



From Climate Plans to Transportation Performance: Evaluating Urban Mobility Commitments in Delhi, Portland, and Berlin

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Abstract

Cities increasingly use climate action plans to promise transportation decarbonization, yet the existence of a plan does not demonstrate that mobility systems are becoming less carbon intensive, more resilient, or more equitable. This article develops and applies a plan-performance evaluation framework to transportation commitments in Delhi, India; Portland, Oregon, United States; and Berlin, Germany. The framework adapts a climate resilience plan-evaluation approach organized around three implementation stages: Preparation, which assesses the empirical foundation and institutional readiness of a plan; Advancement, which evaluates the specificity, integration, and equity of proposed actions; and Investment, which examines finance, accountability, monitoring, and demonstrated outcomes. The comparative analysis draws on climate plans, mobility policies, emissions inventories, progress reports, and scholarly literature. Portland exhibits the strongest public reporting architecture and continuity of community-scale emissions inventories, but its transportation measures remain vulnerable to implementation delay and regional dependencies. Berlin benefits from statutory climate governance and an integrated public-transport and active-mobility policy environment, yet transportation emissions and contested street-space reforms reveal a persistent delivery gap. Delhi has achieved major advances in metro expansion and electric-bus deployment, but its climate-related mobility agenda remains distributed across climate, air-quality, electric-vehicle, and transport instruments, limiting transparent attribution and outcome evaluation. Across all

three cases, technological substitution is more measurable than reductions in automobile dependence, accessibility inequalities, or community resilience. The article argues that credible transportation climate planning requires a traceable chain connecting baseline conditions, quantified actions, responsible institutions, committed finance, interim indicators, distributional outcomes, and corrective decisions.

Keywords: Climate Action Plans, Transportation Decarbonization, Plan Evaluation, Urban Mobility, Implementation, Delhi, Portland, Berlin, Transport Equity.

1. Introduction

Municipal climate action plans have become a central instrument of urban environmental governance. They translate global mitigation objectives into local commitments concerning buildings, energy, land use, waste, and transportation. Transportation is often the most difficult sector because emissions are produced through millions of daily decisions that are shaped by metropolitan form, infrastructure, service quality, prices, and institutions extending beyond municipal control. A city may purchase electric buses while road traffic continues to grow, expand rail while station access remains unsafe, or adopt ambitious mode-share targets without identifying the street reallocations and operating funds required to achieve them.

This difficulty creates a fundamental evaluation problem. Plan quality is commonly assessed through the presence of targets, analytical sophistication, stakeholder participation, or alignment with recognized planning standards. These characteristics matter, but they do not establish whether actions were funded, implemented, maintained, or associated with measurable change. The literature has repeatedly identified gaps between climate-policy ambition and delivery, particularly where local governments lack authority, finance, administrative capacity, or stable political support (Bulkeley & Betsill, 2013; Guyadeen et al., 2019; Reckien et al., 2018). Transportation further complicates attribution because outcomes depend on regional agencies, national vehicle standards, energy systems, private operators, land markets, and travel behavior.

This article evaluates the transportation components of climate governance in Delhi, Portland, and Berlin. The cases are deliberately different. Delhi is a rapidly motorizing megacity in which climate-relevant transport commitments are distributed across the Climate Change Agenda, electric-vehicle policy, air-quality programs, metro investment, bus procurement, and regional planning. Portland is a North American city with a long record of climate planning, annual community emissions inventories, and a recent Climate Emergency Workplan containing accountable priority actions. Berlin is both a municipality and a German federal state, operating within European Union and national climate frameworks and implementing the Berlin Energy and Climate Protection Programme 2030 alongside mobility legislation.

The article asks three questions. First, to what extent do the cities establish a credible chain from transportation evidence to actions, investment, and outcomes? Second, which commitments are most readily evaluated, and which remain obscured by fragmented authority or weak indicators? Third, what institutional features help convert transportation climate plans into observable performance? The analysis does not rank the cities through a single composite score. Instead, it identifies strengths, gaps, and transferable lessons while respecting differences in governance, income, urban form, and infrastructure maturity.

