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ARTICLE

Inclusive Net-Zero Framework for Assessing Urban Transport Policies and Programmes—Case of India

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ABSTRACT

India's Net-Zero commitment, announced at the COP26 held in Glasgow, underscores the critical role of urban transport in achieving long-term climate goals. This paper examines the adequacy of existing transport policies and programmes at both macro (national and state) and city levels in advancing Net-Zero readiness. This paper critiques the conventional Avoid–Shift–Improve framework and introduces the ERASI framework (Enhance, Retain, Avoid, Shift, Improve) as a more contextually relevant paradigm for Indian cities and the Global South. It then, through a systematic assessment of the policy documents at all the levels, identifies structural gaps, fragmented approaches, and misalignments across governance scales. The papers findings highlight that Indian cities possess a comparatively sustainable urban form, yet policies inadequately support integrated planning to sustain compact, mixed-use development, underscoring the need for 'Retain' principles through coherent long-term strategies. Indian cities also record low mobility of specific populations, which requires the 'Enhance' option. The paper also highlights the absence of coherent strategies linking macro and local interventions, insufficient integration of inclusivity and transport justice, and the need for alignment between technological transitions and governance mechanisms. The paper also argues that achieving Net-Zero transport requires a reframing of urban transport policy that emphasizes equity, and coherence in existing frameworks.

Keywords: Urban Transport; Net-Zero Transport; ASI Framework; Transport Policy; Global South

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1. Introduction

In line with global objectives, India announced her Net-Zero commitment at the 26th Conference of the Parties (COP26) in 2021, held in Glasgow, aiming to achieve Net-Zero emissions by 2070 [1]. This implies India's transition to Net-Zero transport in general and in urban transport, in particular, will go hand-in-hand with expected rapid urbanisation [2,3]. Transitioning to Net-Zero transport necessitates comprehensive policies addressing demand and supply-side interventions and technological advancements. At the city level, this transition will require transportation planning in consonance with land use planning, increasing the supply of public and non-motorised transport, planning for technological transition, and above all, governance mechanisms that allow this transition [4,5]. India has multiple macro-level and local-level policies related to these aspects. The question we pose in this paper is: are the available policies and programmes at the macro and local level adequate to meet the Net-Zero ambition concerning the urban transport sector? If not, then which other areas require policy and programme strengthening? We undertake a full spectrum assessment of policies and programmes related to urban transport—macro (national and state), and local (city) level, using the case of Rajkot, a mid-sized Indian city. This approach provides a holistic perspective related to policy provision in India, and enables us to draw insights for 'implementable' future pathway towards Net-Zero transport at the city level.

The National Urban Policy Framework (NUPF) identifies several systemic issues in India's urban transport, including fragmented public transport systems, inadequate road-based public transport, insufficient non-motorized transport infrastructure, and the absence of comprehensive parking policies. It also admits challenges related to accessibility for differently-abled individuals and safety concerns for women, restricting equitable access to public transport [6]. In addition to these criticisms by the NUPF, there are other concerns with the approach to urban transport, one of which is the lack of inclusion of development goals within the transport policies and programmes, resulting in missed opportunities for incorporating transport justice goals, such as enhancing mobility of 'underserved' segments of the urban population [7]. This requires a re-framing of the urban transport paradigm for achieving an Inclusive Net-Zero transport at the city level.

In this paper, we have systematically reviewed and assessed available transport policies and programmes relevant to a city in India, modifying the existing and widely used 'ASI' framework, i.e., Avoid-Shift-Improve framework. The 'ASI' framework's critique is presented in Section 2 along with the proposal of a new framework, ERASI, i.e., Enhance, Retain, Avoid, Shift, and Improve framework. We argue that the ERASI framework is more relevant not just for Indian cities, but also for the cities of the Global South, which are experiencing a high level of population and economic growth on the one hand and continued poverty and high inequalities on the other. Hence, building on NUTP's surface-level gaps identification, we propose the ERASI framework as a solution to the root cause. Urban transport-related policies and programmes are assessed through the development of a matrix, whose methodology is presented in Section 3. Note that the range of interventions in the transport sector is through policies and programmes, which are clubbed together under the rubric 'policies'. Sections 4 and 5 assess the alignment of the macro and local level transport policies to the ERASI framework. Section 4 focuses on insights obtained from the policy contents at macro and local level, and Section 5 focuses on insights obtained based on disaggregated ERASI components. Last section summarizes the paper and teases out the main action agendas for ensuring Net-Zero 'readiness' in Indian cities.

India's Transport Landscape

Indian cities are experiencing a high growth rate of motorization in the last two decades [7]; higher-income and upper-middle-income groups remain the dominant private vehicle users [8] while lower- and middle-income groups remain captive users of Public Transport (PT), Intermediate Public Transport (IPT) and Non-motorized Transport (NMT) [9]. The modal share varies depending on city size and types (the economic base), as average trip length, trip purpose, affordability, etc., remain influential variables for mode selection. Limited micro-level research points to low-income women walking (and not cycling) and thereby having short trip lengths, whereas low-income men tend to cycle rather than take public transport [10–12]. With the increase in household income, men tend to shift to

private motorized vehicles, first two-wheelers and then four-wheelers, whereas the women in these households shift to using PT where available (largely in metro and large cities) or IPT [10,13]. The provision and use of PT increases with city size increase; an older study of 2008—no systematic study available since then—shows that in cities with less than half a million population, 34% walked, and only 10% used either PT or IPT [14]. Further, 42% walked or cycled in 30 cities of various sizes [14]. In contrast, in cities with a population of more than 8 million, 22% walked, whereas 44% used public transport. Thus, there are multiple challenges related to urban transport in Indian cities: (i) catering to sizeable latent demand for public transport built up on account of non-availability and poor quality, (ii) increasing mobility or trip lengths of a large section of the urban population, among which are low-income women enabling them to access opportunities for livelihood and capability enhancement (through access to education and healthcare infrastructure), (iii) improving NMT infrastructure thereby providing good last-leg connectivity on the one hand and encouraging walking and cycling for short trips, and (iv) shifting vehicles to cleaner fuels.

In recent years, however, the urban transport landscape has undergone a strategic transition, shifting from reactive, vehicle-centric models toward people-centered planning aligned with the Sustainable Development Goals [15,16]. While challenges like "peripheralization of low-income populations" [17] and "elite capture" of capital-intensive projects remain, the current environment offers a unique foundation for inclusive decarbonization. Research emphasizes that Indian cities already possess a high baseline of non-motorized transport (NMT) and walking; these are viewed not merely as signs of "transport poverty" but as vital low-carbon assets that can be optimized through context-sensitive infrastructure [18]. Moreover, the integration of electrified intermediate public transport (IPT) and improved bus systems provides progressive pathways to enhance "last-mile" connectivity and employment for the urban poor. By implementing an "enhance-retain-avoid-shift-improve" framework, mid-sized cities can leapfrog toward resilient, gender-sensitive systems that prioritize safety and accessibility [19]. This balanced approach suggests that addressing equity gaps is not a barrier to growth but a prerequisite for a sustainable, Net-Zero future [20].

2. Modifying the ASI Framework for Urban Transport in India

The "ASI" framework in transport stands for 'Avoid-Shift-Improve, a widely accepted framework to promote sustainable mobility. It advocated for prioritizing strategies to first reduce unnecessary travel ("Avoid"), then shift to more environmentally friendly modes of transport ('Shift'), and finally improve the efficiency of existing modes ('Improve')—essentially creating a hierarchy of measures to minimize the environmental impact of transportation while maximizing accessibility and quality of life. The 'ASI' approach was initially developed in the early 1990s in Germany and first officially mentioned in 1994 in the report of the German parliament´s Enquete Commission [21]. This approach serves as a way to structure policy measures to reduce the environmental impact of transport and thereby improve the quality of life in cities on the one hand, and increasingly for climate change mitigation efforts in the transport sector. In the development community, the ASI approach was first embraced by international NGOs, as well as multilateral and bilateral development organizations working on transport [22]. It was considered a worthwhile alternative to the predict–provide–manage approach [23]. The 'ASI' approach is focused on the demand side and offers a more holistic approach towards overall sustainable transport system design.

The 'ASI' approach follows an implicit hierarchy of actions, with appropriate and context-sensitive 'Avoid' measures intended to be implemented first, followed by 'Shift' measures, and finally by 'Improve' measures. Growing evidence shows that 'Avoid' and 'Shift' strategies can account for 40–60% of transport emission reductions, at lower costs than 'Improve' strategies [24,25]. Yet, the updated Nationally Determined Contributions (NDCs) under the Paris Agreement continue to focus strongly on 'Improve' measures (52% of all measures) [24]. We argue here that this is a limited approach to framing sustainable and inclusive urban transport in the cities of the global South for the reasons discussed in the following text.

