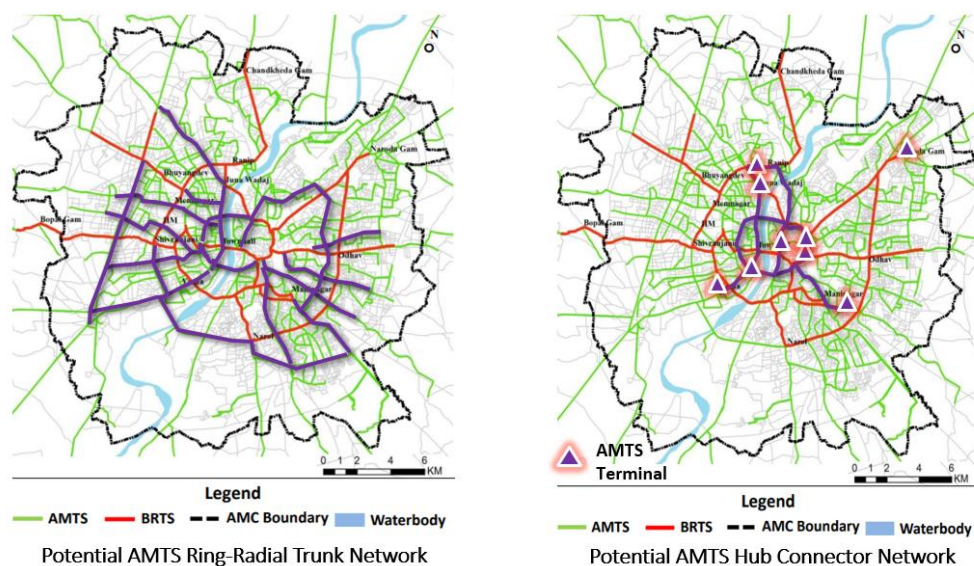


Figure 6-2: Conceptual priority routes for AMTS (a) ring-radial trunk network & (b) hub connectors

6.2 Planning Strategy

AMTS must aim to be the backbone of the transport system in Ahmedabad. As AMTS is expected to support 50% PT ridership it requires a rational planning strategy to increase its service accessibility. AMTS vision to adopt customer centric approaches to serve the city commuter better, with focus on improving service levels shall reinstate commuter trust within the system. Simultaneously, AMTS must also focus on improving internal efficiencies by rationalizing its services network and planning for integrated services.

**Creating
operational
efficiencies**

Accessible Network Development: Accessible public transport network is a key requirement for encouraging commuters to use services. Provision of accessible services shall require improved public transport availability. City must plan to achieve PTA of LOS 2 to be achieved by 2030. AMTS must increase its accessibility through provision of bus stop served by frequent service of less than fifteen minutes within 500m radius for at least 80% of the population.

Creating Service Hierarchy: AMTS need to develop a hierarchy-based network to reinstate service levels high demand routes. The priority route network, as proposed in covid recovery strategy, through ring-radial trunk network and transit hub connectors can be strengthened and branded as AMTS service hierarchy. Additionally, AMTS together with Janmarg and MEGA may create feeder routes to realign with changing needs of city travel pattern. AMTS may also plan for introducing conductor-less express services between high demand OD pairs. Creating a hierarchy in service will allow AMTS to improve efficiency of its network.

Fleet Strategy: Unlike rail-based public transport system, bus system provide flexibility of operation. The bus system can develop strategies to build itself as an adaptive PT system. In case of Ahmedabad, city possesses BRTS and AMTS as two bus system. The fleet design limits itself from being used across both systems. A fleet design compatible for both

system shall not only provide fleet management but also opportunity for provision of integrated services. AMTS have taken such initiative in past and should continue to procure fleet compatible for both systems. Additionally, the fleet induction should adopt midi buses to access areas with road network constraints as well as to serve high and low demand areas viably. Mix on AC and non-AC fleet should also be made provide choice for various user group. Considering the fuel technology, as discussed earlier in this report, there are significant benefits to be achieved from opting to electrify the fleet gradually over the next few years. AMTS should strategically plan for transition to electric bus fleet as estimates suggests the technology would provide financially stable operations in long-term.