Table 1. Transportation Climate Plan-Performance Evaluation Framework

Stage	Core question	Transportation evidence	Performance test
Preparation	Does the city understand conditions and possess readiness?	Emissions, travel, accessibility, hazards, vulnerability, authority, participation	Current, disaggregated baseline and explicit institutional responsibilities
Advancement	Do actions form a credible and equitable pathway?	Avoid-Shift-Improve package, targets, land use, transit, active mobility, freight, resilience	Specific actions linked to mechanisms, agencies, timeframes, and affected groups
Investment	Are commitments converted into delivery and learning?	Capital and operating funds, staff, regulation, milestones, reporting, outcomes	Traceable finance, implemented outputs, measured outcomes, and corrective decisions

Note. The framework adapts Jha (2024) to transportation-sector evaluation.

2. From Plan Quality to Plan Performance

Plan evaluation has traditionally focused on internal quality. Well-known approaches examine factual basis, goals, policies, implementation provisions, interorganizational coordination, and public participation (Berke & Godschalk, 2009). Climate-plan research has extended this tradition by assessing emissions inventories, mitigation targets, adaptation measures, equity, monitoring, and consistency with international commitments (Grafakos et al., 2020; Guyadeen et al., 2019). Such evaluation is valuable because unclear goals and unsupported actions are unlikely to produce accountable implementation. Page | 89

Performance evaluation requires a further step. It asks whether a plan changed budgets, regulations, infrastructure, operations, exposure, accessibility, travel behavior, or emissions. This is methodologically demanding. First, plans are implemented through multiple agencies and instruments. Second, outcomes may appear years after adoption. Third, external events such as fuel prices, economic cycles, pandemics, or national subsidies affect travel and emissions. Fourth, citywide emissions can decline even while disadvantaged neighborhoods experience worsening access or pollution. A credible evaluation must therefore combine process, output, outcome, and distributional indicators rather than relying on a single emissions trend.

Transportation policy is frequently organized through the Avoid-Shift-Improve framework. Avoid measures reduce the need or distance to travel through land-use coordination, digital access, or demand management. Shift measures move trips to public transport, walking, cycling, or shared high-occupancy modes. Improve measures reduce the environmental intensity of vehicles and fuels (United Nations Framework Convention on Climate Change, 2020). Municipal plans often favor Improve actions because vehicle procurement, charging points, and fleet shares are administratively legible. Avoid and Shift measures require land-use reform, contested allocation of street space, high-quality operations, and behavioral change.

Consequently, a plan may demonstrate substantial activity while leaving the structural sources of transport emissions largely intact.

Equity and resilience further widen the evaluation lens. A transportation action can reduce average emissions but increase household costs, displace lower-income residents from transit-rich areas, or neglect people unable to use digital or active modes. Climate resilience requires service continuity during heat, flooding, wildfire smoke, energy disruption, and extreme precipitation. It also requires community capacity to reach essential services during disruption. Evaluation must therefore consider who benefits, who bears costs, and whether low-carbon systems remain usable under future climate conditions.

3. Evaluation Framework and Method

The framework used here adapts a climate resilience plan-evaluation structure developed around empirical evidence, community resilience, equitable outcomes, and funding capacity. It translates higher-level qualities into attributes, sector-specific parameters, and observable metrics. For transportation, the framework is organized into Preparation, Advancement, and Investment. These stages are analytical rather than strictly chronological. A mature planning system continually updates baseline evidence, revises actions, reallocates finance, and learns from performance.

Preparation evaluates whether the city understands existing conditions and possesses the institutional readiness to act. Relevant evidence includes a regularly updated transportation emissions inventory, travel behavior and accessibility data, fleet and fuel characteristics, climate hazards, social vulnerability, and geographic disparities. Institutional readiness includes clearly defined authority, coordination across transport and land-use agencies, public and community-based organization participation, and transparent treatment of uncertainty.

