The Urban Unit
Urban Sector Planning & Management Services Unit (Pvt.) Ltd.

Strategic Enhancements for Sustainable Transport in Pakistan:

POLICY RECOMMENDATIONS FOR ELECTRIC VEHICLE ADOPTION

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The Urban Unit

503 – Shaheen Complex, Egerton Road, Lahore
Tel: +42 99205316-22 Fax: +42 99205323
Email: uspmu@punjab.gov.pk Website: www.urbanunit.gov.pk

PREPARED BY:

1. Dr. Syed Murtaza Asghar Bukhari
   General Manager/ Senior Specialist - Transport Planning & Management

2. Mr. Muhammad Bilal
   Senior Research Analyst - Transport Planning & Management

REVIEWED BY:

3. Omer Masood
   Chief Executive Officer - The Urban Unit

FOREWARD

As Pakistan faces increasing challenges from urbanization, air pollution, and dependency on imported fossil fuels, the need for a sustainable and cleaner mode of transportation has become more pressing. In this context, electric vehicles (EVs) offer a promising solution that aligns with global efforts to reduce carbon emissions and combat climate change. The adoption of electric mobility in Pakistan is not merely an environmental necessity but also a strategic imperative to reduce reliance on imported oil, improve public health through reduced emissions, and modernize the transport sector.

The development of Pakistan's National Electric Vehicle Policy (2019) and the subsequent Electric Vehicle Policy (2020-2025) reflect a growing recognition of the transformative potential of EVs. These policies lay the groundwork for integrating electric vehicles into Pakistan's transportation landscape by addressing key areas such as infrastructure development, financial incentives, and local manufacturing. However, despite all efforts the desired transition could not be achieved so there remain significant challenges in realizing the full potential of electric mobility in the country. Therefore, in order to accelerate the transition to electric mobility, it is essential that policymakers, industry stakeholders, and the public collaborate to build a robust ecosystem that supports EV adoption.

The move towards electric vehicles is a crucial step in Pakistan's journey towards sustainable development, and with the right interventions, it can help propel the country towards a greener, more prosperous future. This under lying policy review is an effort to provide a comprehensive analysis of the existing policies on electric vehicle adoption in Pakistan, identifying gaps and offering recommendations to facilitate a smoother transition to a future of electric mobility.

Undoubtedly, moving towards electric vehicles represents a vital step in Pakistan's pursuit of sustainable development, and with the right interventions, this shift can drive the nation towards a cleaner, greener, and more prosperous future. It is time for Pakistan to embrace electric mobility as a means to achieve a cleaner, healthier, and more sustainable transport system for all.

EXECUTIVE SUMMARY

The paper, "Enhancing Pakistan's Electric Vehicle Policy: Addressing Gaps for Sustainable Transport Solutions," provides a comprehensive analysis of Pakistan's efforts to transition from conventional vehicles to electric vehicles (EVs). It evaluates key policy interventions, particularly the National Electric Vehicle Policy (2019) and the Electric Vehicle Policy (2020-2025), assessing their impact, limitations, and potential for achieving sustainable transport solutions.

The National Electric Vehicle Policy (2019) offers a broad framework for EV adoption across all vehicle categories, with a focus on phased penetration targets, financial incentives, and charging infrastructure development. While ambitious, the policy has faced challenges such as high costs, infrastructure bottlenecks, and limited impact on the two- and three-wheeler segment. The Electric Vehicle Policy (2020-2025), meanwhile, narrows its focus to electric two- and three-wheelers and heavy commercial vehicles, providing more targeted fiscal incentives for these segments. However, it also encounters hurdles related to high upfront costs, grid dependency, and insufficient charging infrastructure.

The comparison reveals that while both policies set a solid foundation for EV adoption, they fall short in terms of financial accessibility, infrastructure expansion, and timely implementation. Gaps include inadequate charging infrastructure in rural areas, lack of incentives for retrofitting, and unclear timelines for achieving policy targets.