Development of Transit Infrastructure: Transit services in a city cannot operate in isolation. It is recommended that city may plan for development of ‘Bus-Ports’ as integrated transit hubs. This would provide commuters a seamless interchange opportunity through various urban transport services. Transit node may be identified based on model proposed under IMP Ahmedabad considering hierarchy of interchange and density of origin-destination zone. Kalupur railway station, Maninagar railway station, Sabarmati railway station, Geeta Mandir and Ranip regional bus terminals are best fit for development of regional interchange. Locations such as Lal Darwaza, Wadaj, Paldi, Hatkeshwar, etc. may be potential sites for development of urban transit hubs. AMTS may conduct a detail feasibility study for development of transit hubs and leverage land value capture to finance infrastructure.

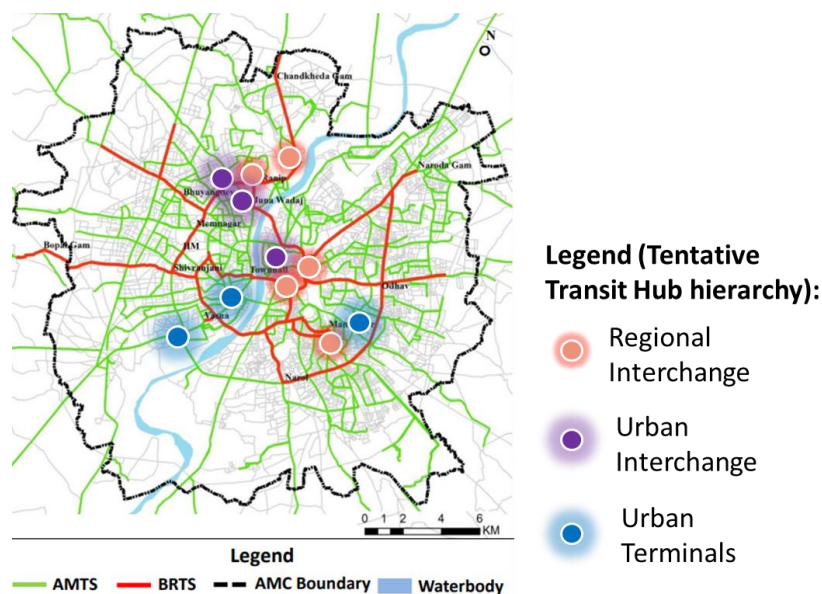


Figure 6-3: Tentative sites for development of transit hubs

The increase in fleet leads to need of development of depots. The described, the depots are not distributed across city which either leads to high dead-km and/or increase in low revenue-km. The high demand generating areas like Bopal, Thaltej, Gota, Sarkhej, Lamba, Isanpur, Vatva, Naroda Patiya, etc. do not have depots within 5 km increasing dead-km. The city needs to strategically allocate land across city to minimize dead-km while increasing accessibility. AMTS must coordinate with AMC to reserve land at strategic locations for depot. Since, each km of operation cost to service provider, minimizing dead-km shall

translate to huge financial saving. The figure below indicates tentative buffer areas where AMTS should identify appropriate and for development of depot.