Advancement evaluates the content and integration of planned actions. It examines whether commitments are specific, time-bound, and connected to responsible agencies; whether they address Avoid, Shift, and Improve strategies rather than a single technology; whether land use, public transport, active mobility, freight, parking, and pricing are coordinated; and whether distributional effects and climate resilience are incorporated. The relevant question is not only what the city intends to build, but how the proposed package is expected to change access, travel, and emissions.

Investment evaluates the conversion of commitments into implementation and learning. It examines identified capital and operating funds, staffing, regulatory authority, procurement, interim milestones, public reporting, and outcome indicators. It also asks whether monitoring leads to corrective decisions. An action labeled complete may represent adoption of a study or ordinance rather than a change in mobility conditions. Accordingly, the framework distinguishes administrative outputs from system outcomes.

The study uses structured qualitative comparison. Primary evidence includes Portland's 2015 Climate Action Plan, Climate Emergency Workplan 2022–2025, emissions inventories, and progress reports; Berlin's Energy and Climate Protection Programme 2030, implementation program for 2022–2026, mobility legislation, and monitoring materials; and Delhi's Climate Change Agenda, Electric Vehicles Policy 2020, planning and economic survey documents, public transport programs, and air-quality measures. Secondary scholarship is used to interpret governance and implementation. The analysis is document-based and does not claim causal attribution between individual plan provisions and emissions trends. Its purpose is diagnostic: to determine whether each planning system makes implementation and outcomes traceable.

4. Case Study: Portland, Oregon

Portland has one of the longest municipal climate-planning histories in the United States. The City of Portland and Multnomah County adopted a carbon-reduction strategy in 1993 and have maintained a community-scale emissions inventory for more than three decades (City of Portland, n.d.-a). The 2015 Climate Action Plan established a pathway toward an 80 percent reduction below 1990 emissions by 2050, while the 2020 Climate Emergency Declaration and the Climate Emergency Workplan 2022–2025 increased the emphasis on near-term delivery, climate justice, and accountability (City of Portland & Multnomah County, 2015; City of Portland, 2022).

Preparation is Portland's clearest strength. Longitudinal emissions inventories create an empirical basis for assessing sector trends rather than relying exclusively on modeled futures. The city also developed a decarbonization pathways analysis that tested action scenarios against adopted targets. The analysis estimated that combined transportation policies and renewable-fuel changes could make material contributions to 2030 reductions, while recognizing that no individual measure was sufficient (City of Portland, 2022; Portland Bureau of Planning and Sustainability, 2022). This provides a stronger causal narrative than a list of disconnected projects.

The transportation agenda spans active transportation, transit-supportive land use, pricing and parking, electric vehicles, cleaner fuels, and freight. This breadth is consistent with Avoid-Shift-Improve logic. Portland's land-use pattern and regional light-rail system provide a comparatively favorable platform for low-carbon mobility, and the city has invested in bicycle infrastructure and neighborhood accessibility. Nevertheless, the city cannot independently control regional transit service, freeway investment, statewide pricing, vehicle technology, or

development throughout the metropolitan area. The institutional boundary between city ambition and regional delivery remains a central risk.

The Climate Emergency Workplan improves traceability by identifying priority actions, lead bureaus, schedules, and public progress reporting. Its 47 actions were designed as a near-term implementation instrument rather than another long-range vision. The 2025 progress report explicitly describes both progress and remaining gaps, a practice that strengthens accountability (City of Portland, 2025). Yet action-status reporting also reveals a methodological limitation. Completion of a policy, pilot, or program does not necessarily show that vehicle travel, accessibility, or transportation emissions changed at the required pace.

Portland's performance challenge is therefore not the absence of data or policy breadth. It is the conversion of analytical maturity into politically durable street allocation, regional service improvements, affordable transit-oriented housing, and reduced vehicle travel. Transportation outcomes are also sensitive to post-pandemic travel patterns and fiscal pressures affecting transit. An evaluation system should connect action completion to annual indicators such as per-capita vehicle miles traveled, transit service hours, frequent-network access, walking and cycling accessibility, zero-emission vehicle adoption by income, freight emissions, and household transportation cost.

