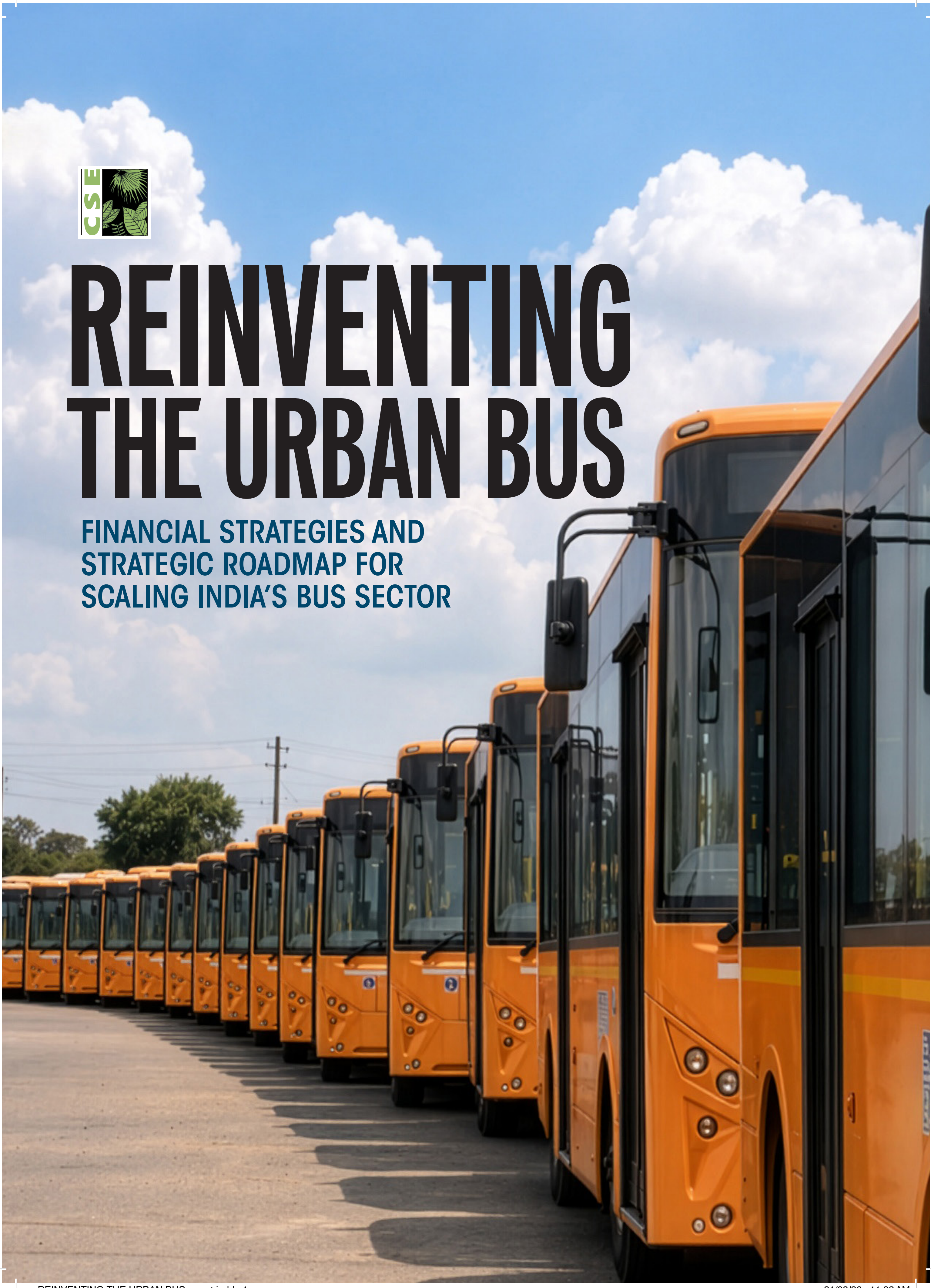

REINVENTING THE URBAN BUS

FINANCIAL STRATEGIES AND STRATEGIC ROADMAP FOR SCALING INDIA'S BUS SECTOR

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Summary spotlight

India stands at a historic inflexion point as its urban population is projected to surge by 230 million residents, reaching 760 million by FY2046–47, with growth heavily concentrated in under-equipped Tier-2 and Tier-3 cities. While the National Urban Transport Policy targets a 70–75 per cent public transport modal share in mega-cities, most achieve only 25–35 per cent, and over 400 small-to-medium cities lack organized bus services entirely.

This severe deficit is marked by a national average of just 13.3 buses per lakh population—70 per cent below the Ministry of Housing and Urban Affairs (MoHUA) Service Level Benchmark (SLB). The resulting surge in private vehicles causes chronic congestion, costing Rs 1.47 lakh crore annually in lost productivity, and causes severe public health damage, with road transport accounting for 25–40 per cent of urban PM2.5 emissions. This lack of robust transit disproportionately burdens low-income groups, increases commuting costs, and heightens safety risks for women due to infrequent, poorly organized systems.

Although a single 12-metre bus can flexibly penetrate neighbourhoods and displace 40–50 cars, expansion and modernization are severely bottlenecked. Approximately 40,000 buses exceed their 15-year operational limit, penalizing the network with excessive maintenance costs, high fuel consumption, and severe tailpipe emissions. Replacing this aging stock is constrained by low cost-recovery ratios and high debt across State Transport Undertakings (STUs).

Simultaneously, India has committed to a leapfrog agenda of total fleet electrification. Transitioning to electric buses directly lowers toxic tailpipe exposure and cuts well-to-wheel CO_2 emissions by 60–70 per cent on the current grid, approaching near-zero lifecycle emissions by 2040 as the grid integrates 60–70 per cent renewable energy. The economic case has matured rapidly. Aggregated procurement via central schemes has dropped electric bus prices by 40–50 per cent, and plummeting battery costs (falling below US $100/kWh) ensure a lower 15-year lifecycle total cost of ownership (TCO) than diesel variants.

Furthermore, this transition fuels a multibillion-dollar domestic manufacturing ecosystem for buses, batteries, and motors, generating substantial employment. Backed by clear policy mandates, Central assistance under upcoming frameworks like FAME-III and PM e-Bus Sewa now explicitly bars funding for diesel buses, shifting entirely to electric platforms. However, electric buses carry a 70–90 per cent upfront capital premium over diesel equivalents, a baseline cost that financially distressed STUs cannot absorb without deep structural interventions.

India faces a critical dual challenge. It must rapidly scale up urban bus deployment to address a severe 60 per cent fleet deficit while simultaneously enforcing a full transition to zero-emission electric vehicles. This massive modernization agenda cannot be resolved through incremental vehicle additions or short-term subsidies alone. Because financially broken STUs cannot absorb the 70–90 per cent upfront capital premium of electric buses or fund necessary multi-megawatt depot upgrades, policymakers must execute aggressive, infrastructure-first institutional and financial restructuring. By mandating aggregated procurement models, implementing automatic fare escalation, transferring legacy liabilities off STU balance sheets, and de-risking the sector, India can unlock private equity and global green capital to transform underfunded public transit into a scalable, clean, and investment-grade asset class.

It is now well understood from credible assessments that initiatives needed to combat air pollution and carbon emissions are severely underfunded. This funding deficit is particularly acute within the transportation sector—a primary driver of urban emissions—which requires a complex, multilayered mix of technology upgrades, fuel quality improvements, and systemic overhauls in urban mobility and transportation systems. While capital allocations within transit occasionally appear sizeable on paper, these figures are heavily skewed toward massive infrastructure investments in rail-based systems and private electric vehicle subsidies. Overall funding flows fail to target the highly granular, localized interventions necessary to curb ambient air pollution effectively across diverse transit modes.

This systemic imbalance leaves surface public transit—specifically multi-modal bus networks—under-resourced, despite buses serving as the prime movers for mass daily commuting. To bridge this gap, governments and financial institutions must move toward a solution-oriented funding strategy that serves as a key enabler for clean air. Rather than relying on broad sectoral buckets, an optimized framework would isolate specific mobility solutions, such as de-risking the high upfront procurement costs of electric bus fleets, bus-related infrastructure (depots, terminals, ITMS, etc.) and financing non-motorized transport infrastructure. Implementing highly targeted, solution-specific allocation models will allow policymakers to direct capital where it yields the highest return for public health and emission reduction, transforming underfunded public transit systems into the backbone of clean urban air. This assessment, therefore, focuses on urban bus systems.

Initiative scope: The Centre for Science and Environment (CSE), in collaboration with global sustainability consultancy CITIES Forum, has developed a comprehensive roadmap up to the year 2047—aligned with the Viksit Bharat national vision—to scale sustainable bus services and support a dedicated Bus Mission across all 35 States and Union Territories. Built on Vahan registration data from FY2010-11 to FY2025-26 and guided by MoHUA's Service Level Benchmarks (SLBs), the initiative establishes a state-wise demand and cost model. It assesses the current sector baseline, forecasts demand to 2047, quantifies transition costs and financial requirements, details structural barriers, and outlines the institutional, regulatory, and financial reforms necessary for a phased implementation path.

To guide policy and investment, the analysis focuses on the following objectives:

i) Baseline assessment that defines the current state of India's stage-carriage bus sector regarding fleet size, geographical distribution, institutional structures, and financial health;

ii) Long-term demand projection for bus demand based on varying urbanization levels and target SLB achievements;

iii) Financial strategy quantifying the total investments required under an ambitious electrification path and determining how to finance them; and

iv) Barrier and reform mapping that identifies structural barriers—such as high upfront capital costs, charging infrastructure deficits, and grid limitations—to design institutional, regulatory, and fiscal solutions; and

v) Phased transformation roadmap that designs a clear, milestone-driven action plan with distinct roles and dedicated funding mechanisms to transform the sector.

Rather than relying on short-term fixes, this landmark assessment provides the first comprehensive, state-by-state analytical blueprint to guide a unified National Bus Mission up to 2047. By explicitly tying historical Vahan registration trends and MoHUA Service Level Benchmarks to long-term electrification costs and rigorous structural reforms, the roadmap answers exactly *what* infrastructure and capital are needed, *how* to de-risk the sector's financial health, and *when* specific milestones must be met to convert public transit into a scalable, clean and investment-grade asset class.

Methodology

This study combines rigorous quantitative data modelling with qualitative policy analysis across all 35 States and Union Territories. The quantitative framework utilises a state-by-state demand-forecasting and financial-assessment model configured across three distinct growth paths: conservative, base case, and ambitious. By integrating localized urbanization rates, MoHUA's Service Level Benchmarks (SLBs), and a strict 15-year vehicle retirement cycle applied directly to historical registration data, the model generates precise, year-by-year procurement and capital demand profiles up to FY2046-47.

The qualitative framework features comprehensive evaluations of national transit policies (including the NUTP, FAME-II, and PM e-Bus Sewa schemes), state and STU financial accounts, Vahan portal metrics, and national transport statistics. This research is supported by deep-dive interviews and strategic engagements with central government entities (MoHUA), centralized procurement agencies (CESL), STU leadership teams, original equipment manufacturers (OEMs), and development finance institutions. To anchor these findings, the study integrates granular case studies analysing three major Indian STUs alongside three pioneering global urban transit networks to extract actionable, comparative insights. Thus, it establishes that a well-designed, robustly funded urban bus system can be a social equity instrument and an environmental necessity.

Key findings

Profile of the bus sector in India: India's stage-carriage sector is defined by severe geographic and technological disparities. Fleet density spans from a high of 25–30 active buses per lakh population in smaller states like Himachal Pradesh and Goa to under 5 in large, low-income eastern states like Bihar and Jharkhand. While the transit network is dense across southern states like Karnataka and Kerala, northern Hindi-belt states have lower bus procurement rates, and North-Eastern states remain heavily dependent on informal shared transport.

Against this uneven backdrop, the national fleet is undergoing a rapid technological transformation but remains heavily dominated by fossil fuels: BS-VI diesel accounts for roughly 77 per cent (~834,000 buses), while CNG and Bio-CNG make up 17 per cent (~1,84,000 buses) as a crucial near-term transition fuel in cities with established gas networks. Electric battery vehicles (BEVs) constitute approximately 4 per cent (43,000 to 45,000 buses), driven by Central programmes like FAME-II and PM e-Bus Sewa, while hybrids (~1 per cent) and early-stage hydrogen pilots (<0.1 per cent) make up the remainder.

Operational landscape and business models: The operational landscape of India's bus sector is defined by a deep institutional divide managed by State Transport Undertakings (STUs). High-performing entities like KSRTC Kerala, GSRTC Gujarat, and KSRTC Karnataka achieve solid cost recovery ratios of 80–93 per cent while maintaining manageable staff-to-bus ratios of 5.5 to 5.8. Conversely, financially stressed mega-operators—such as UPSRTC in Uttar Pradesh (~95,000 buses) and MSRTC in Maharashtra (~17,000 buses)—face severe losses. To navigate these challenges, cities utilize distinct operational frameworks: the traditional state-owned STU model, which ensures comprehensive coverage but suffers from chronic losses; city-specific SPVs like BMTC Bengaluru and BEST Mumbai, which offer strong urban alignment but lack broader economies of scale; Gross Cost Contracts (GCC), where private operators provide and maintain fleets for a fixed Rs 45–55 per kilometre while the state absorbs ridership risk—reducing expenses compared to the Rs 65–75 per kilometre cost of traditional STU operations; and emerging hybrid models utilizing route concessions, co-investments, and digital mobility aggregators.

Because of this intense operational bifurcation and acute regional imbalances in fleet density, the bus sector cannot be modernized through a uniform approach. Upgrading the network requires highly customized, state-specific roadmaps and fiscal strategies. Every intervention must be precisely calibrated against local institutional capacities, existing regional fuel networks, and the distinct operational business models already at play on the ground.

Financial performance and legacy structural issues: The financial state of most State Transport Undertakings (STUs) is fragile, severely barring fleet renewal and the clean energy transition. Distressed STUs operate with cost recovery ratios as low as 50–65 per cent, generating weak revenue of Rs 25–38/km against steep operational costs of Rs 60–80/km, pushing accumulated loss-to-revenue ratios past 5x for the most severely impacted entities. This deep-seated distress is driven by politically suppressed fares covering only 62–70 per cent of operating costs—highlighted by DTC Delhi's lowest cost recovery at 31 per cent—alongside severe staffing inefficiencies. STUs employ 8.2 lakh workers, with a national average staff-to-bus ratio of 6.8:1 (exceeding 9:1 in stressed systems), resulting in Rs 16–24/km in excess personnel costs and massive, unfunded pension liabilities, such as MSRTC's Rs 35,000–40,000 crore burden. Furthermore, infrastructure deterioration and a lack of digital integration severely impair route and financial planning, with older depots requiring refurbishment costs of Rs 10–25 crore each.

While electric bus technology offers a superior lifecycle total cost of ownership, adoption is bottlenecked by institutional and financial barriers rather than technological ones. Weak STU balance sheets prevent operators from absorbing the 70–90 per cent upfront capital premium of electric buses, which cost approximately Rs 0.70 crore more than diesel counterparts. Simultaneously, severe depot infrastructure deficits and grid connection delays of 18–36 months halt progress; out of roughly 1,200 STU depots nationwide, only 200–300 have been surveyed for EV readiness, revealing that only ~15 per cent possess high-voltage connections, a mere 8 per cent feature 180kW DC fast chargers, and upgrading a single depot requires a steep capital expenditure of Rs 3–8 crore. Overcoming these bottlenecks mandates an immediate overhaul of the sector's architecture by scaling aggregated procurement via Gross Cost Contract (GCC) models, implementing automatic fare escalation, transferring legacy pension debts off STU balance sheets, and establishing a single-window National Urban Bus Mission for executing the above along with grid power upgrades.

Urban fleet deficit and definitional challenges: While India's National Urban Transport Policy targets a 70 to 75 per cent public transport modal share for mega-cities, actual levels linger at just 25 to 35 per cent.[1] This deficit is most critical in smaller cities/towns that absorb the bulk of future growth; currently, over 400 cities with populations exceeding one lakh operate no organized municipal bus services at all.[2] Assessing the exact resources needed to close this gap introduces methodological hurdles because India lacks a single consolidated figure for 'urban buses'. To isolate this gap and navigate the intercity continuum—where states like Madhya Pradesh, West Bengal and Rajasthan dedicate the vast majority of absolute vehicle assets to long-distance routes rather than municipal transit—this report establishes a strict, conservative floor definition that isolates dedicated city bus operations within a single urban agglomeration. A standard 12-metre bus can displace 40–50 private cars at a fraction of the infrastructure cost and with significantly lower emissions, making structured fleet expansion a priority.

To resolve these transit gaps without inducing capital inefficiencies, procurement frameworks must abandon uniform models in favour of vehicle and battery formats optimised for distinct city typologies. Mega-cities with over 40 lakh residents require high-capacity, low-floor 12-metre standard and 18-metre articulated units with 320kWh+ lithium iron phosphate (LFP) batteries for high-intensity Bus Rapid Transit (BRT) corridors, while mid-tier cities housing 10 to 40 lakh residents can rely on standard 12-metre semi-low-floor buses with 250–300kWh batteries optimized for overnight depot charging. For medium and smaller cities under 10 lakh populations, procurement should pivot to agile 9-metre minibus platforms featuring 120–200kWh batteries to cost-effectively navigate narrow street networks and lower ridership densities. Finally, hill stations require highly specialized electric formats configured with a minimum of 180kWh batteries, robust regenerative braking and hill-hold configurations to manage steep gradients. Ultimately, closing the municipal transport gap across hundreds of underserved cities requires this coordinated approach that maps customized, technology-specific assets directly to population classes, geographic terrains, and local corridor densities.

Baseline, demand and procurement: There is a massive deficit in public transport infrastructure. Across the country, an organized urban city-bus fleet of approximately 65,000 vehicles serves an urban population of nearly 469 million in FY2025–26, see *Table 1: Estimated bus fleet size* for details. This is derived from the MoHUA efficient and sustainable city bus services (ESCBS) core of 45,450 vehicles, a 2 per cent natural growth rate, and deployments via FAME-I, FAME-II and PM e-Bus Sewa. This translates to a fleet density of merely 13.3–13.8 buses per lakh of urban population—a stark shortfall when measured against the Ministry of Housing and Urban Affairs (MoHUA) Service Level Benchmark target of approximately 44 buses per lakh graded across city classes. This severe deficit represents a quarter of the MoHUA megacity benchmark (60 per lakh).

This creates an overwhelming service deficit of roughly 70 per cent, leaving over 400 cities with populations between 1 lakh and 1 million completely devoid of organized bus operations. Consequently, the modal share of public transport in Indian cities lingers between 25 per cent and 35 per cent, remaining far short of the 70–75 per cent target established by the National Urban Transport Policy. The operational crisis is further exacerbated by a severe ageing backlog, as nearly 40,000 urban buses currently operate past their 15-year statutory lifespan. Looking at the

Table 1: Estimated bus fleet size

Fleet measure	Size	Provision	Source
All registered buses	~14.5 lakh	count only	Vahan/MoRTH, all bus types, FY2010-11 to FY2024-25
STU stage-carriage fleet	~2.9 lakh	~20 per lakh total pop.	CIRT, FY2018–19
Organised urban city-bus fleet	~65,000	~13.3 per lakh urban pop.	MoHUA ESCBS, FAME, PM e-Bus Sewa

Source: Cities Forum Analysis, reconciling Vahan/MoRTH, CIRT (FY2018-19) and MoHUA programme data. Nesting: ~65,000 urban buses are a subset of ~2.9 lakh STU stage-carriage buses, themselves a subset of ~14.5 lakh registered buses.

broader national picture across all service categories, 5.8 lakh buses are set to reach their end-of-life between financial years 2026 and 2030, presenting both a critical challenge and a timely opportunity for fleet renewal.

In contrast, India's cumulative national stage-carriage fleet reached 1,555,691 buses by FY2025–26 (with an active operational fleet of 10,82,769 vehicles), but the vast majority serve long-distance intercity and semi-urban routes. Annual new additions remain strong at 111,049 buses (a 19.3 per cent 15-year CAGR), heavily concentrated across Karnataka, West Bengal, Madhya Pradesh, Maharashtra and Uttar Pradesh, which command over 55 per cent of the active national total. However, the existing network is severely penalized by an overaged backlog of roughly 40,000 buses operating past their 15-year lifespans.

To achieve graded service level benchmark (SLB) compliance by 2047, the urban fleet must scale drastically across three projected paths. Option 1 (the absolute must minimum) – aims to reach graded SLB fleet availability norms of 44 buses per lakh by 2047 - targets 3,35,623 buses by 2047 (scaling from 65,202 in FY 2026, and 1,57,121 by FY2035 and 2,22,570 in FY2040); Option 2 (the intermediate path) – aims to reach graded SLB fleet availability norms of 44 buses per lakh by 2030 and uniform rate of 60 buses per lakh by 2040 and maintains it till 2047 – targets 4,57,668 buses (passing through 3,08,812 in FY2035, and 3,95,484 in 2040); and Option 3 (the Viksit Bharat ambition) – aims to reach global-best levels, about 88 buses per lakh (based on global cities benchmark and World Bank guidance), by 2047 – targets 6,71,000 buses by 2047 (passing through 3,56,322 in FY2035, and 4,72,384 in 2040). Under the primary mission (Option 3), total procurement reaches about 9.1 lakh buses over the period, an average near 41,500 a year, rising to a peak close to 78,000 in the mid-2040s as the mission's own early inductions come up for their first replacement.

Demand forecasting until 2047 and its methodology: India's urban bus requirement is modelled using a normative, population-linked equation based on the MoHUA SLB framework. Rather than relying on unconstrained historical trend extrapolation, the model anchors future fleet needs directly to a state's active urban population and a targeted policy achievement rate. Grounded in baseline estimates, state-by-state urban population projections are calibrated against the UN World Urbanisation Prospects medium-variant metrics, anticipating an annual national urban population growth rate of 1.9 per cent to 2.1 per cent. To assess requirements across the urban continuum, a blended baseline SLB norm of approximately 44 buses per lakh population is utilized. This tiering assign 60 buses per lakh for mega-cities (above 40 lakh), 50 for metro cities (10–40 lakh), and 40 for smaller urban localities (under 10 lakh).

Population projections and policy scenarios: The overarching demand driver is linked to expanding demographic data, forecasting a national urban population surge from 530 million to 763 million by 2046–47.

To evaluate policy and institutional readiness, the following three distinct SLB achievement paths are analysed:

i) Option 1 sets the service standard at the graded Service Level Benchmark, about 44 buses per lakh, reached by 2047 through a steady climb from today's 13.3. In fleet terms, this means about 3.36 lakh buses in operation by 2047

ii) Option 2 sets the graded SLB by 2030, and then pushes uniform provision to 60 buses per lakh by 2040, holding there to 2047. The fleet reaches about 4.58 lakh by 2047.

iii) Option 3 sets the service standard at global-best provision, about 88 buses per lakh by 2047, aligning India's aspiration to become Viksit Bharat. The fleet reaches about 6.71 lakh by 2047.

State-wise demand analysis: The regional demand distribution under the base case highlights severe, concentrated deficits. Highly urbanized and populous states dictate the largest total fleet requirements. For instance, Uttar Pradesh, one of the most populus state in the country, shows a baseline demand of 242,250 buses, though its apparent current surplus reflects a heavily blended intercity fleet that serves dual urban functions. True urban deficits are most severe in absolute terms across metropolitan economic hubs like Maharashtra and Delhi; Maharashtra faces a massive deficit with a demand of 207,900 buses against a fraction of active urban provisions, while Delhi exhibits a demand of 70,200 buses against just 15,000 DTC units. Conversely, low-income states with rapid urban growth, such as Bihar and Jharkhand, suffer from exceptionally weak transit numbers driven by historically constrained state fiscal capacities.

Envisaging a bus mission with three levels of ambition: The national Viksit Bharat 2047 vision requires a formal bus mission to drive the transition. The bus mission is framed not as a single target but as three graded options, each applying MoHUA's graded SLB norms of fleet-availability (60 buses per lakh for mega-cities, 50 for metro, 40 for smaller cities). They differ in ambition and pace. Option

3 is considered as the primary mission in this study (see *Table 2: The three mission options for urban bus augmentation* and *Figure 1: Urban electric bus fleet in operation, FY2026–47 under the primary mission [Option 3]*).

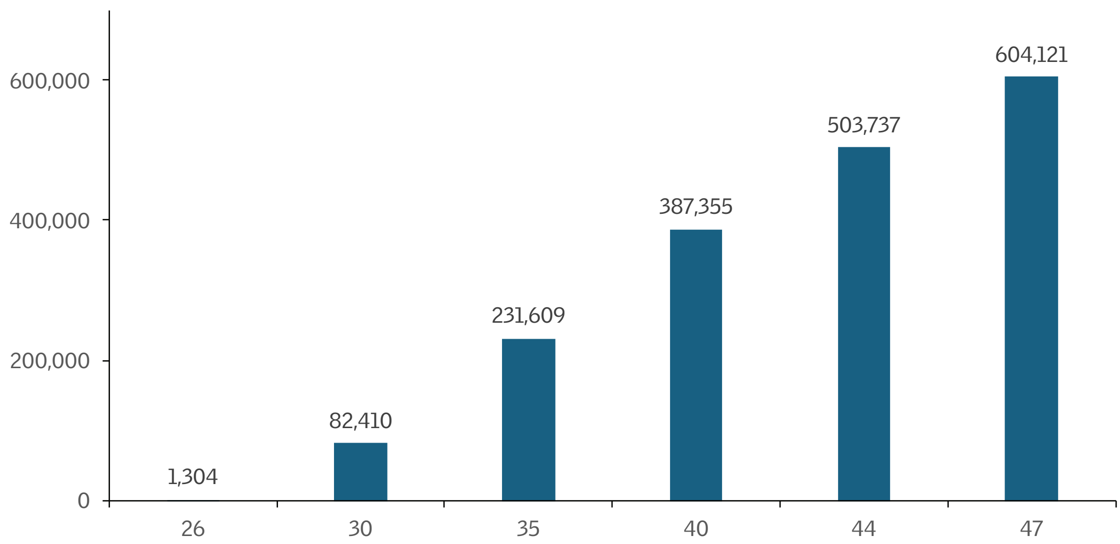
To address the expanding urban transport demands through 2047, this analytical modelling outlines three distinct planning paths anchored in progressive policy ambition. Under a Conservative path, Option 1 targets achieving the graded Service Level Benchmark of roughly 44 buses per lakh by 2047. This scenario would yield an operational fleet of 3.36 lakh buses—of which 3.02 lakh, or approximately 90 per cent, would be electric—requiring a total procurement of 4.2 lakh buses

Table 2: The three mission options for urban bus augmentation

Metric	Option 1	Option 2	Option 3
Ambition	Reach graded SLB by 2047	Reach graded SLB by 2030, 60/lakh by 2040 and hold it for 2047	Global-best by 2047
Provision rate 2047 (per lakh)	44	60	88
Fleet in operation 2047	3.36 lakh	4.58 lakh	6.71 lakh
Total buses procured 2026-47	4.20 lakh	6.80 lakh	9.10 lakh
Average procurement per year	~19,000	~31,000	~42,000
Total CapEx (Rs lakh crore)	6.55	10.55	14.20

Source: Cities Forum Analysis, Viksit Bharat Urban Bus Mission model. Option 3 is the primary mission; Option 1 reproduces the graded-SLB target reached gradually by 2047.

Figure 1: Urban electric bus fleet in operation, FY2026–47 under the primary mission (Option 3)



Source: Cities Forum Analysis, Viksit Bharat Urban Bus Mission model (Option 3).

between 2026 and 2047 at an average rate of nearly 19,000 buses annually, peaking at 35,000 buses per year.