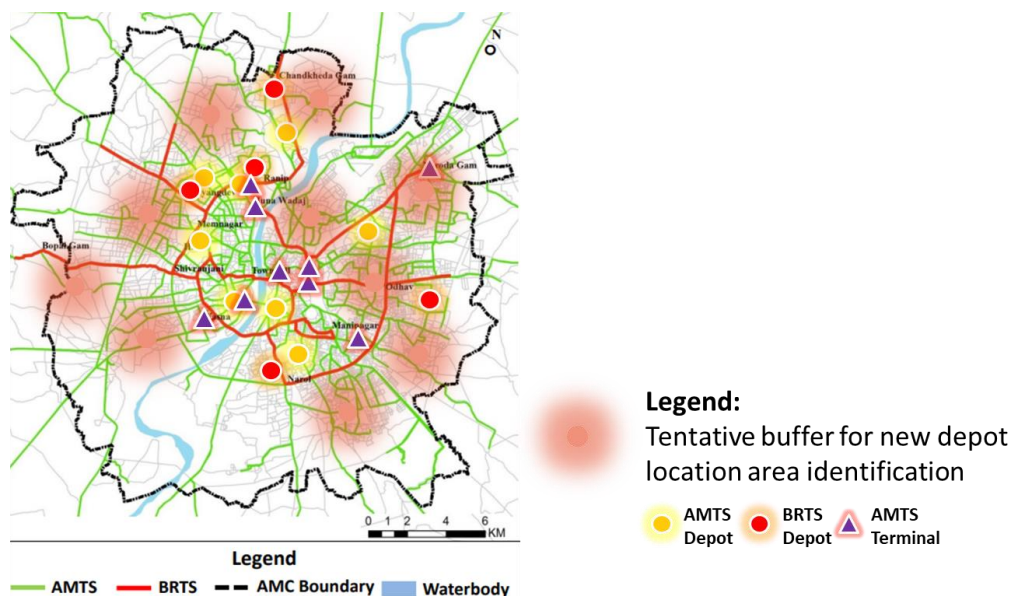


Figure 6-4: Tentative sites for development of AMTS depots

2.1	Accessible Network Development <ul style="list-style-type: none"> Improve public transport availability of at least LOS 2 by 2030 Bus stop within 500m to at least 90% of service area population PT Service availability ≤ 15 min to 80% network Ensure (real time) information accessibility to users via digital platform 	Reliable 'Access for ALL'
2.2	Create Service Hierarchy <ul style="list-style-type: none"> Strengthen AMTS ring & radial as trunk services network Strengthen hub connector service network Advance planning of AMTS as MRT feeder bus routes Introduce conductor-less express services on high demand OD pairs. 	Creating service choices to attract choice-based riders
2.3	Fleet Strategy <ul style="list-style-type: none"> 30% urban bus fleet to be electric by 2030 Transition to 900mm floor BRT compatibility buses for seamless mobility Fleet Mix to be considered for route/service requirement based on (a) bus capacity; (b) AC/non-AC; & (c) Fuel Technology viability 	Fleet flexibility to improve accessibility and efficiency
2.4	Development of Transit Infrastructure & Integrated Service Network <ul style="list-style-type: none"> Coordinate & develop passenger 'Bus-Ports' with HSR, Western Railways & GSRTC; seamless interchanges with MRT; hierarchy-based transit hubs Upgrade Bus Terminals as TTMCs (zonal) through PPP Development of Depots distributed across city 	Integrated PT Services

6.3 Operations Strategy

AMTS need to build internal efficiencies in the system to make itself sustainable. The provision should be focused on ensuring service performance levels as well as encourage potential commuters to adopt AMTS as preferred choice to commute.

Creating Service Reliability: Increase in traffic and congestion levels reduces the system speed. This can lead to decrease in vehicle utilization over a period. Various forms of bus priority measures such as signal priority, bus lanes, queue jumpers, etc. can be adopted to ensure fleet productivity. Such measures shall also save journey time of commuters encouraging use of AMTS services.

Customer at the core of bus service operations

Planning for Service Optimization: AMTS should set-up a periodic process of service optimization (by type) based on passenger data analytics. The process shall empower decision makers with a rational tool for optimizing services. The city should also encourage public transport entities in region to plan for coordinated services and reducing internal competition to increase efficiency of services.

Building Operational Efficiencies: Overall objective of AMTS should be to improve its operating ratio ($EPKM \div CPKM$) while delivering service levels. AMTS needs to adopt strategies for increasing its fleet utilization. The fleet health management and well-equipped bus maintenance facility shall reduce breakdowns and increase service reliability. The measure adopted shall improve staff productivity and vehicle productivity to improve CPKM.

3.1	Creating Service Reliability <ul style="list-style-type: none"> Ensure schedule adherence and trip adherence To provide bus priority in various forms to high demand corridor; this shall also improve bus utilization & CPKM. 	Improve mode share (AMTS) to 15% by 2030 & 20% by 2035
3.2	Planning for Service Optimization <ul style="list-style-type: none"> Set-up a periodic process for service optimization (by type) based on data-based OD assessment, Service levels and customer rating. Plan for co-ordinated services between BRTS, AMTS & Feeder 	Improve occupancy level upto 75% by 2030
3.3	Building Operational Efficiency <ul style="list-style-type: none"> Strategies including bus priority & fleet health management to be adopted for increasing fleet utilization & reliability Strategies to increase staff productivity & increase transparency 	Contain deficit below INR 100 upto 2030 & below INR 120 upto 2035
3.4	Periodic Service Level Monitoring <ul style="list-style-type: none"> Set benchmarks for performance level of services by type Strengthen SLA monitoring to ensure reliability On-site supervision/vigilance staff to log incidences by category, time, place, proof of incidence, assignment to resolution unit. 	Achieve overall service level of AMTS to atleast LOS 2

Periodic Service Monitoring: AMTS should set time-based benchmarks for achieving service levels. Periodic monitoring of these service indicators shall encourage staff to

efficiently operate services. Additionally, an on-site supervision/vigilance staff may be assigned with electronic log to map incidences by category, time, place, proof of incidence, assignment to resolution. This will create transparency and accountability with operators to maintain fleet.