5. Case Study: Berlin, Germany

Berlin's climate governance is embedded in a stronger statutory and multilevel policy structure. The Berlin Energy Transition Act establishes climate objectives, while the Berlin Energy and Climate Protection Programme 2030, commonly known as BEK 2030, organizes mitigation and adaptation measures. The implementation period for 2022–2026 specifies measures across sectors, including transport (Berlin Senate Department for Urban Mobility, Transport, Climate

Action and the Environment, 2022). Berlin also operates within German federal climate law and European Union vehicle, fuel, and emissions policies.

Preparation benefits from established statistical capacity, public transport data, and integration with national emissions accounting. Berlin's dense urban form, extensive U-Bahn, S-Bahn, tram, bus, cycling, and walking networks give the city structural advantages. The Mobility Act created a legal basis for prioritizing public transport, cycling, walking, and safer streets. Unlike a purely aspirational climate document, the mobility framework assigns normative status to mode shift and street redesign.

Advancement is comparatively comprehensive. Berlin's transport agenda includes public transport expansion, cycling networks, pedestrian improvements, parking management, fleet electrification, shared mobility, and changes to road-space allocation. It therefore extends beyond vehicle efficiency. The city also recognizes that climate-neutral mobility requires coordinated urban development rather than isolated transport technology. However, comprehensiveness creates delivery complexity. Rail expansion, service operations, district implementation, construction capacity, and politically contested street projects involve different actors and timescales.

Berlin illustrates why legal commitment is necessary but insufficient. Germany's transportation sector has repeatedly struggled to remain within emissions pathways, and urban progress is affected by federal vehicle policy and regional commuting. At city scale, implementation of cycling and street-space commitments has faced changes in political priorities and uneven district capacity. The case therefore challenges the assumption that statutory plans automatically close the implementation gap.

Monitoring is stronger for system activity and aggregate emissions than for distributional accessibility. Public transport supply, bicycle facilities, registered vehicles, traffic counts, and emissions can be measured, but a complete evaluation should also identify whether low-income households, outer districts, disabled travelers, caregivers, and shift workers gain reliable low-carbon access. Berlin's mature public transport system reduces some barriers, yet housing affordability and peripheral travel remain central to the relationship between transport and climate performance.

Berlin's principal lesson is that an integrated legal framework can stabilize direction, but performance still depends on budgets, construction and operating capacity, district-level implementation, and sustained political willingness to reallocate street space. Monitoring should therefore distinguish legal adoption, funded delivery, physical completion, service change, behavioral response, and emissions outcome.

6. Case Study: Delhi, India

Delhi was an early Indian city to adopt a climate agenda, publishing the Climate Change Agenda for Delhi 2009–2012. Subsequent climate-relevant transportation policy has developed through multiple instruments rather than a single continuously updated municipal climate plan. These include the Delhi Electric Vehicles Policy 2020, metro expansion, bus procurement, air-pollution action plans, the Master Plan for Delhi, national vehicle and fuel standards, and regional transport investment. This policy density demonstrates activity, but it complicates accountability because commitments, baselines, agencies, and reporting systems are not consistently assembled into one performance chain.

Delhi's preparation context is demanding. The metropolis experiences rapid motorization, severe air pollution, high exposure to heat, and complex travel across the National Capital

Region. Transportation emissions and air pollutants overlap but are not identical, and programs designed for local air quality may not report greenhouse-gas outcomes. Travel is served by metro rail, buses, walking, two-wheelers, autorickshaws, taxis, informal and shared modes, and private cars. Governance is distributed among the Government of the National Capital Territory of Delhi, municipal bodies, Delhi Metro Rail Corporation, Delhi Transport Corporation, central ministries, regional authorities, traffic police, and neighboring states.

Delhi has delivered highly visible Improve and Shift measures. Metro expansion has created a large electric rapid-transit network, and the Electric Vehicles Policy established purchase incentives, charging provisions, and targets intended to accelerate vehicle electrification and improve air quality (Transport Department, Government of NCT of Delhi, 2020). Electric-bus procurement offers particularly important co-benefits because it can reduce tailpipe pollution while improving collective mobility. These measures demonstrate that fragmented climate governance can still produce substantial sectoral outputs.

