



Article

Operational Efficiency of Arunachal Pradesh State Transport Services: An Empirical Study from 2009-10 to 2022-23

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Abstract: This paper examines the operational efficiency of Arunachal Pradesh State Transport Services (APSTS) through an empirical analysis spanning 2009-10 to 2022-23. The study relies on secondary data obtained from the annual reports and official records of APSTS. Key operational efficiency parameters assessed include: Percentage Fleet Utilisation, Over-aged Vehicles, Revenue-Earning Km, Dead Km, Vehicle Productivity, Passenger Carried Per Vehicle Per Day, Occupancy Ratio, Staff Productivity, Staff-Vehicle Ratio, Fuel Efficiency, Cost per Km, Revenue per Km, and Operating Ratio. The analysis employed appropriate tools such as ratio analysis, percentage trend analysis and graphs, which assess not only operational efficiency but also examine trends and variations in operational efficiency over time. The findings revealed that the operational efficiency of APSTS was significantly lower than the national average. Additionally, the percentage trend analysis indicates significant fluctuations in operational efficiency levels across different years during the study period, reflecting various structural, financial, and operational challenges faced by APSTS. The study also identifies areas of operational weakness and suggests scope for enhancing operational efficiency through improved resource utilisation and policy interventions. This research contributes to the limited empirical literature on state road transport undertakings in North-Eastern India and offers valuable insights for policymakers and transport administrators.

Keywords: Arunachal Pradesh State Transport Services (APSTS), Cost efficiency, Fuel efficiency, Kilometre efficiency, Occupancy ratio, Operational Efficiency, Operational efficiency parameters, Over-aged Vehicles, Percentage Fleet Utilisation, Vehicle Productivity, Staff Productivity, Staff-vehicle Ratio and SRTUs.

INTRODUCTION

Public transport systems are fundamental to economic development, social equity, and regional integration, particularly in developing economies where affordability and accessibility remain key policy objectives. In India, State Road Transport Undertakings (SRTUs) constitute a vital component of the public transport framework, providing mobility across urban, semi-urban, and rural regions. Despite their social mandate, many SRTUs continue to face persistent challenges such as operational inefficiency, financial stress, ageing fleets, and rising input costs. These constraints underscore the need for a systematic and evidence-based evaluation of operational efficiency to ensure its effective

functioning and long-term sustainability.

Within this broader national context, the state of Arunachal Pradesh presents a uniquely challenging environment for public transport operations. Located in the North-Eastern region of India, the state is characterised by difficult terrain, dispersed settlements, low population density, and limited transport infrastructure. These structural and geographical factors significantly influence the planning, deployment, and efficiency of transport services. Arunachal Pradesh State Transport Services (APSTS), as the primary public transport provider in the state, plays a crucial role in enhancing regional connectivity, ensuring mobility in remote areas, and supporting socio-economic development. However, the distinctive operational conditions of the region

exert considerable pressure on the efficiency and financial viability of APSTS.

Given these challenges, operational efficiency emerges as a central dimension of performance assessment for public sector transport organisations, as it reflects how effectively available resources are transformed into transport services. In the case of SRTUs, operational efficiency is commonly evaluated using indicators such as fleet utilisation, the average age of the fleet, the percentage of over-aged vehicles, target kilometres and their achievement, gross kilometres, revenue-earning kilometres (vehicle utilisation), dead kilometres, passengers carried per vehicle per day, occupancy ratio, vehicle productivity, staff productivity, staff-vehicle ratio, fuel efficiency, and cost efficiency (i.e, operating ratio, cost per Km and earnings per Km). Empirical assessment of these indicators enables the identification of operational strengths, inefficiencies, and performance trends over time. However, existing empirical literature has largely focused on national-level undertakings or transport corporations operating in relatively developed regions, resulting in limited scholarly attention to SRTUs functioning in geographically constrained and less-studied states such as Arunachal Pradesh.

The period from 2009-10 to 2022-23 represents a particularly significant phase in the operational history of APSTS. This timeframe captures variations in transport demand, cost structures, and administrative practices, alongside broader policy and economic developments influencing public transport in India. Importantly, it also encompasses the COVID-19 pandemic, which had a profound impact on public transport systems through service disruptions, reduced ridership, and changes in resource utilisation. Examining operational efficiency across this extended period, therefore, allows for a comprehensive assessment of both long-term performance patterns and the effects of short-term external shocks.

Against this backdrop, the present study undertakes an empirical examination of the operational efficiency of Arunachal Pradesh State Transport Services over the period 2009-10 to 2022-23 using selected key operational efficiency indicators. By systematically analysing efficiency parameters, their temporal trends, and comparing APSTS's operational parameters with the national average, the study seeks to bridge an important research gap in the literature on public sector transport efficiency. The findings are expected to generate policy-relevant insights that can support improved operational performance and contribute to the sustainable functioning of public transport services in geographically challenging regions such as Arunachal Pradesh.

REVIEW OF LITERATURE

Efficiency refers to how well resources (such as land, labour, capital and time) are used to achieve specific outputs. In other words, efficiency may be defined as the ability of an organisation to optimise its processes and resource utilisation to accomplish a task with minimum waste of resources such as time, money, and effort. According to Peter Drucker, efficiency is "doing things right," focusing on maximising output with given inputs. Alfred Marshall defined efficiency as the use of resources in such a way that output is maximised without inputs being wasted. Hence, efficiency may be defined as performing activities with minimum wastage of time and resources. It is a measure of productivity. Efficient systems and processes eliminate or reduce non-value-added activities and maximise productivity. Therefore, it is important to regularly evaluate operational parameters to enhance operational efficiency, reduce cost, and streamline resource utilisation.

Operational efficiency is a vital aspect of the overall performance of transport undertakings as it directly affects their profitability, customer satisfaction, and long-term sustainability. In road transport undertakings, operational efficiency refers to the organisation's capacity to minimise costs, maximise outputs, and optimise resource allocation while maintaining excellent service quality and customer contentment (Christopher, 2016). The concept of operational efficiency in road transport undertakings is intricate and influenced by multiple factors. This includes fleet management, fleet utilisation, vehicle output, manpower productivity, staff-bus ratio, cost-effectiveness, route optimisation, driver performance, maintenance efficiency, tyre efficiency and logistics efficiency.

Researchers have used different parameters to measure the operational efficiency in the road transport sector. The Ministry of Road Transport and Highway (MoRTH) reviewed the operational efficiency of State Road Transport Undertakings (SRTUs) in India using key operational parameters such as fleet utilisation, staff productivity, vehicle productivity, staff-bus Ratio, occupancy ratio and fuel efficiency, fleet strength, the age profile of the fleet, percentage of over-aged fleet, staff strength and revenue earning kilometres. In 2007, Sreenivasulu conducted a study focusing on the operational efficiency and financial viability of the Andhra Pradesh State Road Transport Corporation. The study primarily centred on evaluating operational efficiency through parameters such as fleet strength, fleet utilisation, vehicle utilisation, occupancy ratio, fuel efficiency, and operation volume. In 1996, Srinivasan studied the operational efficiency and financial performance of the Dheeran Chinnamalai Transport Corporation Limited in Tiruchirappalli. The study involved the use of various parameters to assess operational efficiency, including operational fleet strength, kilometre efficiency, fleet and vehicle

utilisation, km operated, average daily passenger count, occupancy ratio, fuel efficiency, breakdown and accident rates, bus-to-staff ratio, tyre lifespan, lost kilometres due to lack of crew, staff productivity, and over-aged fleet.

RESEARCH GAP

The existing body of literature concerning State Road Transport Undertakings (SRTUs) in India has predominantly focused on well-established transport corporations. As a result, the Arunachal Pradesh State Transport Services (APSTS) remains largely under-researched. There is a significant lack of long-term, empirical and region-specific analysis regarding the operational efficiency of APSTS. In light of these identified gaps, it is imperative to conduct a thorough study of the operational efficiency of the Arunachal Pradesh State Transport Services covering the period from 2009-10 to 2022-23. This research will provide valuable insights tailored to the unique regional context of Arunachal Pradesh.