2.1. 'Avoid': Reduce or Avoid the Need to Travel

'Avoid' includes policies that minimise or eliminate

the need for travel by promoting integrated land use and transport planning. Strategies include encouraging mixed-use development, enhancing digital connectivity to reduce commuting needs (e.g., remote work and teleconferencing), and implementing travel demand management measures to optimize urban accessibility [26]). Avoiding the need to travel is a vital strategy for achieving Net-Zero transport, though its applicability is limited to the developed cities' contexts. Teleworking, e-commerce, and digital service delivery potentially reduce physical travel. However, socioeconomic conditions and urban dynamics in India and other countries of the Global South, largely necessitate physical mobility to access education, employment, and services, particularly for lower-income groups and informal sector workers. Thus, while minimising unnecessary travel is beneficial, the Indian context requires a balanced approach that prioritises efficient, low-carbon transport systems and improved urban planning over purely avoidance-based strategies [27].

2.2. 'Shift': Shift to Environmentally Friendly Transport Modes

'Shift' includes policies that encourage a modal shift towards environmentally friendly and active modes of transport, such as public transport, walking, and cycling. Policies under this category support investments in public transit systems, developing pedestrian-friendly and cycling infrastructure, and pricing mechanisms like congestion charges to discourage private vehicle use [28]. Shifting to environmentally friendly transport modes is essential for achieving Net-Zero emissions in India, given the rapid urbanisation, rising population, and increasing dependence on private vehicles and air pollution [29]. But, currently, a significant number of urban trips in cities, mainly small—and medium-sized cities, are by 'active transport' modes, and the future transport strategies for low-carbon require retaining these modes for certain trips. Hence, instead of Shift, 'Retaining' active modes for trips is a priority for Indian cities. Nonetheless, 'Shift' to sustainable modes such as electric vehicles (EVs), public transport, and non-motorized transport in Indian cities requires large-scale infrastructure improvements, including shaded and safe footpaths and cycle tracks, EV charging infrastructure, designated PT lanes and stops, and car-pooling lanes/zones.

2.3. 'Improve': Improve Energy Efficiency of Transport Modes

'Improve' includes policies that enhance the energy efficiency and environmental performance of transport infrastructure, vehicles, and fuels. The interventions could be electrifying public transport fleets or their shift to any other cleaner fuels, setting stringent vehicle emission standards, promoting R&D in clean vehicle technology, and fostering the adoption of renewable energy sources within the transport sector [30]. Improving energy efficiency in India's transport sector is essential for achieving Net-Zero emissions. Smart traffic management systems and investments in infrastructure, such as charging stations and efficient road designs, will further support this transition [31].

2.4. Modified Framework: Introducing 'Enhance' & 'Retain'

The discussion in Sections 2.1–2.3 reveals three structural limitations of the ASI framework when applied to the urban transport context of India and, more broadly, the Global South.

First, the 'Avoid' component assumes a baseline of excessive or unnecessary travel that can be reduced. Yet, as discussed in Section 2.1, a large segment of India's urban population—particularly low-income women, informal sector workers, and the urban poor—suffers not from excessive mobility but from insufficient mobility. For these groups, the policy imperative is not to avoid travel but to enable it. The ASI framework offers no space for this fundamentally different starting condition. Second, the 'Shift' component (Section 2.2) presupposes that users need to be shifted from unsustainable modes to sustainable ones. However, in small and medium Indian cities, 42% of trips are already by walking or cycling [23] and a significant proportion of low-income populations are already captive users of public and non-motorised transport. The challenge here is not shifting to these modes, but retaining them in the face of rapid motorisation, land speculation, and urban sprawl that are eroding the compact, mixed-use urban form that currently supports short trip lengths and active transport. Third, the 'Improve' component (Section 2.3) focuses on technological efficiency—cleaner fuels, electrification, emission standards—which, while essential, is agnostic to

who benefits from the improvement. An electric private vehicle benefits its owner but does nothing for the mobility of the urban poor; an EV-based mass transit system, by contrast, serves both decarbonisation and equity. The ASI framework, by failing to distinguish between these distributional outcomes, risks channeling policy attention toward technology-led solutions that leave the most vulnerable populations unserved.

The common thread across these three limitations is the absence of an equity and context-sensitivity lens in the ASI framework. The framework was developed in Germany in the early 1990s [32] for cities characterised by high per-capita mobility, well-established public transportation, and relatively low-income inequality. Applying it without modification to cities with deeply unequal transport consumption—where some segments are over-consuming motorised transport while others lack even basic mobility—results in a policy framework that addresses emissions without addressing the structural inequities that shape transport demand in the first place.

To address these gaps, we propose two additional criteria components, 'Enhance' and 'Retain'. Together, they form the Enhance-Retain-Avoid-Shift-Improve (ERA-SI) framework.

2.5. 'Enhance': Enhance the Mobility of the Mobility-Deprived Sections

'Enhance' includes policies on improving mobility for socio-economically disadvantaged sections of society, ensuring equitable access to transport services, including targeted investments in public transport infrastructure, subsidies (such as free bus as being implemented in some cities in India) for low-income groups, including women, and measures to bridge accessibility gaps in underserved areas [32,33]. Elsewhere, we have discussed how transport accessibility enables achieving the targets of the Sustainable Development Goals (SDGs) [15–20]. Transport systems enhance well-being by improving accessibility through a balance of mobility and proximity to essential services [34–36]. Mobility-deprived groups, particularly low-income populations, face barriers such as inadequate infrastructure, high costs, and limited information while accessing shared mobility services. Prioritising enhanced mobility enables a shift to shared, active, and low-carbon transport modes, contributing to Net-Zero emission goals. Inclusive transport systems also address inequalities and chronic stresses, fostering urban resilience and sustainability [37].

2.6. 'Retain': Retain Compact Urban Forms, Mixed Land-Use Patterns, and Short Trip Lengths

'Retain' includes policies that aim to preserve the existing low demand for motorised transport, given the mixed land uses in large and metropolitan cities and the compact, small—and medium-sized towns in India. Indian cities have high densities [38–40], and hence, compact urban form and mixed land-use patterns reduce the need for long commutes. This promotes proximity to essential services, thereby minimising emissions. For instance, remote sensing and land-use studies show that 40–55% of urban land in Indian cities is mixed-use, with residential, commercial, and informal activities overlapping in the same neighbourhoods**.** Indian cities' population density exceeds 15,000–25,000 persons/km^2, compared to 2,000–5,000 persons/km^2 in U.S. metros [41]. Indian cities also have an average trip length of 5–7 km [42], compared to American and European cities with an average trip length of 18–20 km [43,44].

Ironically, the exception to mixed land use patterns is the planned cities such as Delhi, which have segregated land uses [45] due to the concept of CBD (Central Business District) that increases long trips to work. 'Retain', therefore, focuses on non-transport policies such as those related to spatial planning to retain shorter trip lengths and including informal sector, fuel and ticket pricing to retain affordable transportation for all, fiscal to support subsidised public transport, and housing that would enable affordable housing across the geographic spread of the city as against peripheral locations [6,17]. Together, these policies ensure continued reliance on sustainable modes such as walking, cycling, and public and shared transport. The small and medium towns are compact with mixed uses and depend primarily on walking, cycling, and shared paratransit for mobility. Land market speculation in these urban centres [46] leads to sprawl, increasing dependence on motorised transport, which also requires addressing through land and spatial planning policies. Policies need to curtail the non-sustainable development of these urban centres [47,48].

3. Materials and Methods

We identified 19 macro-level transport policies to identify their potential to deliver 'Net-Zero'. India's federal structure enables policymaking at the national, state (subnational), and city levels. We searched online for all currently relevant transport policies at all three levels. We have included three levels of policies because the national level policies are followed up by the central government funding of programmes and schemes. Each state in India has the option to make its own policies, besides implementing national-level policies. The translation of national and state policies into implementable projects occurs at the city level, through its planning and governance mechanisms. Further, the policies may or may not be accompanied by a programme; programmes can be launched without policies, at both the national and the state level. At the local level, besides implementing national policies and programmes through projects, there are local plans, such as land use and traffic and transportation plans (also called Comprehensive Mobility Plans), which influence the implementation of national and state-level policies and programmes. All these documents, the policies, programmes, and plans prepared at the three levels of government, are included in the generic term 'policy'. The center and state-level policies are clubbed together for analysis and are referred to as 'macro policies' (list attached in **Appendix A**). The local level documents are referred to as 'action plans'. These are city-level transport planning documents, including the city's master plan, comprehensive mobility plan, air-pollution reduction plans, low-carbon mobility plans, and documents that govern transport demand and supply at the city level (list attached in **Appendix B**). To ensure that macro-level policies can be compared with city-level action plans, we have selected Rajkot, a city of 2.0 million (estimated population in 2024) [49], which has 12 city-level transport planning documents.

We have selected Rajkot, a city, to discuss the multi-scalar transport policies in India for the reason that it is our project city, for which we have proposed a Net-Zero transport potential. We have worked in Rajkot city a decade ago to prepare its Low Carbon Mobility Plan. Rajkot is located in the state of Gujarat, an industrial and high-growth state. Hence, a Net Zero transport plan for this city also illustrates the choices India would make in her high economic growth transition scenario to a Net-Zero future.