The evaluation gap lies in connecting these outputs to system-level outcomes. Electric vehicles can reduce tailpipe emissions, but their climate benefit depends on electricity generation, vehicle use, induced travel, and lifecycle conditions. Metro kilometers do not directly establish mode shift if feeder access is unsafe, fares are burdensome, or private vehicle travel grows simultaneously. Bus counts do not reveal service frequency, kilometers operated, reliability, coverage, or passenger accessibility. Air-quality indicators are influenced by regional combustion, dust, industry, weather, and seasonal agricultural burning, making transportation-policy attribution difficult.

Delhi's Advancement profile is therefore uneven. Improve measures are comparatively specific and countable, while Avoid measures such as integrated land use, parking restraint, proximity planning, and travel-demand reduction are less consistently tied to climate metrics. Shift measures exist through metro, bus, and active-mobility initiatives, but evaluation is fragmented across agencies. Equity is recognized through affordable public transport, low-floor buses, and mobility for women and disabled people, yet systematic reporting of accessibility gains by income, gender, disability, and location remains limited.

Investment is similarly dispersed. Metro projects have identifiable capital programs, and electric mobility receives national and territorial support. Less visible requirements such as bus operations, sidewalk maintenance, shade, drainage, feeder integration, and institutional coordination are harder to trace. Delhi would benefit from a consolidated transportation climate-performance account that annually reports emissions, mode share, vehicle kilometers, transit service, accessibility, fleet transition, charging availability, road danger, heat and flood disruptions, spending, and distributional outcomes across the metropolitan area.

Delhi's experience should not be interpreted through a simple deficit comparison with Portland or Berlin. The scale of travel demand, pace of urbanization, prevalence of mixed and informal mobility, and division of authority are fundamentally different. The analytical finding is narrower: major outputs are occurring, but the absence of an integrated and regularly reported theory of change makes it difficult to determine whether the combined portfolio is reducing automobile dependence and greenhouse-gas emissions equitably.

7. Comparative Findings

The three cases demonstrate that plan ambition and performance traceability are distinct qualities. Portland provides the clearest longitudinal emissions evidence and action-status

reporting. Berlin provides the strongest statutory integration between climate and mobility. Delhi demonstrates rapid delivery of major transit and electrification outputs despite a fragmented plan landscape. None provides a complete chain from intervention to equitable transportation emissions outcomes.

Preparation differs most in continuity and consolidation. Portland's annual inventory supports longitudinal interpretation, although regional travel complicates jurisdictional attribution. Berlin benefits from standardized statistical systems and multilevel climate governance. Delhi possesses extensive administrative and operational data, but the evidence is distributed across institutions and is frequently organized around air pollution, vehicles, or projects rather than a unified greenhouse-gas and accessibility account. Data scarcity is not the only problem; institutional interoperability and common definitions are equally important.

Advancement reveals a common preference for measurable technology. Electric buses, charging points, rail kilometers, and vehicle standards can be assigned to agencies and reported as outputs. Measures that reduce travel demand or reallocate road space are more politically difficult and causally diffuse. Portland and Berlin articulate broader mode-shift and land-use strategies, but implementation remains contested. Delhi's portfolio emphasizes transit expansion and electrification, while parking, street allocation, and metropolitan land-use coordination are less visible within climate accountability.

Investment is the decisive stage. Plans become credible when capital and operating resources, staff, authority, procurement, and maintenance are connected to milestones. Portland's workplan reporting makes delays visible, but regional funding dependencies remain. Berlin's legal commitments provide continuity, but delivery capacity and political changes affect

implementation. Delhi can mobilize large capital programs, yet routine operations and first-and-last-mile conditions are not reported through the same climate-performance architecture.

Equity is present rhetorically in all three settings but remains difficult to evaluate. Aggregate emissions reduction does not show whether disadvantaged residents gain access, bear higher costs, experience displacement, or remain exposed to pollution and climate hazards. A stronger system would report accessibility to essential destinations, household transportation burden, service reliability, traffic danger, and climate disruption by neighborhood and population group.