OBJECTIVES OF THE STUDY

This study has been carried out with the following primary objectives:

- i) To examine the trends in operational efficiency of APSTS from 2009-10 to 2022-23
- ii) To analyse key operational efficiency parameters of APSTS from 2009-10 to 2022-23
- iii) To compare APSTS's operational efficiency indicators against the national average

RESEARCH METHODOLOGY

This section describes the methodology employed for the study, which includes research design, source of data, unit of analysis, study period, operational efficiency parameters, tools and techniques of Analysis and scope and limitations of the study.

Research Design

The study adopts a descriptive and analytical research design and employs an empirical approach to evaluate the operational efficiency of Arunachal Pradesh State Transport Services (APSTS).

Source of Data

The study relies solely on secondary data. The necessary secondary data have been collected from Annual Reports of APSTS and other official records and publications of APSTS. Additionally, other relevant annual reports from the Transport Research Wing of the Ministry of Road Transport and Highways (MoRTH), Government of India, and statistical abstracts from the Government of Arunachal Pradesh were also utilised as data sources, as these data are deemed reliable for analysing the operational efficiency of transport undertakings such as APSTS.

Unit of Analysis

In the present study, the unit of analysis is the Arunachal Pradesh State Transport Services (APSTS), as the study aims to evaluate the APSTS's overall operational efficiency using year-wise operational statistics for the period from 2009-10 to 2022-23. The APSTS is a public transport undertaking under the administrative control of the Department of Transport, Government of Arunachal Pradesh.

Period of Study

This study carefully examines a substantial period of 14 financial years, spanning 2009-10 to 2022-23. This extensive timeframe has been intentionally selected to provide valuable insights into long-term trends and changes in operational efficiency, allowing for a thorough understanding of the shifts and developments in this critical area.

Operational Efficiency Parameters

The operational efficiency of APSTS was evaluated employing commonly accepted indicators for assessing the operational efficiency of State Road Transport Undertakings (SRTUs). These indicators provide a comprehensive view of various aspects of transport operations. Key parameters assessed include fleet utilisation (%), fleet age, kilometre efficiency (revenue earning km and dead km), vehicle productivity, passenger carried per vehicle per day, staff productivity, staff-vehicle ratio, occupancy ratio (%), target kilometre and its achievement, fuel efficiency (km/litre), and cost efficiency (i.e., operating ratio, cost per km and earning per km). The operational efficiency parameters employed in this study have been explained in the subsequent sections below:

- i. **Percentage Fleet Utilisation:** Percentage fleet utilisation of APSTS can be defined as the ratio of the average fleet operated on the road to the total fleet strength held, multiplied by 100.
- ii. **Over-aged Vehicles:** Over-aged vehicles are defined as those that have exceeded 15 years of age.
- iii. **Revenue-earning Km and Dead Km:** Revenue-earning kilometres, also known as effective kilometres, refer to the distance a vehicle travels while carrying passengers and generating revenue. On the other hand, a dead kilometre refers to the distance a vehicle travels without passengers.
- iv. **Vehicle productivity:** Vehicle productivity refers to the number of revenue-earning kilometres per vehicle per day over a year. It is calculated by dividing the annual revenue-earning kilometres by the average fleet operated and then dividing the result by 365 days.
- v. **Passenger Carried per Vehicle per Day:** Passenger Carried per Vehicle per Day (PCVD) refers to the average number of

passengers carried per vehicle per day. It is calculated by dividing the total number of passengers carried by the average size of the fleet in operation and then dividing the result by 365 days.

- vi. **Staff Productivity:** Staff productivity refers to the effective kilometres performed by each staff member per day over the course of a year. It is calculated by dividing the total effective kilometres performed by the total number of staff and then dividing the results by 365 days.
- vii. **Staff-Vehicle Ratio:** Staff-vehicle ratio may be defined as the number of staff per vehicle operated. It is calculated by dividing the total staff by the average number of vehicles operated per year.
- viii. **Occupancy Ratio (%):** Occupancy ratio may be defined as the total number of passengers transported as a percentage of the seats available on the APSTS vehicles operated. This metric is distinct from the load factor, which represents the total number of passengers transported as a percentage of the total carrying capacity of the vehicles operated, including both seats and standing spaces.
- ix. **Fuel Efficiency:** Fuel efficiency is commonly used to indicate the operational efficiency of transport undertakings. It is defined as the average distance covered per litre of fuel.
- x. **Operating Ratio:** Operating ratio may be defined as operating cost as a percentage of total revenue. It indicates how efficiently a firm manages its core operations.
- xi. **Cost per Km and Earnings per Km:** Cost per Km is defined as the cost incurred per Km operated by a transport undertaking. On the other hand, Earnings per Km refers to the revenue generated per km operated by the APSTS.

Tools and Techniques of Analysis

The collected secondary data have been systematically analysed using analytical tools such as ratio and trend analysis. Furthermore, simple statistical measures, such as averages and percentages, have been employed where necessary. The results of the analysis are presented in a clear tabular format, supported by bar graphs and line graphs to enhance clarity and facilitate effective comparisons across different years.

Scope and Limitations

This study is confined to the analysis of the the operational efficiency of Arunachal Pradesh State Transport Services (APSTS) over the year from 2009-10 to 2022-23, focusing on key operational efficiency parameters such as fleet utilization, over-aged vehicles, effective kilometers, dead kilometers,

vehicle productivity, staff-vehicle ratio, staff productivity, occupancy ratio, fuel efficiency, cost per kilometer, earnings per kilometer, and operating ratio. It is important to note that this analysis is limited to examining internal operational performance without making interstate comparisons or comparing with private transport operators. Furthermore, aspects like passenger satisfaction, service quality, and managerial efficiency are beyond the scope of this study.

There are certain limitations that must be acknowledged as the study relies solely on secondary data, which may pose issues related to accuracy, consistency, and availability. Additionally, external factors such as policy changes, geographical and terrain challenges, fluctuations in fuel prices, and extraordinary events have not been analysed separately. Lastly, the findings are specific to APSTS and may not be generalizable to other state road transport undertakings.

RESULTS AND DISCUSSION

The results of the study have been discussed in the following sub-sections: -

Fleet Utilisation Analysis

Fleet utilisation is a key performance indicator that provides insight into the efficiency of vehicle operations, maintenance, and service delivery. A higher percentage of fleet utilisation shows that more vehicles are operational on the road and fewer service breakdowns and failures, indicating higher operational efficiency and vice versa. The efficiency in fleet utilisation of the APSTS was assessed using parameters such as total fleet strength, average fleet operated, off-road vehicles and percentage of fleet utilisation.

Total Fleet Strength and Fleet-operated

From 2009-10 to 2022-23, the average fleet strength held by the APSTS was 251.07, while the average fleet operated was about 202.93, resulting in about 48 off-road vehicles. During the financial year 2022-23, the fleet size and fleet operated reached a record high, with a total of 342 vehicles in the fleet size, and the fleet operated was 281 vehicles. Moreover, the highest percentage of fleet utilisation was observed in 2014-15. Over the years, the fleet size of the APSTS has increased significantly, with a growth of 44.92 per cent from 236 vehicles in 2009-10 to 342 vehicles in 2022-23. While the annual fleet operated also increased by 77.85 per cent during the same period.

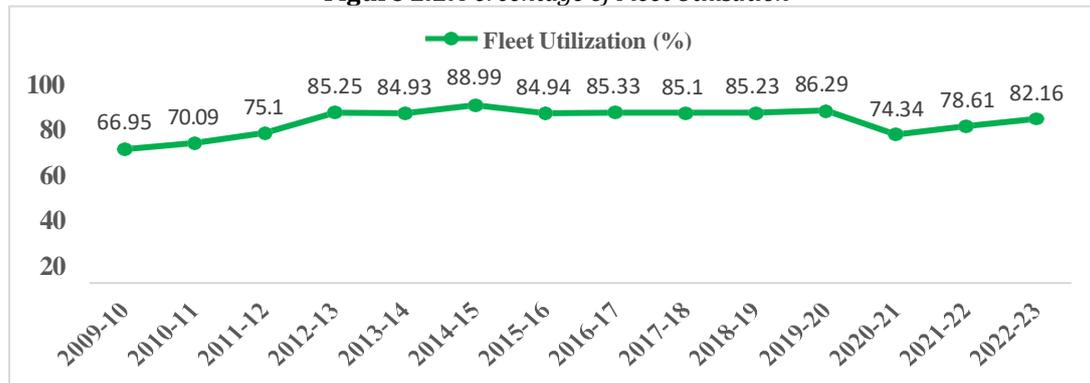
Percentage Fleet Utilisation

Figure 1.1 provides a graphical representation of the percentage of fleet utilisation of APSTS from 2009-10

to 2022-23. The fleet utilisation of APSTS ranged from 66.35 per cent to 88.99 per cent over the study period. It has increased by 22.72 per cent from 2009-10 to 2022-23. During the study period, about 80.95 per cent of the fleet size was operational and plying on roads on average. It was also observed that APSTS's percentage fleet utilisation has been relatively stable, except for a drop during the

financial year 2020-21, which is attributable to the COVID-19 pandemic, according to one of the officials of APSTS. Moreover, the APSTS's fleet utilisation percentage has dipped below the national average of 90.13 per cent during the study period, except for the financial year 2014-15.