The paper recommends updating the EV policies to include stronger consumer incentives, broader infrastructure development, and the integration of hybrid vehicles as a transition measure. Additionally, enhanced public-private partnerships and international cooperation are suggested to accelerate the deployment of EVs and meet the country's sustainability goals.

INTRODUCTION

The transportation sector in Pakistan is a major contributor to air pollution and greenhouse gas emissions. Pakistan is ranked as the 5th most vulnerable country to climate change, according to the Global Climate Risk Index. A report by IQAir-AirVisual places major Pakistani cities—Gujranwala, Faisalabad, Lahore, and Peshawar—among the 30 most polluted cities globally. Similarly, the United Nations Development Programme (UNDP) has identified Pakistan as the 7th most climate-vulnerable nation, with projected annual losses of approximately USD 3.8 billion and 0.6% of its GDP due to climate-related impacts. A recent environmental study conducted by the Urban Unit, Government of Punjab, highlighted vehicular transport as the leading contributor to pollution in Lahore, accounting for over 80% of the city's total pollutants.

The environmental challenges linked to road transportation in Pakistan are of considerable significance. On one hand, a large portion of the population depends heavily on private vehicles to access their destinations. On the other hand, the increasing number of vehicles is exacerbating environmental degradation, leading to severe negative externalities that affect both the citizens and the government.

Pakistan's vehicle fleet now exceeds 30 million, with over 80% of motor vehicles consisting of two and three-wheelers. This trend aligns with patterns seen in other goods and services, where vehicle ownership is closely tied to per capita income. Ranked 129th globally with a per capita income of USD 1,542, Pakistan's vehicle market is dominated by two-wheelers due to their affordability. Similarly, three-wheelers have secured a strong presence, driven by their low purchase cost and the lack of adequate last-mile connectivity in public transportation systems.

In contrast, cars are primarily owned by the higher-income segment, as their acquisition and operating expenses are beyond the reach of most citizens. Buses, though limited in local coverage, remain the preferred mode of public transport for longer domestic travel. The country also has a robust market for trucks of various sizes, used extensively for both local and long-distance freight transportation. This vehicle distribution pattern is reflected in Pakistan’s motor vehicle statistics and motorization rate.

Unfortunately, Pakistan's motor fleet remains heavily reliant on internal combustion engine vehicles, which are a major contributor to transport-related emissions. Although the Government of Pakistan (GoP) issued directives in August 2020 to transition to Euro 5 fuel standards, the progress has been slow, and environmental degradation continues to worsen. This issue is exacerbated by the ongoing availability of high-sulfur petroleum products at fuel stations across the country, which contribute significantly to harmful emissions. These emissions are a key factor behind the recurring SMOG and air pollution-related diseases that affect the population annually.

Additionally, many older vehicles with poor hydrocarbon conversion efficiency are common on Pakistan's roads. A significant number of two-wheelers and three-wheelers still utilize 2-stroke engines, which are less efficient compared to newer 4-stroke engines. Given the substantial size of the two-wheeler and three-wheeler segments, these vehicles generate disproportionately high emissions compared to other categories. Furthermore, catalytic converters are largely absent in these segments, particularly among two-wheelers, three-wheelers, and Heavy Transport Vehicles (HTVs).

At the same time, Pakistan is striving for self-reliance, grappling with a trade deficit primarily driven by the import of petroleum products. Gasoline (petrol) is the predominant fuel for transportation in the country, especially for two-wheelers, three-wheelers, and passenger cars, while heavy transport vehicles (HTVs) mainly use diesel. As of FY 2019-20, nearly 70% of the gasoline requirements and 35% of the diesel consumed in Pakistan are met through imports. In response, the Government of Pakistan (GoP) has implemented a series of policy directives aimed at reducing dependence on imported fuels and mitigating the negative impact on foreign exchange reserves.

The transport sector is the largest consumer of petroleum in Pakistan, followed by the energy sector. Although there has been a noticeable increase in hybrid electric vehicles (HEVs), particularly among passenger vehicles, the focus is shifting toward introducing all-electric vehicles (EVs) to fully capitalize on the efficiency gains from electrified transport. By mid-2023, there were approximately 2,500 passenger EVs on the roads, accompanied by fewer than a dozen fast-charging stations.