Option 2, framed as the Base Case, aims to reach the SLB by 2030 and scale further to 60 buses per lakh by 2040. This trajectory builds an operational fleet of 4.58 lakh buses by 2047, containing 4.12 lakh electric buses, and requires procuring 6.8 lakh buses in total—averaging about 31,000 buses annually with a peak requirement of 55,000 buses per year.

Finally, the recommended Option 3, aligning with the ambitious Viksit Bharat vision, targets a global-best benchmark of approximately 88 buses per lakh graded by 2047. This ambitious pathway expands the active fleet to 6.71 lakh buses, with 6.04 lakh electric variants, demanding a total procurement wave of 9.1 lakh buses. Meeting this scale necessitates an average annual procurement of roughly 41,500 buses, escalating to a peak year volume of nearly 78,000 buses.

Electrification of buses and power grid demand: This three-phase bus electrification strategy follows a strict procurement timeline, increasing the electric share of new purchases from 30 per cent in FY2025–26 to 50 per cent by FY2029–30, 75 per cent by FY2034–35, and a 100 per cent mandate by FY2039–40. This trajectory aggressively drives the active national fleet's EV share from a 2–3 per cent baseline (43,000 units) to 25 per cent by FY2030, 65 per cent by FY2040, and 90 per cent by FY2046-47—deploying 6.04 lakh electric buses under the primary mission and scaling to 950,000 operational units by 2047. Supporting this zero-emission network requires 121 GWh of active battery capacity and a surge in charging infrastructure from an initial 2.0 lakh points to 1.43 million cumulative chargers, triggering a peak annual infrastructure spend of Rs 24,000 crore by FY2039–40.

To power this fleet, annual charging demand will increase from 800 MU through milestones of 37,000 MU and 55,000 MU, ultimately reaching 85,000 MU by FY2046–47. While this total represents a manageable 1.8 per cent of India's 2024 generation and 4–5 per cent of projected 2047 consumption, success hinges on a highly synchronized, proactive infrastructure rollout. Dedicated multi-megawatt grid links and depot power must be planned alongside vehicle procurement rather than as an afterthought, utilizing smart-charging networks, distribution upgrades, vehicle-to-grid (V2G) frameworks, and demand response management to transform bus depots into controllable loads during renewable energy surpluses.

Financial cost considerations: The assessment of financial requirements maps unit cost assumptions directly onto annual procurement timelines, incorporating a 3 per cent annual capital expenditure (CapEx) escalation and a 4 per cent operational expenditure (OpEx) inflation rate. Unit costs are anchored to real market benchmarks, including CESL data, FAME-II costs and actual depot electrification projects. At baseline, a standard 12-metre electric bus is priced between Rs 1.50 crore and Rs 1.65 crore—nearly double the Rs 0.80 crore required for a standard diesel vehicle—while blended charging infrastructure adds Rs 0.20 crore per vehicle. However, the model balances this upfront premium by factoring in a 20 per cent real reduction in electric bus CapEx by FY2034–35, driven by scaling manufacturing and falling battery costs.

This vehicle price drop, paired with a significant energy cost differential where electricity costs Rs 12/km versus diesel's Rs 25/km, gives electric buses a 7.9 per cent total cost of ownership advantage over a 15-year lifecycle. Ultimately, this demonstrates an average investment payback period of 8.2 years.

Capital expenditure estimates and the current funding structure: Achieving full sector modernization between FY2026 and FY2047 requires a cumulative capital expenditure (CapEx) of Rs 6.55 lakh crore under Option 1, scaling up to Rs 14.20 lakh crore under Option 3. This translates to an annual average investment of roughly Rs 31,190 crore. Due to an intense, retirement-driven replacement wave of diesel and CNG buses alongside urgent initial charging infrastructure rollouts, this capital requirement is heavily front-loaded during the FY2026–30 phase at Rs 1,06,500 crore.

Rather than relying on a single gap figure, the total financial requirement is distributed across a diverse funding matrix. The Central Government provides 30 per cent (Rs 1,97,000 crore) through PM e-Bus Sewa-type frameworks, while State Governments contribute 22 per cent (Rs 1,44,100 crore). The remaining balance is met by multilateral concessional debt (12 per cent), STU internal funds (10 per cent), commercial banks (10 per cent), and private operator equity and green bonds. Backing this investment, the lifecycle case strongly favours electric buses; the total cost of ownership (TCO) for a 12-metre electric bus over 15 years is already highly competitive with diesel and continues to improve due to significantly lower running costs per kilometre.

Challenges of the current financing landscape: The current financing paradigm is bottlenecked by three core vulnerabilities that prevent long-term sector transformation. First, an over-reliance on central capital subsidies has created total scheme dependency and extreme procurement volatility, causing sharp investment drop during transition windows between policy frameworks. Second, the efficiency of these capital subsidies is inherently limited. While they lower upfront asset acquisition costs, they completely fail to incentivise daily operational availability, route expansion, or long-term fiscal discipline. Third, the entire lifecycle risk of ownership, debt, and depreciation is heavily concentrated on the balance sheets of STUs, which lack the financial capacity to absorb these liabilities. To overcome these issues, modern transit finance dictates distributing risk to the entities best suited to handle them. This requires assigning route risk to public entities, operational management to private firms, and asset funding to the capital markets.

Trend in viability gap funding (VGF) from pre- to the e-bus era: Historically, VGF was tailored around legacy procurement models defined by fragmented, city-by-city tenders, thin competition, and specifications that inflated asset costs. For instance, ahead of the 2010 Commonwealth Games, the Delhi Transport Corporation (DTC) bought 3,125 low-floor CNG buses at prices roughly double a standard CNG bus and 26 per cent higher than diesel equivalents, widening the viability gap. Early electric bus deployments initially worsened this gap due to market fragmentation and policy 'infrastructure blindness'. Early FAME-II bids reached unviable heights—averaging Rs 69/km for 12-metre buses and Rs 63.3/km for 9-metre buses—because operators had to absorb opaque downstream depot realities and upstream grid augmentation costs into their operating expenses.

Over the past five years, urban bus VGF has fallen sharply due to structural changes and a shift to the Gross Cost Contract (GCC) model. Modern schemes like PM-eBus Sewa now bridge this gap by providing 100 per cent central assistance for 'Behind-the-Metre' (BTM) power infrastructure and depot civil construction, effectively isolating capital risks from operator bids. Furthermore, national demand aggregation (such as CESL's tender for 5,450 buses across 5 cities) dropped per-kilometre rates by 7–48 per cent. This reduced 12-metre bus bids to Rs 43.49/km with subsidies, and Rs 54.30/km under the National Electric Bus Programme (NEBP) without subsidies.

Tax burden on buses: An urban stage-carriage bus in India is heavily penalised by an uncoordinated, five-layer tax structure, creating significant fiscal stress. At the vehicle level, conventional buses face an 18 per cent GST (reduced from 28 per cent in September 2025), while electric buses sit at 5 per cent. The service itself is taxed at either a 5 per cent GST without Input Tax Credits (ITC) or an unworkable 18 per cent with full ITC, though non-AC stage-carriages remain exempt. Consequently, under the 5 per cent service rate, the 18 to 28 per cent GST paid on inputs like tyres, spares, batteries, and depot civil works becomes a completely sunk cost. Compounding this are layered state levies—including seat-linked motor vehicle taxes and passenger taxes charged directly on fare revenue—alongside non-creditable energy taxes like excise duties and VAT on diesel, plus electricity duties on charging.

This structure creates a stark asymmetry with private cars. Measured per passenger-kilometre, space-efficient public buses are taxed far more heavily than private automobiles, which pay only a one-time road tax and fuel duty despite averaging just over one occupant. Furthermore, a standard 18 per cent commercial GST applies to core depot infrastructure like substations and civil works, which blocks ITCs. This operational strain was recently amplified by an April 2026 landmark ruling from the Gujarat Authority for Advance Ruling (AAR) in the case of M/s JBM Ecolife Mobility Surat P. Ltd, which rejected concessional interpretations and mandated that electric bus rental and operational services be taxed at the standard residual rate of 18 per cent GST.

Financial requirements for modernizing the bus fleet: The financial commitments required to realize the operational pathways are substantial. Capital expenditures for Option 1 are estimated at Rs 6.55 lakh crore, or approximately US $76 billion, over the 2026–47 period to cover vehicle acquisitions, charging hardware and depot expansions. Option 2 elevates the capital outlay to Rs 10.55 lakh crore, roughly equivalent to US $123 billion. Meanwhile, the recommended Option 3 demands a cumulative capital investment of Rs 14.20 lakh crore, or approximately US $165 billion.

Addressing this expenditure reveals a major structural funding gap. Existing and anticipated Central government schemes are projected to cover only about 30 per cent of Option 3's total capital cost. This leaves a substantial 70 per cent deficit—amounting to approximately Rs 9.9 lakh crore—that must be systematically mobilized across state governments, State Transport Undertakings, private operator equity under gross cost contracting (GCC), commercial banks, non-banking financial companies, green bonds, and international climate finance.

While central frameworks like PM e-Bus Sewa can subsidize 40 per cent of the electric bus CapEx—committing roughly Rs 2.62 lakh crore—a significant funding gap of Rs 3.93 lakh crore remains to be mobilized from state budgets, private equity, commercial debt, and international financial institutions. Despite this steep upfront barrier, long-term operational economics strongly favour the transition. Driven by a major energy and maintenance cost differential—where electric operating costs are Rs 28/km versus diesel's Rs 45/km—the TCO for a 12-metre electric bus over a 15-year lifecycle is approximately 18 per cent lower than its fossil-fuel counterpart.

Ultimately, closing India's urban mobility gap and navigating this Rs 6.55 lakh crore investment is fundamentally an infrastructure and financial architecture challenge rather than a technological problem. While net urban fleet expansions remain modest, the primary driver is a massive retirement cycle demanding 1.1–1.4 lakh vehicles annually through 2047. India cannot resolve this through short-term capital subsidies or by loading debt onto bankrupt STU balance sheets. Instead, the state must capitalize on the lifecycle TCO advantages of electric buses by utilizing aggregated public-private contracting frameworks and blended financing vehicles like the National Urban Bus Electrification Fund (NUBEF) to transform clean transportation into a self-sustaining, investment-grade asset class.

To bridge the Rs 9.9 lakh crore financing gap and de-risk investments, this assessment recommends establishing the National Urban Bus Electrification Fund (NUBEF) as an anchoring mechanism, with an initial corpus of Rs 25,000 crore funded by the Central government, states and multilateral banks. This is complemented by a standardized national Green Bus Bond framework to raise Rs 15,000+ crore from capital markets backed by state guarantees for STU fleet renewal. Concessional climate debt (at 4–5 per cent) from institutions suchas the World Bank, ADB, KfW and JICA should be routed through NUBEF, while targeted Viability Gap Funding (VGF) and Results-Based Finance (RBF)—disbursed against verified outputs like passenger-kilometres operated and emissions avoided—ensure long-term commercial bankability and performance efficiency.

Grid integration and policy frameworks: Scaling the active e-bus fleet to 6.04 lakh vehicles by 2047 creates a total charging demand of ~37,000 MU/year and requires 121 GWh of active battery capacity. While this represents a manageable grid load of roughly 1.8 per cent of India's 2024 electricity generation, it demands robust power procurement and depot infrastructure integration. Policy frameworks must mandate guaranteed 2-MW dedicated power supplies to bus depots and integrate smart-charging protocols with distribution companies (DISCOMs). Furthermore, structural tax reforms are essential to lower systemic costs, including extending the concessional 5 per cent GST rate to depot civil works, high-tension substations and grid connectivity, alongside amending GST codes to legally define electricity and battery-swapping charges as 'fuel equivalents' under GCC contracts.

Integrating a massive electric fleet demands a dedicated, parallel grid expansion programme totalling Rs 24,000 crore in power infrastructure investments. This plan covers high-tension feeders and dedicated substations for over 1,000 depots nationwide, smart charging systems and depot rooftop solar engineered to supply at least 30 per cent of peak operational demand. Because the combined state and STU share requires Rs 2.09 lakh crore over the projection horizon, the strategy cannot rely on existing cash-starved public balance sheets. Transport authorities must legally enforce comprehensive STU financial restructuring to lift five to ten major entities to investment-grade credit ratings by 2030—an absolute prerequisite to unlocking the projected Rs 1.18 lakh crore in commercial bank loans and green bond capital markets.

Furthermore, because these massive electrical loads are completely absent from current utility roadmaps, policymakers must mandate joint planning between transport ministries and electricity distribution companies while instituting dedicated state-level revolving funds to manage concessional international finance. Ultimately, vehicle electrification is an infrastructure program requiring a deep financial overhaul, not an isolated environmental initiative. India must transition from short-term vehicle capital subsidies toward an outcome-linked, output-based funding structure. By combining the creation of the National Urban Bus Electrification Fund (NUBEF) with aggressive STU balance sheet cleaning and independent tariff indexing, the government can transform public transport into an investment-grade asset class, leveraging global climate finance and private capital markets up to 2047.

Requisite financial instruments and capital mobilization: To resolve these systemic failures, this analysis mandates the immediate deployment of five innovative financing instruments, led by the establishment of the National Urban Bus Electrification Fund (NUBEF). This blended finance facility will feature an initial Rs 25,000 crore corpus—pooling Rs 10,000 crore from the Central government, Rs 5,000 crore from states, and up to US $1.5 billion in international concessional debt—to on-lend to eligible operators at below-market interest rates of 4–5 per cent over a 12- to 15-year tenure. For capital market integration, a Green Bus Bond framework targets Rs 15,000–20,000 crore in issuances by FY2034–35. Backed by state guarantees to achieve investment-grade ratings for 8–10 select STUs, this structure will link capital access directly to standardized environmental metrics under SEBI guidelines.

Simultaneously, a structured Viability Gap Funding (VGF) framework will replace fiscally opaque cross-subsidies to bridge the gap between commercial Gross Cost Contract (GCC) rates and sustainable fare revenues along unserved or low-income urban corridors. Funding streams will be further diversified through Results-Based Financing (RBF) modalities—such as the World Bank's Program for Results (PforR) and the ADB's Results-Based Lending—which unlock up to US $1.0 billion by tying payouts strictly to verified metrics like electric-kilometres operated and emissions avoided. Finally, the framework maximises international climate finance by integrating Germany's KfW highly concessional Euro-denominated loans, the ADB Climate Change Fund, and the Green Climate Fund (GCF) Enhanced Direct Access window channelled through accredited local entities like NABARD.

Mandatory sectoral and institutional reforms: Unlocking these capital investments and operational capabilities hinges on executing systemic regulatory and institutional reforms across the bus sector. On the contracting front, public authorities must mandate Gross Cost Contracting as the universal framework for deployments exceeding 100 buses, effectively reallocating demand risk away from private fleet operators. Tariff governance must be modernized by establishing independent fare authorities and automatic fare-revision formulas to prevent political delays in cost recovery.

Simultaneously, operational and financial restructuring must target the ten most financially stressed State Transport Undertakings to elevate their balance sheets to investment-grade credit ratings by FY2030. Institutionally, states must establish Unified Metropolitan Transport Authorities alongside statutory City Mobility Plans for every urban centre housing more than 5 lakh residents. Furthermore, targeted tax rationalization is vital: restoring the Input Tax Credit for urban stage-carriage operators, replacing complex motor vehicle taxes with nominal flat fees linked to registration, eliminating passenger taxes on urban fares, harmonizing GST to a concessional 5 per cent rate for depot civil and power grid infrastructure and explicitly amending GST codes to treat electricity and battery-swapping expenses as recognized fuel equivalents.

Opportunity for massive expansion in bus manufacturing and industry: This necessary expansion opens unprecedented market horizons for domestic bus manufacturing and industrial supply chains. Meeting the recommended mission profile demands a 17-fold scale-up in annual urban bus procurement, rising from the current rate of roughly 2,500 buses per year to an average of 41,500 units annually, before hitting the peak demand of 78,000 buses. India's top five Original Equipment Manufacturers currently hold an estimated annual electric bus production capacity of about 40,500 units; however, this infrastructure operates at less than 10 per cent capacity utilization. Absorbing future demand requires scaling total production while driving deep domestic localization. Key opportunities lie in expanding battery manufacturing, power electronics, structural chassis design and bus body-building supported by Production Linked Incentive-style mechanisms and standardized quality benchmarks to maintain long-term industrial viability.

Lessons from domestic and global case studies: Case studies from Delhi and Bengaluru reveal that infrastructure readiness, not technology, is the primary hurdle to electrification. The Delhi Transport Corporation (DTC) successfully scales 1,500 electric buses under a Gross Cost Contract (GCC) model despite carrying over Rs 25,000 crore in losses—saving Rs 12–18/km over CNG—though it faces 12 to 24 month grid delays. Meanwhile, the Bengaluru Metropolitan Transport Corporation (BMTC) operates 900 electric buses by leveraging early integration with its local utility and blending FAME-II subsidies, state grants and internal equity to cap per-bus costs at Rs 30–35 lakh. Nationally, the PM e-Bus Sewa scheme has fundamentally shifted the market, deploying 10,000 electric buses and slashing costs by 35–45 per cent through aggregated procurement and a 12-year GCC framework. However, the programme highlights a distinct risk due to a lack of sustainability planning once assets transfer to urban local bodies, which currently lack the administrative capacity to manage interfaces with private operators.

Globally, Shenzhen serves as the electrification benchmark after transitioning its entire 16,359-bus fleet by 2017 through heavy subsidies, a pioneering battery-leasing model, and coordination by a dedicated transport-energy bureau for grid upgrades. Meanwhile, Bogotá provides a blueprint for developing economies by integrating 1,200 electric buses using multilateral debt at ~4 per cent interest—proving systemic transit restructuring must precede mass EV deployment—whereas Cape Town underscores the immense difficulty of transitioning informal operators without complex financial compensation and equity participation. Chengdu further demonstrates that electrification is highly achievable in non-mega cities if original equipment manufacturer (OEM) service networks are pre-positioned and smart charging software balances electrical loads over a 24-hour cycle.

Collectively, these global case studies confirm that successful electrification requires centralized procurement, integrated grid planning, operator formalization, and concessional debt. For India, this dictate transitioning away from short-term subsidies to treat electrification as a utility infrastructure programme. Policy must mandate joint MoHUA-Ministry of Power task forces, deploy national battery-leasing models to cut upfront costs, and embed operator formalization and driver training directly into Gross Cost Contract (GCC) requirements. Ultimately, adopting an 'infrastructure-first' strategy—where grid and depot readiness precedes vehicle procurement—is the only way India can avoid current domestic deployment delays and secure long-term financial sustainability after central subsidies expire

Battery accumulation and circular economy imperatives: Operating nearly a million electric buses by 2046–47 creates a massive hazardous-material challenge and a vital resource recovery opportunity, making a circular economy an immediate strategic imperative. As standard 250–300 kWh bus batteries reach their eight- to 10-year operational lifespans, an immense wave of 95,000 annual pack retirements will generate 240,000 to 285,000 tonnes of end-of-life battery mass each year. Because this scrap contains highly concentrated volumes of lithium, cobalt, nickel, manganese, and graphite, scaling a closed loop is critical to prevent environmental hazards and secure India's strategic mineral supply chains. Meeting this challenge mandates a national battery recycling programme that utilizes viability gap funding to build advanced hydrometallurgical processing facilities, enforce end-to-end traceability, and support secondary stationary energy storage markets.

Roadmap for sustainable bus transport and financing to 2047

While India faces an expanding urban mobility crisis, it has a unique strategic opportunity to absorb 230 million new urban residents by building one of the world's cleanest transit network. By leveraging a looming retirement wave that requires 1.1 to 1.4 lakh vehicles annually, the country can phase out old diesel stock and avoid locking in fossil-fuel liabilities for the next 15 years. To meet MoHUA's Service Level Benchmarks, this study proposes a long term National Urban Bus Mission roadmap across three execution options, aiming for 100 per cent electrification of new additions by FY2039-40. Navigating a Rs 6.55 lakh crore CapEx requirement, this roadmap balances a net addition of 94,000 urban buses with a front-loaded replacement of 1.31 lakh buses annually between 2026 and 2030 (including a 5.8 lakh vehicle retirement cohort). Ultimately, achieving Viksit Bharat 2047 requires an infrastructure-first overhaul by linking central and state funding to local SLB metrics, mandatory depot power upgrades, and aggressive STU balance-sheet restructuring, policymakers can transform public transit into an investment-grade asset class funded by private equity and global green capital.

Phase 1: Strengthening the base (FY2026 to FY2029–30): The initial phase prioritises legal, institutional, and infrastructure groundwork to resolve immediate systemic challenges. Key actions include launching an overaged bus emergency programme to replace 40,000 decaying buses with electric models by FY2028-29, expanding the PM e-Bus Sewa scheme to 20,000 units, and establishing a unified National Urban Bus Mission (NUBM) alongside a Rs 25,000 crore National Urban Bus Electrification Fund (NUBEF). To clear technical bottlenecks, a joint task force will mandate and fund dedicated 2 MW+ power links at all major depots. Simultaneously, the government will enforce mandatory SLB reporting for cities with over 5 lakh residents and deploy a standardized National Gross Cost Contracting (GCC) template to shift 50 per cent of new additions into regulated public-private models. This push will expand the active electric bus footprint to 1.5 lakh units, scaling the EV share of new acquisitions from 30 per cent to 50 per cent by 2030.

Phase 2: Scale-up and systemic reform (FY2030 to FY2034–35): The second phase transitions the sector to a self-sustaining commercial model, restricting diesel vehicle funding as the EV share of new additions crosses 75 per cent. To fund this expansion, the NUBEF corpus will double to Rs 50,000 crore by integrating other fiscal strategies including international climate finance lines, while a national facility supports the issuance of Rs 8,000 crore in state-guaranteed STU Green Bonds. While maintaining affordability objectives, operational sustainability is reinforced via independent Fare Fixation Committees and automatic cost-indexed fare adjustments across 10 states, pushing average operator cost recovery past 75 per cent. Institutional and environmental reforms require all cities with over 5 lakh residents to publish 20-year Comprehensive City Mobility Plans (CCMPs), and launch a Results-Based Financing system via a verified Rs 5,000 crore World Bank disbursement line. A cross-subsidy scheme is needed to keep the fares affordable.

Phase 3: Full electrification and long-term sustainability (FY2035 to FY2046-47): The final phase solidifies India's clean transit lead by enforcing a 100 per cent electric mandate for all new urban procurements from FY2039–40 onward, ensuring a 90 per cent electric active fleet by 2047. Financial modernisations drive national cost recovery past 82 per cent while unburdening operators by shifting historical pension liabilities fully onto state balance sheets. Consequently, public financing transitions away from traditional capital grants, executing 80 per cent of new investments through market-driven, output-linked, and results-based structures. This technical consolidation integrates advanced grid frameworks—turning major depots into flexible utility assets that manage 20–30 per cent of charging loads via active demand response and vehicle-to-grid (V2G) systems—while completing a circular economy that recovers 95 per cent of domestic battery materials and secures national SLB compliance across 85 per cent of major cities.

Proposed monitoring and evaluation framework: Accountability is managed through a multi-tier, data-driven framework tracking explicit targets up to 2047, including climbing to 200 million daily urban bus trips, scaling to 950,000 operational electric buses, ensuring 100 per cent of depots connect to 2 MW+ links, and avoiding 90 million tonnes of annual CO_2 emissions. Data validation will leverage integrated digital fleet management APIs and automated ticketing setups built directly into procurement pipelines. To eliminate political reporting bias, an independent performance monitoring cell within MoHUA will conduct third-party verifications to publish standardized annual transparency indexes.

Key recommendations

To execute these structural shifts seamlessly, a comprehensive roadmap of the following ten priority recommendations provides a clear operational framework.

First, the government must launch a National Urban Bus Mission that unifies scattered programmes like FAME, PM e-Bus Sewa, PM e-Drive and legacy JNNURM initiatives under a single accountable national authority.

Second, an immediate Overaged Bus Replacement Emergency must be declared to clear the 40,000-bus backlog with zero-emission electric vehicles by FY2028–29.

Third, the National Urban Bus Electrification Fund should be established with an initial anchor corpus of Rs 25,000 crore rupees to de-risk investments and crowd in commercial and concessional capital.

Fourth, Gross Cost Contracting must become the mandatory national standard for fleet allocations exceeding 100 buses.

Fifth, Service Level Benchmark reporting must be made strictly mandatory for all cities exceeding 5 lakh in population.

Sixth, financial restructuring of the top ten stressed undertakings must be fast-tracked to open access to capital markets.

Seventh, a standardized national Green Bus Bond framework should be rolled out to raise over Rs 15,000 crore, backed by state guarantees.

Eighth, power infrastructure must be secured by guaranteeing 2 MW dedicated supply lines to depots while mandating smart-charging protocols with local distribution companies.

Ninth, policy must enforce a 100 per cent electric vehicle procurement mandate for all new urban bus additions by FY2039–40, steering the active national urban fleet toward a 90 per cent electric composition by FY2047.

Finally, public subsidy models must transition to results-based financing structures that disburse funds based strictly on verified outputs, such as passenger-kilometres delivered and carbon emissions avoided.

All these measures can be deployed in three different time horizons.

Immediate (Horizon 1): Consolidate separate bus schemes into a unified, outcomes-linked National Urban Bus Mission (NUBM) under MoHUA with multi-year funding guarantees, and execute an Overaged Bus Emergency Programme to replace the 40,000 decaying vehicles with electric models by FY2028–29.

Short-term (Horizon 2): Capitalize a National Urban Bus Electrification Fund (NUBEF) at an initial corpus of Rs 25,000 crore via joint central, state, and multilateral banking tranches; mandate Gross Cost Contracting (GCC) as the baseline framework for deployments exceeding 100 buses; and tie urban fund eligibility to mandatory local SLB reporting for cities with populations over 5 lakh.

Medium-term (Horizon 3): Launch an STU Financial Restructuring Programme to elevate the 10 most distressed operators to investment-grade credit ratings; develop a National Green Bus Bond Framework to raise Rs 15,000+ crore from capital markets; and mandate dedicated 2 MW power links at all new and upgraded depots in coordination with utility distribution companies.

Long-term (Horizon 4): Restrict all new city bus procurements to 100 per cent electric formats by FY2039–40 to lock in a 90 per cent clean active fleet by 2047, and fully phase out capital grants in favour of results-based financing structures that tie public disbursements to verified passengers, kilometres and avoided emissions.

Cross-cutting policy reforms

Reset and size future VGF benchmarks against post-aggregation rates rather than legacy costs to avoid overpaying by roughly a third. Enforce a national aggregation window before calculating viability support. Retain VGF strictly for its true purpose which includes sustaining unviable, socially necessary routes in smaller cities where fare revenues cannot cover competitive operational rates.

Tax reforms: Restore input tax credits (ITCs) to stage-carriage operators at the 5 per cent merit rate or optimize the 18 per cent option. Abolish or cap regressive state passenger taxes that actively target low-income commuter fares. Rationalize motor vehicle tax into a nominal registration fee decoupled from seating capacity. Grant a matching 5 per cent concessional GST tier to core depot civil and electrical infrastructure. Amend the GST code to legally define electricity and battery-swapping as 'fuel equivalents' under GCC models to neutralize adverse AAR rulings.

Enable fiscal instruments within the federal framework: As an enabler, the Centre must avoid routing everything centrally. Instead, central capital support must be conditional on states and cities executing the tax, land, tariff, and pricing levers that are constitutionally theirs. To maximize efficiency, the financing architecture must assign economic instruments according to the legal competence and balance sheet of each tier of government.