Figure 1.1: Percentage of Fleet Utilisation

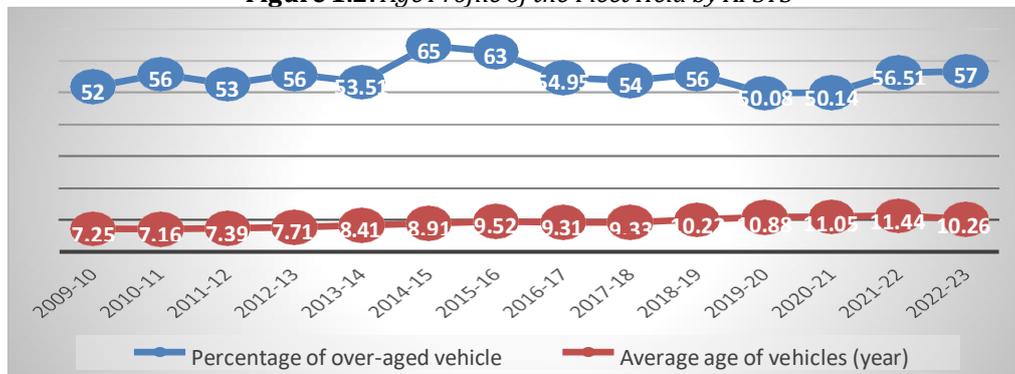


Source: Office of the General Manager, APSTS from 2009-10 to 2022-23

Age Profile of the Fleet

Figure 1.2 exhibits that from 2009-10 to 2022-23, the age of APSTS vehicles ranged from 1 year to 31 years. During the same period, the APSTS fleet had an average age of 9.20 years. In contrast, the average age of the 56 SRTUs fleet in India was 6.36 years. It suggests that the APSTS has a higher proportion of older vehicles in its total fleet strength.

Figure 1.2: Age Profile of the Fleet Held by APSTS



Additionally, it was observed that the highest percentage of overaged vehicles was recorded in 2014-15 at 65 per cent, followed by 63 per cent during 2015-16. In contrast, the lowest percentage of overaged vehicles was recorded during 2019-20 and 2020-21 at 50 per cent. On average, 55.51 per cent of the APSTS fleet was overaged. It is important to note that more than half of APSTS' total fleet is overaged, resulting in increased fuel, repair and maintenance costs and lower fuel efficiency.

Kilometre Efficiency

Kilometre efficiency has been measured in terms of Revenue-Earning Km and Dead Km. Revenue-earning Km was calculated by subtracting dead km from the gross Km operated by the APSTS.

$$\text{Revenue-Earning Km} = \text{Gross Km Operated} - \text{Dead Km}$$

While dead km represents unproductive km operated (operational inefficiency), the vehicle does not carry any

passengers at this time. Expenses such as fuel, repairs, maintenance, and other costs arising from empty journeys can significantly impact the overall profitability of APTS. Therefore, it is essential to 547tilizat dead kilometres to 547tilizat resource 547tilization and cost-effectiveness.

The analysis indicates that revenue-earning kilometres increased by 41.72%, from 81.10 lakh km in 2009-10 to 114.94 lakh km in 2022-23, with an average of 85.75 lakh km during the study period. On a per-vehicle basis, annual revenue-earning kilometres ranged from 28,226 to 54,027 km. However, the average annual growth rate was modest at 3.46%.

The trend remained largely stable between 2009-10 and 2019-20, but a sharp decline to 63.79 lakh km was observed in 2020-21 due to the COVID-19 pandemic. Subsequently, performance recovered significantly, rising to 87.95 lakh km in 2021-22 and further to 114.94 lakh km in 2022-23.

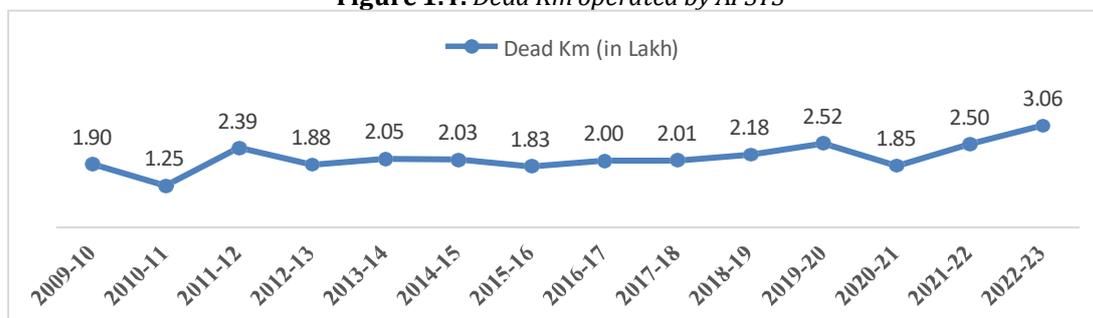
Figure 1.3: Revenue Earning Km



Source: Office of the General Manager, APSTS from 2009-10 to 2022-23

During the study, it was observed that the dead Km increased from 190,000 Km in 2009-10 to 306,000 Km in 2022-23, representing a growth rate of about 61 per cent. Notably, there was a sudden fluctuation in the trend of dead km after 2019-20, where the figure decreased to 185,000 Km and then abruptly rose to 306,000 Km in 2022-23. This sudden increase in dead Km indicates increasing operational inefficiencies of APSTS.

Figure 1.4: Dead Km operated by APSTS

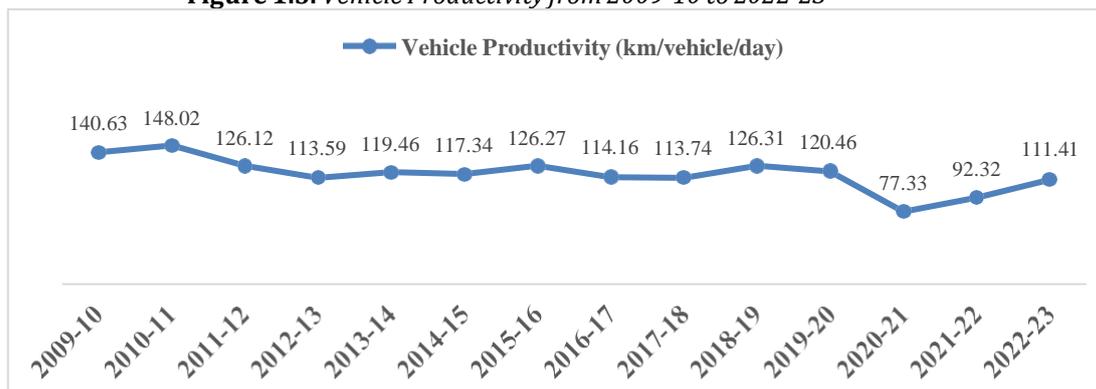


Source: Office of the General Manager, APSTS from 2009-10 to 2022-23

Vehicle Productivity

Over the study period, the vehicle productivity of APSTS varied from 77.33 to 148.02 km per vehicle per day. It decreased drastically by 20.77 per cent from 140.63 km per vehicle per day in 2009-10 to 111.41 km per vehicle per day in 2022-23. The average vehicle productivity of APSTS during the study period was 117.65 km per vehicle per day, while the national average of 56 state road transport undertakings (SRTUs) in the country is 308.08 km per vehicle per day. The vehicle productivity of APSTS is considerably below the national average.