The growing population and rapid motorization which raised concerns about fuel dependency and environmental degradation, have prompted the need for sustainable solutions like induction of Electric Vehicles (EVs) in the country.

It will not be false to say that EV induction and adoption is seen by the political elites as a crucial step toward reducing Pakistan's carbon footprint, minimizing reliance on imported fuel, and improving air quality' therefore, identical to other developing countries, multiple efforts have been made for the induction of the electric vehicles in the country. Among these interventions; two policy documents which set the steering course include National Electric Vehicle Policy (2019) and Engineering Development Board's Electric Vehicles Policy (2020-2025). In addition to these, there are other policy interventions i.e., Automotive Development Policy 2021-26 and National Transport Policy 2018. These also include glimpses of the provisions for the electric vehicles in the country.

Despite significant efforts, the goal of transitioning from conventional fuel vehicles to electric vehicles (EVs) has not been achieved. This is largely due to the fact that the interventions proposed in the aforementioned policies did not adequately address key factors related to the adoption of EVs in the country.

This policy paper first reviews the existing policies and their proposed measures. It then identifies the gaps and successes of the two main policies aimed at introducing EVs in the city. Lastly, the paper offers recommendations based on global best practices that can be adopted to promote the widespread adoption of electric vehicles as the preferred mode of transport.

NATIONAL TRANSPORT POLICY 2018

Before delving into the core policies regarding the induction of electric vehicles (EVs) in Pakistan, it is essential to examine the National Transport Policy and its stance on electric mobility. The National Transport Policy of Pakistan (2018) aims to modernize the transport sector, emphasizing sustainability, efficiency, and inclusivity. It recognizes electric vehicles as a crucial intervention for reducing emissions and promoting eco-friendly transport. However, despite proposing several interventions to facilitate the transition to EVs across

various vehicle categories, the policy reveals significant gaps, particularly concerning two- and three-wheelers, passenger cars, and heavy-duty vehicles.

PROPOSED INTERVENTIONS FOR ELECTRIC VEHICLES IN NTP 2018

Two and Three-Wheelers Electrification: Regarding two and three-wheelers (motorcycles and rickshaws), the policy acknowledges their vital role in urban mobility, especially for middle- and low-income populations. It aims to promote the electrification of these vehicles by supporting public transport alternatives and encouraging a reduction in conventional fuel-powered options. However, it lacks a clear roadmap to incentivize the mass adoption of electric variants in this segment.

Financial Incentives for Adopting Electric Cars: The policy also suggests financial incentives such as subsidies and tax rebates for adopting electric cars and encourages private sector participation in establishing EV infrastructure. While it emphasizes phasing out internal combustion engines and mentions the use of public-private partnerships to develop necessary infrastructure, it falls short of providing specific timelines and concrete actions that would expedite the transition to electric private vehicles.

Gradual Physical Transition of Heavy Vehicles: For larger vehicles like trucks and buses, the policy promotes gradual transition to electrification, particularly within urban transit systems, such as bus rapid transit (BRT). It mentions pilot programs in major cities like Karachi and Lahore for introducing electric buses. However, there is insufficient focus on the freight sector, where heavy-duty electric trucks could play a significant role in reducing emissions. Additionally, while the policy promotes multimodal logistics hubs for freight, it does not clearly outline how electric trucks would be integrated into these systems.

Limitations of NTP 2018 in Relation to Electric Vehicles

Lack of Comprehensive Charging Infrastructure: A notable limitation of the policy is its vague approach to developing a robust nationwide charging infrastructure. Although it mentions the installation of EV charging stations, it lacks a clear implementation plan and detailed distribution strategies, particularly for rural or less accessible areas. This gap is especially concerning for electric cars and heavy-duty vehicles, which require extensive charging networks to operate effectively.