For a systematic review of macro-level policies and city-level action plans (often ranging several hundred pages), we tabulated key intervention items included in the aims & objectives, thematic areas addressed, key strategies, and regulatory/financial measures to implement strategies. Since our focus is on transport sector policies and plans, we could discern a pattern of recurring strategies, followed by interventions. Each document had multiple interventions to meet its respective aims and objectives. In other words, the aims and objectives of each of the policy or plan documents had multiple interventions suggested. We have assessed these interventions for their potential to achieve the Net-Zero transport future rather than the entire policy or plan document. For example, the National Urban Transport Policy (NUTP) lists 'Equitable Road Space Distribution' as one of the key strategies, and 'Provision of Non-motorized Transport (NMT)' as its key intervention. The same intervention is also found in other policies (see **Appendix A**), making it a recurring intervention. Hence, we identified recurring interventions across all documents macro and city-level) and have used these for assessing the possibility of these policies/action plans in advancing the aim of reaching Ne-Zero in transport.

We identified 142 interventions across all macro policies (see **Appendix A**). At the city level, we identified 189 interventions across all plans (details attached in **Appendix B**). These policies and programmes have been downloaded from the government websites. The city level action plans were collected from the city. Rather than individually assessing their Net-Zero transport potential, we have categorized these into nine intervention categories, namely: 1. Air Quality Improvement Measures; 2. Clean Energy Transition; 3. Climate-Resilient Transport Infrastructure; 4. Integration with Statutory Planning; 5. Non-Motorised Transport Promotion; 6. Public Transport Access; 7. Sustainable Modal Shift Promotion; 8. Traffic Demand Management and Decongestion; 9. Transport Electrification. Of these, only six, Clean Energy Transition, Integration with Statutory Planning, NMT Promotion, Public Transport Access, Traffic Demand Management and Decongestion, and Transport Elec-

trification, could be found in the macro-level policies.

Among the macro policies, several had similar or overlapping interventions; e.g., "Providing NMT Infrastructure" was found across 6 policies, while "Providing a Mass-transit System (MTS)" was found across 8 policies. Hence, all similar or overlapping interventions were combined to generate a list of 52 'unique' interventions across 19 policies. In other words, interventions that were similar, although differently worded, were considered the same intervention. We categorize these 52 interventions into six of the nine intervention categories listed above (see **Appendix A**). These six intervention categories are: Among the city-level plans, after removing duplicates/content overlaps, a total of 116 interventions were identified across twelve city-level plans, of which only 47 have been listed in the **Appendix B** along with their categorization into all of the nine intervention categories listed above (see **Appendix B**).

Assessment Framework

For assessment, the nature of each intervention—often included in multiple policies and plans—is assessed against the E-R-A-S-I (ERASI from now on) framework's principles. Instead of evaluating the impacts of policies and plans, which would require on-ground implementation of a policy in a specific city context, this paper focuses on the 'presence' of ERASI components in each of the interventions for its potential to advance the Net-Zero aim. Based on the discussion in the previous section, the core principles for each of the ERASI components are presented in **Table 1**.

Table 1. Contents of Each ERASI Component.

Component	Principle
Enhance—E	Enhance mobility of the mobility-deprived sections: This includes initiatives focusing on increasing travel demand for vulnerable groups like women, urban-poor, children, the elderly and differently-abled.
Retain—R	Retain existing sustainable behaviour and demand of socio-economically disadvantaged sections: This includes initiatives on enhancing access to basic services, economic opportunities, and civic facilities.
Avoid—A	Reduce or avoid the need to travel: This includes initiatives that diminish travel demand, especially motorized travel demand.
Shift—S	Shift to more sustainable transport modes: This includes initiatives that increase mode shares and trip lengths of Public Transport and Non-Motorized Transport modes.
Improve—I	Improve the energy efficiency of transport modes and vehicle technology: This includes initiatives that focus on enhancing vehicle and fuel technology to minimize vehicular emissions.

Source: Prepared by the authors.

The assessment framework includes interventions and their categories on the y-axis (represented as columns B, C, & D in **Appendices A** and **B**), and each of the ERASI components on the x-axis (columns E, F, G, H, & I in **Appendices A** and **B**). We noted each intervention's alignment with ERASI components (based on the principles mentioned in **Table 1**) through a binary score (0–1); i.e., if an intervention shared the same principle as the 'Enhance' component, we denoted a "1" in the 'E' column on the x-axis. Interventions in alignment with all five ERASI components would be assigned "1" in each ERASI component. Thus, if a particular intervention is expected to contribute to achieving a content or contents (see **Table 1**) of each of the ERASI components, then that intervention will achieve the highest score of "5" (the total score of an intervention is presented in column J in **Appendices A** and **B**). Conversely, if the intervention does not contribute to any of the ERASI components, then this intervention will be assigned a score of "0". All 52 interventions listed in the macro-level policies, and 116 at the city-level, were

assigned a score of "0" to "5" to identify the most potent interventions in delivering Net-Zero. The interventions in **Appendices A** and **B** are listed in descending order of their total score. Thus, at the macro level (**Appendix A**), interventions, namely, Preparation of Comprehensive Mobility Plan (CMP), Integrated Land Use and Transport Planning, Implementing Service Level Benchmarks (SLBs), and Providing Road Network and Associated Facilities, post a score of 5. Similarly, at the city level (**Appendix B**), two of the proposed interventions, Low-carbon Mobility Planning for Aging Population (median age rising from 29–30 to 38–40 years) and Strengthening Regulations for Transport Governance post a score of 5.

4. Results

4.1. ERASI-Alignment of Macro and Local Policy Interventions

4.1.1. Macro Level Policy Analysis

The 52 interventions in the 19 macro-level policies align with multiple ERASI components (See **Appendix A**). The left-side graph in **Figure 1** shows the distribution of total interventions by intervention categories. The intervention category Clean Energy Transition had 13 interventions across 19 macro-level policies. This category of intervention had the largest number of interventions, whereas NMT promotion had the least number (5) of interventions. When each intervention is given a binary score (as discussed above), it was found that several interventions aligned with all five ERASI components—generating a score of "5", while several aligned with only 1 component—generating a score of "1" (these details are given in **Appendix A**). After scoring thus for each intervention, we generate a total score of 119 (see **Table 2**). The right-side graph in **Figure 1** gives the distribution of total scores by each intervention category. The higher the score of each of the intervention categories, the closer the category is to supporting the Net-Zero goal. The details of the scores achieved by each of the Intervention Categories with regard to achieving ERASI components are as follows:

- Public Transport Access—12 interventions (23% of total interventions) generating a score as high as 33 and an average score of 2.75 (**Table 2**).
- Integration with Statutory Planning—8 interventions (15% of total interventions) generating a score of 29 and an average score of 3.63.
- Traffic Demand Management—9 interventions (17% of total interventions) generating a score of 22 and an average score of 2.44.
- Transport Electrification—5 interventions (5% of total interventions) generating a total score of 6 and an average score of 1.20.
- NMT Promotion—5 interventions (5% of total interventions) generating a total score of 16 and an average score of 3.20.
- Clean Energy Transition—13 (25% of total interventions) interventions, but, generating a total score of only 13 and an average score of 1.00.

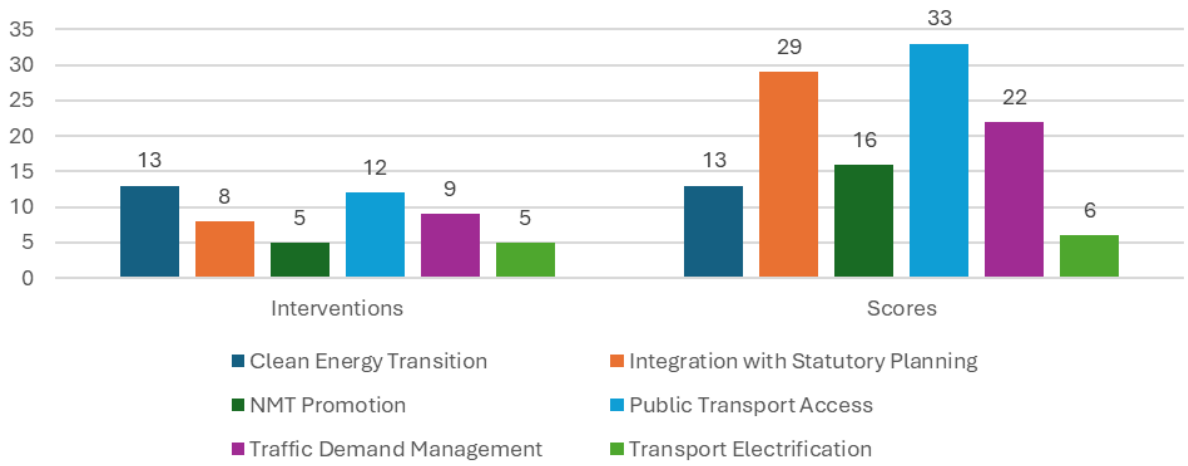

Figure 1. Total Interventions and Scores by Intervention Categories (Macro-Level Policies).

Table 2. Score of Intervention in ERASI Components (Macro Level).