Figure 1.5: Vehicle Productivity from 2009-10 to 2022-23



Source: Computed from the annual operational report, APSTS

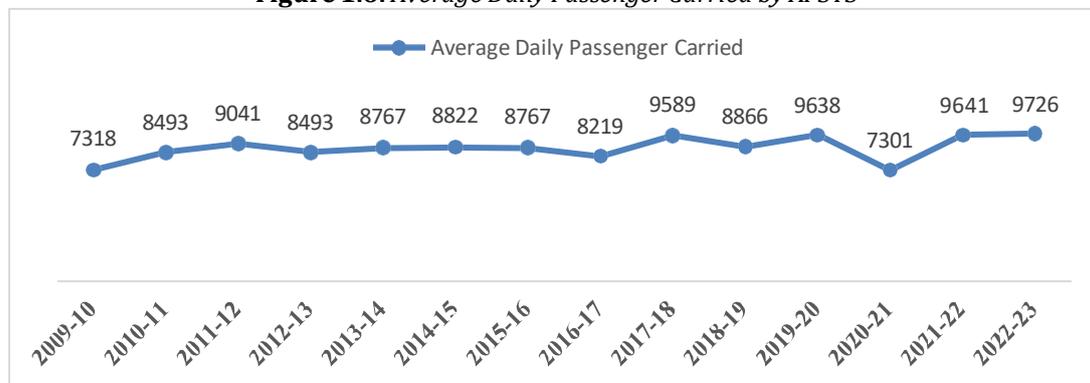
The average vehicle productivity of Arunachal Pradesh State Transport Services (APSTS) declined from 140.63 km per vehicle per day in 2009-10 to 111.42 km in 2022-23. The highest productivity was recorded at 148.02 km in 2010-11, while the lowest was 77.33 km in 2020-21. This decline indicates inefficient vehicle utilisation, leading to higher operational costs per passenger since fixed costs are spread over fewer passengers. To improve performance, measures such as optimising route planning, rationalising service frequency, streamlining operations, strengthening fleet management, and aligning services with changing demand are essential.

Passenger Carried per Vehicle per Day

The average annual passengers carried by APSTS stood at 31,99,871 passengers, and it grew by 32.89 per cent during the study period. The maximum number of passengers (i.e., 35,50,000) was carried during 2022-23, while the lowest number (i.e., 26,65,000) was carried during 2020-21. During the initial year of the study period (i.e., 2009-10), the APSTS carried 26,71,198 passengers.

Moreover, it was found that the average number of passengers carried per day by APSTS was approximately 8,763 during the study period. The average daily passenger count increased from 7,318 in 2009-10 to 9,726 in 2022-23. It remained relatively constant for most of the years during the study period. However, it was observed that during 2020-21, the average daily passenger carried declined drastically.

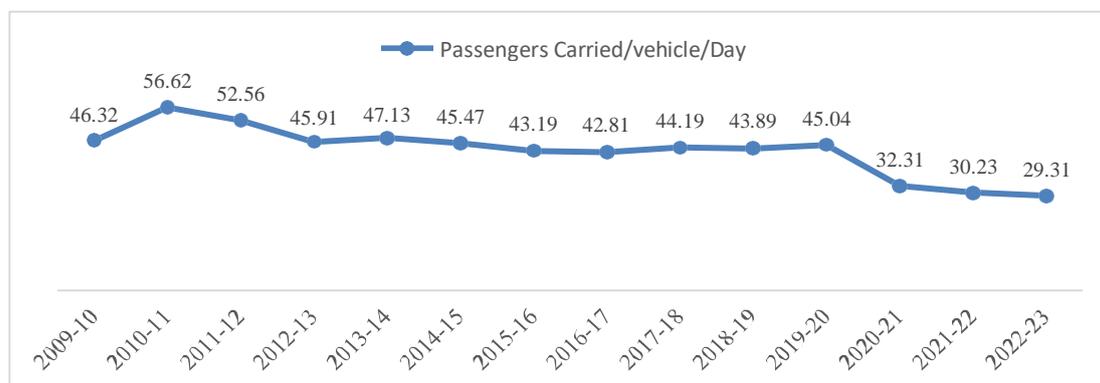
Figure 1.6: Average Daily Passenger Carried by APSTS



Source: Computed from the annual operational report of APSTS from 2009-10 to 2022-23.

Furthermore, the PCVD of APSTS ranged from 32.31 to 56.62 passengers per vehicle per day during the study period. The average passenger carried per vehicle per day of APSTS is 44.09, alarmingly lower than the national average of 506.97 passengers per vehicle per day. This is one of the primary reasons for the considerably low revenue generation by APSTS. Additionally, the trend line indicates that the PCVP is gradually decreasing. It decreased by 36.72 per cent from 46.32 passengers per vehicle during 2009-10 to 29.31 passengers per vehicle per day during 2022-23. This could be due to a lack of service demand, poor routing, high competition, and poor service quality.

Figure 1.7: Passenger carried per vehicle per day



Source: Computed from the annual operational report of APSTS from 2009-10 to 2022-23

Occupancy Ratio (%)

During the study period, APSTS's occupancy ratio ranged from 40% to 70%, increasing from 53.17% in 2009-10 to 70% in 2022-23, a growth of 31.65%. The average occupancy ratio was 55.18%, substantially below the national average of 70.44%. This low occupancy may be attributed to competition from private operators, operation on uneconomic routes for welfare purposes, weak service demand, and poor route planning.

Figure 1.8 shows the trend of APSTS's annual occupancy ratio growth during the study period. The growth rate was highly volatile, with abrupt increases and decreases. The highest growth of 48.94% occurred in 2018-19, while the lowest of -29.82% was recorded in 2013-14, indicating challenges in maintaining stable occupancy ratios.

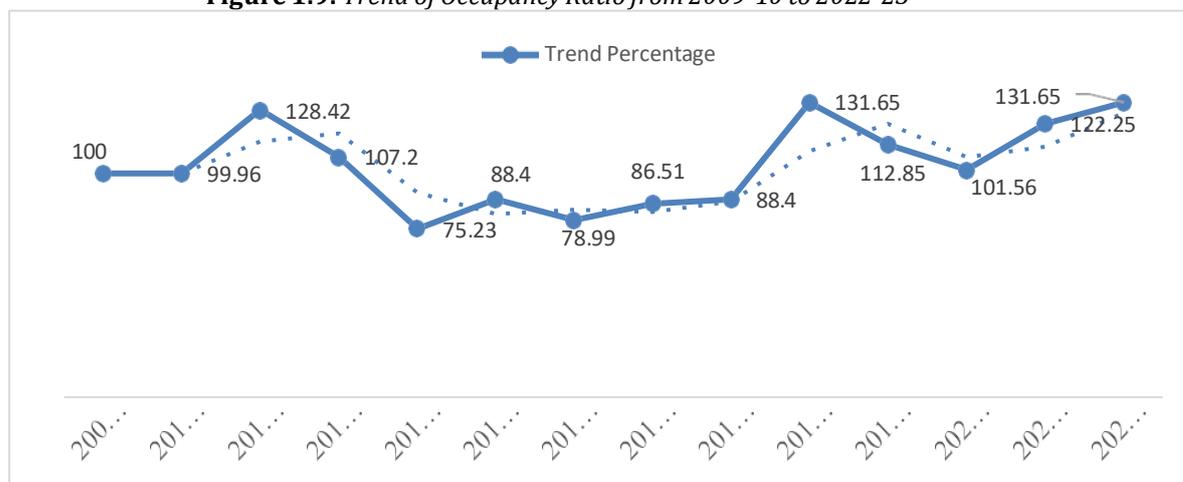
Figure 1.8: Annual Growth of Occupancy Ratio



Source: Computed from the annual operational report of APSTS from 2009-10 to 2022-23.

The average annual growth rate of occupancy during the study period was 4.10%. Figure 1.9 illustrates that, despite significant fluctuations over the previous 11 years, the occupancy ratio has steadily improved and stabilised since 2020-21.