Finally, monitoring rarely demonstrates policy learning. Reporting often indicates whether an action is complete, underway, or delayed. A performance-oriented system should also document why outcomes differ from expectations and what changes follow. Corrective action is the missing link between monitoring and governance. Without it, progress reports can become inventories of activity rather than mechanisms for institutional adaptation.

8. A Performance-Oriented Transportation Climate Standard

The comparison supports seven requirements for credible transportation climate planning. First, cities need a regularly updated baseline that integrates greenhouse gases, travel behavior, accessibility, fleet composition, freight, land use, climate hazards, and social vulnerability. Second, every major action should have a transparent theory of change identifying whether it Avoids travel, Shifts trips, Improves technology, or combines these mechanisms.

Third, plans should assign responsible and supporting institutions, including organizations outside city government. Metropolitan dependencies should be represented explicitly rather than hidden within municipal targets. Fourth, capital and operating finance should be reported

separately. A city may fund vehicles or infrastructure without funding the frequency, maintenance, staffing, enforcement, or public realm that makes them effective.

Fifth, monitoring should use a hierarchy of indicators. Inputs include budgets and staff. Outputs include buses purchased, rail completed, lanes installed, or ordinances adopted. Intermediate outcomes include service frequency, travel time, accessibility, mode share, vehicle kilometers, and fleet utilization. Final outcomes include greenhouse-gas reduction, air-quality co-benefits, resilience, safety, and distributional effects. Reporting one level as though it proves the next should be avoided.

Sixth, evaluation should be spatially and socially disaggregated. Citywide averages must be complemented by neighborhood, income, gender, disability, age, and race or socially relevant group analysis, adapted to local legal and cultural contexts. Seventh, monitoring must trigger corrective decisions. Plans should define thresholds for revising budgets, regulations, project design, or implementation responsibility when interim results are insufficient.

These requirements can be incorporated into existing climate plans, mobility plans, capital programs, and public dashboards. They do not require a uniform global template. Their purpose is to establish traceability while allowing different cities to pursue context-specific pathways.

9. Limitations and Future Research

The analysis is based primarily on published documents. It cannot fully observe internal budget negotiations, informal coordination, procurement constraints, political bargaining, or community experience. Documentation also differs in language, institutional scope, reporting year, and measurement methodology. The absence of a published indicator does not prove that

an agency lacks the relevant data, while the presence of a target does not prove institutional commitment.

Future research should combine the framework with interviews involving planners, transit operators, finance officials, community-based organizations, and affected residents. Quantitative work could test whether higher Preparation, Advancement, and Investment quality predicts subsequent changes in transport emissions or accessibility across a larger sample. Longitudinal case studies could also examine how plans respond to political turnover, fiscal shocks, extreme weather, and changes in travel behavior.

10. Conclusion

Urban climate governance has produced an abundance of transportation commitments, but the central planning challenge is now performance. Delhi, Portland, and Berlin each demonstrate meaningful institutional strengths: Delhi's capacity to deliver major transit and electric-mobility programs, Portland's longitudinal inventory and public progress reporting, and Berlin's statutory integration of climate and mobility. Each also exposes a different implementation gap.

The comparative evidence suggests that credible evaluation requires more than counting projects or comparing aggregate emissions. Cities need a traceable relationship among empirical conditions, proposed actions, institutional responsibility, finance, implementation outputs, accessibility and behavioral outcomes, emissions, equity, resilience, and corrective decisions. Technological progress is important, but transportation decarbonization ultimately depends on land use, reliable public transport, safe walking and cycling, management of road demand, and the affordability of low-carbon access.

A plan should therefore be treated as the beginning of an evaluative cycle rather than the final product of planning. The practical test is whether governments can explain what changed, for

whom, at what cost, with what emissions effect, and how the next decision will respond to the evidence.

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Conflict of Interest/Competing Interests

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Data Availability

The raw data supporting the findings of this research paper will be made available by the authors upon a reasonable request.

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