6.4 Digital Strategy

Public transit agencies need to adopt fast paced technology changes to compete with other modes. To achieve its vision, AMTS can leverage the matured technology to improve its operations, monitoring and management creating efficiencies with rational decision making. In addition to the strategies discussed already, AMTS must invest heavily in a digital strategy to improve the experience of bus users.

Leveraging technology for efficiencies

Digital Strategy for Operations: It is recommended that AMTS to create a tool for data-based planning & scheduling; scaled-up with BI for bus-km optimization empowering rational decision making. Digital tools may also be adopted for data driven SLA monitoring. This shall induce transparency, provide accuracy as well as reduce turnaround time for incidence management.

Enhancing Digital Accessibility: Information accessibility, ease of payments and Mobility as a Service will draw more people to use public transport. City may adopt digital platforms to provide real time information of integrated services. AMTS should look forward for Stage-wise implementation of features of Mobility as a Service enabling user to plan journey through choices.

4.1	Digital Strategy for Operations <ul style="list-style-type: none"> Create a tool for data-based planning & scheduling; scaled-up with BI for bus-km optimization, OD assessment & reliability. Maximize data driven SLA monitoring to induce transparency and accuracy as well as tracking resolution of incidences 	Setup periodic process for rational decision-making operation planning & monitoring
4.2	Enhancing Digital Accessibility <ul style="list-style-type: none"> Ensure real time information accessibility to commuters on integrated platform for MRT + BRT + AMTS + Feeder. Stage-wise implementation of features of 'Mobility as a Service' by 2025, enabling user to plan journey through choices. 	Enhanced real time information accessibility for commuters
4.3	Promoting Digital Fare / Digital Pass <ul style="list-style-type: none"> Promoting digital fare/pass for MRT + BRT + AMTS + Feeder to provide integrated services Digital e-ticketing, e-pass & e-card program may enable optimizing ticketing staff cost to AMTS. 	Increase share of digital revenue to 50% of by 2030 & 75% by 2035

Promoting Digital Fare and Digital Passes: Digital fare or cashless travels have been considered a boon during COVID times as it reduces the common contact surfaces. Moving toward digital fare / digital passes is further important as it reduces cost of manual ticketing. Transition to digital fares shall allow possibilities for conductor-less services on selected few routes reducing staff-bus ratio and associated costs. To optimize its ticketing staff expenses, AMTS shall need to promote digital fare / digital passes significantly. The availability of

digital fare / digital passes also allows operator to diversify fare products not only by user group or service type but also by time and number of trips. It also provides opportunity to explore integrated fare journey providing affordable services to users.

6.5 Institutional Strategy

Efficiencies in the public transport system can also be achieved by adopting mature management processes. To achieve goals of integrated, optimized, and efficient service planning and operation, city transit authorities like SCADL, AMTS, BRT and Metro services, must work together.

Establishment of Unified Metropolitan Transit Authority: Creation of an umbrella organization like UMTA for public transport services in Ahmedabad will ensure coordinated decision making, eliminating duplication of services and provide users with seamless journey experience. Government of Gujarat had made an initiative to create an umbrella organization 'Multimodal Affordable Transport Authority' (MATA) while its realization was not achieved. Ahmedabad Municipal Corporation and Government of Gujarat may continue with past efforts to establish urban public transport agency for coordinated transit decision making.

It is recommended that the two bus systems may eventually merge as 'one system one institution' similar in lines with Sitilink-Surat and Rajpath Limited-Rajkot. Existing form of operating as two separate bus entities, AMTS and AJL, has duplicated system efforts and lead to isolated planning and decision making. There are two separate bus operation control centers, separate investment in hardware and software, duplication in ITMS service staff and administration. Creation of UMTA shall reduce system redundancies, coordinated planning of services and financial sustenance.

Business Process Re-engineering: AMTS needs to redefine its role as bus service planning, monitoring, and regulating authority. The current administration of AMTS needs to be broaden their technical knowledge to adopt to new tools of planning, monitoring and decision making. AMTS would need to build capacities for technical and management staff to adopt to modern technology and creating efficiency through policy reforms.