Figure 1.9: Trend of Occupancy Ratio from 2009-10 to 2022-23

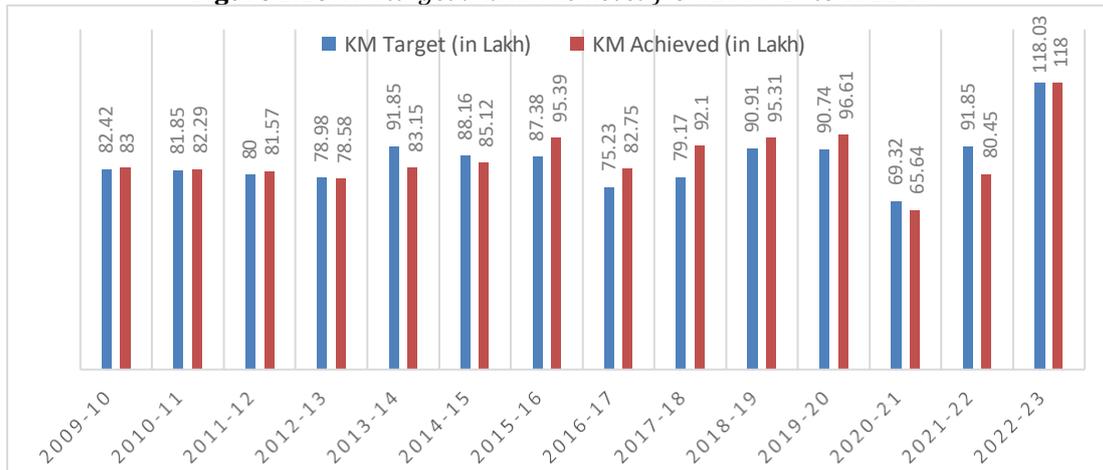


Targeted Km and its Achievements

Over the study period, the kilometres achieved by APSTS varied from 65.64 lakh km to 118 lakh km. The total Km achieved by APSTS grew by 42.17 per cent from 83 lakh Km during 2009-10 to 118 lakh km during 2022-23. During this period, the average Km achieved by the APSTS was found to be 87.85 lakh Km.

Figure 1.10 shows the total targeted Km and total Km achieved by APSTS during the study period from 2009-10 to 2022-23. The analysis revealed that the APSTS achieved its targeted Km in 8 financial years, but it could not achieve the targeted Km in 6 financial years.

Figure 1.10: Km target and Km Achieved from 2009-10 to 2022-23

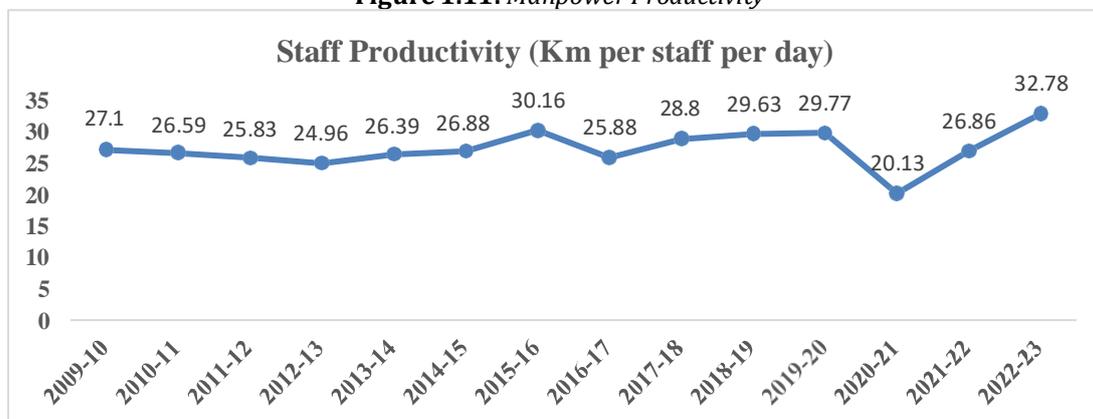


Source: Annual operational report of APSTS from 2009-10 to 2022-23.

Staff Productivity

It is evident that the staff productivity APSTS has increased by 20.74 per cent from 27.10 Km/staff/day in 2009-10 to 32.72 Km/staff/day in 2022-23. However, it is imperative to underscore that its staff efficiency has consistently remained below the national average of 59.36 km/staff/day during the study period, with an average of 27.27 km/staff/day.

Figure 1.11: Manpower Productivity



Source: Computed from the annual operational report of APSTS from 2009-10 to 2022-23.

The trend line indicates that the staff productivity (km per staff per day) of APSTS remained almost the same throughout the years, except for two financial years (2016-17 and 2020-21), when there was a significant drop in productivity

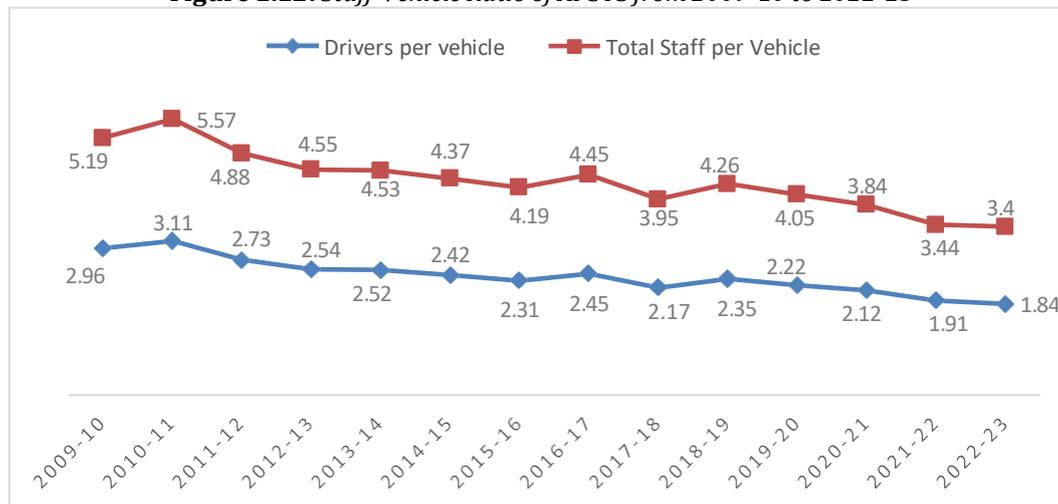
Staff-Vehicle Ratio

The staff-vehicle ratios of APSTS for the period 2009-10 to 2022-23 are presented in Figure 1.12. During the study period, the ratio ranged from 3.40 to 5.57 staff per vehicle. It declined by 34.49%, from 5.19 staff per vehicle in 2009-10 to 3.40 in 2022-23, primarily due to a 77.85% increase in fleet operations without a commensurate rise in workforce. The average staff-vehicle ratio of 4.33 remained below the national average of 5.12, indicating

relatively efficient staff utilisation, but also a potential need for additional personnel to ensure optimal service delivery.

Similarly, the driver-vehicle ratio decreased by 37.83% over the study period, ranging from 1.84 to 3.11 drivers per vehicle, with an average of 2.40. This indicates that, on average, at least two drivers were deployed per operated vehicle.

Figure 1.12: Staff-Vehicle Ratio of APSTS from 2009-10 to 2022-23

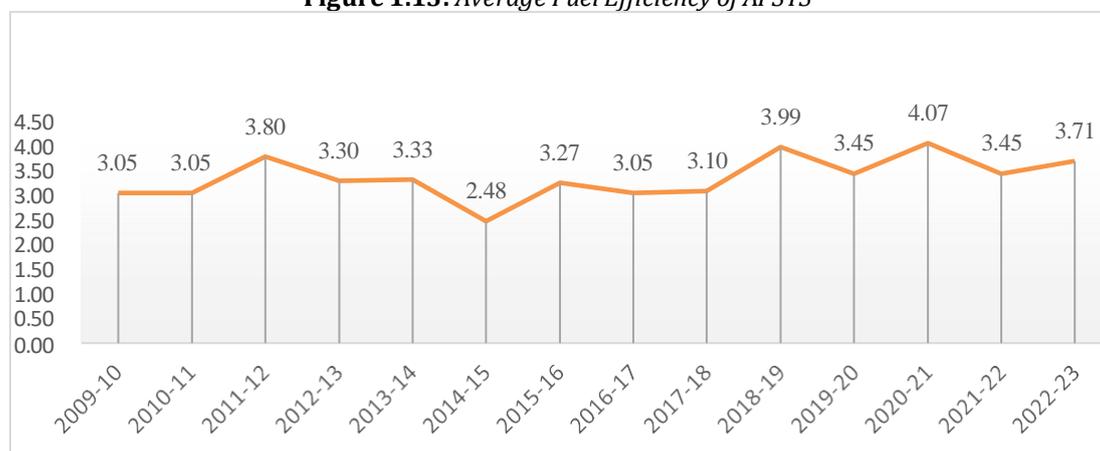


Source: Computed from the annual operational report of APSTS (2009-10 to 2022-23)

Fuel Efficiency

The following graph shows the year-wise fuel efficiency of APSTS from 2009-10 to 2022-23. The average fuel efficiency of the APSTS was 3.40 litres per km. The fuel efficiency of the APSTS increased by 21.64 per cent from 3.05 litres per km in 2009-10 to 3.71 litres per km in 2022-23. However, the fuel efficiency of the APSTS varies between hilly and plain routes. On mountainous routes, the average fuel efficiency is 2.90 litres per kilometre and 3.5 litres per kilometre on plain routes.