Limited Focus on 2-3 Wheelers: While the policy identifies the critical role of two- and three-wheelers in urban transport, it does not adequately address the financial barriers to adopting electric vehicles in this category. Given their potential to significantly reduce urban air pollution, the policy could benefit from more targeted incentives, such as affordable financing options, widespread subsidies, and public awareness campaigns to promote the transition.

Unclear Incentives for Private Sector Involvement: although the policy emphasizes the importance of private sector engagement in developing EV infrastructure and manufacturing, it lacks detailed plans or guidelines on incentivizing private investment in the production and distribution of electric vehicles. This could impede progress in electrifying the vehicle market, especially for cars and heavy-duty vehicles, where significant private sector investment is essential for scaling up.

Lack of Detailed Transition Strategies: While electric buses for public transit are included in the policy, the framework for integrating electric heavy-duty trucks into logistics systems is underdeveloped. Given that heavy vehicles contribute significantly to emissions in freight transport, the lack of detailed strategies for

transitioning these vehicles to electric alternatives could limit the overall effectiveness of the policy in reducing transport sector emissions.

In summary, the National Transport Policy of Pakistan lays a necessary foundation for electrifying the transport sector but requires refinement to address several key limitations. Although the proposed interventions for electric vehicles, particularly in the areas of private cars, two- and three-wheelers, and heavy-duty vehicles, indicate an understanding of the need for sustainable transport solutions, the absence of detailed action plans, timelines, and robust infrastructure incentives will likely hinder the country's ability to achieve its EV objectives.

Addressing these gaps is critical to fully realizing the environmental and economic benefits of transitioning to electric vehicles in Pakistan. The success of this transition depends on overcoming challenges related to infrastructure, affordability, and developing a local manufacturing ecosystem. Further refinement and targeted interventions are essential to ensure that the goals of sustainable transport, especially concerning two- and three-wheelers, private cars, and heavy-duty vehicles, can be effectively achieved.

Lastly, it is also important to note that the National Transport Policy is issued by the Federal Ministry of Communications and is not binding on the provinces. Each province operates under its own regulations, such as the Motor Vehicle Ordinance of 1965 and the Motor Vehicle Rules of 1969, which do not address electric vehicles. Furthermore, none of the provinces have developed their own transport policies or guidelines regarding the induction or regulation of electric vehicles, creating a regulatory gap in this area.

AUTOMOTIVE DEVELOPMENT POLICY 2016-2021

The Automotive Development Policy (ADP) 2016-2021, issued by the Engineering Development Board under the Federal Ministry of Industries and Production, Government of Pakistan, provided a comprehensive framework for advancing the country's automobile industry. It aimed to boost production, promote localization, and enhance the sector's economic contribution. However, in the context of electric vehicles (EVs) and the global shift toward sustainable transportation, the policy exhibited both strengths and significant limitations. While it laid a foundation for growth, its approach to EV development was less progressive compared to the global trend toward cleaner, greener mobility.

Proposed Interventions for Electric Vehicles in ADP 2016-2021

Greenfield Vs Brownfield Investment Categories: The ADP sought to attract new investment, boost competition, and expand consumer options while aligning the automotive industry with international safety and environmental standards. It introduced two investment categories: **a)** Greenfield (new vehicle production facilities), and **b)** Brownfield (revival of non-operational facilities), offering incentives like concessional duty rates on parts and duty-free machinery imports for assembly plants.

CKD vs CBU: The policy placed a strong emphasis on localization and vehicle assembly through CKD (Completely Knocked Down) operations instead of importing CBUs (Completely Built Units). The ultimate goal was to build a robust domestic automotive industry, laying the groundwork for future growth in electric vehicle production.

Tariff Reduction Strategy: Despite the lack of explicit focus on electric vehicles (EVs), some indirect measures were proposed that could have supported their development. The tariff reduction strategy, intended to boost local production and reduce costs, provided a potential advantage for EV manufacturers. Additionally, the policy advocated for incentivizing the import of non-localized parts at reduced duty rates. This proposal aimed to facilitate EV production, which heavily depends on imported technologies and components like batteries and electric powertrains. Although these measures weren't directly targeted at EVs, they offered some leverage for the industry's growth.