**Building a
performance based
resilient institution**

Performance Based Institutional Operations: To elevate AMTS from existing fiscal crisis AMTS needs to assign role of staff based on performance levels. This strategy shall enable timely achievement of AMTS service benchmarks and performance targets by creating accountability. HR policy needs to re-align itself to performance-based career growth path encouraging staff to deliver required services.

5.1	Establishment of Unified Metropolitan Transport Authority (UMTA) <ul style="list-style-type: none"> Establishing an umbrella organization for integrated urban mobility developing system efficiencies & coordinated decision making for AMC + SCADL + AJL + AMTS + MEGA + RTO + Traffic Police 	Institutional strengthening in line with UMTA
5.2	Business Process Re-engineering <ul style="list-style-type: none"> AMTS's role to be aligned as bus service planning & regulating authority Capacity building for technical and management staff to adopt to new technology and creating efficiency through policy reforms 	Responsive & resilient business processes
5.3	Performance based Institutional Operations <ul style="list-style-type: none"> Role of staff based on system performance levels to attain accountability Establishing HR policy for performance-based career growth path for technical and management staff 	Creating accountability with efficiencies

CASE STUDY | UNIFIED TRANSPORT AUTHORITIES

A Unified Metropolitan Transport Authority was instituted in Kochi by an act in state legislature. The act enables UMTA to co-ordinate and deliver a better multi modal transport experience.

However, previous experiences of setting up such authorities has not yielded positive results in other cities. Therefore, it is better to look at examples like Land Transport Authority – Singapore, Road Transport Authority – Dubai and Transport for London. Here, the authorities are not responsible only for coordination but also exercise control over operation of various modes of public transport service.

6.6 Financial Strategy

As discussed earlier in this report, financial support offered by the Government of Gujarat to operate electric and diesel/CNG buses is commendable. However, AMTS need an additional sustainable source of revenue to bridge the prevailing gap between earnings and expenditure to improve their services. This can be achieved by way of setting up an Urban Transport Fund (UTF) which is aligned with dedicate revenue resources. UTF will not only help AMTS in improving their services but also allow the city authorities to invest in supporting infrastructure like transit infrastructure, bus stops, last mile facilities and information systems. While improvement of services is necessary, city authorities must implement transport demand management measures such as regulation of on street parking and congestion pricing.

Alignment of Funds for Reforms: GoG in 2005 had provided a INR 100 Cr support to AMTS to reform and revive itself. Similar funding support should again be provided to AMTS for adapting to new set of reforms. The support may be linked to various domains of bus operations such as INR 100 Cr for transit infrastructure development considering equal amount to be received through GOI schemes and/or PPP, INR 70 Cr for electrification of 10% of its fleet by offering bus capex subsidy, INR 25 Cr for institutional reforms including development of UMTA as well as UTF and INR 5 Cr for technical service planning, benchmarking support and implementation of integrated ticketing. Additionally, INR 25 Cr support may be provided to AMC for implementing demand management measures including parking policy. This financial support may be included as part of 15th finance commission of GoG through performance based to be achieved over next three years.

Alignment of Indirect Revenue Resources to UTF: GoG needs to provide annual financial commitments to AMTS - AMC for delivery of bus services and infrastructure creation. The financial commitment may be performance based. Such commitments shall encourage AMTS to provide commuter centric services. GoG may align revenue resources such as public parking, street advertisements, share of property tax and/or registration charges associated with TOD, carbon credits, and green cess on private vehicle purchase, etc to UTF supporting sustainable public transport services including for AMTS. Old initiative like VGF and labour transit scheme may continue to be provided in future considering required modification at time of renewal of these initiatives.

**Reduce
dependency on
farebox revenue**

Non-Farebox Revenue Resources: Recently, AMTS has taken steps to increase in non-farebox revenue share. There are wide possibilities available to further increase its share on non-farebox revenue reducing dependency on farebox. AMTS may explore more avenues of advertisement revenues such as AV advertisement and collaboration with radio, etc. Also, land value capture has a high potential to tap significant revenues. Further, AMTS may conduct a study for assessing potential of data monetization.

Investment through Public Private Partnership: Investments through PPP on bus services and infrastructure development are to reduce front end cost of Government. The PPP investments may provide financially stressed AMTS to provide quality infrastructure and commuter service eliminating delays caused by financial constraints. AMTS is already looking forwards for 100% GCC operations. AMTS can explore possibilities to develop transit infrastructure through PPP utilizing TOD and TDR tools offered by city development plan. PPP investments can also be used to provide Mobility as a Service platform for users.