Figure 1.13: Average Fuel Efficiency of APSTS



Source: Annual operational report of APSTS from 2009-10 to 2022-23.

Cost Efficiency

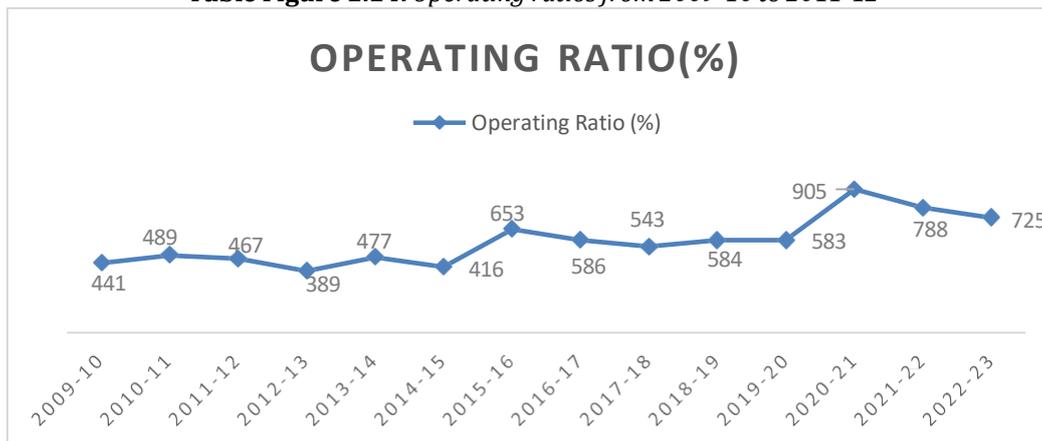
Cost efficiency directly impacts the profitability of a business, and therefore, it must be monitored and improved continuously. The cost efficiency of the APSTS was analysed using parameters such as operating ratio, cost per km and cost per vehicle.

Operating Ratio

The operating ratios of APSTS from 2009-10 to 2022-23 are depicted in Figure 1.14. In the transportation industry, the benchmark for operating ratios ranged from 80 per cent to 95 per cent. However, APSTS's operating ratios are significantly higher than the standard norm during all the financial years under study. The average operating ratio of APSTS was recorded at 574.74 per cent. This indicates that the core operation of APST services could be more

efficient, and it incurs excessive operating costs.

Table Figure 1.14: Operating ratios from 2009-10 to 2011-12



Cost per Km and Earning per Km

Earnings per Km (EPKM) and Cost per Km (CPKM) are two important parameters to measure cost efficiency. The CPKM of the APSTS was observed to be much higher than the EPKM during the study period. The average EPKM was just Rs. 19.09, while the average CPKM was Rs. 111.2. As a result, the APSTS incurred losses of Rs. 92.12 per km on average. This indicates that the revenue generated is significantly lower than the costs incurred over the study period. Moreover, cost per km increased by 124 per cent, while earnings per Km increased by 41% during the study period from 2009-10 to 2022-23.

Figure 1.15: Earnings per Km and Cost per Km



This scenario calls for effective cost management practices, mainly focusing on implementing effective cost control and reduction techniques to reduce operational costs. Measures must be taken to reduce the costs to an optimum level so that APSTS achieves the breakeven point as soon as possible and leads to a profitable operation.

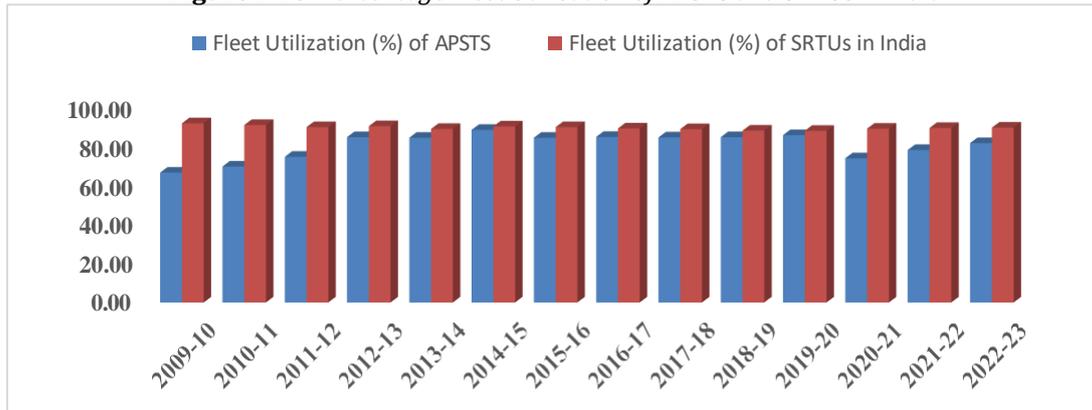
Comparative Analysis of KOPIs

This section provides a comparative analysis of the key operational performance indicators (KOPIs) of APSTS with the national average. The national average of various KOPIs was calculated using the operational statistics of the reporting SRTUs published by MoRTH from 2009-10 to 2022-23. The comparative study of KOPIs of the APSTS and SRTUs in India is presented in the following subsections.

Comparative Analysis of Fleet Utilisation

APSTS recorded consistently lower fleet utilisation than the national average during the study period, with about 19% of its fleet remaining off-road. Its average utilisation was 80.95%, compared to 90.13% for SRTUs in India. APSTS utilisation ranged from 66.5% to 88.99%, while SRTUs ranged from 88.50% to 92.40%. The underutilisation of APSTS's fleet may be due to a high share of over-aged vehicles, delays in repairs and maintenance, or workforce shortages.

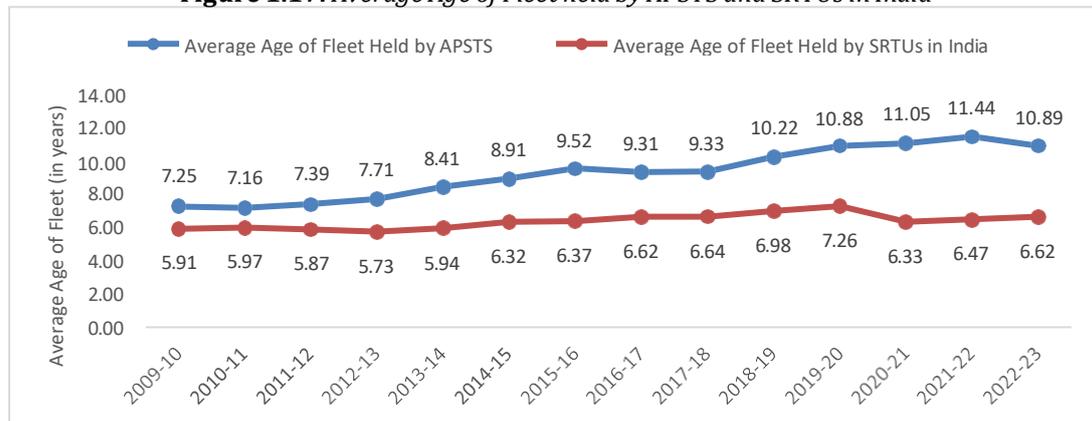
Figure 1.16: Percentage Fleet Utilisation of APSTS and SRTUs in India



Comparative Analysis of the Average Age of Vehicles

During the study period, the average age of APSTS vehicles ranged from 7.25 to 11.44 years, compared to 5.73 to 7.26 years for SRTUs in India. Throughout the period, APSTS maintained a higher average fleet age than the national average, indicating a relatively older fleet. Such ageing vehicles tend to consume more fuel and require frequent repairs and maintenance, resulting in higher operational costs.