Central government level (sovereign standing and scale): Accessing international windows like the Green Climate Fund (GCF), bilateral funds, and multilateral development bank (MDB) concessional loans (e.g., KfW) requires the sovereign balance sheet via the Department of Economic Affairs. A dedicated, ring-fenced window is required inside the national framework to ensure capital isn't absorbed into general infrastructure pools. Managing national green bond frameworks, GST policy, and large-scale demand aggregation rests here. Crucially, the Centre operates the Rs 3,435.33 crore Payment Security Mechanism (covering 38,000 e-buses through FY2028–29) which eliminates operator risk by leveraging a Direct Debit Mandate with the Reserve Bank of India to automatically debit defaulting state accounts. The mission must extend this guarantee template through 2047 to substitute grants with low-cost contingent liabilities.

State government level (Constitutional levers): States hold exclusive competence over rationalizing motor vehicle and passenger taxes. They must provide state balance-sheet guarantees, viability gap top-ups within their fiscal limits, and clean up STU balance sheets (ring-fencing pensions and indexation fares). States control the allocation of physical depot land and determine dedicated bus-charging tariff categories through State Electricity Regulatory Commissions (SERCs).

City and urban local body (ULB) level (local asset base): Responsible for raising local capital via municipal bonds (backed by credit ratings and audited accounts), land value capture, and corridor betterment levies. Executing demand-side pricing instruments, including parking pricing, congestion charging, advertising rights, and transport surcharges on local property tax.

Table 3: Priority recommendations

#	Horizon	Recommendation
R1	Immediate	Launch a National Urban Bus Mission under MoHUA, consolidating various government schemes into a single outcomes-linked programme with multi-year funding.
R2	Immediate	Declare an Overaged Bus Emergency Programme to retire and electrically replace about 40,000 overaged buses by FY2028–29.
R3	Short term	Establish a National Urban Bus Electrification Fund, co-capitalized by the Centre, states and multilateral banks.
R4	Short term	Mandate Gross Cost Contracting as the standard model for new urban deployments above 100 buses.
R5	Short term	Require SLB compliance reporting for cities above 5 lakh population, linked to urban-fund disbursements.
R6	Medium term	Launch an STU Financial Restructuring Programme for the most stressed undertakings.
R7	Medium term	Build a National Green Bus Bond Framework to draw capital-market finance into fleet renewal.
R8	Medium term	Mandate dedicated depot power at new and upgraded depots, co-ordinated with DISCOMs for smart charging.
R9	Long term	Reach 100 per cent electric new procurement from FY2039–40 and about 90 per cent electric operating fleet by FY2046–47.
R10	Long term	Move bus operations to results-based financing, with payments tied to verified outcomes.

SECTION 1: The context

Indian cities face a surge in mobility demand of historic proportions. Managed effectively, this demand can drive economic growth and expand opportunity; managed poorly, or left unaddressed, it will deepen congestion, worsen air quality, and lock the country into a high pollution, high-carbon transport future for decades. It is necessary to deepen the policy and public understanding of the challenge, the central role of the bus, the case for electrification, to assess the adequacy of the policy landscape.

1.1 The urban mobility crisis

India is experiencing rapid urbanization, and the pace of this transition continues to accelerate. The 2011 Census counted 377 million urban residents, 31.2 per cent of the population.[3] By 2026 that number is about 490 million, and UN medium-variant projections put it at roughly 535 million in 2030, 659 million in 2040, and 763 million in 2047.[4] The net addition of some 270 million urban residents between 2026 and 2047 is unprecedented in Indian history, and it will be concentrated not in the established mega-cities but in hundreds of fast-growing Tier-2 and Tier-3 cities that remain poorly served or not served by public transport systems.

Without proactive investment in multi modal public transit, the consequences are well established. Private-vehicle ownership has grown at 8–12 per cent a year across most major cities in the past two decades. The number of registered motor vehicles crossed 310 million in 2023, about 200 million of them two-wheeler.[5] This unprecedented growth of private vehicles has overwhelmed road-capacity expansion, and the resulting congestion has been estimated to cost around Rs 1.47 lakh crore a year in lost productivity,[6] roughly half a per cent of GDP.

The Global Burden of Disease[7] study attributes about 1.7 million premature deaths a year in India to air pollution.[8] A large share of it is from vehicles that are among the top two to three major contributors to air pollution in most cities of India. Vehicles contribute about 25–40 per cent of particulate load in major metros. The health toll of congestion is heavy. Shifting to zero tailpipe emissions modes including electric buses can cut tailpipe emissions at street level and also carbon emissions, even on India's current coal-heavy grid, and this benefit will grow further as the grid-scale renewable energy share increases.

The equity stakes are just as high. The urban poor, some 60–70 per cent of city residents, depend on buses, walking and cycling. When bus services decay, they are pushed onto costlier, potentially less safe informal transport, and their access to work, education and health narrows. Women bear this burden most acutely, facing heightened safety risks when services are infrequent and unreliable. A funded, well-run bus system is not just transport infrastructure; it is a first-order instrument of social equity that should be the focus if India has to achieve the vision of Viksit Bharat by 2047.

India provides about 13.3 organized city buses per lakh of urban population, roughly a quarter of the MoHUA megacity benchmark of 60, and a fraction of the provision in comparable East Asian cities.

1.2 Why buses?

No mode matches the bus for flexibility, reach, affordability and speed of deployment. A 12-metre bus carries 70–80 passengers, the equivalent of 30–40 cars, on a fraction of the road space, and uses five to six times less energy per passenger-kilometre than private cars. Buses remain the backbone of public transport worldwide, carrying about 60 per cent of ridership.

India's urban form makes the case stronger still. Unlike the dense, transit-planned cities of East Asia, Indian cities sprawl at low density with wider spread trip patterns that fixed rail serves poorly. Metro rail serves key corridors but reaches only a small share of residents and depends on bus feeders to extend its catchment. Even in Delhi, India's most metro-developed city, buses carry roughly twice the Metro's daily ridership. Bus Rapid Transit offers metro-like performance at a fraction of the cost, and systems in Ahmedabad, Pune and elsewhere have reached 15–25 per cent modal share within their corridors. The task is to replicate that across the hundreds of cities that have nothing today.

Meeting the NUTP target of 70–75 per cent public-transport modal share means buses must carry 40–50 per cent of motorized trips even after metros are counted. That calls for more buses, but also better ones: better designed, better operated and better governed, run by professional city bus agencies who does not treat urban routes as an afterthought to intercity operations.

1.3 The electrification imperative

Bus electrification has moved from aspiration to policy to real deployment based on economic logic. Central funding for bus procurement now flows almost entirely to electric vehicles; diesel buses are excluded from PM e-Bus Sewa and PM e-Drive support. Several states have committed to buying only electric. The question is no longer whether India's fleet electrifies, but how fast, at what cost, and through what institutions.

The economics have shifted sharply. Aggregated procurement under PM e-Bus Sewa achieved electric-bus prices of about Rs 1.05–1.20 crore per 12-metre bus,[9] 40–50 per cent below what individual STUs paid for small orders of the same 12 metre bus. Battery costs have fallen from about USD 700 per kWh in 2015 to under US $100 per kWh in 2025.[10] At these levels the total cost of ownership of a new electric bus over 15 years is already competitive with diesel, though the higher sticker price still deters financially stressed STUs.

The state of the grid qualifies this benefit rather than undermines it. An electric bus on today's grid produces roughly 60–70 per cent lower well-to-wheel CO_2 than diesel; as renewable capacity climbs toward the 500 GW-by-2030 targets, charging gets cleaner still, moving electric buses toward near-zero lifecycle emissions by 2040. Electrification also builds a domestic manufacturing base and the jobs that come with it, provided demand is large, steady and predictable, which a sustained mission can guarantee.

Three barriers hold electrification back: upfront capital cost against weak STU balance sheets, thin depot-charging infrastructure in smaller cities, and grid-connectivity limits at many depots. All three need transport, power and finance to move together.

1.4 Policy and regulatory framework

The governance and regulation of India's bus sector is built upon a highly stratified legal system that distributes authority across multiple tiers of government. At its core, the sector operates under the statutory mandate of the Motor Vehicles Act of 1988, as amended in 2019, which dictates the legal parameters for vehicle operations, safety standards, and licensing. Under this Act, the central Ministry of Road Transport and Highways delegates critical operational powers to State

Transport Authorities, who are responsible for issuing the stage-carriage permits that legally dictate public bus routes and networks.

Beyond this legal backbone, the institutional framework is split across a complex web of distinct ministerial verticals. At the Central level, the Ministry of Housing and Urban Affairs steers macro urban planning and enforces quantitative Service Level Benchmarks, while the MoRTH handles vehicle manufacturing and permit compliance.

Simultaneously, the rollout of modern clean-energy transit requires navigating the Department of Heavy Industries for electric-vehicle fiscal incentives alongside the Ministry of Power, which regulates grid connectivity, electricity distribution companies, and charging-infrastructure standards.

Down the chain, execution drops onto an intricate layer of state transport departments, public State Transport Undertakings, individual urban local bodies, and dedicated city transport authorities. This multi-layered institutional fragmentation ultimately breeds severe coordination gaps across the ecosystem—bottlenecks that experts suggest could only be effectively resolved by establishing a single-window National Urban Bus Mission to unify and streamline sectoral governance.

Bus schemes defining public spending in bus sector: The trajectory of Central government fiscal instruments reveals that public spending has evolved from simple capital expenditure for conventional bus asset procurement to highly structured, technology-driven interventions that couple mass transit expansion with full-scale fleet electrification, including operational aspects.

The central financial instruments that have shaped the bus sector over the last two decades are detailed in the following:

JNNURM (**Phase 1: 2008–09 | Phase 2: 2012–13**): The first large-scale national urban bus procurement framework. Phase 1 procured 14,405 buses (out of 15,485 sanctioned) with a central allocation of Rs 1,547 crore. Phase 2 procured 7,509 buses (out of 10,000 sanctioned) with an allocation of Rs 1,298 crore. Financing focused on conventional low-floor buses and ancillary projects via joint Central, State, and Urban Local Body (ULB) matching grants.

FAME-I (**2017–2019**): A pilot demand-linked incentive scheme marking the initial pivot toward clean energy. It procured and deployed 425 electric buses backed by a Rs 895 crore budget, introducing dedicated capital for both vehicles and associated charging facilities.

FAME-II (2019–2024): A scaled-up demand-incentive framework that sanctioned 6,862 electric buses (out of a 7,000 target) with a significantly larger allocation of Rs 11,500 crore (out of a broader Rs 10,000–Rs 11,500 crore total envelope). By early 2025, roughly 5,135 of these e-buses were actively deployed. This was complemented by the grand challenge in which several state governments had also invested on their own to procure electric buses.

PM e-Bus Sewa (2023–27): A major innovation that decouples procurement from debt-laden State Transport Undertaking (STU) balance sheets by utilising a 12-year Gross Cost Contract (GCC) model managed by Convergence Energy Services Limited (CESL). It has sanctioned 10,000 e-buses with a dedicated budget of Rs 20,000 crore, specifically targeting deployment in small and medium-sized cities.

PM e-Drive (2024–27): The direct successor to the FAME schemes, introducing wider allocations and an intensified domestic manufacturing thrust. It has sanctioned 14,028 e-buses with a budget of Rs 4,391 crore focused on large metropolitan cities. As of early 2026, active deployments under this new window have just about begun.

Scheme convergence (NCAP, 2019–26): In tandem with dedicated transport funds, municipal bodies who run buses, have increasingly leveraged the National Clean Air Programme (NCAP) to cross-subsidize clean energy public transit, as observed in cities like Mumbai in Maharashtra to accelerate local e-bus procurement.

Across these primary central instruments spanning the 2008–27 horizon, the approximate total public spending allocated exclusively to the bus transit and associated charging/infrastructure vertical stands at Rs 39,631 crore.

Thus, the strategic focus of these schemes varies significantly, moving from pure vehicle acquisition to building integrated urban mobility ecosystems (see *Table 4:Direct procurement vs. infrastructure thrust*).

Table 4: Direct procurement vs. infrastructure thrust

Funding framework	Procured/sanctioned buses	Sanctioned amount	Focus and core thrust	Operational mechanism and target
Conventional Fleet Expansion (JNNURM 1 2008–09 and JNNURM 2 2012–13)	JNNURM-1 Procured/sanctioned buses: 14,405/15,485 JNNURM-2 Sanctioned buses: 7,509/10,000	JNNURM-1 Rs 1,547 crore Central assistance with additional assistance from State and ULBs JNNURM-2 Rs 1,298 crore Central assistance for buses and ancillary projects	Direct bus procurement: High-capacity asset addition to address immediate urban transit deficits	Standard capital subsidy model for Internal Combustion Engine (ICE) buses
First-wave electrification (FAME 1 2017–19 and FAME 2 2019–24)	FAME 1 Procured/sanctioned buses: 425/425 FAME 2 Procured/sanctioned buses: 6,862/7,000	FAME 1 Rs 895 crore Central assistance for procuring e-bus and associated charging facilities FAME 2 Rs 11,500 crore Central assistance for bus and associated infrastructure development.	Technology pilot and scaling: Linking vehicle procurement incentives with foundational charging infrastructure setup.	Demand incentives directly targeting the high upfront capital cost differential of e-buses.
Structural De-Risking (PM e-Bus Sewa 2023–27 and PM e-Drive 2023–27)	PM e-bus Sewa Sanctioned buses: 10,000 PM e-Drive Sanctioned buses 14,028	PM e-bus Sewa Rs 20,000 crore Central assistance to deploy e-buses in smaller and medium size cities PM e-Drive Rs 4,391 crore Central assistance for deploying e-buses in large cities	Institutional reform: Differentiating by city tiers, scaling manufacturing, and shifting financial risk to private operators	Centralized demand aggregation (via CESL) and GCC operational subsidies for long-term contract stability.
Indirect Transit Support (AMRUT 2015 – 2021 and 2021 – 2026& Smart Cities - 2015 - 2025)			Ancillary and systemic infrastructure: Zero direct vehicle procurement support; focuses entirely on the surrounding ecosystem.	AMRUT: Finances last-mile multi-modal integration (walkways/ footpaths) Smart cities: Finances Intelligent Transport

Funding framework	Procured/sanctioned buses	Sanctioned amount	Focus and core thrust	Operational mechanism and target
				Systems (ITS) to optimize route efficiency and service delivery
Leveraging other schemes—National Clean Air Programme (NCAP) 2019–26				
The approximate total public spending allocated to bus transit and associated charging/infrastructure vertical stands at Rs 39,631 crore.				

1.5. Varying estimates of bus and funding requirement

Various agencies have attempted to forecast public transit demand and bus requirements to assess necessary investments. Because the scope, timeline and objectives of these studies vary, their findings are not directly comparable, though they collectively highlight severe operational shortfalls. Most reports project demand, timelines, vehicle counts, and levels of electrification based on a specific sectoral lens—such as net-zero pathways, private intercity travel, or public urban transit (see *Box: Varying estimates of bus requirement and its financing*).

The conversation is shifting toward upscaling India's bus-based networks through a comprehensive, Central-government-led funding programme tightly coupled with systemic policy reforms and state-level institutional training. To restore the financial health and autonomy of debt-laden STUs, focus must move toward operationalizing several financial instrument and fiscal strategies, dedicated State and Urban Transport Funds, expanding private sector participation via standardized model contracts, and phasing out the heavy government tax burdens that consume considerable STU gross operating costs.

While diverse estimates exist regarding necessary transport reforms and capital investments, the sector has arrived at a critical crossroads now. This moment is defined by the positive, tangible momentum driven by institutional focus on upscaling public bus fleets alongside state supported zero-emission electrification.

While this shift offers an unprecedented opportunity to revive and expand underfunded urban bus networks, it also creates an opportunity to evaluate how to strategically scale up the entire urban bus ecosystem to absorb surging travel demand while adhering to net-zero timelines. Recognizing this dual mandate, this study provides a forward-looking analysis of the expected scale of change in this transformed scenario, calculates the capital cost of the transition, outlines

VARYING ESTIMATES OF BUS REQUIREMENTS AND FINANCING NEEDS

Several studies with varying scope have been carried out from time to time to estimate the requirement of buses and funding.

Bus requirement

A 2026 NITI Aayog[11] report on sectoral insights into transport sector for Viksit Bharat shows that under its Net Zero Scenario (NZS), the share of passenger trips handled by public and shared transport must rise from 47 per cent to 60 per cent by 2070. Near-term central targets include deploying 50,000 electric buses by 2030 and fully electrifying public fleets across 20 metropolitan areas. Under this scenario, electric buses are projected to command a 90 per cent EV sales share by 2050 (holding through 2070), complemented by hydrogen fuel-cell buses accounting for up to 5 per cent of sales by 2070.

Another market assessment for intercity electric buses in India in the Transit Intelligence report for the timeline 2024–30 forecasts that India's total registered bus fleet will expand from 23 lakh (2.3 million) in 2023–24 to 31.6 lakh (3.16 million) by 2030, comprising 2.22 lakh public and 29.36 lakh private buses. Meeting this requires procuring 20 lakh (2 million) units between 2024 and 2030 (11.5 lakh for replacements and 8.5 lakh for augmentation). In line with the EV30@30 targets, it projects national sales of 3.15 lakh e-buses by 2030, with 2.52 lakh in the private intercity segment. The analysis distinguishes between air-conditioned (AC) contract-carriage e-buses (running an optimal 500 km/day) and non-AC stage-carriage e-buses (averaging 400 km/day).

A 2022 World Bank report on improving bankability of e-bus procurement in India[12] has evaluated baseline market scale and notes that India has over 800,000 registered buses across intra- and intercity segments, with State Transport Undertakings (STUs) running approximately 40,000 urban and 100,000 intercity/rural buses, while the private sector controls the remaining majority. Urban fleets (~40,000) represent a mere 2 per cent of total national bus stock, meaning urban deployment serves as a catalytic testing ground before the massive private intercity segment undergoes electrification. The study concentrates on 9-metre and 12-metre urban e-buses procured via Gross Cost Contract (GCC) models under FAME-II, which initially subsidized up to 7,090 e-buses.

Earlier, the Centre for Science and Environment while assessing immediate short-term modernization had estimated that million-plus cities alone require 89,256 buses against an existing baseline of 54,368. This represents an absolute deficit of 34,888 buses, which expands to a net requirement of 55,518 vehicles when accounting for the retirement of ~20,630 overaged units. Evaluated scenarios encompass all-electric fleets, all-internal combustion engine fleets, and 50/50 ICE-Electric procurement mixes.

Funding requirement

The financial capital required to meet these targets varies drastically by scenario, jurisdiction, and targeted segment of various studies.

According to Niti Ayog,13 implementing the macro transport-sector net zero scenario demands a cumulative investment of US $4.3 trillion (~Rs 350+ lakh crore) between 2026 and 2070, marking a 25 per cent increase over current policy pathways. This figure is strictly limited to vehicle procurement and battery charging/EV infrastructure; it excludes broader civil outlays like road/rail expansions or hydrogen refuelling networks.

Yet another assessment of macro urban infrastructure by KPMG in 2017, cites Ministry of Housing and Urban Affairs (MoHUA) estimates and notes that India requires approximately Rs 39,20,000 crore (US $600 billion) for urban transport infrastructure between 2011 and 2031. Within this envelop, Rs 21,75,600 crore (US $333 billion) is earmarked for urban roads and mass transit, though funding allocations historically lean heavily toward roads

(44 per cent) over mass rapid transit (11.5 per cent). To boost public transit's share to 50 per cent of urban trips primarily via buses, the report projects a need for 460,000 additional buses to supplement the baseline public fleet of 140,000.

The World Bank stresses specifically that the initial FAME-II public subsidy of Rs 3,545 crore (~US $479 million) must not be viewed as a final funding destination. Instead, it estimates that reforming contractual frameworks into a 'Revised Gross Cost Contract' model can slash total cost of ownership (TCO) by 10–15 per cent. Furthermore, transitioning to market-led or state-led fleet aggregation platforms can trigger 15–25 per cent in capital savings—translating to Rs 490–1,225 crore per 1,000 buses over 10 years—fundamentally enhancing commercial bankability.

With respect to the private intercity electrification, Transit Intelligence states that procuring 3.15 lakh private intercity e-buses by 2030 requires capital upwards of Rs 3 lakh crore (~US $37.8 billion), assuming an average vehicle-plus-charger cost of Rs 1.2 crore. Dropping the unit price from the current Rs 1.5 crore to Rs 1.1 crore is essential to achieve capital parity with diesel.

CSE's 2018 data shows that modernizing the bus fleets of India's nine largest cities requires Rs 57,764–59,514 crore for an all-electric fleet, Rs 34,914–36,665 crore for an all-ICE fleet, and ~Rs 48,000 crore for a 50/50 mix (averaging Rs 1.65 crore per bus layout). Scaling this to all million-plus cities (~56,000 buses) doubles the capital requirement to ~Rs 1 lakh crore.

Meanwhile, the World Resources Institute (WRI),14 India, study outlines a total investment programme of Rs 3.5 lakh crore over 10 years under an urban-support scenario. To meet baseline service levels by 2031, WRI estimates a total national need of 5.85 lakh operational buses (a net addition of 2.46 lakh units above business-as-usual trends), requiring the construction of 2,464 new depots (at Rs 20 crore each) and 1,232 new terminals, alongside an Rs 7,392 crore centralized Intelligent Transport System (ITS) budget, training for 1 lakh personnel, and urban Viability Gap Funding (VGF) across 4,963 crore kilometres.

This literature reveals deep operational, and financial hurdles that impede the flow of investment capital into bus transit:

Fleet electrification presents severe upfront cash flow hurdles. Capital costs (vehicles, battery replacements, chargers) consume 33–36 per cent of an AC e-bus's TCO and 39–43 per cent of a non-AC e-bus's TCO. While long-distance AC intercity e-buses (500 km/day) achieve a TCO 12–15 per cent lower than diesel, urban non-AC stage-carriage e-buses (400 km/day) are actually 6–13 per cent more expensive to run than diesel due to lower daily utilization and high initial asset costs.

Public bus operators face a 30 per cent deficit in cost recovery from fare-box revenues. Manpower costs alone devour 74 per cent of total revenues, while rigid fixed operational expenses (salaries, energy prices) comprise 80 per cent of total costs. This leaves STUs with virtually zero financial elasticity to optimize expenses internally or service commercial debt.

Commercial lending is highly constrained because financiers inflate TCO estimates by 31–34 per cent purely due to uncertainties over battery longevity, volatile future electricity tariffs, and the low creditworthiness of STUs. The historic absence of standardized contracts, subsidy bank guarantees, and payment security mechanisms drives up the cost of capital.

Financing a bus fleet is futile without physical depots and power infrastructure. Transit Intelligence highlights that only 1 per cent of private operators utilize government-provided depots, leaving 50 per cent to rely on ad hoc, risky street parking or shared lots. Power connectivity is equally bottlenecked by a lack of reliable 24x7 grid supply at depots, missing DISCOM mandates, and a lack of interoperable highway fast-charging networks.

Public bus systems are ironically penalized by local fiscal frameworks. CSE reports that direct and fuel taxes average Rs 6.9 per kilometre for city transit authorities—gobbling up roughly 15 per cent of their revenue per kilometre and 10 per cent of their total operational costs, actively undermining their financial sustainability.

Capital flows disproportionately into rail-based mass transit (Metros) or general road expansion. Heavy road investments without a commensurate focus on public bus systems induce private vehicle demand, creating a vicious cycle of traffic congestion, lower bus speeds, falling ridership, and further revenue leakage. Compounding this is a lack of 'solution-wise' bankability, because bus transit is treated as a loss-making public service, the lack of ring-fenced financing platforms or dedicated micro-allocations (specifically for depots or contract de-risking) blocks private capital.

pathways for sustainable financing, and establishes a framework to deploy and govern urban bus transport in a dedicated, nationwide mission mode.

1.6 Objectives, scope and methodology

This study builds a comprehensive, implementable roadmap for scaling sustainable urban bus transport to 2047, aligned with the Viksit Bharat vision. It covers all 35 States and Union Territories. Its analytical focus is the organised urban city-bus tier, distinct from the wider stage-carriage fleet, though the institutional and financial analysis addresses the STUs and operators that serve both urban and intercity routes.

1.6.1 The six-stage analytical model

The quantitative core of this study is a state-wise demand and financial model that proceeds through six linked stages, each feeding the next. The model moves from the fleet that exists today, through the population it must serve and the service standard it must meet, through the buses that must be procured, electrified and financed. Each stage is described below.

Stage 1, Fleet reconstruction: The model begins by reconstructing the existing bus fleet from Vahan registration data, using annual bus additions from FY2010–11 to FY2025–26. Rather than assuming a single average fleet age, it distributes the fleet across induction-year and applies the 15-year statutory life, so that retirement in any future year is driven by the actual size of the buses inducted 15 years earlier. This age-cohort method produces a realistic, uneven retirement profile to clear the overaged backlog.

Stage 2, Population projection: Urban population is projected for each state from a 2024 base, calibrated to United Nations medium-variant projections, with forecast year at 2030, 2040 and 2047. The national total urban population runs from about 490 million in 2026 to about 763 million in 2047.

Stage 3, Service-level-benchmark (SLB)-based demand: Required fleet is derived by applying MoHUA's graded Service Level Benchmark fleet availability norms to projected urban population. Each state is assigned a single representative graded norm reflecting its dominant city class: 60 buses per lakh for megacity-dominant states, 50 for metro, 40 for smaller-city-dominant states, giving a population-weighted national blended norm of about 44.

Stage 4, Procurement derivation: Gross procurement in each year is the sum of three streams: expansion (the year-on-year increase in required fleet as population grows and the achievement rate rises); replacement (the 15-year cohort-based retirement from Stage 1); and backlog clearance (the front-loaded retirement of the roughly 40,000 overaged buses).

Stage 5, Electrification and power: An electrification trajectory raises the electric share of new procurement from about 30 per cent today to 100 per cent by FY2039–40. Applying this to the procurement stream gives the electric and diesel split each year, the electric share of the operating fleet, and, from utilization and energy-intensity assumptions, the annual charging-energy demand, the number of charging points, and the battery capacity in service.

This is a high-level, secondary-data assessment that sizes the direction and magnitude of required investment, not a project-level costing exercise. Its principal limitation is that registration data cannot cleanly separate urban city buses from the wider stage-carriage fleet; the urban baseline is therefore constructed bottom-up from published programme sources.

Stage 6, Costing: Finally, unit costs, for electric and diesel buses, charging infrastructure and depot upgrades, are applied to the procurement stream, with a 3 per cent annual escalation and a projected fall in electric-bus prices, to give annual and cumulative capital expenditure. Operating-cost assumptions give the lifecycle, total-cost-of-ownership comparison between electric and diesel.

Three options, rather than a single forecast, are run through these six stages, exploring what different levels of ambition and pace would require. The qualitative analysis that surrounds the model draws on national policy documents, STU annual reports, scheme-implementation data for FAME-II and PM e-Bus Sewa, CIRT performance statistics, international case studies and stakeholder consultation.

SECTION 2: Baseline assessment and current deployment status

This study establishes the current-state picture in two parts. Part A assesses the baseline that includes the bottom-up build-up of estimating the urban fleet, the age-band basis for retirement, the geographic profile, the overaged backlog, and the gap between current provision and the service-level benchmarks.

Part B maps the current deployment, the energy mix, the operating entities and their business models and financial performance, infrastructure readiness for electrification, and the barriers to be cleared.

Part A: Baseline assessment

2.1 Three fleet measures: All buses, STU stage-carriage, urban city-bus

India has no single authoritative figure for 'urban buses', and different sources have arrived at different estimates. Vahan registers all buses but cannot isolate urban service type. The Central Institute of Road Transport (CIRT) reports STU fleets that mix intercity and urban operations. This study reconciles three layered tiers, each from its own source (see *Table 5: Three layers fleet numbers [FY2025–26]*).

