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Evaluating Ridership Forecast Accuracy in Indian Urban Transit Projects Using MAPE and Regression Analysis

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INTRODUCTION & AIM

Urban transport systems in India are undergoing rapid transformation, with significant investments in metro rail, Bus Rapid Transit (BRT), and related infrastructure. Despite these investments, the performance of several systems has consistently fallen short of expectations, resulting in considerable economic, social, and financial implications. A key contributing factor is the persistent overestimation of ridership forecasts in Detailed Project Reports (DPRs), which undermines the long-term viability of these projects.

A comparative analysis of high-error and low-error projects further provides insights into the structural limitations of existing forecasting practices. Based on these findings, the study proposes data-driven recommendations for adopting more robust, econometrically grounded, and locally adaptive forecasting methodologies, which are essential for improving the sustainability and planning effectiveness of future urban transit investments in India.

METHOD

The results clearly demonstrate extremely high levels of forecasting error, confirming the presence of systemic bias in DPR-based projections.
For example, in the case of Kanpur Metro:

$$\text{MAPE} = \sum [\frac{Actual - Forcast}{Forcast}] \times 100 \quad \text{MAPE} = \sum [\frac{6000 - 944000}{944000}] \times 100 \approx 99.36 \text{percentage}$$

MAPE-BASED FORECAST BIAS ACROSS TRANSPORT MODES

Transport Mode	Typical MAPE Range	Level of Forecast Bias	Key Observation
Metro Rail	50% – 100%+	Very High	Severe overestimation in most cities
BRT Systems	30% – 60%	Moderate to High	Better than metro but still inaccurate
IPT Influence	Indirect (>50%)	High	Demand diverted due to unaccounted competition

ERROR CLASSIFICATION

Error Range (%)	Classification	Cities Example
0–40%	Low Deviation	Kochi
40–70%	Moderate Deviation	Hyderabad, Bengaluru, Delhi
70–100%	High Deviation	Kanpur, Nagpur, Pune, Chennai

RESULTS & DISCUSSION

The evaluation of economic elasticities reveals a clear mismatch between DPR assumptions and observed ridership behaviour. DPRs typically assume high positive elasticities for network expansion and modal shift; however, actual impacts are significantly lower due to constraints such as inadequate last-mile connectivity and weak multimodal integration.

City	Projected Ridership (Daily)	Actual Ridership (Daily)	Absolute Deviation	% Deviation
Kanpur	944,000	6,000	938,000	99.36%
Nagpur	383,439	21,616	361,823	94.36%
Pune	609,148	34,243	574,905	94.38%
Jaipur	293,175	37,000	256,175	87.38%
Kochi	132,910	80,000	52,910	39.80%
Ahmedabad	675,000	107,000	568,000	84.15%
Kolkata	918,000	238,680	679,320	73.98%
Chennai	1,944,000	226,197	1,717,803	88.36%
Hyderabad	1,100,000	490,000	610,000	55.45%
Bengaluru	1,610,000	585,000	1,025,000	63.66%
Delhi	5,347,000	2,779,000	2,568,000	48.02%

COMPARISON OF ASSUMED VS OBSERVED ELASTICITIES

Variable	DPR Assumption	Observed Behaviour	Key Insight
Network Expansion	High Positive	Moderate/Low Positive	Overestimated impact
Income	Positive	Weak/Negative	Shift to private modes
Fare Levels	Low Sensitivity	High Sensitivity	Users are price-sensitive
Modal Shift (IPT)	High Shift Expected	Low Shift Observed	IPT remains dominant
Accessibility	Strong Impact	Conditional Impact	Depends on last-mile connectivity

CONCLUSION

The findings indicate a significantly high level of forecasting bias in Indian urban transport systems, with errors in some cases exceeding 1,500%, reflecting fundamental limitations in underlying assumptions and modelling approaches. Such deviations demonstrate that projected ridership is often several times higher than actual demand, indicating a systemic tendency toward overestimation rather than random error. This has direct implications for project viability, as inflated projections lead to overestimated revenue expectations and persistent financial deficits, undermining operational sustainability and increasing reliance on public subsidies.

FUTURE WORK / REFERENCES

Designing a framework for sustainable public transportation system selection, which aims to select the mode based on performance.

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