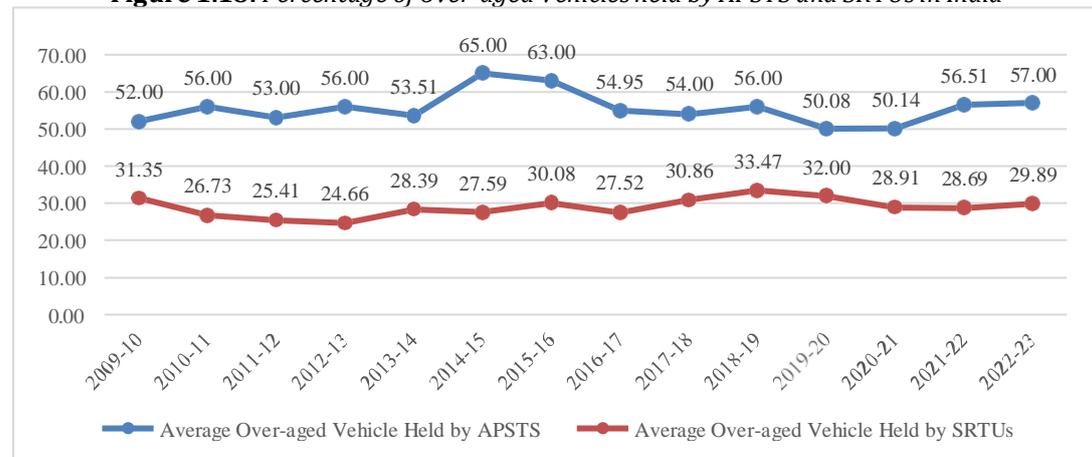
Figure 1.17: Average Age of Fleet held by APSTS and SRTUs in India



Comparative Analysis of the Proportion of Over-aged Vehicles

During the study period, over 50% of APSTS vehicles were over-aged, with the proportion ranging from 50.08% to 65%, compared to 34.13% for SRTUs at the national level. A high share of over-aged vehicles adversely affects productivity and increases operational costs. Therefore, APSTS management should prioritise the timely scrapping and replacement of such vehicles, preferably with modern electric buses equipped with advanced features.

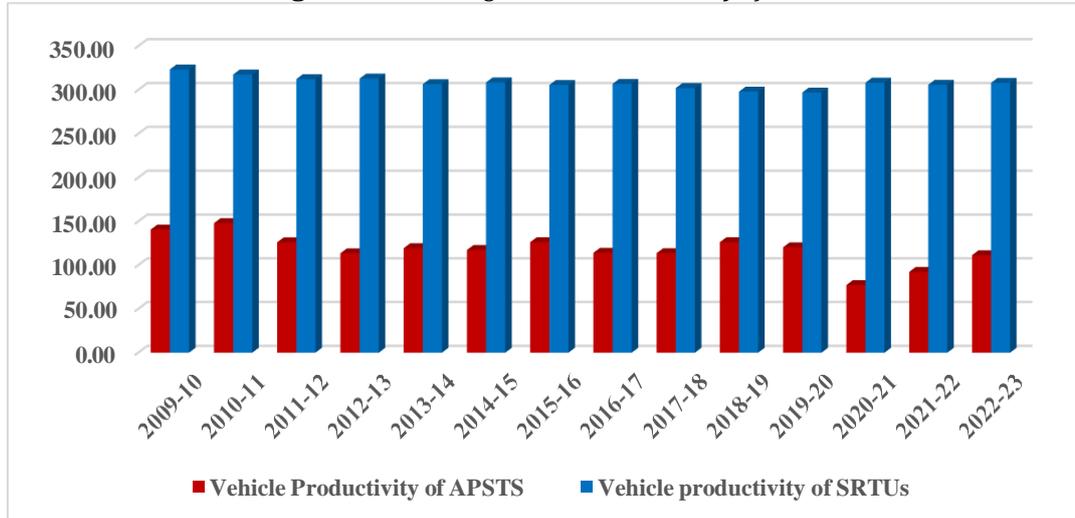
Figure 1.18: Percentage of Over-aged Vehicles held by APSTS and SRTUs in India



Comparative Analysis of Vehicle Productivity

A comparative analysis of vehicle productivity during the study period reveals that APSTS recorded a significantly lower average productivity (117.65 km per vehicle per day) than the national average for SRTUs (308.08 km per vehicle per day), amounting to less than half of the national figure. Between 2009-10 and 2022-23, APSTS productivity ranged from 77.33 to 148.02 km per vehicle per day, whereas the corresponding range for SRTUs in India was 297 to 323 km per vehicle per day.

Figure 1.19: Average Vehicle Productivity of APSTS and SRTUs in India

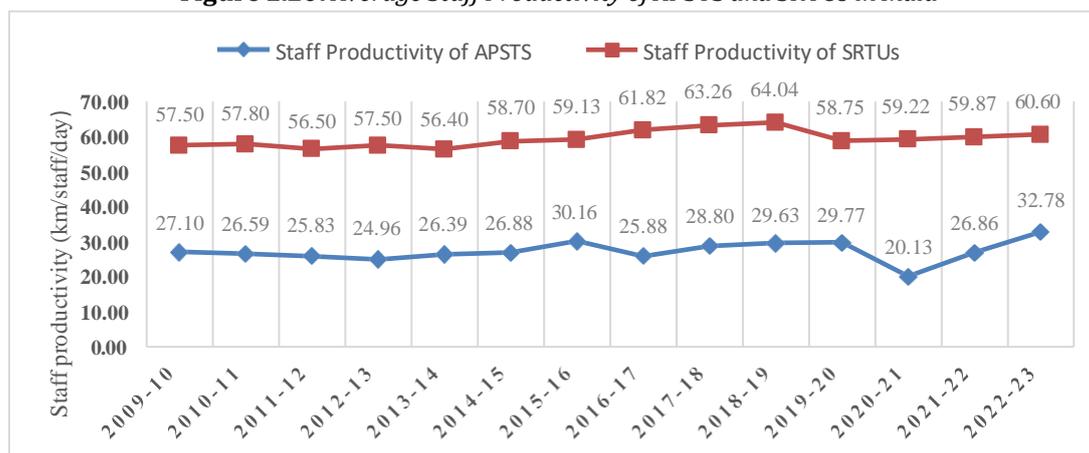


This signifies that the vehicle productivity of the APSTS is considerably low. The low productivity of the vehicles results in lower revenue generation. The main reasons for low vehicle productivity could be due to low service frequency, low service demand, and poor maintenance practices.

Comparative Analysis of Staff Productivity

This sub-section compares the staff productivity of APSTS with the national average. The findings indicate that APSTS recorded an average staff productivity of 27.27 km per staff per day, ranging from 20.13 to 32.78 km during the study period. This is significantly lower than the national average of 59.36 km per staff per day for reporting SRTUs, suggesting comparatively lower staff efficiency in APSTS.

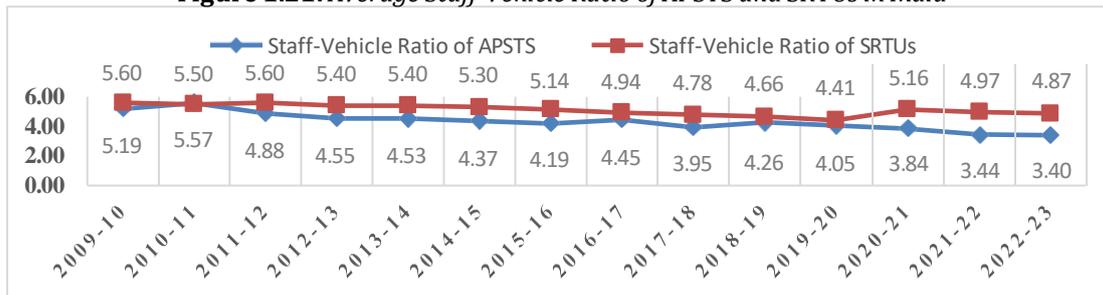
Figure 1.20: Average Staff Productivity of APSTS and SRTUs in India



Comparative Analysis of Staff-Vehicle Ratio

The analysis shows that APSTS had an average staff-vehicle ratio of 4.33 during the study period, compared to 5.12 for SRTUs at the national level. The ratio in APSTS ranged from 3.40 to 5.57, whereas for SRTUs it ranged from 4.41 to 5.60. Except for 2010-11, APSTS consistently recorded a slightly lower ratio than the national average. The continuous decline in the ratio suggests a potential need for additional staff to meet operational requirements.