Tier 1 (all registered buses, about 14.5 lakh) counts every bus type, stage and contract carriage, school, mini-bus staff and private. It is used to derive the age-cohort retirement profile and is not a service metric, so it is not expressed per capita. Tier 2 (STU stage-carriage, about 2.9 lakh) is the public-bus universe

Table 5: Three layers fleet numbers (FY2025–26)

Tier	Measure	Size	Provision	Source
Tier 1	All registered buses	~14.5 lakh	Count only	Vahan/MoRTH, all bus types, FY2010-11 to FY2024-25
Tier 2	STU stage-carriage fleet	~2.9 lakh	~20 per lakh total population	CIRT, FY2018–19
Tier 3	Organized urban city-bus	~65,000	~13.3 per lakh urban population	MoHUA ESCBS, FAME, PM e-Bus Sewa

based on the CIRT figure of about 20 buses per lakh of total population,[15] but it is dominated by intercity and district services. Tier 3 (organized urban city-bus, about 65,000) is the tier the service-level benchmarks measure and the one this study is built on.

2.2 The urban baseline, built bottom-up: The story of the ~65,000

The most important number in this study, and the hardest to establish, is the size of the organised urban city-bus fleet today. Everything downstream, the demand gap, the procurement requirement, the capital cost, is measured against it. This section sets out, in full, how the figure of approximately 65,000 is derived.

Vahan portal, the vehicle-registration database, records every bus registered in India, roughly 14.5 lakh, but it registers by vehicle category, not by service type, and cannot distinguish a city bus running a 20-kilometre urban route from an intercity coach or a school bus (for most states). CIRT reports the fleets of the State Transport Undertakings, roughly 2.9 lakh, but these combine intercity, district and urban operations in a single figure, and the urban share is not separately reported.

The Ministry of Housing and Urban Affairs (MoHUA), in its 2019 review of Environmentally Sustainable City Bus Services (ESCBS), drawing on CIRT data for FY2016–17, put the organized city-bus fleet at approximately 45,450 buses. This is the last authoritative, service-specific count of India's urban bus fleet, and has been used as the foundation of the build-up. To bring it forward to FY2025–26, the study adds the fleet growth and the programme deployments that have occurred since.

Natural growth: The organized city-bus fleet grew broadly in line with its historical rate over the nine years from FY2016–17. Applying a conservative 2 per cent per annum, consistent with the sector's own trend and with the observation in the ESCBS review that the rate has been broadly constant, adds about 8,867 buses.

Programme deployments: On top of natural growth sit the electric buses deployed through central schemes, each a documented, deployed count rather than a sanction. FAME-I added about 425 buses through pilot deployments; FAME-II added about 5,135 deployed of the roughly 6,862 sanctioned to February 2025; and PM e-Bus Sewa had delivered about 5,000 of its 10,000-bus target by early 2026. These are added to the ESCBS base because they represent new organised urban service, much of it in cities that previously had none.

Table 6: Urban city-bus fleet build-up (FY2025–26)

Component	Buses	Source
Organized city-bus fleet, all-India	45,450	MoHUA ESCBS (2019), CIRT FY2016–17
plus natural growth at 2 per cent p.a. (9 years)	8,867	Cities Forum Analysis
plus FAME-I e-buses (deployed)	425	ITDP India (2022)
plus FAME-II e-buses (deployed)	5,135	MHI/PIB, to Feb 2025
plus PM e-Bus Sewa (delivered)	5,000	MoHUA, to early 2026
equals existing urban fleet, FY2025–26	~65,000	Cities Forum Analysis

Source: Cities Forum Analysis build-up from MoHUA ESCBS (2019), ITDP India (2022), MHI/PIB and MoHUA programme data. PM E-DRIVE (14,028 sanctioned) is excluded, with zero deployed as of March 2026.

What is deliberately excluded: One large number is left out on purpose. PM E-DRIVE, the successor scheme, has sanctioned some 14,028 buses, but as of March 2026 none had been deployed. The study counts only buses actually on the road. Summed, these components give the build-up in Table 6 (see *Table 6: Urban city-bus fleet build-up [FY2025–26]*).

The build-up reconciles to approximately 65,000 organized city-buses in FY2025–26, which equals about 13.3 buses per lakh of urban population against a 2024 urban population of about 4,692 lakh. The figure is internally consistent and corroborated by two independent reference points. ITDP India, working from 2019 data, reported roughly six to seven city-buses per lakh;[16] the growth since, driven by PM e-Bus Sewa and state procurement, is consistent with the rise to 13.3. Separately, MoHUA and CIRT reported about 10.8 STU buses per lakh of total population for FY2018–19, a different denominator but the same order of magnitude. Three independent approaches, the bottom-up build-up, the ITDP city-bus estimate, and the CIRT STU ratio, all point to the same picture: a fleet of roughly 65,000 buses, a small fraction of what the benchmark requires, serving only a fraction of India's more than 450 cities with over one lakh population.

No official source reports the size of India's organized urban bus fleet. The figure of ~65,000 is constructed bottom-up from the MoHUA ESCBS base plus documented scheme deployments, counts only buses actually on the road, and is corroborated by two independent estimates.

2.3 Historical growth and the age-cohort basis

To model retirement, the study reconstructs the total registered-bus fleet from Vahan additions between FY2010–11 and FY2025–26, distributes the fleet across induction years, and retires each cohort 15 years after it entered service. This produces a realistic retirement profile rather than a smooth average. Three phases stand out: the JNNURM-driven expansion (FY2010–11 to FY2019–20), the COVID-19 disruption (FY2020–21 to FY2021–22), and the recovery-and-electrification phase from FY2022–23. The JNNURM-era buses will retire through the late 2020s, the COVID cohorts will create a dip around FY2035–37, and today's ramp-up and future procurement will resurface as replacement demand in the mid-2040s.

2.4 Geographic distribution

Organized urban bus service is highly concentrated. A handful of states and metropolitan agencies, Karnataka (BMTC), Maharashtra (BEST and others), Delhi (DTC and the cluster scheme), Telangana (TSRTC), Tamil Nadu (MTC) and Gujarat, account for most of the organised city-bus fleet. The recent record is concerning: DTC bus ridership in Delhi fell by about a third over the decade to 2019, and BEST daily ridership in Mumbai dropped some 40 per cent over seven years.[17] Most Tier-2 and Tier-3 cities, which will absorb the bulk of future growth, have little or no organized service, and it is exactly these cities that PM e-Bus Sewa prioritizes.

2.5 Retirement and the overaged backlog

The 15-year life set by MoRTH norms creates a systematic retirement cycle, and a critical finding of the baseline is the overaged backlog: buses past their 15-year life still in revenue service because replacement lagged, particularly through COVID. The backlog is estimated at about 40,000 buses,[18] derived by comparing the age-cohort retirement schedule against reported active fleet. The figure varies by state: some operators retire buses before 15 years as maintenance costs climb, others run them for 18–20 years when replacement capital is absent.

Overaged buses carry heavy penalties: older BS-II and BS-III engines burn 20 to 30 per cent more diesel per kilometre than BS-VI vehicles; maintenance often runs Rs 15–20 per km against Rs 6–8 for newer buses; breakdowns rise and availability falls; and emissions of particulates such as NOx and CO_2 climb. Retiring these buses and replacing them with electric equivalents is an urgent priority that pays off on both cost and emissions.

Clearing the roughly 40,000-bus overaged backlog by FY2028–29 and converting it to electric is the single most powerful early priority to accelerate fleet renewal and electrification.

2.6 Service-level benchmarks: Current status versus targets

MoHUA's Service Level Benchmark framework is the normative basis for judging fleet adequacy. This study uses the fleet-availability benchmark, buses per lakh of urban population, as the principal metric for the demand gap. The fleet availability norms are 60 buses per lakh for mega-cities, 50 for metro cities and 40 for smaller cities (see *Table 7: MoHUA fleet-availability benchmarks and current provision*).

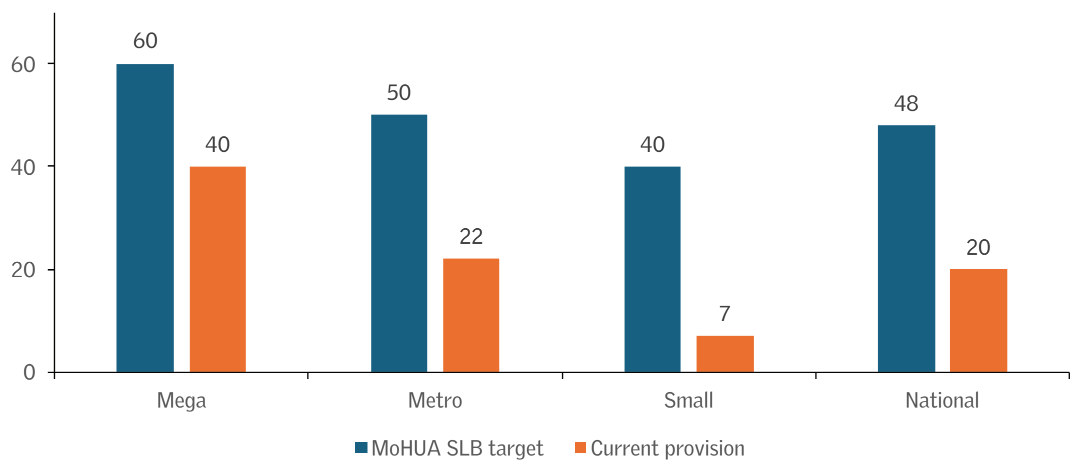
The deficit is worst in smaller and medium cities. More than 400 urban agglomerations of 1–10 lakh population, together home to well over 100 million people, have no organized municipal bus service at all,[19] relying entirely on informal minibus, auto-rickshaw and shared two-wheeler services. PM e-Bus Sewa targets exactly this category. In larger cities the deficit is compounded by uneven deployment: even where per-capita fleets look adequate, service coverage clusters on high-ridership corridors while residential peripheries go under-served.

Table 7: MoHUA fleet-availability benchmarks and current provision

City class	Population threshold	SLB target (per lakh)	Current provision (est.)	Gap (per cent)
Megacities	Above 40 lakhs	60	35–45	~25–40 below
Metro cities	10–40 lakh	50	15–30	~40–70 below
Small/medium	Below 10 lakhs	40	0–15	~60–100 below
Graded blend	All urban pop.	~44	~13.3	~70 below

Source: MoHUA Service Level Benchmarks; current-provision ranges are Cities Forum Analysis estimates by city class; the graded-blend current figure (~13.3) is the model's organised urban provision per lakh urban population (FY2025–26).

Figure 2: SLB target versus current provision, by city class (buses per lakh)



Source: Cities Forum Analysis; MoHUA Service Level Benchmarks

2.7 Institutional landscape

State Transport Undertakings: STUs carry most of the organized fleet, and many runs accumulated losses exceeding annual revenue, which leaves them unable to finance renewal or electrification without external support.

City bus agencies and SPVs: Dedicated agencies such as BMTC and DTC and metropolitan SPVs are typically closer to genuine urban service and have often pioneered electric-bus adoption.

PPP and private operators. Gross-cost and net-cost contracting with private operators is the main route to scaling electric buses where STU balance-sheet capacity is weak, and it is central to the delivery architecture proposed later in this report.

2.8 State-wise fleet profile: All 35 states and UTs

The comprehensive state-wise fleet profile as of FY2025-26, covering cumulative registered buses, active fleet after 15-year retirements, annual additions, and the 15-year compound annual growth rate of additions, is profiled (see *Table 8: State-wise registered-bus fleet profile, FY2025–26 (Tier-1 basis*).

This is the Tier-1 measure (all registered buses), which forms the age-cohort basis for the retirement and replacement modelling in Chapter 3. It should not be read as an urban provision, which is the far smaller Tier-3 measure established in Section 2.2. The data reveal substantial heterogeneity across states in fleet size, growth momentum, and provision (see *Table 8: State-wise registered-bus fleet profile, FY2025-26 [Tier-1 basis]*).

The heterogeneity is structural, not incidental. A handful of states, Madhya Pradesh, West Bengal, Karnataka, Maharashtra and Uttar Pradesh, hold the largest absolute fleets, together accounting for more than half the national active fleet. But absolute fleet size tells little about urban bus adequacy: much of the fleet in the largest states operates on intercity and district routes, not dedicated urban service. The north-eastern states and smaller UTs show the highest growth rates, Arunachal Pradesh at 35 per cent and Dadra and Nagar Haveli at 34 per cent, but from very small bases, often linked to specific Central-scheme deployments. These growth spikes should not be mistaken for mature urban systems.

Table 8: State-wise registered-bus fleet profile, FY2025–26 (Tier-1 basis)

State/UT	Cumulative fleet	Active fleet	Average annual additions	15-yr CAGR (per cent)
Andhra Pradesh	76,962	57,449	3,973	19.6
Arunachal Pradesh	10,455	9,940	1,725	35.1
Assam	16,321	13,977	1,486	24.0
Bihar	31,704	26,055	3,185	21.2
Chhattisgarh	67,515	55,131	4,562	19.4
Delhi	22,657	17,620	2,992	15.7
Goa	4,907	3,901	514	20.6
Gujarat	58,007	48,979	5,167	22.8
Haryana	82,171	66,105	4,950	22.6
Himachal Pradesh	15,141	12,329	1,257	20.5
Jammu and Kashmir	16,745	13,970	1,586	20.7
Jharkhand	14,993	12,434	1,427	20.8
Karnataka	134,471	101,149	7,762	18.5
Kerala	74,333	57,967	6,502	18.9
Madhya Pradesh	174,042	125,423	6,465	18.0
Maharashtra	135,563	108,469	13,826	20.9
Odisha	55,923	35,532	3,332	14.4
Punjab	42,652	34,028	2,391	20.2
Rajasthan	77,442	54,706	4,866	17.5
Tamil Nadu	96,322	72,024	10,371	17.9
Uttar Pradesh	130,084	110,449	12,052	22.3
Uttarakhand	16,321	13,193	1,306	21.1
West Bengal	170,936	125,242	5,114	18.5
Other NE & UTs	33,000	28,000	3,200	25
INDIA TOTAL	~14.5 lakh	~10.8 lakh	~1.11 lakh	19.3

Source: Cities Forum Analysis from Vahan registration data (MoRTH), FY2010-11 to FY2025-26. Figures are all registered buses (Tier-1), the cohort basis for retirement modelling, not urban city-bus provision.

2.9 Regional analysis

A regional lens reveals structural patterns in fleet distribution. States are grouped into six broad regions: Southern, Northern, Eastern, Western, Central, and North-East plus Union Territories (see *Table 9: Regional fleet distribution, FY2025–26* and *Figure 3: Active bus fleet by region*).

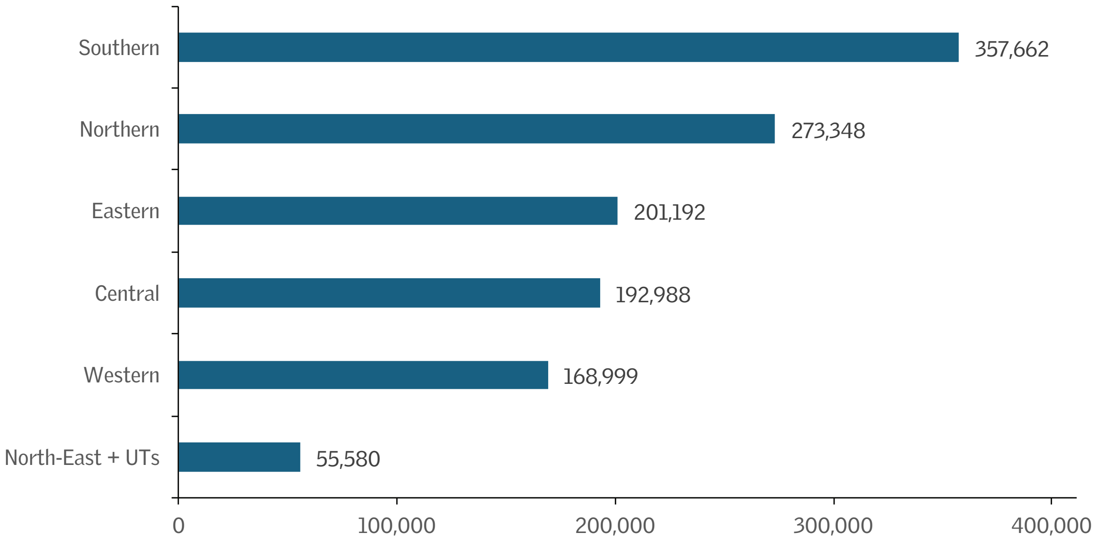
The Southern region, led by Karnataka, Tamil Nadu, Kerala and Andhra Pradesh, has the most mature STU ecosystem in India, with extensive networks, relatively higher utilization and the most advanced engagement with electric buses. Karnataka's KSRTC operates one of India's largest and most professionally managed networks, and Kerala's KSRTC has been an early mover on electric

Table 9: Regional fleet distribution, FY2025–26

Region	Active fleet	Share (per cent)	Top state	Characteristics
Southern	~3,57,700	33.0	Karnataka	Highest fleet intensity; strongest STU capacity; most advanced on EVs
Northern	~2,73,300	25.3	Uttar Pradesh	Large absolute fleet; significant per-capita deficit
Eastern	~2,01,200	18.6	West Bengal	Mixed maturity; uneven COVID recovery
Central	~1,93,000	17.8	Madhya Pradesh	Large fleet; predominantly intercity routes
Western	~1,69,000	15.6	Maharashtra	High urbanisation; growing EV adoption
North-East and UTs	~55,600	5.1	Assam	Small states; high growth from low base

Source: Cities Forum Analysis from Vahan data. Shares are of the Tier-1 active fleet; regions overlap in aggregation and do not sum to exactly 100 per cent.

Figure 3: Active bus fleet by region



Source: Cities Forum Analysis from Vahan data

adoption. The Northern region is dominated in absolute bus numbers by Uttar Pradesh, though its per-capita provision remains below the national average given the state's massive population. The Eastern and Central regions carry large fleets weighted heavily toward intercity service, underscoring once more that fleet size is not an indicator of urban adequacy.

Part B: Current deployment and mapping

This maps the current deployment of urban and stage-carriage buses across India that includes the national picture, the energy mix, and financial performance of the major operating entities, the business models under which they operate, the readiness of infrastructure for electrification, and the barriers that must be cleared. It draws on state-level data, STU annual reports, CESL implementation data and the team's primary research. The full selected operator-by-operator financial deep-dive is placed in *Appendix A*.

2.10 National deployment overview

Bus provision across India is deeply and structurally uneven. Measured as active buses (both inter- and intra-city) per lakh of total population, provision ranges from roughly 25–30 in smaller states with extensive STU networks, such as Himachal Pradesh and Goa, to under five in large, lower-income states such as Bihar, Jharkhand and parts of eastern India. The southern states run the densest networks in proportion to population; the northern states, with large populations and historically lower investment in public transport, show markedly lower per-capita provision. The north-eastern states present a mixed picture, some with reasonable STU networks relative to urban population, others depending heavily on informal shared-jeep and Sumo services.

In urban-specific terms, the deficit is most severe precisely in the states with the highest projected urban population growth but the weakest urban transport institutions, the places where demand will rise fastest and capacity is least prepared to meet it.

2.11 Energy mix and electrification progress

India's bus fleet energy mix is shifting rapidly, though diesel remains dominant. The table below presents the estimated composition of the STU stage-carriage fleet (Tier-2) as of FY2025–26 and the deployment context for each technology (see *Table 10: Bus fleet energy mix, FY2025–26 [estimate]*).

The balance is state own-procurement, notably in Delhi, Karnataka, Maharashtra, Tamil Nadu and Andhra Pradesh.[20] Key OEMs supplying the Indian market include Tata Motors (the largest supplier of both 9-metre and 12-metre BEVs), Olectra-BYD, JBM Auto, PMI Electro Mobility and Ashok Leyland. Chinese OEMs participate through technology partnerships rather than direct supply, reflecting local-content requirements.

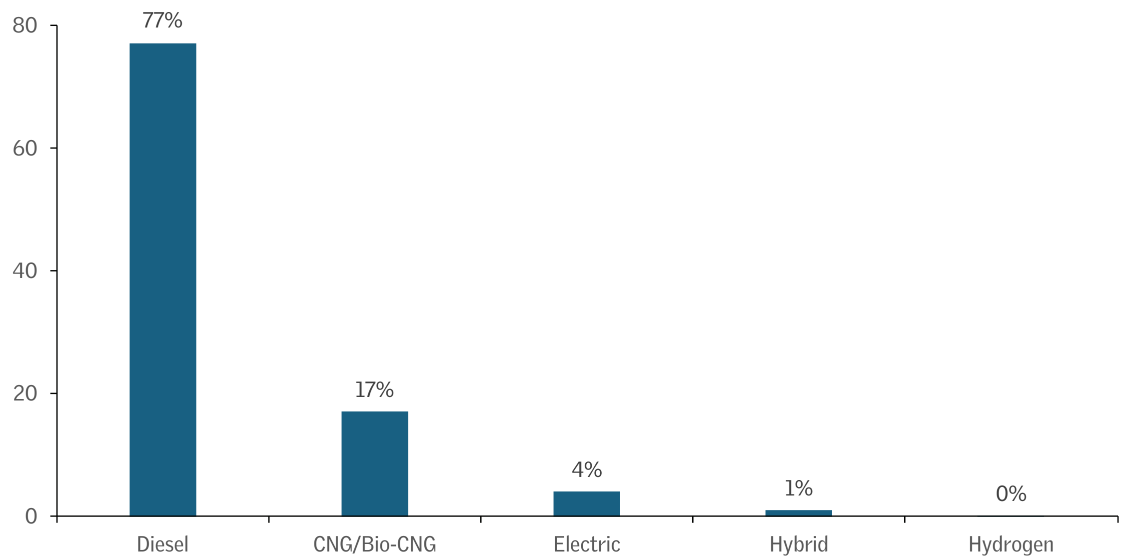
The CNG fleet, concentrated in cities with established city-gas distribution, is a meaningful near-term transition technology, particularly where depot grid capacity is not yet sufficient for immediate full electrification. Cities such as Surat, Pune, Nashik, Jaipur and Rajkot operate substantial CNG fleets that can transition to battery-electric as grid infrastructure is expanded. The decision to prioritise

Table 10: Bus fleet energy mix, FY2025-26 (estimate)

Fuel / technology	Fleet share (per cent)	Approx. buses	Primary geographies	Deployment context
Diesel (BS-VI)	~77	~2,23,000	All states	Dominant technology; BS-VI (Euro-VI equivalent) since April 2020
CNG / Bio-CNG	~17	~49,000	Delhi, Mumbai, Pune, Surat, Jaipur	Mature; dependent on city-gas distribution network
Electric (BEV)	~4	~12,000	Delhi, Bengaluru, Mumbai, Chennai	Rapid growth under FAME-II and PM e-Bus Sewa
Hybrid	~1	~3,000	Limited	Largely legacy; little new deployment
Hydrogen (pilot)	<0.1	~200	Delhi (IOCL pilot)	Early-stage; commercial viability unproven at scale

Source: Cities Forum Analysis from CIRT, MoRTH and scheme data. Shares apply to the STU stage-carriage fleet (Tier-2, ~2.9 lakh); the organised urban electric subset is smaller and concentrated in the metros.

Figure 4: Bus fleet energy mix percentage, FY2025–26



Source: Cities Forum Analysis

electric buses in new-scheme funding effectively caps CNG procurement growth, though existing CNG fleets will run out their useful lives (see *Figure 4: Bus fleet energy mix percentage, FY 2025–26*)

2.12 Major STU and city bus agency profiles

It is insightful to profile the 12 largest bus operating entities by active fleet, giving a comparative snapshot of fleet, service, cost recovery, electrification and financial status (see *11: Major STU and city-bus agency performance snapshot, FY2025–26 [estimates]*). These are total STU stage-carriage fleets (Tier-2), spanning intercity

Table 11: Major STU and city-bus agency performance snapshot, FY2025–26 (estimates)

STU/Agency	State	Active fleet	Daily pkm (mn)	Cost recovery (per cent)	Approx. EV share(per cent)	Staff:bus	Status
UPSRTC	Uttar Pradesh	~95,000	~45	68	5	7.2	Stressed; large accumulated losses
KSRTC	Karnataka	~25,000	~60	82	8	5.8	Moderate; improving
MSRTC	Maharashtra	~17,000	~40	62	4	8.5	Severely stressed
TNSTC / SETC	Tamil Nadu	~22,000	~50	78	7	6.5	Moderate; improving
WBTC	West Bengal	~14,000	~30	65	3	7.8	Stressed
APSRTC	Andhra Pradesh	~12,000	~28	70	5	7.2	Improving
DTC	Delhi	~7,800	~35	55	20	9.1	Stressed; high EV adoption
KSRTC	Kerala	~5,200	~22	85	6	5.5	Best-in-class
BMTC	Karnataka	~6,500	~30	80	15	6.2	Moderate; EV pioneer
RSRTC	Rajasthan	~8,500	~18	72	4	6.8	Moderate
GSRTC	Gujarat	~7,200	~20	88	3	5.5	Strong performer
HRTC	Himachal Pradesh	~3,200	~8	76	3	6.1	Moderate

Source: Cities Forum Analysis from STU annual reports (FY2024–25) and CIRT Performance Statistics of STUs. Full operator detail in Appendix A.

and urban operations; the urban subset each serve is smaller. The full financial deep-dive is in *Appendix A*.

The data reveal a stark bifurcation. A small group of well-run undertakings, KSRTC Karnataka, KSRTC Kerala and GSRTC Gujarat, achieves cost-recovery ratios of 80 to 90 per cent, holds staff-to-bus ratios to efficient levels, and has actively adopted electric buses. These organizations prove that financially viable, operationally excellent STU management is achievable in the Indian context. They remain the exception. The majority of major STUs show cost recovery of 60–75 per cent, staff-to-bus ratios of 7: 9, and limited capacity for capital investment in fleet renewal. Delhi's DTC is the instructive outlier: among the most electrified large fleets in the country at about 20 per cent, yet among the most financially stressed at 55 per cent cost recovery, a combination possible only because central and state support has carried the capital burden its balance sheet could not.

2.13 Business models and operating arrangements

India's urban bus sector operates under a diversity of models that has evolved over decades of reform. The appropriate model for any city depends on its size, institutional capacity, fiscal resources and local political economy. Four principal models operate at scale.

2.13.1 Traditional STU model: The state government owns, operates, maintains and finances the entire system through a statutory corporation, with operations run by STU employees and capital funded from state budgets and central grants. Its advantages are continuity, accountability to the state, and comprehensive coverage, including socially important but commercially unviable routes. Its disadvantages are chronic losses, large staff complements, limited operational agility, and growing difficulty attracting capital for renewal as balance sheets deteriorate. It remains the dominant model by fleet, and the one most in need of restructuring.

2.13.2 City bus agency model: A city-specific entity, often a statutory body or SPV under the urban local body, operates urban services with a mandate focused exclusively on the urban area. BMTC in Bengaluru and BEST in Mumbai are the canonical examples. City agencies typically bring a stronger urban-service orientation, better alignment with city development plans, and greater accountability to local government. They face similar financial-sustainability challenges to STUs and often lack the scale economies of state-level procurement, but they are structurally closer to genuine urban service and have frequently pioneered electric adoption.