Intervention Categories—Macro	Interventions' Score—'Enhance'	Interventions Score—'Retain'	Interventions' Score—'Avoid'	Interventions' Score—'Shift'	Interventions' Score—'Improve'	Total Score	Average Score
Clean Energy Transition	0	0	0	0	13	13	1.00
Integration with Statutory Planning	3	7	4	8	7	29	3.63
NMT Promotion	5	4	3	4	0	16	3.20
Public Transport Access	8	9	0	12	4	33	2.75
Traffic Demand Management	4	5	3	7	3	22	2.44
Transport Electrification	0	0	0	1	5	6	1.20
Grand Total	20	25	10	32	32	119	2.29

Source: Prepared by the authors. See **Appendix A** to understand how these scores have been derived.

This analysis shows that, although only 12 interventions were listed under the intervention category, Public Transport Access, each one of these had high alignment with each of the ERASI components except 'Avoid', and hence obtained a total score of 33 and an average score of 2.75. The second intervention category with high scores is Integration with Spatial Planning, with a total score of 29 and an average score of 3.63. Traffic Demand Management, too, has significant alignment with the ERASI framework, with this intervention category getting an average score of 2.44. In contrast, the Clean Energy Transition intervention category had the largest number of interventions (13), the alignment of interventions with the ERASI component was low, resulting in the lowest total score of 13 and average score of 1.00, among the five intervention categories. Interestingly, NMT promotion has the second-highest average score of 3.20, whereas it had the least number of interventions included (of 5).

This analysis shows that the tendency to lay emphasis on fuel switching in transport to cleaner fuels might not yield the expected results with regard to a Net-Zero future. Even the shift to the Electrification of Vehicles gives a low average score of 1.20, and hence does not contribute much to the ERASI framework for transport. In fact, governments find it easier to deal with fuel switch (such as emphasise Electrification of Vehicles, i.e., promotion of Electric Vehicles (EVs), as these appear to be a low-hanging fruit accomplished in a shorter time period. Instead, enhancement of NMT infrastructure, Spatial Planning, Public Transport access, and Traffic Demand Management, all of which provide links with land use, density, land price, road space allocation in favour of public transport and walking and cycling infrastructure, and policies to reduce private transport such as congestion charges and high parking charges would give higher results for moving towards Net-Zero transport. Many of these interventions are harder as they require negotiation of local power politics and are also long-term.

The second intervention category that has low scores (of 16) is 'NMT Promotion'. This intervention category only has 5 interventions. Its alignment with ERASI is high because it provides safe and affordable last-mile connectivity with the Public Transport, and is the mode of travel for a significant proportion of the urban population, as discussed above. This appears to be a low-hanging fruit, but it is not, given that the vehicle (four-wheeler and two-wheeler) lobbies in the cities of the global south are powerful and vocal, and consider footpaths (sidewalks) and cycle lanes as intrusive in their right of way. There is some contradiction in the interventions proposed in the macro policies; there is a push for Public Transport, but the concomitant need for NMT infrastructure to increase usage of Public Transport does not appear in the priorities of the macro policies.

Consistent with international narratives, macro-level policies have prioritized 'Shift' and 'Improve' interventions with a total share of 27% each (**Table 2**). Around 21% interventions align with 'Retain' strategies, followed by 'Enhance' (17%) and 'Avoid' (8%). Interestingly, enhancing the mobility of a segment of the urban population by providing Public Transport is part of the policy landscape at the macro level in India. Intervention categories that predominantly align with the 'Enhance' component are Public Transport Access and NMT Promotion. The 'Improve' component includes Clean Energy Transition and Transport Electrification related interventions. Public Transport Access and Integration with Statutory Planning predominantly support the 'Shift' and 'Retain' compo-

nents. NMT Promotion and Traffic Demand Management are spread roughly across all ERASI components.

4.1.2. City-Level Policy Analysis

At the city level, too, the 116 interventions derived from 12 action plans distributed over 9 intervention categories (**Appendix B**), we find that each of these (interventions) aligns with multiple ERASI components. Binary scoring for each intervention, as explained above, generates a total score of 224. The distribution of 116 interventions proposed in the city action plans can be seen in the left-side chart in **Figure 2**. Here, we see that Clean Energy Transition, the intervention category, had the largest number of interventions (21), followed by Transport Electrification (17 interventions). In fact, both these intervention categories deal with transport fuel. But, the left-side graph in **Figure 2** shows that these two intervention categories do not score high in ERASI scores; they score 26 and 21, respectively. The details of the scores achieved by each of the Intervention Categories with regard to achieving ERASI components are as follows: Public Transport Access—13 interventions generating a total score of 33 and an average score of 2.54 (**Table 3**).

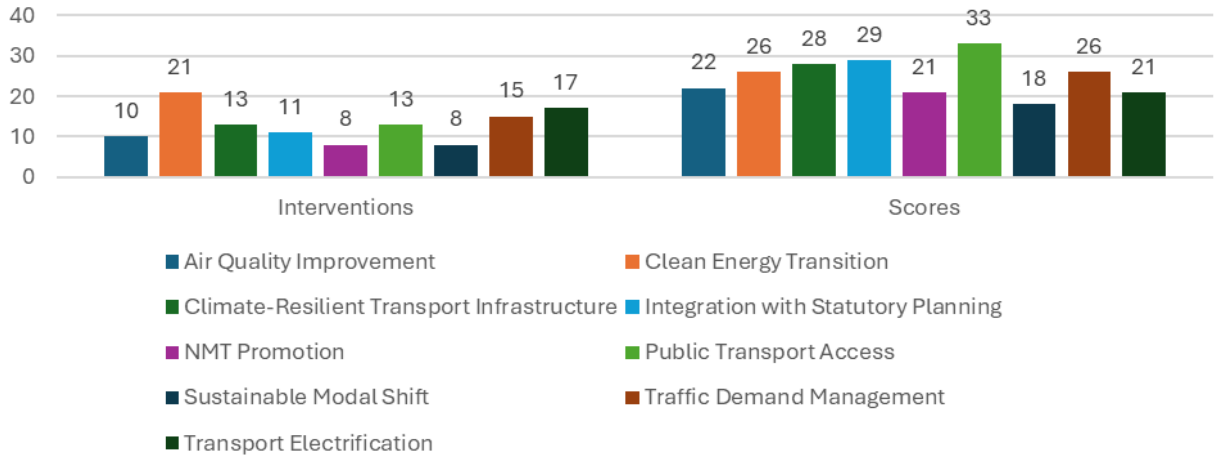

Figure 2. Total Interventions and Scores by Intervention Categories at City-Level.

Source: Prepared by the authors.

Table 3. Alignment of Intervention Categories with ERASI Components, City Level.

Intervention Categories—City	Interventions' Score—'Enhance'	Interventions' Score—'Retain'	Interventions' Score—'Avoid'	Interventions' Score—in 'Shift'	Interventions' Score—'Improve'	Total Score	Average Score
Air Quality Improvement	0	0	6	8	8	22	2.20
Clean Energy Transition	0	1	1	4	20	26	1.24
Climate-Resilient Transport Infrastructure	9	12	1	6	0	28	2.15
Integration with Statutory Planning	4	5	6	7	7	29	2.64
NMT Promotion	6	7	0	8	0	21	2.63
Public Transport Access	8	10	0	13	2	33	2.54
Sustainable Modal Shift	2	4	2	8	2	18	2.25
Traffic Demand Management	0	4	12	7	3	26	1.73
Transport Electrification	1	1	0	3	16	21	1.24
Grand Total	30	44	28	64	58	224	1.93

Source: **Appendix B**, to understand the source of the numbers presented in this table.

- Integration with Statutory Planning—11 interventions generating a total score of 29 and an average score of 2.64;
- Climate-Resilient Transport Infrastructure—13 interventions generating a total score of 28 and an average score of 2.15;
- Traffic Demand Management—15 interventions generating a total score of 26 and an average score of 1.73;
- Clean Energy Transition—21 interventions generating a total score of 26 and an average score of 1.24;
- Air Quality Improvement—10 interventions generating a total score of 22 and an average score of 2.20;
- NMT Promotion—8 interventions generating a total score of 21 and an average score of 2.63;
- Transport Electrification—17 interventions generating a total score of 21 and an average score of 1.24;
- Sustainable Modal Shift—8 interventions generating a total score of 18 and an average score of 2.25.

Public Transport Access leads with a share of 15% in the total score (of 224), followed by Climate-Resilient Transport Infrastructure and Integration with Statutory Planning, each with a 13% share in the total score, followed by Clean Energy Transition and Transport Demand Management, each having a 12% share (left-side graph in **Figure 2**). Transport Electrification and NMT Promotion each have 9% of the share in the total score. Air Quality Improvement has a share of 10% in the total score and the last is Sustainable Modal Shift (8%).

However, in terms of alignment with the ERASI framework, we find that there is concurrence with the macro-level policies, with Integration with Statutory Planning (average score of 2.64), NMT Promotion (average score of 2.63), Public Transport Access (average score of 2.54), and Sustainable Modal Shift (average score of 2.25) leading at the city-level. Again, the Clean Energy Transition and Transport Electrification, although having a relatively high number of interventions, have a low average ERASI score of 1.24. Hence, at both the macro and city levels, low-hanging actions such as changing fuel have gained priority, although their ERASI scores are low. The long-term and difficult interventions requiring structural (physical as well as political) changes at the local level have low interventions, although these are high in the average ERASI scores. Primarily, energy transition does not support the 'Enhance' component of the ERASI framework. Interestingly, at the city level, emphasis on Climate-Resilient Transport Infrastructure, which includes interventions such as air pollution reduction, decongestion, and flood-proof streets, is a step in the right direction.