Adopting Tax waivers / Incentives: Public transport delivers positive externalities. The society itself is an indirect beneficiary from per capita reduction in pollution. As AMTS shall increase its mode share and transition to electric fleet the pollution levels in the city shall reduce significantly improving air quality and saving health care budgets. AMC may approach GoG for adopting carbon crediting to finance public transport. Similarly, green cess on purchase of private vehicles can be levied to finance public transport. GoG may further incentivize public transport through MV tax and passenger tax waivers. AMTS may also explore fare incentive for promoting PT usage.

6.1	Alignment of Funds for Reforms <ul style="list-style-type: none"> Reform based financial support to AMTS for: <ul style="list-style-type: none"> Institutional & financial reforms Transit infrastructure development & electrification of fleet Service planning and implementation of integrated fares 	Incentives to adopt timebound reforms
6.2	Alignment of indirect Revenue Resources <ul style="list-style-type: none"> Align annual financial commitments for buses services, transit infrastructure, ITMS & AFCS Align operational VGF and dedicated pool of funds (including carbon credits, pvt. vehicle cess, parking fees, etc.) for sustainable PT operations 	Improving non-farebox revenue share to > 30% by 2030 & > 35% by 2035
6.3	Non-Farebox Revenue Resource <ul style="list-style-type: none"> Explore opportunities for Land Value Capture by development of TOD, TDR, TTMC, betterment levy, etc Assign street advertising revenue to Urban Transport Funds Conduct technical study to assess data monetization 	Improve Operating Ratio (EPKM ÷ CPKM) to > 0.30 by 2030
6.4	Investment through Public-Private-Partnership <ul style="list-style-type: none"> Outsourcing operations of buses on GCC or Hybrid GCC model Operations of Spl. Services through Royalty Charges Transit Infrastructure development through Land Value Capture Technology investment through MaaS / AFCaaS initiatives 	Encouraging PPP
6.5	Adopting Tax waivers / Incentives <ul style="list-style-type: none"> Green mobility cess may be procured on registration of pvt. modes Performance based green/carbon credits to attain operational efficacy Promoting PT sustainable operations through MV Tax, GST waivers, etc. Passenger fare incentives for promoting PT usage Continued support of VGF & Labour transit scheme 	Incentivizing Public Transport

CASE STUDY | NON FAREBOX REVENUE

Long-term visioning and effective planning enabled BMTC to use land-bank planning as an approach towards financial sustainability and public transport accessibility. Over the years, the agency purchased land parcels across the city as an investment for future operations. As the city grew, BMTC developed these sites and designed them into dual-purpose terminal facilities for interchanging passenger use and commercial activities. Revenue from these commercial facilities eases the financial burden on the agency by significantly offsetting a part of its operational costs.

7 Conclusion

7.1 Outcome Oriented Approach

The study indicates an evident need of reforms and strategy to be adopted to achieve sustainable bus operations. The AMTS Vision Plan 2035 has been developed with an outcome specific approach. The study represented a long-term technical plan to assess need of public transport availability, fleet requirements and cost estimates up to 2035. To contain the operational deficit various measures have been adopted with specific progressive targets.

The Ahmedabad public transport is expected to achieve PTA of LOS 2 by 2030 and LOS 1 by 2035. The vision is to serve 20% mode share by AMTS by 2035 by implementing various recommendations adopting planning, technology, and fiscal tools. AMTS needs to plan for specific strategies and reforms aligned with defined outcome. In addition to goals mentioned in section 5.4, following are few outcome based strategies to priorities and implement:

- Improvement in public transport availability to LOS 2 to reduce operational deficit by INR 2 per km by distributing fixed cost, and auxiliary infrastructure costs.
- Data-based route and service optimization along with demand management measure like on-street parking charges would increase ridership upto 30% per bus and achieving occupancy of 75% reducing operational deficit by INR 6 per km.
- Conversion of existing diesel fleet to cleaner fuel CNG buses to reduce operational deficit by INR 9 to 12.
- Gradual conversion of 50% fleet to electric would provide additional VGF support of INR 12.5 per km.
- Converting bus crew to contract staff to reduce operational deficit by INR 1 per km.
- Digital fare reducing fare leakage reduce operational deficit by INR 1 per km.
- Efforts to improve Non-Farebox revenue share to 35% to 40% would reduce operational deficit by INR 8 to 10 per km.
- Reforms for innovative financing through UTF may compensate for excess deficit of INR 10 to 15 per km.