2.13.3 Gross Cost Contract (GCC) model: A public authority, a city agency, CESL or a state body contracts a private operator to provide buses, drivers and maintenance at a fixed per-kilometre rate, while retaining fare revenue and bearing ridership risk. This model expanded in India at scale through PM e-Bus Sewa, and thus has delivered competitive per-kilometre rates, roughly Rs 45–55 per km for electric GCC contracts under CESL procurement against Rs 65–75 per km for comparable STU operations, transferred operational risk to operators with fleet-management expertise, and, critically, enabled electric-bus deployment without STU capital investment.

2.13.4 Hybrid and innovative models. Several states are experimenting with blended arrangements: net-cost contracts, wet-lease and dry-lease structures, and viability-gap-funded concessions on socially necessary routes. These are still maturing, but they extend the toolkit for matching the delivery model to local capacity and route economics.

2.14 STU financial performance

The financial health of the sector is the single greatest constraint on urban bus provision. Cost-recovery ratios, the share of operating cost met by fare and non-fare revenue, span from below 55 per cent at the most stressed undertakings to nearly 90 per cent at the strongest. Four structural drivers separate the two ends: fare structures held below cost recovery for long periods, often for social reasons; staffing ratios well above efficient levels, a legacy of past hiring; large accumulated pension and gratuity liabilities that consume revenue; and infrastructure deterioration from years of deferred capital spending. Where these are managed, as in Kerala, Gujarat and Karnataka, cost recovery reaches 85–90 per cent. Where they are not, accumulated losses can exceed a full year of revenue, leaving the undertaking unable to finance renewal on its own.

Most major STUs cannot finance fleet renewal from their own balance sheets. Any urban bus expansion programme must therefore be structured to shift the capital burden from the operator, through central capital support, gross-cost contracting, or both.

2.15 Infrastructure readiness for electrification

The physical infrastructure for electric-bus operations has three components. These include depot charging infrastructure (on-site electrical systems, chargers and civil works); grid connectivity (the high-tension supply from the DISCOM to the depot); and the smart-charging and fleet-management software needed to optimise charging and manage battery health. Readiness across all three is low and uneven, and this, not the availability of buses, is the practical bottleneck for electrification in most cities.

Among the roughly 1,200 STU depots across India, only a small number, perhaps 200 to 300, have been surveyed and assessed for EV readiness.[21] Of those assessed, the majority require significant electrical upgrades: transformer capacity additions (most depot transformers are sized for lighting and light power (not for bulk power of 180 kW DC chargers), dedicated high-tension feeder lines to segregate charging load, civil works for charger foundations and cable trenches, and drainage upgrades. Depot electrification typically costs Rs 3–8 crore per depot, depending on size, existing infrastructure and grid proximity. (see Bus depot infrastructure readiness for electrification).

As grid connection alone can take a year or more of DISCOM approvals and works, and because a full electric depot needs 2 MW or more of dedicated supply against a fraction of that today, depot power and grid upgrades must run ahead of, or at least alongside, bus procurement. Any procurement programme that orders buses faster than it builds depot power will show stranded assets. This is why depot

Table 12: Bus depot infrastructure readiness for electrification

Component	Current status (per cent)	Depots needing upgrade	Cost per depot (Rs Cr)	Key challenges
HV grid connection	~15 ready	~1,000	2-5	DISCOM approval timelines; grid capacity
DC fast chargers (180 kW)	~8 equipped	~1,100	1–3	Charger availability; installation lead times
AC slow chargers (22 kW)	~20 equipped	~800	0.5–1.5	Suitable for overnight charging only
Smart charging software	<5 deployed	all EV depots	per depot + licence	Data integration; DISCOM APIs; staff training
Rooftop solar at depots	<3 with solar	all new depots	0.5–2	Net-metering approvals; structural load

Source: Cities Forum Analysis from CESL depot-readiness data, NITI Aayog and RMI. Figures are indicative estimates for direction-setting.

Table 13: Mapping barriers and enablers

Barrier	Enabling condition
Upfront capital cost exceeds STU balance-sheet capacity	Central capital support and gross-cost contracting to move the burden off the operator
Depot power and grid connectivity are inadequate	Depot-power build-out sequenced ahead of procurement, with DISCOM co-ordination
STU finances are too weak to borrow at scale	Financial restructuring and a standing electrification fund
Procurement is scheme-driven and year-to-year	A multi-year mission with predictable, outcomes-linked funding
Manufacturing capacity is below mission volumes	A large, steady demand signal to underwrite capacity expansion
Governance is fragmented across ministries and tiers	A single-window mission and empowered city transport authorities

Source: Cities Forum analysis

infrastructure is treated in the proposed roadmap as a critical-path item, not a downstream consequence of procurement.

2.16 Barriers and enabling conditions

Six barriers recur across the analysis, each with a corresponding enabling condition the mission must supply (see *Table 13: Mapping barriers and enablers*).

These barriers are not independent. Capital cost, weak balance sheets and scheme-driven funding compound one another; depot power and manufacturing capacity are both scale-and-lead-time problems; governance fragmentation sits underneath all of them.

SECTION 3: Demand assessment and forecasting to 2047

It is necessary to estimate how large the organized urban bus fleet must become, and how fast, to meet the service-level benchmarks and move toward global-best provision. This analysis sets out the forecasting method, presents the state-wise demand, derives the procurement requirement, and traces the electrification and power-demand pathways. The three mission options that follow from this analysis are designed and compared in Chapter 5.

3.1 Forecasting methodology and formulae

The demand forecast is anchored to MoHUA's Service Level Benchmark fleet availability framework rather than to a trend extrapolation. The forecast follows the six-stage model set out in Section 1.5.1; the formulae that drive each stage are set out below.

Required fleet: For each state and year, the required urban bus fleet is:

Required fleet = Urban population (lakh) x SLB norm (buses per lakh) x Achievement rate

where the SLB norm is the state's representative graded norm (60 for megacity-dominant states, 50 for metro-city-dominant, 40 for smaller-city-dominant), graded nation norm of 44 buses per lakh population and the achievement rate is the share of that norm reached in the given year. The achievement rate is the single variable that defines the options: it is the lever turned up or down to give the three ambition levels. In this study, the achievement rate is taken as 100 per cent, but for sensitivity analysis this parameter could be changed.

Population projection: Urban population is projected by interpolation between UN medium-variant anchor points:

Population (year) = interpolation between UN anchor points at 2024, 2030 and 2040, extended to 2047

Procurement: Gross procurement in each year is the sum of three streams:

Gross procurement = Expansion + Replacement + Backlog clearance

where expansion is the year-on-year increase in required fleet, replacement is the cohort-based retirement of buses reaching their 15-year life, and backlog clearance is the front-loaded retirement of the roughly 40,000 overaged buses.

Electrification and cost: The electric split, power demand and capital cost follow:

EV procurement = Gross procurement x EV share; Charging demand = EV fleet x annual km x kWh per km; CapEx = Procurement x unit cost x escalation

Method and formulae: Cities Forum Analysis, state-wise mission model. The single-representative-norm-per-state approach is a documented simplification; a within-state city-class split would refine state totals without materially changing national direction.

3.2 The demand options

The forecast is presented under three options, defined here and carried through the rest of this chapter. The proposals in Chapter 5 are designed on these same options.

Option 1, the absolute-must minimum: Provision reaches the graded SLB fleet availability norm of 44 buses per lakh by 2047. This is the floor: the minimum that must be done to meet the benchmark India has already set for itself.

Option 2, the intermediate path: Provision reaches the graded SLB fleet availability norm by 2030 and uniform rate of 60 buses per lakh by 2040 and maintains it till 2047 to equate the disincentives small and medium sized cities have with graded benchmark.

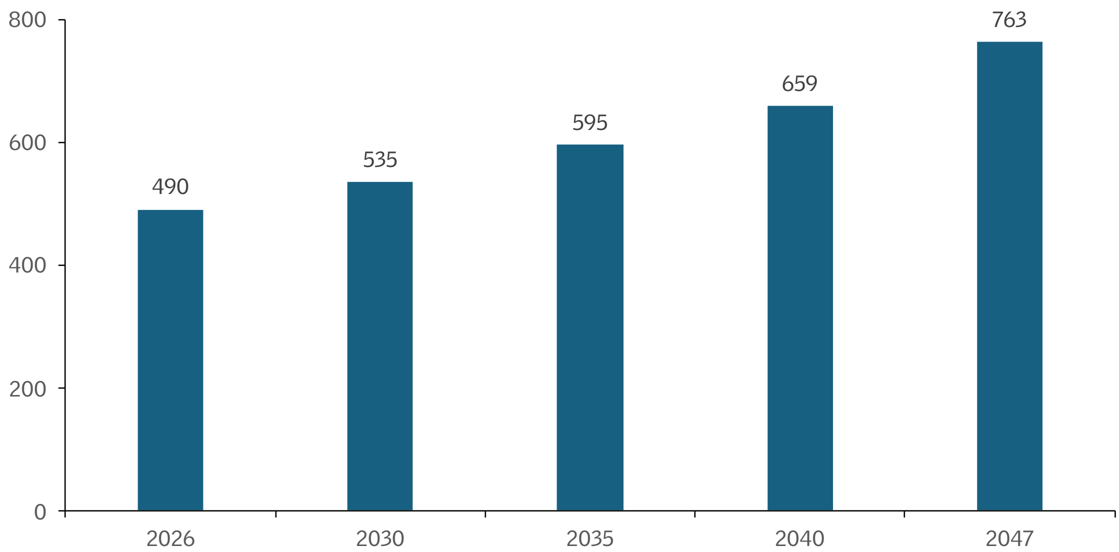
Option 3, the Viksit Bharat ambition: Provision reaches global-best levels, about 88 buses per lakh (based on global cities benchmark and World Bank guidance), by 2047, aligning the proposal with the vision of a developed India. This is the recommended option.

Table 14: Urban population projection

Measure	FY2026	FY2030	FY2040	FY2047
Urban population (crore)	49.0	53.5	65.9	76.3
Urban population (lakh)	4,902	5,351	6,591	7,628
Growth rate (per cent per annum)	2.1	2.0	1.8	1.7

Source: Cities Forum Analysis from UN World Urbanization Prospects 2023

Figure 5: Urban population (million) growth driving demand, 2026–47



Source: Cities Forum Analysis from UN World Urbanization Prospects 2023

The two that matter most for the proposal are Option 1, which sets the non-negotiable floor, and Option 3, which sets the Viksit Bharat ambition. Option 2 is shown throughout as the intermediate reference.

3.3 Urban population projections

State-wise urban population is projected from a 2024 base, calibrated to United Nations medium variant projections, with reference points at 2030 and 2040. The national urban population grows from about 490 million in 2026 to roughly 535 million in 2030, 659 million in 2040, and 763 million in 2047, an overall growth rate easing from around 2.1 per cent per annum in the last 2020s toward 1.7 per cent by the 2040s (see *Table 14: Urban population projection* and *Figure 5: Urban population (million) growth driving demand, 2026–47*).

3.4 National demand by option, to 2047

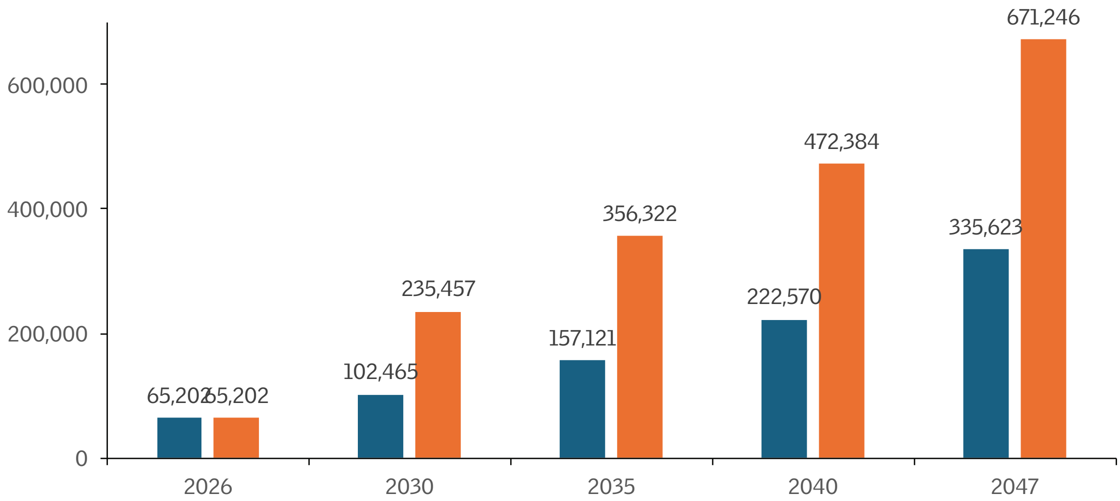
The national fleet-in-operation trajectory under each option is shown below. The gap between Option 1 and Option 3, from about 3.36 lakh to about 6.71 lakh buses

Table 15: National fleet in operation by option and year (number of buses)

Year	Option 1 (floor)	Option 2	Option 3 (Viksit Bharat)
2026	65,202	65,202	65,202
2030	102,465	235,457	235,457
2035	157,121	308,812	356,322
2040	222,570	395,484	472,384
2047	335,623	457,668	671,246

Source: Cities Forum Analysis, mission model. Option 1 reaches the graded SLB by 2047; Option 3 reaches global-best provision by 2047.

Figure 6: Fleet in operation by option, FY2026–47



Source: Cities Forum Analysis, mission model

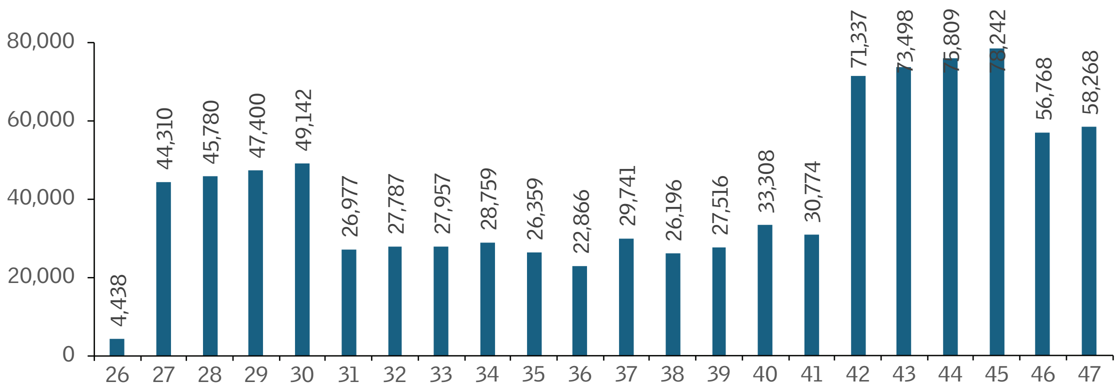
by 2047, is the span of the strategic choice designed in Chapter 5: (see *Table 15: National fleet in operation by option and year (number of buses)* and *Figure 6: Fleet in operation by option, FY 2026–47*).

3.5 Procurement requirement

Total urban-bus procurement over FY2026–47 combines three streams: fleet expansion to close the SLB gap; replacement of buses retiring on the 15-year cycle; and clearance of the roughly 40,000-bus overaged backlog. The retirement stream is modelled on the age-cohort basis established in Chapter 2, so the procurement profile is realistically uneven rather than smoothed.

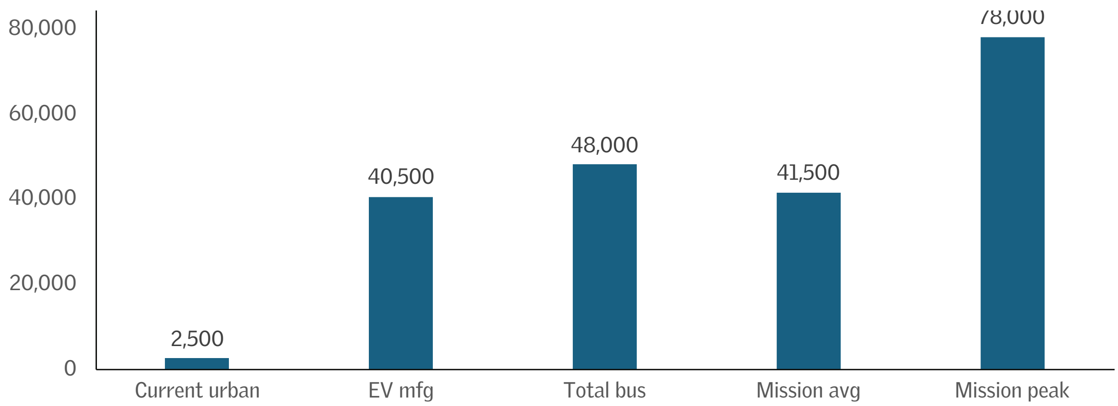
Under the primary mission (Option 3), total procurement reaches about 9.1 lakh buses over the period, an average near 41,500 a year, rising to a peak close to 78,000 in the mid-2040s as the mission's own early inductions come up for their

Figure 7: Annual bus procurement, primary mission (Option 3)



Source: Cities Forum Analysis, mission model (Option 3)

Figure 8: Mission procurement demand against current manufacturing capacity



Source: Cities Forum Analysis; manufacturing capacity from Autocar Professional (FY24), Vahan

first replacement. Replacement, not expansion, dominates the later years (see *Figure 7: Annual bus procurement, primary mission [Option 3]*).

The scale of the urban requirement is the central manufacturing challenge. At about 41,500 buses a year on average, and up to 78,000 at peak, mission procurement is roughly seventeen times the recent urban procurement run-rate of about 2,500 buses a year observed historically, and it approaches the whole of India's current annual bus-manufacturing output. Manufacturing scale-up is therefore not an implementation detail but a binding constraint on the pace of the mission, and it is treated as such in the mission design and roadmap (see *Figure 8: Mission procurement demand against current manufacturing capacity*).

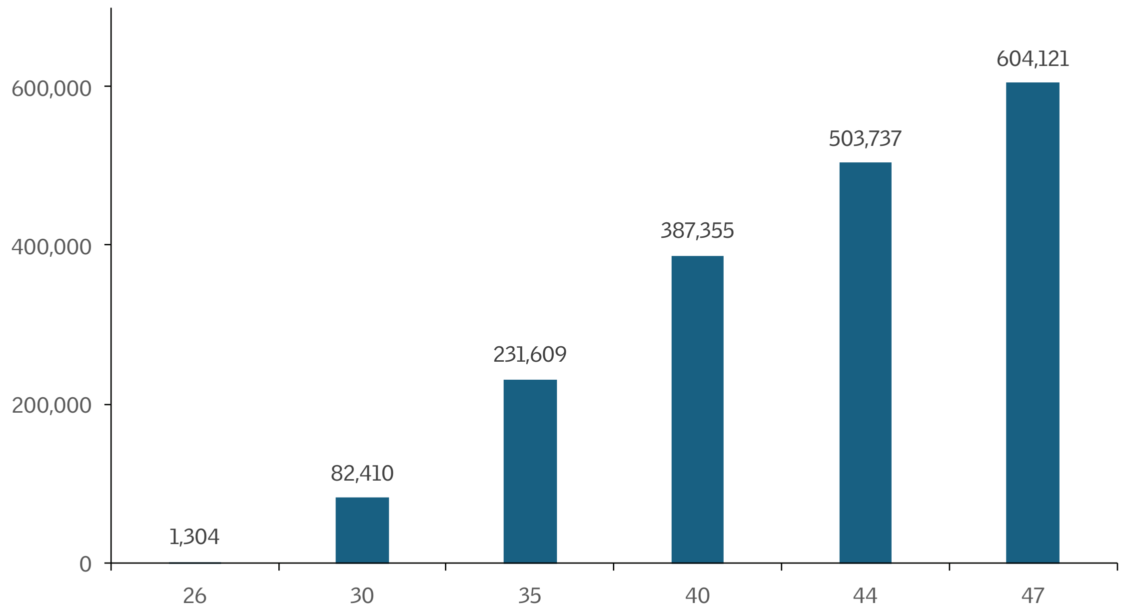
3.6 Electrification trajectory and power demand

The proposed electrification trajectory raises the electric share of new procurement from about 30 per cent today to 50 per cent by FY2029–30, 75 per cent by FY2034–35, and 100 per cent by FY2039–40. The electric share of the operating fleet consequently rises from about 2 per cent today to roughly 35 per cent by 2030, 65 per cent by 2035, 82 per cent by 2040 and about 90 per cent by 2047.

Under the primary mission this means approximately 6.04 lakh electric buses in operation by 2047. Annual charging-energy demand grows to about 37,000 million units a year, approximately 1.8 per cent of India's 2024 electricity generation,[22] and a smaller share by 2047 as national generation grows. The fleet requires approximately 2.0 lakh charging points and about 121 GWh of battery capacity in service (see *Figure 9: Electric buses in operation [Option 3]*).

The power-demand figure is reassuring at the national level, under 2 per cent of current generation. Charging load is concentrated in time (overnight and mid-day) and in space (at depots), so the binding constraint is local distribution capacity and depot connectivity, not national generation.

Figure 9: Electric buses in operation (Option 3)



Source: Cities Forum Analysis, mission model (Option 3)

3.7 Battery accumulation and the circular economy

About 121 GWh of battery capacity will be in service by 2047, and over the following years, all of it will reach end of life. With the right systems in place, this is a strategic resource rather than a liability: second-life applications in stationary storage can extend useful life by several years, and domestic recycling can recover lithium, cobalt and nickel, cutting raw-material imports and lifecycle emissions while building a domestic materials industry. Without those systems, it becomes a waste-management and environmental problem. A battery circular-economy framework, covering standards, extended producer responsibility, second-life aggregation and domestic recycling capacity, should be built into the mission from the outset, not retrofitted once the first large cohorts retire.

3.8 EV fleet mix by city category

Mega-cities need high-capacity 12-metre and articulated buses with large batteries for high-utilization trunk corridors; metro cities are well served by standard 12-metre BEVs; medium cities by a mix of 9-metre and 12-metre vehicles; and smaller and hill cities by 9-metre minibuses with smaller batteries suited to lower-density, lower-range duty cycles. Matching format to city class improves both economics and service quality, and it shapes the battery-capacity and charging-infrastructure requirements by geography.

SECTION 4: Lessons from India and comparable global markets

A review of the experience of bus electrification, in India and internationally, helps to extract the lessons that shape the roadmap design. This review has summarised three Indian and four global cases, then draws them together in a comparative analysis. The detailed Indian case studies are placed in *Appendix A* (alongside the national STU analysis) and the detailed global case studies in *Appendix B*; the key takeaways are presented here.

4.1 The Indian experience

Three Indian cases present the domestic lessons. Delhi Transport Corporation shows both the promise and the difficulty of large-metro electrification that include rapid electric adoption, to about 20 per cent of a large fleet, on one of India's most stressed balance sheets, made possible only because central and state support and the cluster-scheme model carried the capital burden. Bengaluru's BMTC shows the city-agency path that include a dedicated urban mandate, relatively sound operations at about 80 per cent cost recovery, and early electric adoption.

PM e-Bus Sewa shows the national programme model working at scale including 10,000 electric buses across 169 cities under a 12-year gross-cost-contract model, reaching cities that never had organized service, with its decoupling of procurement from STU balance sheets standing as the single most important delivery innovation in India's bus sector. These three cases are analysed in detail in *Appendix A*.

The common thread: Electrification succeeds in India where the capital burden is lifted off the STU balance sheet, through central support, gross-cost contracting, or both. It is constrained wherever the STU is asked to carry the upfront cost alone.

4.2 Global experience

Four global cases sharpen the lessons. Shenzhen, the first city in the world to fully electrify its bus fleet of over 16,000 buses, shows what concentrated public investment and a domestic manufacturing base can achieve, and the scale of depot power such a transition demands. Bogota shows electric integration into a bus-rapid-transit system in a developing economy through gross-cost concessions and development-bank finance. Cape Town shows the difficulty, and the necessity, of grid reliability, electrifying against a backdrop of load-shedding. Chengdu shows a second-tier-city electrification model directly relevant to India's Tier-2 cities. The detailed cases are in *Appendix B*.

4.3 Comparative analysis and transferable lessons

Drawing the cases together, the following comparison identifies the factors that distinguish successful electric-bus programmes and maps each to an implication of a successful bus expansion program (see *Table 16: Success factors across cases and implications for India*).

Table 16: Success factors across cases and implications for India

Success factor	Shenzhen	Bogota	India (DTC/ BMTC/PM e-Bus Sewa)	Key Learnings
Centralized procurement aggregation	Strong	Present	Strong (CESL)	Extend CESL-style aggregation to all new procurement
Battery lease/separation	Strong	Absent	Not yet	Pilot battery-lease models in new tenders
Cross-ministry grid co-ordination	Strong	Present	Partial	Mandate a joint MoHUA-MoP task force on depot power
Concessional development-bank debt	Strong	Strong (IDB)	Limited	Establish the electrification fund with multilateral co-finance
Operator formalization	Present	Strong	Partial (GCC)	Extend gross-cost contracting to formalize operators
Smart charging infrastructure	Strong	Present	Partial	Mandate smart charging at all new depots
Policy continuity on targets	Strong	Present	Present (FAME/ PM)	Maintain continuity; avoid scheme gaps
Post-scheme sustainability planning	Present	Present	Gap	Integrate STU restructuring with the mission

Source: Cities Forum Analysis, synthesising case studies in Appendix B

Across every successful case, one lesson repeats above all others: move the capital burden off the operator and build depot power and grid capacity before the buses arrive, not after.

SECTION 5: Mission design and strategic options

So far, this analysis has established the baseline, the demand and the lessons. It now turns them into a designed mission. It frames the central strategic choice, characterizes three options against a common set of dimensions, makes the case for the recommended option, and sets out the mission architecture, delivery model, critical path and risks.

5.1 The strategic choice

The Service Level Benchmarks define an adequate system. Global-best practice defines a world-class one. The gap between them, and the pace at which either is reached, defines a spectrum of possible mission options (which have been discussed in section 3.2 and 3.4). Three points on that spectrum matter most. These include meeting the benchmark by the end of the period; reaching it early and then pushing beyond; or aiming directly for global-best provision, in line with the Viksit Bharat vision of a developed India by 2047. Each carries a different cost, a different institutional demand and a different risk profile.

5.2 The three options in detail

Each option is characterized below across five attributes that include the service standard it targets, the fleet and procurement it implies, the capital it requires, the institutional and industrial demands it places on the system, and the profile of city it best serves.

The options share a common structure, and graded SLB norms applied to projected urban population, but differ in the level of provision reached and the pace of reaching it.

5.2.1 Option 1: Meet the benchmark

Option 1 sets the service standard at the graded Service Level Benchmark, about 44 buses per lakh, reached by 2047 through a steady climb from today's 13.3. In fleet terms, this means about 3.36 lakh buses in operation by 2047, roughly a fivefold expansion of the current fleet, with total procurement of about 4.2 lakh buses over the period, an average near 19,000 a year, and a peak near 35,000. The capital requirement is about Rs 6.55 lakh crore, the lowest of the three. Institutionally and industrially, Option 1 is the least demanding: it requires manufacturing to scale to roughly eight times the current urban run-rate, a stretch but not a transformation, and it puts the least strain on depot power and financing. It reproduces the target of the original roadmap, and it is the natural floor. Its limitation is ambition: it closes the adequacy gap but leaves India, in 2047, at a provision level its own benchmark treats as merely adequate and that developed-country peers exceeded decades ago. It is best understood as the minimum acceptable mission, not the intended one.