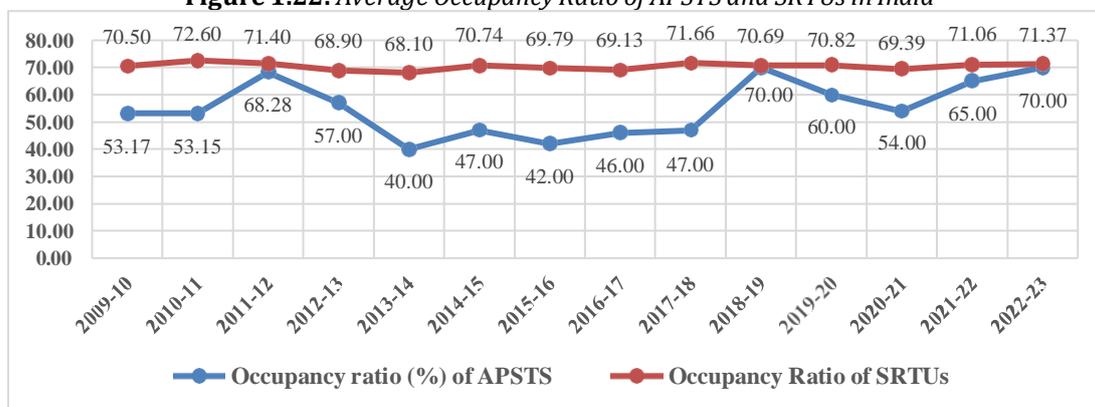
Figure 1.21: Average Staff-Vehicle Ratio of APSTS and SRTUs in India



Comparative Analysis of Occupancy Ratio

During the study period, the occupancy ratio of APSTS ranged from 40% to 70%, with an average of 55.34%, compared to the national average of 70.44% for reporting SRTUs. Except for 2018-19 and 2022-23, APSTS consistently recorded a significantly lower occupancy ratio than the national average. The low occupancy level appears to be a key factor contributing to its comparatively low revenue generation and indicates underutilisation of services, possibly due to competition from private operators, service quality issues, weak demand, ineffective route planning, and poor scheduling.

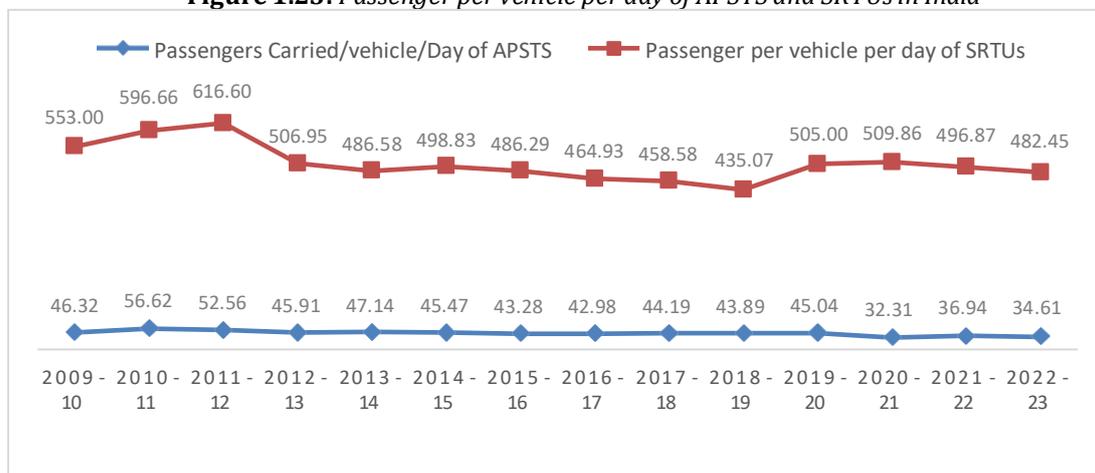
Figure 1.22: Average Occupancy Ratio of APSTS and SRTUs in India



Comparative Analysis of Passenger Carried

This subsection compares the passenger load of APSTS with that of SRTUs at the national level. The analysis shows that the number of passengers carried per vehicle per day by APSTS was significantly lower than the national average throughout the study period. APSTS recorded an average of 44.09 passengers per vehicle per day, compared to 506.98 for reporting SRTUs in India. This low passenger load adversely affects its revenue performance. Enhancing passenger occupancy by optimising fleet deployment could improve cost efficiency and reduce operational expenses.

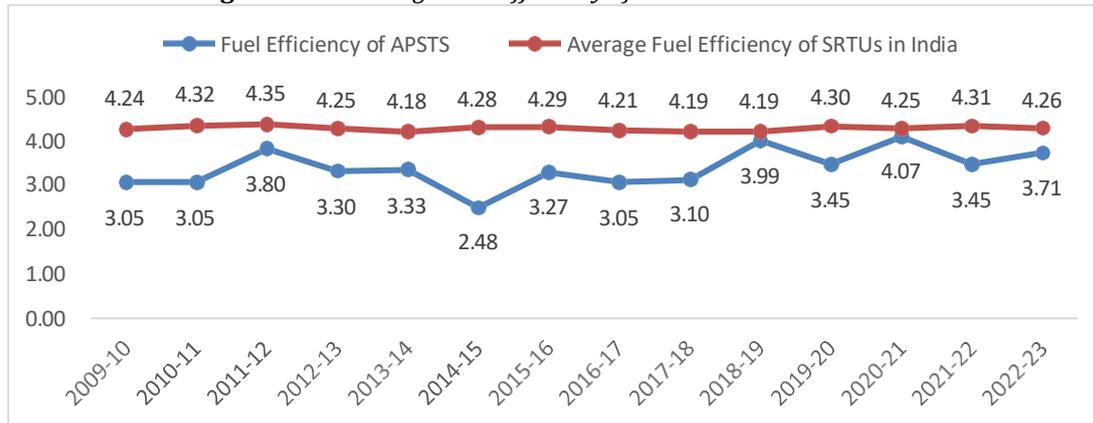
Figure 1.23: Passenger per vehicle per day of APSTS and SRTUs in India



Comparative Analysis of Fuel Efficiency

During the study period, the fuel efficiency of APSTS varied from 2.90 km/litre to 4.07 km/litre. The average fuel efficiency of APSTS stands at 3.40 km/litre, which is lower than the average fuel efficiency of reporting SRTUs in the country, measured at 4.26 km/litre. The main reasons behind the low efficiency could be due to various reasons, such as frequent stops, traffic congestion, vehicle age, poor maintenance, and inefficient driving practices.

Figure 1.24: Average Fuel Efficiency of APSTS and SRTUs in India



CONCLUSIONS

The present study evaluated the operational efficiency of Arunachal Pradesh State Transport Services (APSTS) over the period 2009-10 to 2022-23 by analysing key performance indicators and benchmarking them against national averages of reporting State Road Transport Undertakings (SRTUs). The findings reveal persistent and substantial underperformance across almost all major indicators, indicating structural, operational, and managerial inefficiencies.

Fleet utilisation remained consistently below national averages, accompanied by a significant proportion of off-road buses and a high share of over-aged vehicles. The ageing fleet profile and inadequate vehicle deployment adversely affected vehicle productivity, which remained substantially lower than national benchmarks. Although total revenue-earning kilometres increased over time, revenue-earning kilometres per vehicle per day declined, reflecting inefficient fleet utilisation.

Staff productivity was also considerably below national standards, despite staff costs accounting for a substantial share of total operating expenditure. This imbalance underscores the need for improved workforce efficiency to enhance revenue performance and contain financial losses. Demand-side indicators, including occupancy ratio and passengers carried per vehicle per day, were significantly lower than national averages, suggesting weaknesses in route planning, service quality, and demand generation.

Fuel efficiency was below the national level benchmark, partly due to hilly terrain, poor road conditions, and the predominance of over-aged vehicles. Financially, APSTS remained unsustainable

throughout the study period, with operating costs far exceeding revenues and an unfavourable cost-revenue ratio. Overall, the study concludes that APSTS operates under severe operational and financial constraints and requires comprehensive structural reforms, improved fleet management, enhanced staff productivity, better route rationalisation, and cost-control measures to achieve long-term sustainability and efficiency.

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