Reforms required to catalyze the recommended initiatives are possible to be implemented over 2-3 years. This would continue to provide support to AMTS for sustainable operations for study period.

7.2 Timelines for Implementation of Strategies

The study recommends various strategies to increase AMTS mode share and create system efficiencies for financial sustenance of AMTS services. Since strategy may have an incremental impact on each other, it is recommended that efforts should be made across strategic interventions. The timelines for implementation of study have be proposed for covid recovery phase and for roadmap to implement AMTS Vision.

Chart 7-1: Timeline for implementation of covid recovery strategies

Strategy	Activity	Sub-Activity	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22
Planning for Covid Recovery	Realigning & Operating Priority Routes as Hierarchy Services	Establish Ring-Radial Trunk Network																		
		Operate Terminal to Terminal Hub Services																		
		Initiate dedicated hire-services																		
	Leverage Technology for reliable transport	ETM data analytics for assessing demand																		
		Promote cashless payment																		
	Ensuring Hygiene & Communication Strategy	Commuter Survey for Willing to use AMTS Survey during Covid																		
		Adopt Communication Strategy																		
		Adopt Sanitation Policies and SOPs for users																		
	Fleet Supply Strategy	Purchase of Buses																		
		Prioritize GCC fleet on priority routes																		

Chart 7-2: Timeline for implementation of AMTS vision strategies

Strategy	Activity	H2: 2021	H1: 2022	H2: 2022	H1: 2023	H2: 2023	Yr 2024	Yr 2025	Yr 2026	Yr 2027	Yr 2028	Yr 2029	Yr 2030	Yr 2031	Yr 2032	Yr 2033	Yr 2034	Yr 2035
Planning Strategy	Accessible Network Development																	
	Create Service Hierarchy																	
	Fleet Strategy																	
	Development of Transit Infrastructure & Integrated Service Network																	
Operational Strategy	Creating Service Reliability																	
	Planning for Service Optimization																	
	Building Operational Efficiency																	
	Periodic Service Level Monitoring																	
Digital Strategy	Digital Strategy for Operations																	
	Enhancing Digital Accessibility																	
	Promoting Digital Fare / Digital Pass																	
Institutional Strategy	Establishment of Urban Public Transport Agency																	
	Business Process Re-engineering																	
	Performance based Institutional Operations																	
Financial Strategy	Alignment of Funds for Reforms																	
	Alignment of indirect revenue resources																	
	Non-Farebox revenue resource																	
	Investment through Public-Private-Partnership																	
	Adopting Tax waivers / Incentives																	

Legend for Activities Implementation

Detail Feasibility / Planning Stage
 Implementation Stage
 Operations Stage

7.3 Way Forward

AMTS is providing bus services since 1947. Over 74 years, AMTS has experienced various technical and financial challenges and successfully implemented the solutions. The system had witnessed a peak in 1997 following a decline. The reforms adopted in 2005 under initiative of Government of Gujarat revived the lost ridership by 2008 and contained the financial deficit. Today, AMTS witnesses similar challenges of low ridership and increasing financial deficit. The technical study for AMTS vision development identifies potential areas of reforms adopting new planning, technology, management, and fiscal tools.

The study identifies a significant gap in bus fleet availability and assess a need to increase AMTS bus fleet to 2378 by 2030 to achieve PTA LOS 2. To reduce financial deficit of AMTS services the study recommends restructuring its operations with rational data analytics, performance-based operations and technology-based monitoring are proposed to create system efficiencies. Based on financial estimates, the study recommendation also includes strategic electrification of AMTS bus fleet. The study recommends AMTS to reduce its dependency on farebox revenue and explore ways on financing bus operation through non-farebox revenues. The study is conducted for a period of 15 years, i.e. upto 2035. It is

advised that while the goals of AMTS may be retained over the study period, AMC must conduct the 5 yearly review of goals and targets achieved and recalibrate the yearly targets.

AMTS vision with a commuter centric approach outlines various strategies to ensure public transport availability, access for all, and service choices for commuters. A holistic perspective in policy reforms is provided through planning, operational, digital, institutional, and financial strategies. A time bound approach for implementation of strategies shall pave the way for AMTS towards operational sustainability.

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