5.2.2 Option 2: Benchmark early, then beyond

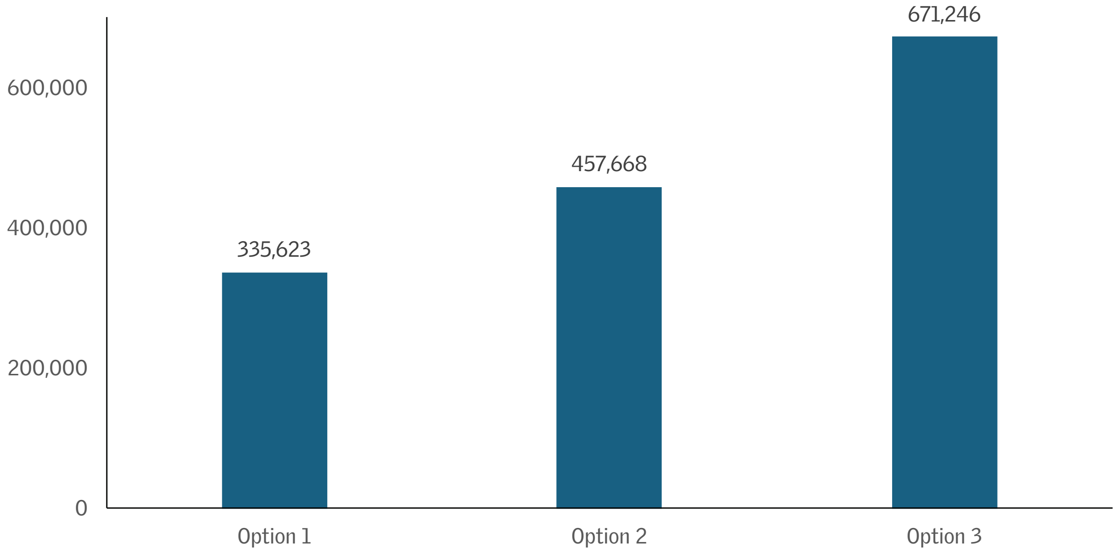
Option 2 raises both the ambition and the pace. It reaches the graded SLB by 2030, a decade and a half earlier than Option 1, and then pushes uniform provision to 60 buses per lakh by 2040, holding there to 2047. The fleet reaches about 4.58 lakh by 2047, procurement totals about 6.8 lakh at an average near 31,000 a year and a peak near 55,000, and capital expenditure is about Rs 10.55 lakh crore. Institutionally, Option 2 demands manufacturing at roughly thirteen times the current run-rate and a materially faster depot-power build-out than Option 1, because the early benchmark pulls procurement forward. It reaches a solid, internationally respectable provision level, though not a world-leading one. It is the considered middle path: more ambitious and better-timed than Option 1, less demanding than Option 3.

5.2.3 Option 3: Global-best by 2047 (recommended)

Option 3 sets the service standard at global-best provision, about 88 buses per lakh by 2047, the graded equivalent of the upper end of international practice, where the best-served large cities run 88 to 120 buses per lakh. This is the level of the cities India aspires to join, and reaching it by 2047 aligns the mission precisely with the Viksit Bharat horizon. The fleet reaches about 6.71 lakh by 2047, roughly a tenfold expansion, with about 6.04 lakh of it electric.

Procurement totals about 9.1 lakh buses at an average near 41,500 a year, rising to a peak close to 78,000 in the mid-2040s as the mission's own early inductions come up for replacement. Capital expenditure is about Rs 14.20 lakh crore. The demands are correspondingly the greatest: manufacturing must scale to roughly seventeen times the current urban run-rate, depot power must be built well ahead of the buses, and the financing architecture must mobilise capital at a pace the sector has never seen (see *Figure 10: Fleet in operation by option, FY2026 to FY2047*).

Figure 10: Fleet in operation by option, FY2026 to FY2047



Source: Cities Forum Analysis, mission model

5.3 Options compared

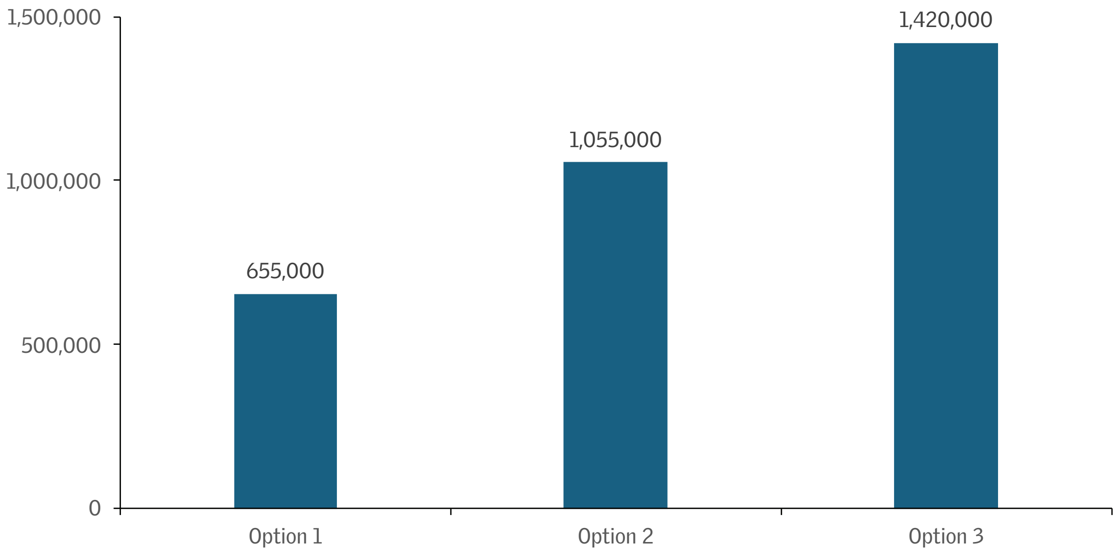
The options are best judged across several dimensions at once. The matrix below sets them side by side on provision, scale, cost, delivery pace and the principal constraints each activates (see *Table 16: The three options compared* and *Figure 11: Total capital expenditure by option [Rs lakh crore]*).

Table 16: The three options compared

Dimension	Option 1	Option 2	Option 3 (recommended)
Ambition	Meet graded SLB by 2047	Meet graded SLB by 2030, 60/lakh by 2040 and hold it for 2047	Global-best by 2047
Provision 2047 (per lakh)	44	60	88
Fleet in operation 2047	3.36 lakh	4.58 lakh	6.71 lakh
Electric buses 2047 (~90 per cent)	3.02 lakh	4.12 lakh	6.04 lakh
Total procurement 2026-47	4.2 lakh	6.8 lakh	9.1 lakh
Average procurement/year	~19,000	~31,000	~41,500
Peak procurement/year	~35,000	~55,000	~78,000
Total CapEx (Rs lakh crore)	6.55	10.55	14.20
Manufacturing demand vs today	~8x	~13x	~17x
Alignment with Viksit Bharat	Partial	Substantial	Full

Source: Cities Forum Analysis, mission model. Manufacturing multiple is against the recent urban procurement run-rate of about 2,500 buses a year

Figure 11: Total capital expenditure by option (Rs lakh crore)



Source: Cities Forum Analysis, mission model

5.4 Details of Option 3

This section details Option 3, global-best provision by 2047, as the mission India should pursue. The recommendation rests on four arguments.

First, alignment with the national vision. The Viksit Bharat goal is a developed India by 2047. A developed India does not run its cities on 44 buses per lakh, a level its own benchmark treats as merely adequate and that developed peer exceeded long ago. Option 3 targets the provision level of the cities India aspires to join. The mission and the national goal should be set to the same ambition, and the mission should be timed to the same horizon.

Second, the cost of the gap is higher than the cost of closing it. The incremental capital cost of Option 3 over Option 1, about Rs 7.65 lakh crore across two decades, is large but finite and phaseable. The cost of the mobility gap it closes, in congestion, in premature deaths from foul air, in constrained access to work and education for the urban poor, recurs every year and compounds.

Third, the constraints are surmountable if faced early. Option 3's binding constraints, manufacturing scale-up to about 41,500 buses a year and depot-power build-out ahead of procurement, are real but tractable, provided the mission commits to them from the outset. A large, steady demand signal will pull manufacturing capacity into being; a depot-power programme sequenced ahead of buses will clear the grid bottleneck.

Fourth, ambition is reversible downward, but delay is not recoverable. A mission designed for Option 3 can be moderated to Option 2 or 1 if fiscal or institutional conditions demand it; the reverse is far harder, because manufacturing capacity, depot power and financing channels built for a smaller mission cannot easily be scaled up mid-course. Designing for the most ambitious option preserves optionality; designing for the least forecloses it.

Option 3 matches the Viksit Bharat vision, and the cost of under-building India's urban bus system is higher and less recoverable than the cost of building it fully.

The remainder of this report, the financial requirements in Chapter 6, the financing and reform plan in Chapter 7, and the roadmap in Chapter 8, is built around Option 3 as the primary mission, while noting throughout where a more constrained option would change the numbers.

5.5 Mission architecture

Delivering Option 3 requires a mission architecture with four integrated elements, each addressing one of the binding constraints identified in Chapter 2.

A single-window programme: A National Urban Bus Mission under MoHUA consolidates all current schemes into one outcomes-linked programme with multi-year funding, ending the stop-start of year-to-year scheme cycles.

A delivery model that spares the operator's balance sheet: Gross-cost contracting becomes the default for new urban deployments, with CESL-style aggregated procurement, standardised bankable contracts and strong payment-security mechanisms, so that electrification does not depend on STU capital.

A power build-out ahead of the buses: A depot-power and grid-upgrade programme, run jointly by MoHUA and the Ministry of Power with the DISCOMs, is sequenced to lead procurement, so that buses arrive to depots that can charge them.

A financing backbone: A standing National Urban Bus Electrification Fund, co-capitalized by the Centre, states and multilateral banks, provides viability-gap support, guarantees and infrastructure finance, replacing annual allocations with a durable channel. The instruments are detailed in Chapter 7.

5.6 Critical path and sequencing

The mission has a clear critical path, and getting the sequence right matters as much as the totals. Three items must lead, because they have the longest lead times and gate everything downstream: depot power and grid connectivity, which can take a year or more per depot; manufacturing capacity, which needs an early and credible demand signal to expand; and the financing and contracting framework, which must be in place before procurement can scale. Backlog clearance, the retirement and electric replacement of about 40,000 overaged buses, is the natural first wave: it delivers the fastest emissions and reliability gains, builds early manufacturing volume, and exercises the delivery model at manageable scale before the larger waves arrive. The full phasing is set out in the roadmap in Chapter 8.

5.7 Risks and mitigations

The mission's principal risks, and the mitigations built into its design, are set out below (see *Table 17: Principal mission risks and mitigation*).

Table 17: Principal mission risks and mitigations

Risk	Severity	Mitigation
Manufacturing capacity lags procurement	High	Early multi-year demand signal; support for capacity expansion.
Depot power and grid connectivity delay deployment	High	Power build-out sequenced ahead of buses; joint MoHUA-MoP task force
STU finances cannot support the transition	High	Gross-cost contracting off the balance sheet; restructuring programme
Financing gap is not closed	Medium	Standing fund; green bonds; climate finance; results-based payments
Battery end-of-life becomes a liability	Medium	Circular-economy framework built in from the outset
Scheme continuity breaks with political cycles	Medium	Statutory multi-year mission with locked funding
Ambition is diluted mid-course	Low	Design for Option 3 preserves downward flexibility without stranding capacity

Source: Cities Forum Analysis

SECTION 6: Financial requirements

It is necessary to estimate the money the mission requires. This analysis sets out the unit-cost assumptions on which all estimates rest, presents the capital expenditure by phase for the recommended mission, makes the lifecycle case for electric over diesel, quantifies the funding gap, and estimates the associated power-sector investment. All figures are for the Option 3 unless otherwise stated, with the range across options noted where it matters.

6.1 Unit cost assumptions

The financial assessment rests on a set of unit costs representing the best available estimates for India's market as of FY2025-26, drawn from CESL PM e-Bus Sewa procurement benchmarks, FAME-II implementation data, OEM quotations, and depot-electrification projects under BMTC and DTC programmes.[23] All costs are in FY2025-26 prices; a 3 per cent annual escalation is applied to future periods (see *Table 18: Key unit-cost assumptions, FY2025–26*).

Table 18: Key unit-cost assumptions, FY2025–26

Cost item	Unit	FY2025–26 cost	Basis
12m electric bus (BEV, non-AC)	per bus	Rs1.50 Cr	CESL benchmark; base warranty
12m AC electric bus	per bus	Rs 1.65 Cr	AC premium ~10 per cent
9m electric minibus	per bus	Rs 1.10 Cr	Smaller format for Tier-2 cities
12m diesel bus (BS-VI)	per bus	Rs 0.80 Cr	Market average
Charging infrastructure (blended)	per e-bus	Rs 0.20 Cr	Mix of AC and DC; civil works
Depot and grid connectivity	per new bus	Rs 0.15 Cr	Civil, HT connection (land excluded)
Electric bus OpEx	Rs /km	28	Energy 12 + maintenance 10 + crew/other 6
Diesel bus OpEx	Rs /km	45	Fuel 25 + maintenance 12 + crew/ other 8
Average annual km per bus	km/yr	~55,000	Urban operations; varies by route
CapEx escalation	Per cent per annum	3.0	Moderate vehicle and infrastructure inflation

Source: Cities Forum analysis from CESL, MHI, OEM and STU project data

6.2 Capital expenditure

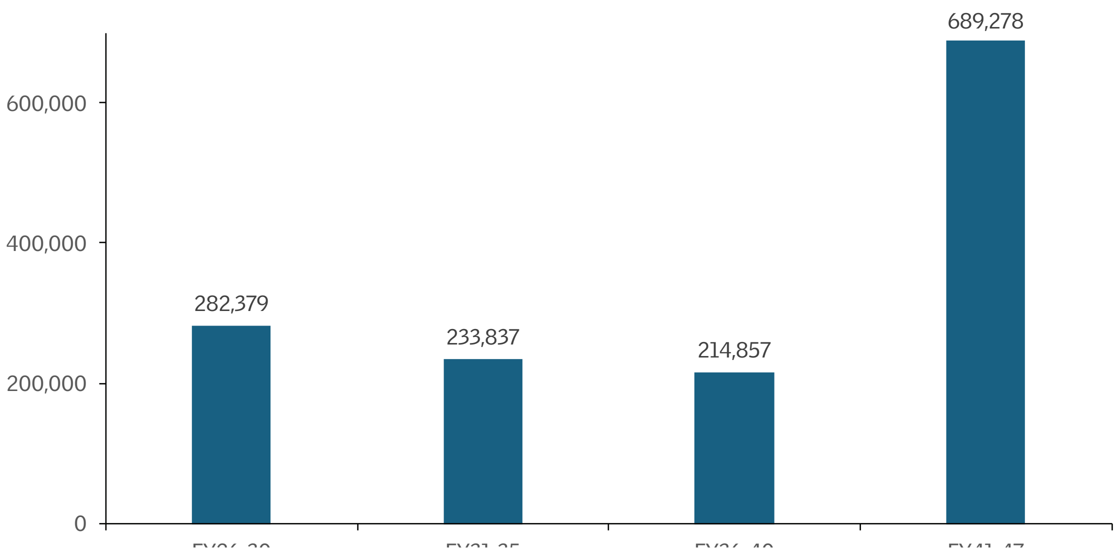
Applying these unit costs to the procurement schedule from Chapter 3, with escalation and the projected fall in electric-bus prices, gives total capital expenditure over FY2026–47 of about Rs 14.20 lakh crore for the Option 3, against Rs 6.55 lakh crore for Option 1 and Rs 10.55 lakh crore for Option 2. The phasing for the recommended mission is set out below (see *Table 20: Capital expenditure by phase, recommended mission (Rs crore, nominal)* and *Figure 12: Capital expenditure by phase [Option 3]*).

Table 19: Capital expenditure by phase, recommended mission (Rs crore, nominal)

Phase	FY2026–30	FY2031–35	FY2036–40	FY2041–47	Total
CapEx (Rs crore)	282,379	233,837	214,857	689,278	1,420,351

Source: Cities Forum Analysis, mission model (Option 3). Nominal Rs, 3 per cent escalation, 15-year fleet life.

Figure 12: Capital expenditure by phase (Option 3)

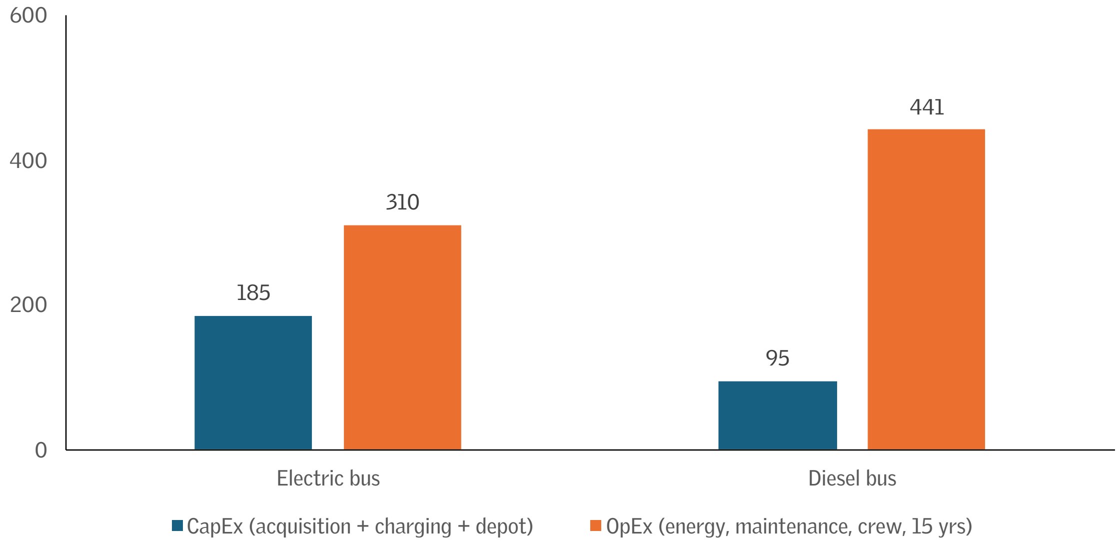


Source: Cities Forum Analysis, mission model (Option 3)

6.3 Total cost of ownership: electric versus diesel

On sticker price, a 12-metre electric bus at about Rs 1.50 crore costs nearly twice a diesel bus at about Rs 0.80 crore. On total cost of ownership over a 15-year life, the picture reverses. Electric operating cost of about Rs 28 per km against diesel's Rs 45 per km, over roughly 55,000 km a year for 15 years, saves on the order of Rs 1.4 crore per bus in undiscounted operating cost, more than offsetting the higher purchase price. The lifecycle case already favours electric at current prices, and it widens as battery costs continue to fall and diesel prices rise. This is why the mission is built around electric procurement: the cheaper bus to own is also the cleaner one (see *Figure 13: Total cost of ownership, electric versus diesel [Rs lakh per bus, 15 years]*).

Figure 13: Total cost of ownership, electric versus diesel (Rs lakh per bus, 15 years)



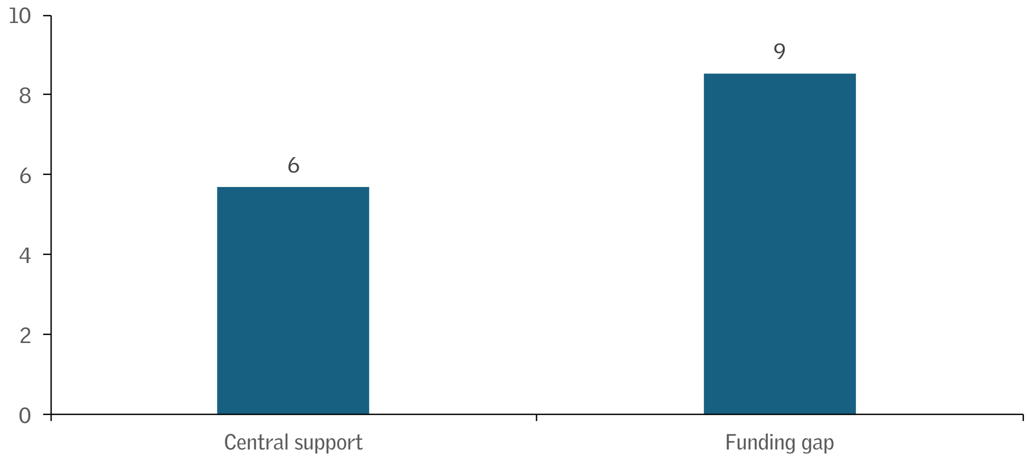
Source: Cities Forum Analysis.

A 12-metre electric bus costs more to buy but less to own. Over 15 years, lower energy and maintenance costs more than repay the higher purchase price, and the advantage grows as battery prices fall.

6.4 The funding gap

Central support under PM e-Bus Sewa-type frameworks can meet a substantial share of the electric-bus capital cost, on the order of 30 per cent of electric-bus CapEx under current norms. Applied the same proportion to the mission options, still leaves a funding gap of 70 per cent that need to be mobilised from private sector partner and further viability gap to be funded by the state governments, STUs, and development-finance institutions over the period (see *Figure 14: Indicative funding split, recommended mission [Rs lakh crore]*).

Figure 14: Indicative funding split, recommended mission (Rs lakh crore)



Source: Cities Forum Analysis. Central share indicative at ~40 per cent of electric-bus CapEx under current norms.

6.5 Power-sector investment and grid integration

Beyond the bus and depot capital already counted, the mission implies investment in the power sector that include distribution-network reinforcement at and around depots, and generation and transmission to serve about 37,000 million units a year of charging demand by 2047. Because the load is concentrated at depots and in time, the binding investment is in local distribution and depot connectivity rather than in national generation, which absorbs the demand comfortably. Smart charging, managed to off-peak and solar-rich hours, can reduce both the peak-demand burden and the carbon intensity of charging, and should be mandated at new depots. Coordination with DISCOMs on this investment is a critical-path item.

SECTION 7: Financing options and sectoral reform

This analysis has reviewed the current financing landscape, sets out the instruments needed to close the funding gap, describes the international climate-finance sources the mission can access, and specifies the sectoral reforms that make the whole program bankable. The instruments and reforms are designed to work together: the reforms make contracts investable, and the instruments channel capital into them.

7.1 Why the current financing landscape falls short

Today's financing is scheme-driven, year-to-year and concentrated on the vehicle. It provides little for depot power, grid connectivity or the working capital that gross-cost contracts require, and it gives operators no multi-year certainty to plan against. STU balance sheets are too weak to borrow at scale, and there is no standing instrument to draw private or climate capital into the sector. The result is stop-start deployment, capacity that cannot plan, and a persistent gap between what schemes fund and what a system-scale transition requires. A mission of this size needs financing that is predictable, multi-year, and structured to move risk to those best able to bear it.

7.2 Potential financing instruments

7.2.1 National urban bus electrification fund: A standing fund, co-capitalised by the Centre, states and multilateral banks, is the financing backbone of the mission. It provides viability-gap support for unviable-but-necessary routes, payment-security guarantees that make gross-cost contracts bankable, and finance for depot power and charging infrastructure. Replacing annual scheme allocations with a durable fund gives the sector the multi-year certainty it has never had.

7.2.2 Green bus bonds: A standardized national framework lets STUs and SPVs raise capital-market finance against contracted payment streams, drawing institutional and ESG investors into fleet renewal. Standardization is the key: a common, bankable structure lets many issuers tap the market at lower cost than bespoke issuances.

7.2.3 Viability gap funding for urban routes: Targeted support for socially necessary but commercially unviable routes ensures coverage is not sacrificed to cost recovery. This is what allows the mission to serve peripheries and smaller cities, not just profitable trunk corridors.

The viability gap funding in the urban bus sector has fallen sharply over the past five years, and this is due to the fact that several other incentives are announced by the government, and the nature of bus contracting has also been evolved under a GCC model. A viability gap programme designed around the procurement costs of the pre-electric era no longer exists and the nature of support is also evolving with every new program announced by the government.

7.2.3.1 What buses used to cost in pre-electric era: Delhi is the clearest illustration, because it has procured buses at scale in every programme. Ahead of the 2010 Commonwealth Games, the Delhi Transport Corporation inducted 3,125 low-floor CNG buses, its first low-floor fleet, in two tranches of 2,500 and 625. The low-floor CNG buses of that generation cost roughly twice as much as a standard CNG bus, and around 26 per cent more than the diesel buses they replaced.[24] The Comptroller and Auditor General subsequently found that the price of these low floor buses was high compared to standard CNG buses.[25]

By the middle of the decade, Delhi has stopped being able to buy buses at all. DTC had cancelled tenders outright because bidders quoted maintenance charges the corporation could not accept, and four successive years of attempts to buy buses had failed for want of reasonably priced bids. That was the pre-electric reality: small, city-by-city tenders; thin competition; bespoke specifications that no manufacturer could amortise; prices that moved in one direction; and a viability gap that widened with every procurement cycle. The gap was not a fact of nature. It was a consequence of how the buses were bought.[26]

Thus, several studies have been reviewed to understand the fiscal status and strategies.[27]

7.2.3.2 Electrification, at first, made it worse: The arrival of electric buses did not initially help. Early FAME-II bids came in higher than FAME-I, not lower. By late 2020 the average bid had reached about Rs 69 per kilometre for a 12-metre electric bus and Rs 63.3 per kilometre for a 9-metre, with wide variation between cities that reflected the absence of any benchmark at all.[28] Of 5,595 electric buses allocated under FAME-II, only 2,450 had actually been procured. Demand sat heavily fragmented across dozens of individual municipal agencies, each writing its own specification, each negotiating alone with the same small group of manufacturers.[29] However, the core problem was never the technology. It was the fragmentation of market structures and infrastructure blindness.

Crucially, the early design of both FAME-I and FAME-II treated the transition primarily as a vehicle procurement challenge, failing to take adequate cognizance of the massive, interdependent infrastructure investments required to actually run the fleets. The policy framework focused on direct asset subsidies for the buses, while leaving the critical downstream and upstream infrastructure severely underfunded and unplanned:

- **The downstream infrastructure deficit:** While the schemes subsidized the acquisition of vehicles, they initially overlooked the hyper-local realities of e-bus depots. Deploying a fleet of 50–100 e-buses requires specialized heavy-duty charging infrastructure, real estate for massive charging yards, all which State Transport Undertakings (STUs) were forced to finance and execute with minimal structural support.

- **The upstream grid blind spot:** Transitioning an urban bus depot to electric requires megawatts of dedicated power. FAME frameworks did not consider the upstream utility requirements: high-tension (HT) substations, heavy-duty transformers, grid-connectivity lines, and the associated load-augmentation fees demanded by Power Distribution Companies (Discoms).

Because early bidding models forced private operators and cash-strapped STUs to absorb these massive, opaque infrastructure costs into their operating expenses, risk margins skyrocketed. The lack of a unified, publicly funded infrastructure blueprint meant that operators had to price the extreme risk of grid unreliability and depot-readiness directly into their per-kilometre rates ultimately driving the early FAME-II bids to economically unviable heights.

Recognizing this critical policy blind spot, the Government has since been corrected with the introduction of the PM-eBus Sewa scheme. Acknowledging that true electrification requires systemic ecosystem support, this scheme explicitly bridges the infrastructure gap by offering 100 per cent central assistance for 'Behind-the-Metre' (BTM) power infrastructure (covering high-tension lines and internal substations) alongside substantial funding for civil depot construction. By directly funding the physical and electrical foundations of an e-bus depot, PM-eBus Sewa removes the capital-intensive upstream and downstream risks from the private operators' bids, fundamentally restructuring the market to make mass deployment financially viable.