Like national policies, city-level plans and programmes also prioritize 'Shift' and 'Improve' principles with 29% and 26% shares each (**Table 3**). Yet, unlike national policies, interventions aligning with 'Enhance' and 'Avoid' principles are at-par with 13% share each—indicating an increase in interventions of 'Avoid' and a decrease in interventions related to 'Enhance' by ~5% at the Rajkot city level. In other words, while the Macro-level policies have recognised the situation of low mobility of a segment of the population and hence have proposed interventions to 'Enhance', there is less recognition of this component of a Net-Zero transport at the city-level. For cities like Rajkot, where vulnerable socio-economic groups experienced curbed mobility, the de-prioritization of the 'Enhance' principle delays the achievement of Transport for All.

4.2. ERASI Component Analysis

In this section, combining all the interventions identified from the policies at the Macro and Local levels (a total of 168 interventions—52 at the macro level and 116 at the City level), we analyse in this section the importance given to individual components of ERASI in the policies. These 168 interventions generate a cumulative score of 347. Maximum interventions fall under 'Shift' (28%), followed by 'Improve' (26%), 'Retain' (20%), 'Enhance' (15%) and then 'Avoid' (11%) (See **Table 4**).

This indicates that both—although 'Enhance' and 'Avoid' have the highest inclusive components for climate change mitigation potential, but have low-priority. The low score attained by 'Enhance and 'Avoid' in the combined assessment of Macro and City level policies is on account of low emphasis on these two components in the plans at the city level. 'Avoid' component has the lowest priority at both, the Macro as well as City level, probably with an understanding that 'development' means an increase in consumption (of transport in this case). However, in highly unequal systems such as Indian cities, there is a need to in-

troduce 'Avoid' related interventions for a segment of the population that is making unnecessary trips or using motorised vehicles for even short trips. 'Avoid' is also important because, if the mobility of some segments of the population has to increase, that of some segments has to reduce to bring equity in transport consumption and balance in GHG emissions from transport. The over-consuming segment of the urban population has consumption at par with the high-income countries, wherein the 'Avoid' (of the ASI) framework is extremely important.

Table 4. Alignment of Intervention Categories with ERASI Components, All Levels (Macro & City).

Intervention Category—Macro & City Level	Intervention 'Enhance'	Intervention 'Retain'	Intervention 'Avoid'	Intervention 'Shift'	Intervention 'Improve'	Total
Air Quality Improvement	0	0	6	8	8	10
Clean Energy Transition	13	14	14	18	33	34
Climate-resilient Transport Infrastructure	9	12	1	6	0	13
Integration with Statutory Planning	13	14	14	15	15	19
NMT Promotion	11	12	6	13	5	13
Public Transport Access	20	22	12	25	14	25
Sustainable Modal Shift	2	4	2	8	2	8
Traffic Demand Management	9	13	21	16	12	24
Transport Electrification	6	6	5	8	21	22
Grand Total	83	97	81	117	110	168

Source: Prepared by the authors.

Enhance

Table 5 synthesises the alignment of intervention categories with each ERASI component, identifying the dominant categories, exemplar interventions, and notable gaps. The detailed intervention-level scoring is available in **Appendices A** and **B**; the discussion below draws out the most significant cross-cutting findings.

Three structural patterns emerge from the component-level analysis. First, there is a pronounced inverse relationship between policy prevalence and inclusivity alignment. The two most prevalent components—'Shift' (28%) and 'Improve' (26%)—together account for 54% of all intervention scores, yet their alignment with the equity-oriented components ('Enhance' and 'Retain') is limited. In particular, the intervention categories that dominate 'Improve'—Clean Energy Transition and Transport Electrification—contain zero interventions aligned with 'Enhance'. This confirms that the prevailing emphasis on technology and fuel-switching, while necessary, does not address the mobility needs of underserved populations.

Second, Public Transport Access and Integration with Statutory Planning emerge as the two most cross-cutting intervention categories, appearing among the top-three aligned categories for four of the five ERASI components. These categories represent the strongest policy levers for simultaneously advancing equity and decarbonisation, as they contribute to 'Enhance', 'Retain', 'Shift', and even 'Avoid' (through integrated land-use planning). Their breadth of alignment contrasts sharply with technology-focused categories, which align primarily with a single component ('Improve').

Third, an important equity tension within the framework itself is revealed. Some 'Retain'-aligned interventions—such as the removal of encroachments to improve walkability—do not align with 'Enhance', as they can harm the livelihoods of street vendors and other socio-economically vulnerable groups who depend on streets for their economic activity. This suggests that policy interventions need to be assessed not only for their ERASI alignment score but also for potential trade-offs between components. Similarly, 'Avoid'-oriented interventions at the city level are more frequently found in climate action plans than in conventional transport plans, suggesting that climate-framing may offer a more effective entry point for demand-reduction strategies than traditional transport planning.

Across both governance levels, the NUTP (2014) [6] and NMSH Parameters emerge as the most frequently cited macro policies (See **Table 6**), contributing to all five

ERASI components. At the city level, the 'Improving Public Transportation in Rajkot' plan and the 'Climate Change and Environment Action Plan of Rajkot District' anchor the largest number of interventions, particularly for the 'Shift' and 'Retain' components. Notably, city-level climate action plans show stronger alignment with 'Avoid' and 'Enhance' principles than conventional transport plans, reinforcing the argument that achieving inclusive Net-Zero transport requires integration beyond the traditional transport planning domain.

Table 5. Synthesis of ERASI Component Alignment across Macro and City-Level Interventions.

ERASI Component	Share of Total Score	Top Aligned Intervention Categories	Key Exemplar Interventions	Notable Gap/Insight
Enhance	15%	Public Transport Access (31%); NMT Promotion (22%); Climate-Resilient Infrastructure (18%)	Organised IPT as feeder system; Well-lit stations and waiting areas; Last-mile connectivity in underserved areas; PBS stations and segregated bike lanes; Programs to increase female workforce participation	Clean Energy Transition, Transport Electrification, and Air Quality Improvement contain zero Enhance-aligned interventions. Technology-focused policies entirely bypass mobility-deprived populations.
Retain	20%	Public Transport Access (27%); NMT Promotion (22%); Integration with Statutory Planning (19%)	Multi-modal integration; Integrated land use and transport planning; Integrated ticketing and smart card systems; Safety features (GPS, panic buttons) in PT; Spatial-level planning framework integration	Retain-aligned interventions do not always align with Enhance. e.g., encroachment removal improves walkability but harms street vendors' livelihoods—exposing an equity tension within the framework.
Avoid	11%	Traffic Demand Management (38%); Integration with Statutory Planning (26%); Air Quality Improvement (15%)	Car-free zones and congestion pricing; Transport Impact Assessment; Comprehensive Mobility Plan preparation; RahaGiri (no-vehicle) days and pedestrian-only streets; City-wide Net-Zero planning	Lowest-priority component at both governance levels. City-level climate plans show higher preference for Avoid than conventional transport plans—suggesting climate framing may be a more effective entry point.
Shift	28%	Public Transport Access (26%); Integration with Statutory Planning (15%); Traffic Demand Management (14%)	Target of shifting 80% motorised trips to NMT and PT; Gender-sensitive bus schedules; TOD planning integration; EV bus deployment in BRTS; E-Rickshaw route planning based on commuter demand	Only component to which all nine intervention categories contribute. Widest breadth of interventions, indicating strong policy consensus. Predominantly supported through regulatory and informative instruments.
Improve	26%	Clean Energy Transition (37%); Transport Electrification (23%); Integration with Statutory Planning (16%)	EV fleet upgrades and charging infrastructure; Alternate fuel integration; Emission standards enforcement; Clean energy adoption in PT; Electric Mobility City Action Plans	Dominated by energy/technology interventions. Over 90% of city-level plans promote Improve, yet its ERASI alignment per intervention is narrow (mainly aligning with Improve alone, not Enhance or Retain).

Source: Prepared by the authors based on **Appendices A** and **B**.

Table 6. Key Policies and Plans Anchoring Each ERASI Component.

ERASI Component	Key Macro Policies	Key City-Level Plans (Rajkot)
Enhance	NUTP 2014; AMRUT 2015; Smart Cities Mission 2015; National TOD Policy 2017; NMSH Parameters	Improving Public Transportation in Rajkot (BRTS & Last Mile Connectivity); Climate-Resilient City Action Plan—Towards a Net-Zero Future
Retain	NMSH Parameters; NUTP 2014; AMRUT 2015; AMP 2016–26; Draft Green Urban Mobility Scheme; National TOD Policy 2017	Improving Public Transportation in Rajkot (11 interventions); Climate Change & Environment Action Plan of Rajkot District (8); Rajkot District Climate Resilience Strategy (6)
Avoid	NUTP 2014; India's NDCs (Transport Sector); AMP 2016–26. Predominantly informative and economic instruments.	Climate Change & Environment Action Plan of Rajkot District; ICLEI Climate Action Plan for Rajkot; GIZ SUM-ACA Project & Air Quality Monitoring
Shift	NUTP 2014; NMSH Parameters; AMRUT 2015. Primarily regulatory and informative instruments.	Improving Public Transportation in Rajkot (13 interventions); Climate Change & Environment Action Plan of Rajkot District (10); Rajkot District Climate Resilience Strategy (8)
Improve	NUTP 2014; NMSH Parameters; Draft Green Urban Mobility Scheme. Primarily economic and regulatory instruments.	Climate Change & Environment Action Plan of Rajkot District (12 interventions); Shakti Foundation/ICLEI Electric Mobility City Action Plan (7)

Source: Prepared by the authors.