7.2.3.3 What demand aggregation did: The Grand Challenge changed this in a single tender. CESL aggregated demand from five cities, Delhi, Kolkata, Bengaluru, Hyderabad and Surat, into one procurement of 5,450 buses; homogenized the technical and contractual specifications across all of them; and used Delhi as the benchmark city for price discovery, adjusting to other cities by local wage rates. The economies of scale achieved by aggregating demand over multiple cities and adopting a tendering process, saw difference in prices ranging from 7 per cent to as low as 48 per cent[30] lower than the prevailing prices in the previous bids for individual procurements by PTAs. The per-kilometre bid crashed from the early FAME-II average of Rs 69 down to Rs 43.49 per kilometre for a 12-metre bus and Rs 39.21 per kilometre for a 9-metre,[31] both inclusive of charging electricity, on a 12-year gross cost contract with 10 lakh assured kilometres per bus. Tata Motors was the lowest bidder across all five lots.[32]

Three comparisons are worth stating plainly:

- Against the Rs 69 per kilometre average for the same 12-metre bus barely eighteen months earlier, the discovered price was roughly 37 per cent lower.

- Against the prevailing cost of diesel and CNG buses in those same cities, the discovered prices were 23–27 per cent lower, before counting any subsidy at all.

- The exchequer saved approximately Rs 361 crore of FAME-II subsidy, which could be redeployed to additional buses.

Nothing about the buses had changed. What changed was the size and the standardization of the order (see *Table 20: What aggregation did to the price of a 12-metre urban bus*).

Table 20: What aggregation did to the price of a 12-metre urban bus

Era	Procurement	Structure	Discovered rate (12 m)
Pre-electric (2008-09)	DTC low-floor CNG, 3,125 buses	Direct purchase, single city	CAG: procured at an inordinately high price; Rs 61.10 crore above justified cost on the 625-bus tranche alone
Early electric (to Nov. 2020)	FAME-II, fragmented city tenders	GCC, city by city	~Rs 69/km (average bid)
Aggregated, with subsidy (2022)	Grand Challenge, 5,450 buses, 5 cities	GCC, national aggregation	Rs 43.49/km
Aggregated, no subsidy (2023)	NEBP, 6,465 buses, 6 states and UTs	GCC, national aggregation	Rs 54.30/km

Source: Cities Forum Analysis from CAG (2011); WRI India FAME-II bid analysis (to November 2020); PIB / CESL Grand Challenge price discovery (April 2022); CESL National Electric Bus Programme (January 2023). Rates are per-kilometre gross cost contract rates inclusive of charging energy and are not adjusted for inflation.

NEXT STEPS: ADDRESSING VIABILITY GAP FUNDING

Size viability gap funding against post-aggregation rates, not legacy costs: VGF benchmarks should be reset to competitively discovered per-kilometre rates and reviewed at every tender cycle. A programme designed around pre-aggregation bids would overpay by roughly a third.

Aggregate first, subsidize second: Demand aggregation delivered a larger price reduction than the subsidy it saved. Every mission procurement above a threshold volume should be routed through a national aggregation window before any viability support is calculated.

Extend payment security across the full mission period: The Payment Security Mechanism covers deployments to FY2028-29. It should be extended to 2047 and expanded to the mission's full volume. Guarantee-based instruments deliver far more deployment per rupee of public money than capital grants.

Retain VGF for what it is actually for: Socially necessary routes and small cities where fare revenue cannot cover a competitive rate, not the technology gap, which has closed.

7.2.3.4 The challenge has moved from price to payment risk: With price largely solved by aggregation, the binding constraint has moved. The barrier is no longer what the bus costs. It is whether the operator will be paid. State transport bodies have a long record of paying contractors late, and that record, more than any technical or financial factor, is why private operators stayed out of city bus operations for two decades.

The PM e-Bus Sewa Payment Security Mechanism, approved by the Cabinet in September 2024 and notified by the Ministry of Heavy Industries in October 2024, addresses this directly. It carries an outlay of Rs 3,435.33 crore and covers more than 38,000 electric buses deployed between FY2024-25 and FY2028-29, guaranteeing payments for up to twelve years per bus.[33] The mechanics are what make it work. Participating authorities must contract on a gross cost basis and register a Direct Debit Mandate with the Reserve Bank of India. If an authority defaults on its monthly payment, CESL pays the operator from the fund and recovers from the authority within 90 days. If recovery fails, the Ministry can ask the RBI to invoke the mandate and debit the state government's account automatically. The operator's risk is not managed; it is removed.

For the mission's financing architecture, the significance of this design lies in one feature above all: it substitutes a guarantee for a grant. Some Rs 3,435 crore of contingent liability unlocks more than 38,000 buses, on the order of Rs 9 lakh of guarantee per bus against a capital cost of about Rs 1.5 crore. If the states pay, the guarantee is never called and the fiscal cost tends towards zero. That is a radically more efficient use of public money than capital subsidy, and it is the template the mission's own instruments should follow.

7.3 Who does what: Governance of economic instruments

The instruments set out in the previous section will not work if they are assigned to the wrong level of government. This is not a procedural technicality. Most financing ideas for Indian urban transport fail not because the instrument is unsound, but because they were handed to a body that lacked the legal competence, the balance sheet, or the accountability to use them. A municipal corporation cannot approach the Green Climate Fund. The Union government cannot rationalise a state's passenger tax. A state transport undertaking with negative net worth cannot issue a bond on its own account. Matching each instrument to the right tier is the precondition for everything else in this chapter.

7.3.1 The Centre: sovereign standing and national aggregation: Instruments that require the sovereign balance sheet, a sovereign counterparty, or a scale that no single city can assemble belong at the Centre.

International climate finance is the clearest case, and the most consequential. The Green Climate Fund, bilateral climate funds and multilateral development bank concessional lending are accessed against the sovereign balance sheet, through the Department of Economic Affairs as the national designated authority. No city, and no state transport undertaking, can approach them directly at meaningful scale. But access is only half the task; the other half is the ring-fence. Climate capital raised on the strength of the bus mission's emissions benefits must be earmarked for the bus mission. Without a dedicated window and an explicit ring-fence, the sector's emissions reductions become the justification for capital that is then absorbed into general infrastructure or general climate pools, and the buses that generated the claim see none of it. This is precisely the function of the National Urban Bus Electrification Fund proposed in 7.2.1: a standing, ring-fenced destination for capital raised on the bus sector's account.

Several other instruments belong at the Centre for the same reason. Sovereign and national green bond frameworks, the capital support schemes, and GST policy through the Council all rest on central competence. So does the payment security mechanism, which depends on the Reserve Bank's Direct Debit Mandate and therefore on sovereign standing. Carbon market design and the treatment of bus-sector credits sit here too. And demand aggregation of the CESL type is, by definition, something only a national body can do across states.

7.3.2 The State: The levers that are constitutionally theirs: A second set of instruments cannot be exercised by anyone but the states, and no amount of central exhortation substitutes for state action on them.

- Motor vehicle tax and passenger tax are state subjects. Only states can rationalize them.
- State guarantees and viability gap top-up, against the state balance sheet and within its fiscal responsibility limits.
- Depot land, which is the binding physical constraint in most cities and is almost always a state or parastatal asset.
- Charging tariff design for depots, through the state electricity regulatory commission, including a dedicated bus-charging tariff category.
- STU restructuring: the pension ring-fence, fare indexation, and the balance-sheet clean-up set out in 7.4.
- Creation of empowered city transport authorities and special purpose vehicles under state law.

7.3.3 The city and the urban local body: instruments that need a local asset base: A third set works only where there is a local asset, a local revenue stream, or a local statute to stand on.

- Municipal bonds, where the urban local body has the credit rating and the revenue base. Only a handful currently do, which is itself an argument for building the capacity rather than for routing around it.
- Land value capture and betterment levies around corridors, depots and terminals.
- Parking pricing and, where the legal basis exists, congestion charging. These are the only instruments that simultaneously raise revenue and improve bus operating conditions, which makes them the most undervalued instruments in the entire set.
- Advertising rights and commercial property development at depots and terminals.
- A dedicated transport surcharge on property tax.

(See *Table 21: Economic instruments, by level of government*).

Table 21: Economic instruments, by level of government

Instrument	Level	Why at this level	Precondition
International climate finance (GCF, MDB concessional)	Centre	Sovereign balance sheet; national designated authority	A ring-fenced window for buses, or the capital is absorbed elsewhere
Sovereign and national green bonds	Centre	Sovereign rating; scale	Standard framework; use-of-proceeds discipline
National Urban Bus Electrification Fund	Centre	Aggregation; ring-fence	Dedicated corpus; outcome-linked release
Payment security mechanism	Centre	RBI Direct Debit Mandate requires sovereign standing	GCC contracting; mandate registration by the authority
Demand aggregation (CESL model)	Centre	Only a national body can aggregate across states	Standardised specification
GST rationalisation, input tax credit	Centre (GST Council)	Constitutional competence	Council consensus
Motor vehicle tax; passenger tax	State	State subject	Political will; revenue substitution
State guarantees; VGF top-up	State	State balance sheet	Fiscal space within FRBM limits
Depot land	State	State or parastatal asset	Land identified ahead of bus delivery
Depot charging tariff	State (SERC)	Regulatory competence	Dedicated bus-charging tariff category
STU restructuring	State	Ownership	Pension liabilities ring-fenced
Municipal bonds	ULB	Local revenue base	Credit rating; audited accounts
Land value capture; betterment levy	ULB	Local land; local statute	Enabling state legislation
Parking pricing; congestion charging	ULB	Local roads; local statute	Enabling legislation; enforcement capacity
Advertising; depot property development	ULB / STU	Local asset	Clear title; commercial mandate

Source: Cities Forum Analysis

7.3.4 The failure mode to avoid: Every national mission is tempted to route everything through the Centre, since that is where the money and the capacity sit. That instinct fails in one crucial way: it leaves the state and city levers untouched, and those are the levers that decide whether a bus system actually works on the ground.

The Centre can finance every bus in the mission and it will still fail if states do not rationalise their taxes, release depot land, and price parking, and if cities cannot run a contract or raise a rupee against their own assets. The financing architecture must therefore spell out the division of labour, and central support should be conditional on states and cities using the instruments that only they can exercise.

7.4.2 Tax Rationalization: Every other reform in this chapter concerns how the bus sector spends money. This one concern how much of it the state takes back. The fiscal burden on passenger bus operations in India is heavy, layered and concentrated on precisely the mode that public policy claims to want more of. It

NEXT STEPS ON ECONOMIC INSTRUMENTS

Publish an instrument-to-tier assignment as part of the mission framework, so that every financing instrument has a named owner, a named precondition, and no ambiguity about who acts.

Ring-fence international climate finance for the bus mission at the point of access, through a dedicated window in the National Urban Bus Electrification Fund. Capital raised on the bus sector's emissions must return to the bus sector.

Make central capital support conditional on state and city action on the levers only they hold: tax rationalisation, depot land, charging tariff, and demand-side pricing.

Invest in urban local body financial capacity as a mission activity in its own right. Municipal bonds, land value capture and congestion charging are unavailable to most cities today for want of ratings, accounts and enabling law, not for want of merit.

has been largely absent from the reform conversation, and it is a structural lever of the same order as tariff reform or contracting reform.

The tax stack on an urban bus: An urban stage carriage bus is taxed at least five times over, by two levels of government, through instruments that do not speak to one another (see *Table 23: The tax stack on an urban stage-carriage bus*).

- **On the vehicle:** Motor vehicles designed to carry ten or more persons attract 18 per cent GST, reduced from 28 per cent by the 56th GST Council with effect from 22 September 2025. An electric bus attracts 5 per cent.[34]

- **On the service:** Passenger transport by bus on a fuel-inclusive fare is taxed at a merit rate of 5 per cent with restricted input tax credit, or, at the operator's option since September 2025, at 18 per cent with full credit. Non-air-conditioned stage carriage services remain exempt.

- **On the inputs, without relief:** At 5 per cent without credit, every rupee of GST paid on the bus itself, and on tyres, spares, batteries and depot works, is a sunk cost. It cannot be set off against anything. It is simply buried in the fare. The 18 per cent option restores the credit but is close to unworkable for a fare-capped stage carriage operator.

- **By the state:** Motor vehicle tax, and in several states a separate passenger tax levied on fare revenue. Both are state subjects, both sit outside GST, and rates vary widely between states.

Table 22: The tax stack on an urban stage-carriage bus

Layer	Levy	Rate	Creditable?	Set by
Vehicle	GST on bus (10 or more seats)	18 per cent (5per cent if electric)	Not at the 5 per cent service rate	Centre/GST Council
Service	GST on passenger transport	5 per cent without ITC, or 18 per cent with full ITC; non-AC stage carriage exempt	Option-dependent	Centre/GST Council
Inputs	GST on tyres, spares, batteries, depot works	18 per cent to 28 per cent	Not at the 5 per cent service rate	Centre/GST Council
Ownership	Motor vehicle tax	Varies by state; commonly seat-linked	Not applicable	State
Revenue	Passenger tax	Varies by state; levied on fare revenue	Not applicable	State
Energy	Excise and VAT on diesel; electricity duty	Outside GST	No	Centre and state

Source: Cities Forum Analysis from GST Council decisions (56th meeting, rates effective 22 September 2025) and state motor vehicle taxation statutes. State motor vehicle and passenger tax rates vary widely and require state-level verification before citation.

- **On fuel and energy:** Diesel sits outside GST, so the excise and VAT an operator pays on fuel generate no credit at all. Electricity is also outside GST, so an electric bus operator earns no credit on charging either.

The comparison that matters: A 12-metre bus carrying forty or more passengers at peak pays motor vehicle tax, in many states a passenger tax, non-creditable GST on the vehicle and on every input, and the full undiluted weight of fuel taxation. A private car carrying an average of just over one occupant pays GST and a one-time road tax at purchase, and thereafter contributes nothing per passenger-kilometre beyond duty on its fuel. Measured per passenger-kilometre carried, the bus, which is the most space-efficient and least polluting motorized mode in any Indian city, is taxed several times more heavily than the car that displaces it. The tax code treats a bus as a commercial vehicle to be taxed and a car as a household good to be encouraged. That is the precise inverse of what the National Urban Transport Policy asks for, and no amount of capital subsidy elsewhere in the system corrects it.

The electric asymmetry cuts the right way, but only halfway: The thirteen-point gap between 5 per cent on an electric bus and 18 per cent on a CNG or diesel bus pushes in the right direction and should be retained. But it is worth being clear about what it does and does not do. It rewards electrification; it does not relieve bus operation. A small city that cannot yet electrify, because it has no depot power, no charging network and no grid headroom, is taxed hardest of all, on exactly the class of city that PM e-Bus Sewa was designed to reach.[35] The current tax code currently penalizes the transition's laggards rather than funding their catch-up,

NEXT STEPS ON TAX REFORMS

Constitute a joint review of the tax treatment of urban stage-carriage services, through the GST Council for central levies and a states' compact for state levies, with four objectives:

1. Restore input tax credit to urban stage-carriage operators, either by allowing credit at the 5 per cent merit rate for stage carriage specifically, or by making the 18 per cent-with-credit option viable through a compensating fare or viability-gap adjustment. This is the single highest-value change available.

2. Abolish or cap passenger tax on urban stage-carriage services. It is a tax on the fares of the poorest commuters, levied to fund the same state that is simultaneously subsidising them.

3. Rationalize motor vehicle tax for urban stage carriage to a nominal registration-linked charge, decoupled from seating capacity, which at present penalises high-capacity buses precisely for being high-capacity.

4. Hold the electric concession and add transitional relief for CNG and diesel stage-carriage fleets in cities without depot power, so that the tax code does not punish cities for a grid gap they did not create.

5. Harmonize infrastructure tax rates grant the same 5 per cent concessional GST to the core infrastructure components (civil works, high-tension substations, and grid connectivity) of an e-bus depot that is currently given to the chargers themselves. This would eliminate blocked Input Tax Credits (ITC) and drastically reduce upfront deployment costs for operators.

6. Amend the legal definition of 'fuel' to introduce an explicit statutory amendment within the GST code to clarify that electricity and battery-swapping charges legally qualify as 'fuel equivalents' under Gross Cost Contracts (GCC). This would neutralize adverse rulings like the Gujarat AAR decision and allow private operators to access lower concessional tax tiers.

Fiscal note. These measures are not costless: passenger and motor vehicle taxes are a source of revenue for states. But they are small in absolute terms against state budgets, and they are levied on a service the same state is already subsidizing through viability gap support and STU assistance. Rationalizing them reduces the subsidy required elsewhere in the same budget. The net fiscal effect is therefore materially smaller than the gross revenue foregone, and should be assessed on that basis rather than in isolation. (Cities Forum Analysis.)

and the laggards are mostly laggards for reasons outside their control. Beyond the vehicles themselves, substantial fiscal bottlenecks exist in the charging ecosystem. While purchasing an electric vehicle charger attracts a concessional GST rate of only 5 per cent[36] (slashed from 18 per cent), the critical infrastructure required to support it is not afforded the same relief. The civil works, grid connectivity, and high-tension substations required to power an e-bus depot are taxed at the standard commercial service rate of 18 per cent, leaving operators with limited avenues to smoothly claim Input Tax Credits (ITC).

Compounding these infrastructure-level hurdles are operational legal barriers, specifically under Gross Cost Contract (GCC) models. This friction was recently underscored by a landmark ruling from the Authority for Advance Ruling (AAR), Gujarat, in the case of M/s JBM Ecolife Mobility Surat P. Ltd (dated April 28, 2026),[37] which further complicated the tax landscape for e-bus operators. And The Gujarat AAR completely rejected the applicant's interpretation and held that electric bus rental and operation services are taxable at the standard residual rate of 18 per cent GST under *Entry 10(iii) of Notification No. 11/2017.*

7.2.4 Results-based financing: Payments tied to verified outcomes, kilometres operated, passengers carried, emissions avoided, align public money with service actually delivered, and create accountability that input-based funding cannot.

7.2.5 International climate finance: The mission's substantial emissions benefits can unlock concessional climate capital, lowering the blended cost of finance and stretching public money further.

7.3 International climate finance: Access mechanisms

Green climate fund: The GCF can provide concessional finance and guarantees for large-scale mitigation programmes; a national bus-electrification mission of this scale is a strong candidate, accessed through an accredited national entity.

Multilateral development banks: The multilateral Bank offer concessional loans and technical assistance for urban transport and electrification, and continue to capitalise the electrification fund, as development banks did in Bogota and other successful cases.

KfW and European climate finance: European development finance, KfW in particular, has a track record in Indian urban transport and can provide long-tenor concessional debt suited to infrastructure horizons.

7.4 Sectoral reforms

7.4.1 Tariff reform: Rational, periodically indexed fares, with transparent and separately funded concessions for students, seniors and low-income riders, let revenue track cost without pricing out the poor. Fares held flat for years for various reasons are a principal driver of STU losses, and they must be rationalized through an indexation mechanism.

7.4.2 Contracting reform: Gross-cost contracting becomes the default for new urban deployments, with standardised, bankable contract terms, robust payment-security mechanisms, and dispute-resolution provisions that give private operators and their financiers' confidence.

7.4.3 STU financial restructuring: A structured programme for the most stressed undertakings pairs debt restructuring with governance and operational reform, targeting investment-grade credit over time. Without it, the weakest STUs cannot participate in the mission even as contract counterparties.

7.4.4 Institutional reform: Empowered city transport authorities and statutory city mobility plans move urban bus service to where it belongs, planned and governed at the city level, integrated with metro and non-motorised transport, rather than run as an afterthought to intercity operations.

Bankability is the binding success factor. The reforms that make contracts bankable, payment security, gross-cost contracting, tariff rationalization and STU restructuring would make the mission an investable programme.

SECTION 8: Roadmap to 2047

The mission design and financing plan needs to be translated into a phased roadmap, with specific actions, roles and milestones across three phases to 2047. The roadmap is built for the recommended mission (Option 3), and it front-loads the items on the critical path, depot power, manufacturing signal, financing framework and backlog clearance, so that the constraints are addressed before they bind.

8.1 Vision and strategic pillars

The vision is a clean, reliable, affordable and equitable urban bus system in every Indian city, largely electric by 2047, aligned with the Viksit Bharat goal of a developed India. Four pillars carry it: scale provision toward global-best levels; electrify the fleet and build the power infrastructure to run it; reform the institutions and finances that deliver it; and build the manufacturing and supply-chain base to sustain it. Each phase advances all four pillars in step, because they are interdependent, buses without depot power strand assets, and provision without financing reform cannot be sustained.

8.2 Phase 1: Foundation Building, FY2026 to FY2029–30

Phase 1 consolidates the gains of PM e-Bus Sewa, addresses the overaged bus replacement, establishes the institutional and financing frameworks for scale-up, and achieves initial SLB compliance milestones in a targeted set of high-priority cities. Front-loading the retirement and electric replacement of about 40,000 overaged buses delivers the fastest emissions and reliability gains, builds early manufacturing volume, and exercises the delivery model at manageable scale (*see Table 23: Phase 1 detailed roadmap, [FY2026 to FY2029–30]*).

Table 23: Phase 1 detailed roadmap, FY2026 to FY2029-30

Action area	Key actions	Milestones by FY2030	Lead agency
National programme	Launch NUBM; establish NUBEF; publish 5-year funding commitment	NUBM operational Q1 FY27; NUBEF corpus Rs 25,000 Cr	MoHUA, MoF, NIIF
Overaged fleet	Declare Emergency Replacement Programme; identify 40,000 overaged buses; tender replacement (all EV)	40,000 overaged buses replaced by FY2028-29; all replacements electric	MoHUA, states, CESL
PM e-Bus Sewa scale-up	Complete delivery of 10,000 buses; resolve depot and grid bottlenecks; begin next 10,000	20,000 PM e-Bus Sewa buses operational by FY2030	MoHUA, CESL, ULBs

Action area	Key actions	Milestones by FY2030	Lead agency
Grid and infrastructure	Establish MoHUA-MoP joint task force; mandate 2 MW depot connections; fund grid extension	All depots above 100 EVs with dedicated 2 MW+ connections	MoP, DISCOMs, states
SLB compliance	Mandate SLB reporting for 50+ cities; link to AMRUT-3 funding	All cities above 5 lakh publishing annual SLB reports	MoHUA, ULBs
STU reform	Launch Financial Restructuring Programme for 5 largest distressed STUs; convert government loans to equity	5 STUs with credible restructuring plans; 2 achieving investment-grade rating	States, MoF
GCC expansion	Publish standardised National GCC Template; require all procurements above 100 buses to use GCC	50 per cent of new urban bus additions under GCC by FY2030	MoHUA, MoRTH, states
Procurement	Scale annual urban procurement; raise EV share from 30 per cent% toward 50per cent	50 per cent of annual additions electric; early backlog cleared	CESL, states, OEMs

Source: Cities Forum Analysis. NUBM: National Urban Bus Mission; NUBEF: National Urban Bus Electrification Fund.

8.3 Phase 2: Scale-up and systemic reform, FY2030 to FY2034–35

Phase 2 scales procurement toward the mission run-rate, drives the electric share of new procurement to 100 per cent, executes STU financial restructuring, and mobilises green bonds and climate finance at scale. Provision reaches the graded SLB under the recommended mission, and the manufacturing base expands to meet mission volumes. This is the phase in which the mission moves from foundation-building to full delivery, and in which the financing instruments prove themselves at scale (see *Table 24: Phase 2 detailed roadmap, FY2030 to FY2034–35*).

Table 24: Phase 2 detailed roadmap, FY2030 to FY2034–35

Action area	Key actions	Milestones by FY2035	Lead agency
Procurement scale-up	Ramp procurement toward mission run-rate; sustain manufacturing expansion	Fleet reaches ~3.5 lakh; SLB benchmark reached	MoHUA, CESL, states
Full electrification	Raise EV share of new procurement to 100 per cent	100 per cent of new procurement electric by FY2039-40 trajectory on track	MoHUA, states, OEMs
STU restructuring	Complete restructuring of 10 most distressed STUs	10 STUs on investment-grade path; pension liabilities ring-fenced	States, MoF
Green finance	Launch national green-bond aggregation facility; issue STU green bonds	Rs 15,000+ Cr green bonds issued; climate finance mobilised	MoF, SEBI, DFIs
Depot electrification	Complete first-wave depot electrification and grid reinforcement	Majority of large depots fully electrified	MoP, DISCOMs, states

Action area	Key actions	Milestones by FY2035	Lead agency
Circular economy	Establish battery EPR registry and second-life standards	Recycling capacity and EPR framework operational	MoEFCC, MoHI
City institutions	Empower city transport authorities; adopt statutory city mobility plans	Empowered authorities in all cities above 10 lakh	MoHUA, states, ULBs

Source: Cities Forum analysis

8.4 Phase 3: Full electrification and long-term sustainability, FY2035 to FY2046–47

Phase 3 carries provision to global-best levels under the recommended mission, takes the operating fleet to about 90 per cent electric. The battery circular economy matures into a domestic materials industry, and the financing model shifts decisively toward results-based, market-raised capital as restructured STU balance sheets strengthen. By 2047 the mission reaches its endpoint: a largely electric urban bus system at world-class provision (see *Table 25: Phase 3 detailed roadmap, FY2035 to FY2046–47*).

Table 25: Phase 3 detailed roadmap, FY2035 to FT2046–47

Action area	Key actions	Milestones by FY2047	Lead agency
Global-best provision	Carry provision to ~88 buses per lakh; absorb replacement echo	Fleet reaches ~6.71 lakh at global-best provision	MoHUA, states, CESL
Near-full electrification	Sustain 100 per cent electric procurement; retire remaining diesel	~90per cent of operating fleet electric (~6.04 lakh EVs)	MoHUA, states
Self-sustaining finance	Shift to results-based, market-raised capital	Restructured STUs at investment grade; reduced subsidy dependence	MoF, states, DFIs
Mature circular economy	Scale domestic battery recycling and second-life storage	Domestic materials-recovery industry operational	MoEFCC, MoHI
Continuous renewal	Institutionalise 15-year cohort renewal as standing programme	Steady-state renewal embedded in state budgets	MoHUA, states

Source: Cities Forum analysis

8.5 Roles and responsibilities

Table 26: Roles across the roadmap

Actor	Primary role
MoHUA	Mission lead; SLB framework; programme design and monitoring
Ministry of Finance	Fund capitalisation; fiscal framework; guarantees
Ministry of Power and DISCOMs	Depot power, grid connectivity, smart charging
Ministry of Heavy Industries	Manufacturing capacity, demand signal, local content
States and STUs	Delivery, restructuring, land and depot provision
CESL and procurement agencies	Aggregated procurement, gross-cost contracting
Private operators	Fleet operation and maintenance under GCC
Development finance institutions	Concessional and climate capital, guarantees

8.6 Monitoring and evaluation

Progress is tracked against a compact set of outcomes: provision per lakh against the SLB; electric share of fleet and of new procurement; overaged backlog cleared; cost recovery and payment-security performance; and charging-infrastructure and depot-power readiness. SLB compliance reporting for cities above five lakh population, tied to disbursement from the electrification fund, gives the monitoring framework real force: funding follows performance, and performance is measured against the benchmark the mission exists to meet.

9. Recommendations

India has a narrow and closing window to build the urban bus system its cities will need, and to build it clean. The scale is large, the cost is real, and the institutional gaps are significant. But the analysis in this report shows the mission is achievable, and that the cost of inaction, measured in congestion, in premature deaths from foul air, and in lost equity, is far higher, and less recoverable, than the cost of action.

Strategic vision and the scale of the opportunity

Plan to absorb 230 million new urban residents by constructing the world's cleanest transit network, leveraging an annual retirement wave of 1.1 to 1.4 lakh vehicles to replace old diesel stock and avoid 15-year fossil-fuel liabilities. Establish a long-term National Urban Bus Mission mapped across three execution options to achieve 100 per cent electrification of new additions by FY2039–40.