5. Discussion and Policy Implications

In this paper, we have developed a framework for assessing transport-related policies from the perspective of the Net-Zero goal proposed by the national government and advanced by some of the state governments in India, in particular the state of Gujarat, where our case study city is located. Gujarat state has declared that all the cities in the state will achieve Net-Zero by 2070 in tandem with the proposal of the national government. Net-Zero city goal actualization requires interventions for each of the sectors of an urban system, namely buildings, transport, land use, etc. The importance of this paper lies in analysing whether the macro and city-level policies advance the goal of achieving Net-Zero transport, a sector we have focused on in this paper, in the case study city of Rajkot, located in Gujarat. Thus, this paper is a situated analysis of multiscalar urban transport sector policies in India, a country expecting a high urbanisation rate in the situation of housing the world's largest population (of about 1.5 billion).

The second important contribution of this paper is in developing the ERASI framework, which is an advancement of the ASI (Avoid-Shift-Improve) framework used globally, arguing that the latter is unsuitable for cities of India as well as the Global South given high levels of inequality in transport consumption on one hand, and lack of mobility of a large segment of the urban population on the other hand. Hence, the transport policies have to promote 'Avoid' in the case of a certain (over-consuming) segment, while 'Enhancing' mobility of a certain (under-consuming or non-consuming) segment. A dualistic framework is required to assess transport policies, which the ERASI framework establishes.

Having established this framework, this paper then takes the approach of teasing out interventions proposed from the multi-scalar policies (at the macro and city level) to analyse their potential to advance ERASI components. Given that we have teased out 168 interventions from the macro and city-level policies, for a manageable analysis, we have clubbed the interventions into nine Intervention Categories. We find that, among all the ERASI components, 'Shift' and 'Improve' together share 54% of all interventions, indicating that all policies and interventions focus on these two aspects of Net-Zero transport. Both 'Shift' and 'Improve' require significant investments in infrastructure, like shared NMT and IPT systems, public transport fleet upgrades, EV charging stations, hybrid vehicles, and alternate fuel integration, for their success. While both 'Shift' and 'Improve' are effective, they require a more phased approach for implementation due to their capital-intensive nature. It is important to note that the existing policies emphasise more access to finance, technology advancement, and fuel alternatives in private and public transport. While these are critical in the short term, sustainability and inclusivity in the transport sector can only be achieved with a very clear vision and commitment to long-term strategies.

The 'Avoid' component's lowest share of interventions (11%) resonates with urban India's transport demand, where universal access isn't a reality. This requires policies to enhance transport access and increase transport demand. Thus, this finding is consistent with India's socio-economic context, where a large workforce is engaged in on-site jobs or physical labour (sectors like agriculture, construction, and services) and a large section (women, children, elderly, urban poor and differently-abled) lacks access to transportation. Therefore, the scope for 'Avoid' strategies is limited. However, there is still a requirement to reduce transport consumption of those over-consuming private fossil-fuel-based transport. For these populations, fuel change options would work better. But, clean fuel and shift to electrification of vehicles give very low average scores in the ERASI framework.

With 15%–20% share of interventions, both 'Enhance' and 'Retain' lack representation in current macro and city-level policies. Both of these align with India's socio-economic realities, where vulnerable groups in cities like the urban poor, women, children and the elderly often lack access to reliable and efficient public transport, yet have a high share of active transport. Interventions related to Public Transport Access and Integration with Statutory Planning promote the 'Retain' component, while NMT Promotion with the other two categories contributes substantially to the 'Enhance' component. The 'Enhance' component of our ERASI framework is not anchored on promoting individual motorized transport but on promoting Public Transport Access and NMT Promotion. This is a

paradigm shift in future transport options.

This analysis shows that the tendency to lay emphasis on fuel switching in transport to cleaner fuels might not yield the expected results with regard to a Net-Zero future. Even the shift to the Electrification of Vehicles gives a low average ERASI score and hence does not contribute much to the ERASI framework for transport. In fact, governments find it easier to deal with fuel switch (such as emphasise Electrification of Vehicles, i.e., promotion of Electric Vehicles (EVs), as these appear to be a low-hanging fruit accomplished in a shorter time period. Instead, enhancement of NMT infrastructure, Spatial Planning, Public Transport access, and Traffic Demand Management, all of which provide links with land use, density, land price, road space allocation in favour of public transport and walking and cycling infrastructure, and policies to reduce private transport such as congestion charges and high parking charges would give higher results for moving towards Net-Zero transport. Many of these interventions are harder as they require negotiation of local power politics and are also long-term.

Second, Public Transport Access and Integration with Statutory Planning emerge as the two most cross-cutting intervention categories, appearing among the top-three aligned categories for four of the five ERASI components. These categories represent the strongest policy levers for simultaneously advancing equity and decarbonisation, as they contribute to 'Enhance', 'Retain', 'Shift', and even 'Avoid' (through integrated land-use planning).

Third, an important equity tension within the framework itself is revealed. Some 'Retain'-aligned interventions—such as the removal of encroachments to improve walkability—do not align with 'Enhance', as they can harm the livelihoods of street vendors and other socio-economically vulnerable groups who depend on streets for their economic activity. This suggests that policy interventions need to be assessed not only for their ERASI alignment score but also for potential trade-offs between components. Similarly, 'Avoid'-oriented interventions at the city level are more frequently found in climate action plans than in conventional transport plans, suggesting that climate-framing may offer a more effective entry point for demand-reduction strategies than traditional transport planning

6. Conclusions

While Indian cities already have a much more 'sustainable' urban form than the cities of the Global North (as seen in Section 2), very few policies focus on enabling integrated planning that ensures the continuation of compact and mixed-use cities. This would require policies that promote 'Enhance' and 'Retain' principles, through long-term strategies like land-use transport planning, land allocation policies, and land-pricing policies (the last two may not be considered to be part of traditional transport policies), and short-term easy to implement interventions such as continuous and safe sidewalks and cycle tracks, increased household access to public transit and organising intermediate public transit.

In this paper, we argue that Net-Zero Transport in Indian cities should have a situated framework, which we call the ERASI framework, pivoting on two important components, 'Enhance' and 'Retain', which are missed out in the global frameworks. At the current stage of policies and plans related to transport in India, there are certain missing aspects such as a framework, clear scalar understanding, as to which policies are more suited at the macro level and which at the city level. Both, levels of policies, including plans at the city level, mention interventions not suited to that particular level; for example, intervention on fuel used for transport is not a local/city level concern, as it is in the domain of macro (national) level policy; similarly, policy intervention related to NMT enhancement is a city level policy. These inconsistencies must be addressed through a coherent strategy, rather than by compiling a scattered list of interventions. In particular, we have flagged the need for alignment and consistency in proposed actions, ensuring they reflect the principles of the ERASI framework, rather than appearing as isolated or ad-hoc measures.

Author Contributions

Conceptualization, D.M., T.M., and S.L.; methodology, D.M. and S.L.; software, D.M. and S.L.; validation, D.M., T.M., and S.L.; formal analysis, D.M. and S.L.; investigation, D.M. and S.L.; resources, D.M. and T.M.; data curation, S.L.; writing—original draft preparation,

D.M. and S.L.; writing—review and editing, D.M., S.L., and T.M.; visualization, S.L.; supervision, D.M.; project administration, D.M. and S.L.; funding acquisition, D.M. and T.M. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

Not Applicable.

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Not Applicable.

Data Availability Statement

All supporting data is attached as appendices. No additional new data was created.

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Conflicts of Interest

The authors declare no conflict of interest.

Appendix A. Interventions & Respective ERASI Scores from Macro Policies

	Policy No.	Transport Intervention	Intervention Category	Enhance Score	Retain Score	Avoid Score	Shift Score	Improve Score	Total Score
A	B	C	D	E	F	G	H	I	J
1	A.2; A.16; A.17	Preparation of Comprehensive Mobility Plan (CMP)	Integration with Statutory Planning	1	1	1	1	1	5
2	A.2; A.14; A.15; A.16	Integrated Land Use and Transport Planning	Integration with Statutory Planning	1	1	1	1	1	5
3	A.2; A.14	Implementing Service level benchmarks (SLBs)	Integration with Statutory Planning	1	1	1	1	1	5
4	A.2; A.3; A.14	Providing road network and associated facilities	Traffic Demand Management and Decongestion	1	1	1	1	1	5
5	A.2; A.15; A.16; A.17	Providing city bus service	Public Transport Accessibility Enhancement	1	1	0	1	1	4
6	A.2; A.3; A.4; A.12; A.14; A.15; A.16; A.17	Providing a Mass-transit System (MTS)	Public Transport Accessibility Enhancement	1	1	0	1	1	4
7	A.2	Organized Intermittent public transport (IPT) as feeder to main transport system	Public Transport Accessibility Enhancement	1	1	0	1	1	4
8	A.14	Conducting Transport Impact Assessment	Integration with Statutory Planning	0	1	1	1	1	4
9	A.1; A.2	Ensure safer road infrastructure by incorporating 'zero black spots' policy and issuing safety design guidelines	Traffic Demand Management and Decongestion	1	1	0	1	1	4
10	A.2; A.3; A.14; A.15; A.16; A.17	Providing NMT Infrastructure —footpaths, cycling tracks etc	NMT Promotion	1	1	1	1	0	4

	Policy No.	Transport Intervention	Intervention Category	Enhance Score	Retain Score	Avoid Score	Shift Score	Improve Score	Total Score
A	B	C	D	E	F	G	H	I	J
11	A.2; A.17	Encourage initiatives like Rahagiri (no motor vehicle) days, bike sharing schemes and EV mobility	NMT Promotion	1	1	1	1	0	4
12	A.2; A.14; A.17	Establishing Urban Transport Fund (UTF)	Integration with Statutory Planning	0	1	0	1	1	3
13	A.2; A.3; A.4; A.14; A.16; A.17	Integrate Transit-oriented development (TOD) planning	Integration with Statutory Planning	0	1	0	1	1	3
14	A.2; A.3; A.4; A.8; A.15; A.16; A.17	Providing first and last mile connectivity	Public Transport Accessibility Enhancement	1	1	0	1	0	3
15	B2; A2; A14; A17	Women-centric NMT and PT infrastrucutre design	Public Transport Accessibility Enhancement	1	1	0	1	0	3
16	A.2; A;14; A.17	Ensuring Universal accessibility for differently abled and senior citizens	NMT Promotion	1	1	0	1	0	3
17	A.1; A.2; A.16; A.17	Ensuring safety of pedestrians and NMT	NMT Promotion	1	1	0	1	0	3
18	A.2; A.14; A.17	Transportation Demand Management (TDM) through measures like car limited zones, congestion pricing zones, no-emission zones, high parking charges etc.	Traffic Demand Management and Decongestion	1	0	1	1	0	3
19	A.1; A.2; A.16	Electronic monitoring and enforcement of road safety	Traffic Demand Management and Decongestion	1	1	0	1	0	3
20	B2, A2; A1; A.16	well-lit stations, bus stops, and surrounding areas for security and safety;	Public Transport Accessibility Enhancement	1	1	0	1	0	3
22	B.2	Gender-based Transport Planning — Separate buses or sections for female passengers; bus schedules that meet the needs of both men and women	Public Transport Accessibility Enhancement	1	1	0	1	0	3
23	A.3; A.15; A.16	Providing multi-modal integration	Public Transport Accessibility Enhancement	0	1	0	1	0	2
24	B2; A2	Gender-sensitive bus schedules that meet the needs of both men and women	Public Transport Accessibility Enhancement	1	0	0	1	0	2
25	B.2	Safety features such as GPS tracking and panic buttons in all public transport modes	Public Transport Accessibility Enhancement	0	1	0	1	0	2
26	A.1	Developing a National Transportation Policy	Integration with Statutory Planning	0	0	0	1	1	2
27	A.2; A.8; A.15; A.16	Providing parking facilities and infrastructure	Traffic Demand Management and Decongestion	0	0	1	1	0	2
28	A.2; A.12; A.15; A.16	Establish integrated waterways transportation	Public Transport Accessibility Enhancement	0	0	0	1	1	2
29	A.2; A.3; A.14; A.15; A.16; A.17	Adoption and implementation of policy for Urban Street Vendors	NMT Promotion	1	0	1	0	0	2
30	A.2; A.4; A14; A.17	Establishing Unified Metropolitan Transport Authority (UMTA)	Integration with Statutory Planning	0	1	0	1	0	2

	Policy No.	Transport Intervention	Intervention Category	Enhance Score	Retain Score	Avoid Score	Shift Score	Improve Score	Total Score
A	B	C	D	E	F	G	H	I	J
31	A.9; A.10; A.11	Providing charging infrastructure for e-vehicles	Transport Electrification	0	0	0	1	1	2
32	A.2; A.16; A.17	Integrate Intelligent Transport Management System (ITMS)	Traffic Demand Management and Decongestion	0	0	0	1	1	2
33	A.2	Install accident response system for road user safety; Emergency Medical Assistance to Road Accident Victims	Traffic Demand Management and Decongestion	0	1	0	0	0	1
34	A.13	Fiscal & taxation measures for cleaner automotive production	Clean Energy Transition	0	0	0	0	1	1
34	A.5; A.13; A.14	Strict Implementation Bharat Stage (BS) emission norms	Clean Energy Transition	0	0	0	0	1	1
36	A.2; A.4	Conducting Alternate Analysis of Mass Transit Systems	Public Transport Accessibility Enhancement	0	0	0	1	0	1
37	A.9	Encouraging retro-fitment of on-road vehicles with hybrid kit	Clean Energy Transition	0	0	0	0	1	1
38	A.12; A.17	Developing Dedicated freight corridors (DFCs) and energy efficient freight transport	Clean Energy Transition	0	0	0	0	1	1
39	A.10	State govts. to frame their own EV policy	Transport Electrification	0	0	0	0	1	1
40	A.13	Developing ‘End of life’ policy for vehicle scrapping	Clean Energy Transition	0	0	0	0	1	1
41	A.1; A.8	Guidelines related to grant of taxi permits, regulation of taxi aggregators, taxi operations, pricing, defining taxi categories etc.	Traffic Demand Management and Decongestion	0	1	0	0	0	1
42	A.1; A.14; A.17; A.2	Planning for Freight Traffic : regulation of heavy motor vehicles (HMVs) such as trucks, buses and lorries	Traffic Demand Management and Decongestion	0	0	0	1	0	1
43	A.1; A.2; A.13	Safer Vehicle: promote safety standard in vehicles through inspection and Recall of faulty vehicles	Clean Energy Transition	0	0	0	0	1	1
44	A.2; A.7; A.17	Providing financial and fiscal measures to support development and promotion of biofuels	Clean Energy Transition	0	0	0	0	1	1
45	A.6; A.14	Implementation of Fuel Economy Standards for passenger cars, HDVs & LCVs	Clean Energy Transition	0	0	0	0	1	1
46	A.7	An indicative target of 20% blending of ethanol in petrol and 5% blending of biodiesel in diesel is proposed by 2030	Clean Energy Transition	0	0	0	0	1	1
47	A.7	Development of Second Generation (2G) ethanol technologies, advance biofuels and its commercialization	Clean Energy Transition	0	0	0	0	1	1
48	A.9; A.10	Supply side incentives for manufactures of EV & components	Transport Electrification	0	0	0	0	1	1
49	A.10	Encourage interlinking of renewable energy sources with charging infrastructure	Clean Energy Transition	0	0	0	0	1	1
50	A.12	Solar powered toll plazas for emission reduction	Clean Energy Transition	0	0	0	0	1	1

	Policy No.	Transport Intervention	Intervention Category	Enhance Score	Retain Score	Avoid Score	Shift Score	Improve Score	Total Score
A	B	C	D	E	F	G	H	I	J
51	A.2; A.8; A.9; A.10; A.17	Deployment of hybrid/electric vehicles (Evs) through Demand side incentives	Transport Electrification	0	0	0	0	1	1
52	A9; A.10	An Electric Vehicle (EV) research and manufacturing zone shall be established	Transport Electrification	0	0	0	0	1	1

Note: A1: Motor Vehicles (Amendment) Act, 2019; A2: National Urban Transport Policy (NUTP), 2014; A3: National Transit Oriented Development (TOD) Policy, 2017; A4: Metro Rail Policy, 2017; A5: Second Auto Fuel Vision and Policy 2025, (2014); A6: Fuel Economy Standards; A7: National Policy on Biofuels, 2018; A8: Taxi Policy Guidelines, 2016; A9: National Electric Mobility Mission Plan 2020 (NEMMP), 2013; A10: FAME Scheme—Phase I & II, 2015 & 2019; A11: Charging Infrastructure for EVs—Revised Guidelines and Standards; A12: India's NDCs Related to Transport Sector; A13: Automotive Mission Plan 2016–26 (AMP 2026), 2015; A14: National Sustainable Habitat Parameters for Urban Transport under NMSH; A15: AMRUT, 2015; A16: Smart Cities Mission, 2015; A17: Draft Green Urban Mobility Scheme (Proposed); A18: National Clean Air Programme, 2019.