Under the recommended mission, India would take its organized urban bus fleet from about 65,000 today to about 6.71 lakh by 2047, roughly 90 per cent of it electric, at a capital cost of about Rs 14.20 lakh crore. Whichever option is chosen, this is one of the largest planned public-transport build-outs anywhere in the world, and, handled well, it can anchor a domestic electric-bus manufacturing industry, a battery materials economy, and hundreds of thousands of skilled jobs in the process.

Realise the Viksit Bharat 2047 vision via an infrastructure-first overhaul that links central/state funding to local SLB metrics, mandatory depot power upgrades, and aggressive STU balance-sheet restructuring to convert public transit into an investment-grade asset class funded by private equity and global green capital.

Phase 1: Strengthening the base (FY2026 to FY2029–30)

Urgent fleet renewal: Launch an Overaged Bus Emergency Programme to replace roughly 40,000 decaying vehicles with electric models by FY2028–29. Expand the PM e-Bus Sewa scheme to reach 20,000 operational units. Establish a unified National Urban Bus Mission (NUBM) under MoHUA and seed the National Urban Bus Electrification Fund (NUBEF) with an initial Rs 25,000 crore corpus. Deploy a joint task force to mandate and fund dedicated 2 MW+ grid links at all major depots. Enforce mandatory Service Level Benchmark (SLB) reporting for all cities with over 5 lakh residents. Deploy a standardized National Gross Cost Contracting (GCC) template via MoHUA to transition 50 per cent of new urban additions into regulated public-private models. Expand the active electric bus footprint to 1.5 lakh units, scaling the EV share of new acquisitions from 30 per cent to 50 per cent by 2030.

Phase 2: Scale-up and systemic reform (FY2030 to FY2034–35): Shift the sector to a self-sustaining commercial model by restricting diesel vehicle funding as the EV share of new additions crosses 75 per cent. Double the NUBEF corpus to Rs 50,000 crore by integrating other fiscal strategies, including international climate finance lines. Support the issuance of Rs 8,000 crore in state-guaranteed STU Green Bonds through a national facility. Secure operational sustainability by forming independent Fare Fixation Committees and enforcing automatic cost-indexed fare adjustments across 10 states. Target an average operator cost recovery ratio exceeding 75 per cent while integrating cross-subsidy schemes to preserve passenger affordability objectives. Require all municipalities housing over 5 lakh residents to publish statutory 20-year Comprehensive City Mobility Plans (CCMPs). Launch a Results-Based Financing system utilizing a verified Rs 5,000 crore World Bank disbursement line. Operationalise a National Battery Recycling Programme configured to capture and track 95 per cent of end-of-life bus batteries.

Phase 3: Full electrification and long-term sustainability (FY2035 to FY2046–47): Enforce a strict 100 per cent electric mandate for all new urban bus procurements from FY2039–40 onward, ensuring a 90 per cent electric active fleet by 2047. Drive the average national cost recovery ratio past 82 per cent. Fully unburden operators by shifting historical STU pension liabilities entirely onto state government balance sheets. Transition public financing away from traditional capital grants to execute 80 per cent of new investments through market-driven, output-linked, and results-based structures. Advanced technical consolidation to turn major depots into flexible utility assets, managing 20 per cent to 30 per cent of charging loads via active demand response and vehicle-to-grid (V2G) systems. Achieve a circular economy that recovers 95 per cent of domestic battery materials and secures national SLB compliance across 85 per cent of major cities.

Key time horizon recommendations

Immediate (**Horizon 1**): Consolidate separate bus schemes into a unified, outcomes-linked National Urban Bus Mission (NUBM) under MoHUA with multi-year funding guarantees. Execute an Overaged Bus Emergency Programme to replace 40,000 decaying vehicles with electric models by FY2028–29.

Short-term (**Horizon 2**): Capitalize the NUBEF at an initial corpus of Rs 25,000 crore via joint central, state, and multilateral banking tranches. Mandate GCC as the baseline framework for all deployments exceeding 100 buses. Tie urban fund eligibility directly to mandatory local SLB reporting for cities with populations over 5 lakh.

Medium-term (**Horizon 3**): Launch an STU Financial Restructuring Programme to elevate the 10 most distressed operators to investment-grade credit ratings. Develop a National Green Bus Bond Framework to raise Rs 15,000+ crore from capital markets. Mandate dedicated 2 MW power links at all new and upgraded depots in coordination with utility distribution companies.

Long-term (**Horizon 4**): Restrict all new city bus procurements to 100 per cent electric formats by FY2039–40 to lock in a 90 per cent clean active fleet by 2047. Fully phase out capital grants in favour of results-based financing structures that tie public disbursements to verified passengers, kilometres, and avoided emissions.

Cross-cutting policy and fiscal reforms

VGF Re-benchmarking: Reset and size future Viability Gap Funding (VGF) benchmarks against post-aggregation tender rates instead of legacy costs to avoid overpaying by roughly a third. Retain VGF strictly for sustaining unviable, socially necessary routes in smaller cities where fare revenues cannot cover competitive operational rates. Enforce a national aggregation window before calculating any viability support.

Indirect tax restructuring: Restore Input Tax Credits (ITCs) to stage-carriage operators at the 5 per cent merit rate or optimize the 18 per cent option. Abolish or cap regressive state passenger taxes that actively target low-income commuter fares. Rationalize motor vehicle tax into a nominal registration fee completely decoupled from seating capacity. Grant a matching 5 per cent concessional GST tier to core depot civil and electrical infrastructure. Amend the GST code to legally define electricity and battery-swapping as 'fuel equivalents' under GCC models to neutralize adverse AAR rulings.

Conditional federalism: The Centre must avoid routing all funding centrally; central capital support must be conditional on states and cities executing the tax, land, tariff, and pricing levers constitutionally assigned to them. Distribute financing architecture tools according to the legal competence and balance sheet capacity of each tier of government.

Central government level (sovereign standing and scale): Access international climate finance windows (GCF, bilateral funds, KfW, MDB concessional loans) via the Department of Economic Affairs. Provide a dedicated, ring-fenced window inside the national framework to prevent transit capital from being absorbed into general infrastructure pools. Manage national green bond frameworks, GST policy, and large-scale demand aggregation. Maintain and extend the Rs 3,435.33 crore Payment Security Mechanism template through 2047 (covering 38,000 e-buses through FY2028–29) using RBI Direct Debit Mandates to automatically debit defaulting state accounts and eliminate operator risk.

State government level (Constitutional levers): Exercise exclusive competence over rationalizing motor vehicle and passenger taxes. Provide state balance-sheet guarantees and viability gap top-ups within established fiscal limits. Clean up STU balance sheets by ring-fencing pensions and indexating fares. Control the allocation of physical depot land and determine dedicated bus-charging tariff categories through State Electricity Regulatory Commissions (SERCs).

City and urban local body level (local asset base): Raise local capital via municipal bonds backed by credit ratings and audited accounts. Execute land value capture and corridor betterment levies. Deploy demand-side pricing instruments, including parking pricing, congestion charging, advertising rights, and transport surcharges on local property tax.

Monitoring and evaluation framework: Track multi-tier progress metrics up to 2047, targeting a climb to 200 million daily urban bus trips, 950,000 operational electric buses, 100 per cent of depots connected to 2 MW+ links, and 90 million tonnes of annual avoided CO_2 emissions. Leverage integrated digital fleet management APIs and automated ticketing setups built directly into procurement pipelines to validate data. Eliminate political reporting bias through an independent performance monitoring cell within MoHUA to run third-party verifications and publish standardized annual transparency indexes.

Table 27: Priority recommendations

#	Horizon	Category	Priority	Recommendation
R1	Immediate	Programme	CRITICAL	Launch the National Urban Bus Mission (NUBM), consolidating all urban-bus scheme funding into a single outcomes-linked programme with five-year guaranteed commitments.
R2	Immediate	Fleet	CRITICAL	Declare an Overaged Bus Emergency Programme: retire and electrically replace about 40,000 overaged buses by FY2028–29.
R3	Short-term	Finance	HIGH	Establish the National Urban Bus Electrification Fund (NUBEF) at Rs 25,000 crore initial corpus, co-financed by the Centre, states and multilateral banks.
R4	Short-term	Contracting	HIGH	Mandate Gross Cost Contracting as the default for all new urban deployments above 100 buses; publish a National GCC Template.
R5	Short-term	Governance	HIGH	Mandate SLB compliance reporting for all cities above 5 lakh population, linked to urban-development fund disbursements.
R6	Short-term	Infrastructure	HIGH	Require 2 MW dedicated power supply at all new and upgraded depots as a condition of central funding; mandate a joint MoHUA-MoP depot-electrification task force.
R7	Medium-term	STU Reform	MEDIUM	Implement an STU Financial Restructuring Programme for the 10 most distressed STUs, targeting investment-grade ratings by FY2034-35.
R8	Medium-term	Finance	MEDIUM	Issue Rs 15,000+ crore in STU green bonds through a national green-bond aggregation facility co-designed by MoHUA, MoF and SEBI.
R9	Medium-term	Circular economy	MEDIUM	Launch a National Battery Recycling Programme with a mandatory EPR registry, second-life standards, and investment in domestic recycling capacity.
R10	Long-term	Strategy	MEDIUM	Adopt a binding long-term electrification target, about 90 per cent electric fleet by 2047, to align all investments and reforms behind a single strategic direction.

Source: Cities Forum Analysis

These recommendations are mutually reinforcing. The programme (R1) provides the institutional home and funding certainty; the overaged emergency (R2) delivers the fastest early gains; the fund (R3) and green bonds (R8) build the financing pathway; contracting (R4) and SLB reporting (R5) supply the delivery discipline; the infrastructure mandate (R6) unblocks the deployment bottleneck; STU restructuring (R7) turns operators into viable partners; the battery programme (R9) manages the lifecycle; and the long-term target (R10) aligns them all. The window to act is open but not indefinitely: each year of delay entrenches higher-cost, higher-emission operations, adds to the depot-electrification backlog, and deepens the STU balance-sheet hole that must eventually be filled.

The question is no longer whether India will build a clean urban bus system, but how fast, at what cost, and through what institutions. This report shows the fastest path is also the cheapest and the cleanest and focus on clear the backlog first and build the power before the buses.

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Appendix A: National STU analysis and Indian case studies

This appendix carries the detailed national analysis of India's State Transport Undertakings, in two parts. The first part (A.1 to A.5) is the operator-by-operator financial deep-dive summarised in Chapter 2 (Part B), profiling the major undertakings and examining the four structural drivers of financial stress that the mission's restructuring programme is designed to address. The second part (A.6 to A.8) presents detailed Indian case studies, Delhi Transport Corporation, Bengaluru Metropolitan Transport Corporation, and PM e-Bus Sewa,that illustrate large-metro, city-agency and national-programme electrification respectively.

Table 28: Major STU and city-bus agency performance snapshot, FY2025-26

STU / Agency	State	Active fleet	Cost recovery (per cent)	EV share (per cent)	Staff:bus	Financial status
UPSRTC	Uttar Pradesh	~95,000	68	5	7.2	Stressed; large accumulated losses
KSRTC	Karnataka	~25,000	82	8	5.8	Moderate; improving
MSRTC	Maharashtra	~17,000	62	4	8.5	Severely stressed; crisis-level losses
TNSTC / SETC	Tamil Nadu	~22,000	78	7	6.5	Moderate; improving under new management
WBTC	West Bengal	~14,000	65	3	7.8	Stressed; complex union dynamics
APSRTC	Andhra Pradesh	~12,000	70	5	7.2	Improving post-bifurcation
DTC	Delhi	~7,800	55	20	9.1	Severely stressed; high EV adoption
KSRTC	Kerala	~5,200	85	6	5.5	Best-in-class; profitable routes
BMTC	Karnataka	~6,500	80	15	6.2	Moderate; EV pioneer
RSRTC	Rajasthan	~8,500	72	4	6.8	Moderate; large intercity network
GSRTC	Gujarat	~7,200	88	3	5.5	Strong performer; profitable
HRTC	Himachal Pradesh	~3,200	76	3	6.1	Moderate; challenging terrain

Source: Cities Forum Analysis from STU annual reports (FY2024-25) and CIRT Performance Statistics of State Road Transport Undertakings. Active-fleet figures are total STU stage-carriage (Tier-2), distinct from the organised urban subset.

A.1 Fare structures

Bus fares in most Indian states have been held below cost-recovery levels for decades, primarily for political reasons. The average bus fare in 2025 covers only 62–70 per cent of the average per-passenger-kilometre operating cost. The fare-cost gap ranges from about 15 per cent in relatively high-fare states such as Gujarat and Karnataka to over 40 per cent in low-fare, high-subsidy states such as Delhi and Maharashtra. Real, inflation-adjusted bus fares have declined by 20–35 per cent across most major STUs since 2015, even as diesel prices rose 40–60 per cent over the same period. The table below sets out fare levels, cost recovery and the annual subsidy required across a representative set of undertakings.

Table 29: STU fare levels, cost recovery and subsidy requirements (FY2025–26 estimates)

STU	Avg. fare (Rs/10km)	OpEx per pass-km (Rs)	Cost recovery (per cent)	Annual subsidy required (Rs crore)
UPSRTC	5.20	8.10	64	~3,200
MSRTC	4.80	8.90	54	~4,500
DTC Delhi	3.50	11.20	31	~3,800
WBTC	5.10	8.40	61	~1,400
TNSTC	6.80	9.50	72	~1,100
KSRTC Karnataka	9.20	10.80	85	~400
GSRTC Gujarat	9.80	10.50	93	Surplus
KSRTC Kerala	9.50	10.20	93	Surplus

Source: Cities Forum Analysis from STU annual reports and CIRT Performance Statistics (FY2025–26 estimates)

The undertakings with fares near cost, KSRTC Karnataka, GSRTC Gujarat and KSRTC Kerala, achieve 85 to 93 per cent cost recovery and require little or no subsidy, while those with the lowest fares, DTC and MSRTC, recover barely half their costs and require the largest subsidies. Fare rationalization, with transparent and separately funded concessions for those who need them, is therefore the single most powerful reform lever.

A.2 Staffing status

India's STUs collectively employ approximately 8.2 lakh workers. The staff-to-bus ratio averages 6.8 to 1 nationally, masking significant variation: best-in-class systems in Singapore and London operate with 3.5–4.5 staff per bus; highly efficient Indian STUs achieve 5.0 to 6.0; but many stressed STUs operate with 8.0–10.0 or more. Each additional unit of staff-to-bus ratio above the 5.0 benchmark represents approximately Rs 4–6 per km in excess personnel cost. An STU running a ratio of 9.0 against the 5.0 benchmark therefore carries roughly

Rs 16–24 per km in excess personnel cost, more than half the total energy cost of operating a diesel bus. Restructuring must address this through natural attrition, redeployment and productivity improvement rather than through measures that would meet justified resistance.

A.3 Pension and legacy liabilities

Many of India's larger STUs operate defined-benefit pension schemes with actuarially unfunded liabilities that in several cases exceed the undertaking's annual revenue. MSRTC's pension liability is estimated at approximately Rs 35,000 to 40,000 crore, more than double its annual revenue of about Rs 15,000–16,000 crore. The recommended treatment under the STU Financial Restructuring Programme is the transfer of legacy pension liabilities to state-government balance sheets, ring-fenced and separately funded, so that the operating entity is freed to invest in fleet renewal and to participate in the mission as a viable counterparty.

A.4 Infrastructure deterioration

Years of deferred capital spending have left depots, workshops and terminals in poor condition at many undertakings, raising maintenance costs and lowering availability. The mission's depot-power build-out is an opportunity to address this deterioration alongside electrification, modernising depots as they are electrified rather than treating the two as separate programmes.

Kerala's KSRTC and Gujarat's GSRTC prove that 85–90 per cent cost recovery is achievable in the Indian context. The gap between them and the stressed undertakings is not geography or scale; it is fares, staffing, legacy liabilities and maintenance, all of which restructuring can address.

A.5 A Restructuring pathway

Drawing the four drivers together, a structured restructuring pathway for a stressed STU proceeds in four steps, each addressing one driver, and each a precondition for the next. First, ring-fence and separately fund legacy pension and gratuity liabilities, freeing operating revenue. Second, index fares and fund concessions transparently, so revenue tracks cost. Third, improve productivity through natural attrition and redeployment, bringing staff-to-bus ratios toward the efficient benchmark. Fourth, modernise depots and workshops alongside electrification, lifting availability and cutting maintenance cost. Executed together, and paired with the gross-cost-contracting model that keeps new fleet off the balance sheet, this pathway can move a stressed undertaking toward investment-grade credit over the course of the mission, turning it from a fiscal liability into a viable delivery partner.

Table 30: STU restructuring pathway

Step	Driver addressed	Action	Outcome
1	Legacy liabilities	Ring-fence and fund pensions separately	Operating revenue freed
2	Fare structure	Index fares; fund concessions transparently	Revenue tracks cost
3	Staffing	Attrition and redeployment	Efficient staff-to-bus ratio
4	Infrastructure	Modernize depots with electrification	Higher availability, lower cost

Source: Cities Forum Analysis

A.6 Case study: Delhi Transport Corporation (large-Metro STU electrification)

DTC provides the richest available dataset in India for large-scale urban EV integration, having deployed its first electric buses under FAME-I and scaled to approximately 1,500 operational e-buses by FY2025–26.

Fleet and operations: DTC's fleet is approximately 77 per cent CNG, 20 per cent electric and 3 per cent diesel. The electric fleet is concentrated at four depots, IP Depot, Rajghat, Hari Nagar and Hasanpur, upgraded with 180 kW DC fast chargers and dedicated high-tension feeders. Electric fleet availability averages 85 to 88 per cent, slightly below the CNG fleet's 90 to 92 per cent owing to charging-downtime management; average daily mileage is about 200–220 km per electric bus against 260–280 km for CNG, reflecting depot charging constraints rather than any fundamental range limit.

Financial performance. Electric operating cost is about Rs 28–32 per km against Rs 40–46 for CNG, a saving of Rs 12–18 per km. A 1,500-bus electric fleet running 200 km a day saves roughly Rs 54–81 crore a year against the CNG counterfactual; against the incremental capital of about Rs 0.70 crore per electric bus over CNG, payback is eight to 10 years, within the 12-year contract term.

Institutional model. DTC's electric buses run under gross-cost contracts with private operators (including EVEY Trans and PEPL) who provide vehicles, drivers and maintenance, while DTC retains route planning, fare collection and monitoring. This has decoupled EV capital risk from a balance sheet carrying accumulated losses exceeding Rs 25,000 crore, and concentrated battery and charging expertise in the operator teams.

Challenges and lessons. Grid-connection approvals from the Delhi DISCOMs took 12 to 24 months in several cases, delaying deployment; charging-management and fleet-management software integration was imperfect; CNG drivers needed retraining for regenerative braking and range management; and Delhi's very low concessional fares limit the commercial viability of the GCC model, requiring continued subsidy. The central lesson is that electrification can proceed even on a severely stressed balance sheet when the capital burden is lifted externally, but grid connectivity, not buses, is the binding constraint.

A.7 Case study: Bengaluru Metropolitan Transport Corporation (City-agency pioneer)

BMTC operates approximately 6,500 buses across 2,400 routes in a Bengaluru urban agglomeration of nearly 15 million, and is India's most successful example of a city bus agency integrating electric buses at meaningful scale, about 900 operational e-buses, or 14 per cent of its active fleet, while holding operational metrics among the best in the country.

Electric fleet performance. BMTC's 900 Olectra-BYD 12-metre low-floor AC electric buses run mainly on high-demand corridors, the Outer Ring Road tech corridors (Whitefield, Electronic City, Hebbal) and the airport route. Electric fleet availability averages 87 per cent at about 210 km per bus per day, with charging managed through a mix of overnight 22 kW AC and midday 60 kW DC opportunity charging under smart scheduling.

Depot electrification. BMTC has electrified five depots, Banashankari, Yeshwantpur, Shivajinagar, Tin Factory and Whitefield, at about Rs 140 crore, each equipped with 50–250 chargers (mixed 22 kW AC and 180 kW DC), dedicated 11 kV feeders, and rooftop solar totalling 3 MW across the five. The local DISCOM, BESCOM, has been closely engaged, with substation upgrades at three depots.

Financial model and lessons. BMTC's electric buses were financed through a blend of FAME-II subsidy (Rs 50 lakh per bus), BMTC equity (Rs 30 lakh) and Karnataka state grant (Rs 40 lakh plus charging infrastructure). The lesson is the value of a city-focused agency aligned with the city's development plan, and of operational discipline and close DISCOM engagement in creating the headroom to adopt new technology well.

A.8 Case study: PM e-Bus Sewa (national programme scale-up)

PM e-Bus Sewa, announced in August 2023 and operationalised through CESL, is the most significant structural transformation in India's urban bus procurement model. It targets 169 cities across 14 states, deploying 10,000 electric buses under 12-year gross-cost contracts, with the explicit objective of providing organised service to cities with little or none.

Procurement innovation: CESL's aggregated procurement, bundling 10,000 buses across 169 cities into a single tender, achieved delivered prices of about Rs 1.05–1.20 crore per 12-metre bus, a 35 to 45 per cent reduction against small-quantity procurement. This price discovery has permanently reset the reference price for electric buses in India, benefiting even non-CESL procurements.

Implementation and financial structure: By early 2026, roughly 4,000–5,000 buses were delivered and operational, the balance in procurement, delivery or depot preparation. Delays clustered in smaller cities facing depot-land acquisition, DISCOM grid connection (18–28 months in several states), and municipal administrative capacity. The Centre bears 100 per cent of bus and charging-infrastructure cost, amortised over the 12-year term; urban local bodies provide depot land and a revenue allocation, and the assets transfer to the ULB after 12 years.

Lesson. By decoupling procurement from STU balance sheets, PM e-Bus Sewa reaches cities that never had organised service and lets financially weak operators host electric fleets they could never have bought. It is the single most important delivery innovation in India's bus sector, and the template on which this mission's delivery architecture is built.

Appendix B: Global case studies

This appendix carries the detailed international case studies summarised in Chapter 4. The Indian cases are analysed in Appendix A alongside the national STU deep-dive.

B.1 Shenzhen, China

Shenzhen became the first city in the world to fully electrify its public bus fleet, 16,359 buses across the entire network, by December 2017, a transition accomplished over roughly six years.[38] It was enabled by three policy pillars: national EV subsidies, city-government co-investment, and a pioneering battery-lease separation model under which batteries are owned by an asset company and leased to operators per kilometre, sharply reducing the operator's upfront capital. China Southern Power Grid invested over US $280 million in dedicated substations and feeder upgrades, co-ordinated by a cross-departmental task force under the Mayor's office. Outcomes included a 48 per cent cut in per-bus energy cost, a 35 per cent cut in maintenance cost, and about 1.35 million tonnes of CO_2-equivalent avoided a year, with fleet availability of 90–92 per cent. The lessons for India are the power of centralized procurement and battery separation, and the necessity of treating grid infrastructure as a coordinated utility programme.

B.2 Bogota, Colombia

Bogota integrated electric buses into its bus-rapid-transit and feeder system through gross-cost concessions, with the fleet financed by private concessionaires backed by development-bank debt, notably from the Inter-American Development Bank. The model demonstrates effective risk transfer in a developing-economy setting: the public authority defines service and retains fare revenue, while private concessionaires own and operate the fleet under long-term contracts. The lesson for India is that gross-cost concessions with development-bank finance can mobilize private capital for electrification without burdening the public operator.

B.3 Cape Town, South Africa

Cape Town's MyCiTi system and South Africa's national EV programme illustrate electrification against a constrained, load-shedding grid. The experience underlines grid reliability as a precondition rather than a detail: without dependable depot power, electric buses cannot maintain schedule, and the transition stalls. For India, with its own distribution-network constraints in many cities, the lesson reinforces the mission's treatment of depot power and grid connectivity as critical-path items.

B.4 Chengdu, China

Chengdu illustrates a second-tier-city electrification model, achieving large-scale electric-bus deployment outside the first-tier megacities through a combination of municipal commitment, domestic manufacturing and staged depot electrification. It is directly relevant to India's Tier-2 cities, which PM e-Bus Sewa prioritizes and where the largest proportional growth in the mission's fleet must occur.

B.5 Comparative summary

The four global cases, set against the Indian experience, yield a compact comparison of the models, their financing, and their transferable lessons.

Table 31: Global cases compared, with India for reference

Case	Fleet electrified	Financing model	Key enabler	Transferable lesson
Shenzhen	16,359 (100 per cent)	Public + battery lease	Domestic OEMs; grid task force	Battery separation cuts upfront cost
Bogota	~1,485	GCC concessions + IDB debt	Development-bank finance	Risk transfer via concessions works
Cape Town	Pilot scale	Municipal + national	Grid reliability focus	Grid dependability is a precondition
Chengdu	~10,000+	Municipal + domestic OEMs	Second-tier applicability	Tier-2 electrification is achievable
PM e-Bus Sewa	10,000 (target)	National GCC + central capital	CESL aggregation	Decouple procurement from balance sheets

Source: Cities Forum Analysis, synthesising the case studies above

In summary, the cases point to a single delivery logic for India: aggregate procurement nationally, as CESL and Shenzhen both do; separate the battery or the balance-sheet burden from the operator, as Shenzhen's battery lease and India's gross-cost contracts both achieve; finance through development banks and concessions, as Bogota does; and treat grid reliability as a precondition, as Cape Town's difficulties warn. Every element of this logic is built into the mission design in Chapter 5 and the financing plan in Chapter 7.

Appendix C: Key assumptions and data sources

This appendix consolidates the principal assumptions and data sources underpinning the analysis, so that every material number in the report can be traced to its basis. Assumptions labelled 'Cities Forum Analysis' are the study team's own estimates; all others are external and are footnoted at first use in the main text.

Table 32: Principal assumptions and their basis

Assumption	Value	Basis
Statutory fleet life	15 years	MoRTH norms
SLB norms (mega/metro/small)	60 / 50 / 40 per lakh	MoHUA Service Level Benchmarks
National blended SLB norm	~44 per lakh	Population-weighted, Cities Forum Analysis
Global-best target (Option 3)	~88 per lakh	World Bank/PPIAF range, graded, Cities Forum Analysis
Urban baseline fleet FY2025–26	~65,000	Bottom-up build-up, Cities Forum Analysis
Natural fleet growth	2 per cent per annum	Cities Forum Analysis
Annual km per bus	~55,000	Urban operations, Cities Forum Analysis
Electric energy intensity	~1.1 kWh/km	Cities Forum Analysis
Electric bus OpEx	~28 per km	CESL, OEM data
Diesel bus OpEx	~45 per km	Market data
12m electric bus price	~1.50 Cr	CESL PM e-Bus Sewa benchmark
CapEx escalation	3 per cent per annum	Cities Forum Analysis
Overaged backlog	~40,000 buses	Cohort analysis, Cities Forum Analysis

Source: Cities Forum Analysis, consolidating external sources footnoted in the main text

As India's rapid urbanization fuels an unprecedented surge in mobility demand, scaling the urban bus sector—the prime mover of affordable, inclusive transit—has become a vital public health and environmental imperative.

To achieve this, this report proposes a dedicated National Bus Mission to steer short- and long-term fleet transformation, directly aligning with the Viksit Bharat 2047 vision. Moving the sector beyond short-term, scheme-driven pilots, this study is grounded in state-by-state demand forecasts and real-world cost evaluations to deliver an actionable blueprint for de-risking, financing and strengthening public transit. Addressing the humongous capital and infrastructure requirements of this transition, it outlines benchmark-driven planning, structural institutional reforms, and innovative financing levers to mobilize local and national public finance, blended finance and global climate finance to establish a sustainable, investment-grade urban bus ecosystem.

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