Appendix B. Interventions & Respective ERASI Scores from City-Level Policy Analysis

	Plan/Document	Intervention Categories	Intervention	'Enhance'	'Retain'	'Avoid'	'Shift'	Improve	Total
A	B	C	D	E	F	G	H	I	J
1	AMC's Climate Resilient City Action Plan—Towards a Net Zero Future (Transport Sector)	Integration with Statutory Planning	Low-carbon mobility planning with focus on vulnerable groups	1	1	1	1	1	5
2	AMC's Climate Resilient City Action Plan—Towards a Net Zero Future (Transport Sector)	Integration with Statutory Planning	Strengthening regulations for transport governance	1	1	1	1	1	5
3	Climate Change and Environment Action Plan of Rajkot District & Rajkot District Climate Resilience Strategy	Integration with Statutory Planning	City-wide net zero planning integration		1	1	1	1	4
4	IRAD's Heat Action Plan for Rajkot City	Integration with Statutory Planning	Ensure integration with spatial-level urban planning frameworks (LAP, DP, CMP)	1	1		1	1	4
5	Climate Change and Environment Action Plan of Rajkot District & Rajkot District Climate Resilience Strategy	NMT Promotion	Infrastructure development for cycling and walking	1	1	1	1		4
6	IRAD's Heat Action Plan for Rajkot City	Climate-Resilient Transport Infrastructure	Climate-resilient infrastructure Integration with main public transport network	1	1		1		3
7	Improving Public Transportation in Rajkot (BRTS and Last Mile Connectivity)	Public Transport Accessibility Enhancement	Dedicated parking spaces for IPT	1	1		1		3
8	Viksit Gujarat 2047 (Net Zero Vision—State)	Clean Energy Transition	Deployment of cleaner fuels options in public transport fleet		1		1	1	3
9	AMC's Climate Resilient City Action Plan—Towards a Net Zero Future (Transport Sector)	Clean Energy Transition	Joint development of sophisticated transport-sector GHG inventory			1	1	1	3
10	GIZ's SUM-ACA project and Air Quality Monitoring in Rajkot	Public Transport Accessibility Enhancement	Measures to improve access to public transport systems	1	1		1		3

	Plan/Document	Intervention Categories	Intervention	'Enhance'	'Retain'	'Avoid'	'Shift'	Improve	Total
A	B	C	D	E	F	G	H	I	J
11	GIZ's SUM-ACA project and Air Quality Monitoring in Rajkot	Traffic Demand Management and Decongestion	Measures to reduce traffic congestion and associated air pollution			1	1	1	3
12	AMC's Climate Resilient City Action Plan—Towards a Net Zero Future (Transport Sector)	Public Transport Accessibility Enhancement	Planning and implementation of first and last-mile connectivity solutions	1	1		1		3
13	ICLEI's and Shakti Foundation's Electric Mobility City Action Plan	Climate-Resilient Transport Infrastructure	Solutions for limited last-mile connectivity during extreme weather events	1	1		1		3
14	IRAD's Heat Action Plan for Rajkot City	Public Transport Accessibility Enhancement	Strategic planning of e-rickshaw routes based on commuter demand		1		1	1	3
15	Improving Public Transportation in Rajkot (BRTS and Last Mile Connectivity)	Climate-Resilient Transport Infrastructure	Transport infrastructure designed to withstand water logging and extreme weather events	1	1		1		3
16	IRAD's Heat Action Plan for Rajkot City	Public Transport Accessibility Enhancement	Commuter-focused approach to system design for PT				1	1	2
17	ICLEI's Climate Action Plan for Rajkot City	Transport Electrification	Deploy EV bus services and introduce new technology in BRTS				1	1	2
18	AMC's Climate Resilient City Action Plan—Towards a Net Zero Future (Transport Sector)	NMT Promotion	Removal of encroachments to improve walkability		1		1		2
19	ICLEI's and Shakti Foundation's Electric Mobility City Action Plan	Traffic Demand Management and Decongestion	Traffic flow optimization strategies			1		1	2
20	Viksit Bharat 2050 (Net Zero Vision—National)	Air Quality Improvement Measures	Air quality improvement initiatives targeting AQI < 50 in major cities				1	1	2
21	IRAD's Heat Action Plan for Rajkot City	Air Quality Improvement Measures	Analysis of temporal and spatial pollution trends			1	1		2
22	Climate Change and Environment Action Plan of Rajkot District & Rajkot District Climate Resilience Strategy	Traffic Demand Management and Decongestion	Dedicated parking zones to clear road space		1	1			2
23	Viksit Gujarat 2047 (Net Zero Vision—State)	Climate-Resilient Transport Infrastructure	Develop green infrastructure (vertical greenery, roof gardens)		1		1		2
24	Viksit Bharat 2050 (Net Zero Vision—National)	Climate-Resilient Transport Infrastructure	Establish cooling shelters, gardens, and shaded public spaces—Green Walkaways	1	1				2
25	Viksit Gujarat 2047 (Net Zero Vision—State)	Traffic Demand Management and Decongestion	Flexible and staggered work timings to reduce congestion			1	1		2
26	Improving Public Transportation in Rajkot (BRTS and Last Mile Connectivity)	Traffic Demand Management and Decongestion	Identification of vehicle emission hotspots and peaking trends			1	1		2

	Plan/Document	Intervention Categories	Intervention	'Enhance'	'Retain'	'Avoid'	'Shift'	Improve	Total
A	B	C	D	E	F	G	H	I	J
27	Climate Change and Environment Action Plan of Rajkot District & Rajkot District Climate Resilience Strategy	Climate-Resilient Transport Infrastructure	Implementation of climate-resilient transport infrastructure standards		1	1			2
28	Viksit Bharat 2050 (Net Zero Vision—National)	Clean Energy Transition	Implementation of hybrid BRT routes to improve connectivity				1	1	2
29	ICLEI's Climate Action Plan for Rajkot City	Sustainable Modal Shift Promotion	Initiatives to shift 80% of motorized trips to non-motorized transport (NMT) & public transit		1		1		2
30	Improving Public Transportation in Rajkot (BRTS and Last Mile Connectivity)	Public Transport Accessibility Enhancement	PT Network optimization focusing on distance, modal integration, and average speed improvement		1		1		2
31	ICLEI's and Shakti Foundation's Electric Mobility City Action Plan	Clean Energy Transition	Reduce the 16% contribution of transport to total GHG emissions & 35% energy consumption by transport sector				1	1	2
32	GIZ's SUM-ACA project and Air Quality Monitoring in Rajkot	Transport Electrification	Replacement of 11 conventional buses with e-buses on BRT corridors				1	1	2
33	GIZ's SUM-ACA project and Air Quality Monitoring in Rajkot	Traffic Demand Management and Decongestion	Strict parking policy for vehicle ownership			1	1		2
34	ICLEI's GHG Inventory —Urban Low-Emission Development Strategies (LEDS) for Rajkot City	Climate-Resilient Transport Infrastructure	Use LANDSAT 8 images to identify urban heat hotspots > Green Infra especially Green Walkways	1	1				2
35	Climate Change and Environment Action Plan of Rajkot District & Rajkot District Climate Resilience Strategy	NMT Promotion	Alignment with India's Net-Zero goal for 2070 for NMT Infrastructure				1		1
36	Shakti Foundation's Air Pollution Knowledge Assessment—Rajkot	Transport Electrification	Assess demand for EVs & Prepare inventory of EV database					1	1
37	GIZ's SUM-ACA project and Air Quality Monitoring in Rajkot	Clean Energy Transition	Phased mandatory blending of CNG, PNG, and compressed biogas					1	1
38	Climate Change and Environment Action Plan of Rajkot District & Rajkot District Climate Resilience Strategy	Clean Energy Transition	Promotion of cleaner fuel alternatives for freight transport					1	1
39	ICLEI's and Shakti Foundation's Electric Mobility City Action Plan	Clean Energy Transition	Reducing emissions from conventional vehicles					1	1
40	ICLEI's and Shakti Foundation's Electric Mobility City Action Plan	Traffic Demand Management and Decongestion	Smart parking systems					1	1

	Plan/Document	Intervention Categories	Intervention	'Enhance'	'Retain'	'Avoid'	'Shift'	Improve	Total
A	B	C	D	E	F	G	H	I	J
41	ICLEI's GHG Inventory —Urban Low-Emission Development Strategies (LEDS) for Rajkot City	Transport Electrification	Strengthening e-vehicle ecosystem through manufacturing and charging infrastructure support					1	1
42	ICLEI's GHG Inventory —Urban Low-Emission Development Strategies (LEDS) for Rajkot City	Transport Electrification	Target of 90% of all vehicles being electric and renewable-powered					1	1
43	ICLEI's GHG Inventory —Urban Low-Emission Development Strategies (LEDS) for Rajkot City	Transport Electrification	Accelerating transition to electric mobility powered by renewables					1	1
44	Shakti Foundation's Air Pollution Knowledge Assessment—Rajkot	Transport Electrification	Adoption of e-buses for public transport networks				1		1
45	Climate Change and Environment Action Plan of Rajkot District & Rajkot District Climate Resilience Strategy	Air Quality Improvement Measures	Air quality readings at major crossroads and adjacent local/ neighborhood streets					1	1
46	Improving Public Transportation in Rajkot (BRTS and Last Mile Connectivity)	Clean Energy Transition	Biomanufacturing and bio-foundry schemes for environment-friendly alternatives					1	1
47	GIZ's SUM-ACA project and Air Quality Monitoring in Rajkot	Transport Electrification	Continuous maintenance and updating of EV interventions					1	1

Note: Please note that this isn't an exhaustive list of interventions and scoring, only an indicative lists for reference.

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