Aside several proposals, a major shortcoming of the ADP was its failure to implement concrete measures for the development and integration of electric vehicles within the broader automotive sector. Globally, many countries have embraced policies that actively promote EV adoption through subsidies, infrastructure investment, and regulatory support for clean energy technologies. In contrast, the ADP 2016-2021 focused largely on bolstering the traditional internal combustion engine (ICE) vehicle market, with minimal emphasis on EV-specific initiatives—a clear missed opportunity for the country's transition to cleaner transport.

Limitations of ADP 2016-2021 in Relation to Electric Vehicles

Constraints for Electric Two and Three Wheelers: The policy also acknowledged the rapid increase in the production and use of two- and three-wheelers, particularly motorcycles and auto rickshaws. However, it failed to prioritize the shift to electric models in this segment, which is essential for curbing urban pollution and reducing fuel dependency. With two-wheelers making up a large portion of Pakistan's transport sector, transitioning to electric models could have a significant environmental impact. Unfortunately, the policy's lack of incentives, such as reduced import duties on EV components and support for charging infrastructure, represented a major missed opportunity.

Constraints for Electric Cars: The ADP anticipated substantial growth in passenger vehicle production, but it overlooked the EV car market. This oversight stemmed from the lack of direct subsidies, tax incentives, and reduced customs duties, which are crucial for encouraging EV production and sales. As a result, manufacturers found it difficult to view Pakistan as a viable market for EVs. Additionally, the absence of efforts to establish a **national charging infrastructure** hindered the widespread adoption of electric vehicles.

Constraints for Electric Heavy Vehicles: The heavy vehicle segment, including buses and trucks, plays a vital role in urban and intercity transport. However, the ADP failed to address the need to transition this sector to electric or hybrid technologies, which are critical for reducing emissions and enhancing efficiency in freight and public transport systems. While global trends increasingly favor electric buses and trucks for urban mobility, Pakistan's policy framework lagged in promoting this essential shift. Moreover, the absence of infrastructure for high-capacity vehicle charging and a lack of support for innovation in EV technology for heavy vehicles further hindered growth in this crucial segment.

The ADP 2016-2021, while ambitious in its objective to boost production and investment in the automotive sector, fell short in terms of electric vehicle development. The policy remained focused on traditional automotive technologies and did not actively engage with the global EV revolution.

Evidently, despite the various proposals outlined in the policy, limitations persist that hinder the recognition of electric vehicles (EVs) as a preferred mode of transport and their effective integration into the country. It is fair to say that contradictions exist among the notified policies, reflecting a dual standard in the treatment

of the vehicle fleet in Pakistan. This inconsistency is also evident within the Automotive Development Policy 2016-2021, which further complicates the push for EV adoption.

To effectively integrate electric vehicles into Pakistan's transport landscape, relevant departments recognized the need for a comprehensive policy to address gaps in EV manufacturing incentives, promote charging infrastructure development, and support a gradual transition from conventional ICE vehicles to sustainable electric alternatives. This led to the drafting of the National Electric Vehicle Policy (2019), considered as a key step towards building a cleaner, greener future for all vehicle segments.

NATIONAL ELECTRIC VEHICLE POLICY (2019)

The National Electric Vehicle (EV) Policy of Pakistan, published in 2019, is an ambitious step toward addressing the country's climate change challenges while simultaneously aiming to reduce the dependency on fossil fuel imports and emissions across all vehicle segments: cars, buses, trucks, and two- and three-wheelers. It focuses on climate change mitigation by encouraging EV adoption and reducing the oil import bill.

Proposed Policy Interventions

Phased EV Penetration Targets: The policy outlines a three-phase plan: market development, fuel import reduction, and local EV manufacturing/export. It sets targets for EVs such as 100,000 cars and 500,000 two- and three-wheelers by 2025. The policy sets progressive goals to promote EV adoption across multiple vehicle categories. It outlines three phases:

- Phase 1 (Years 1-2): Market development and public awareness, incentivizing the setup of local EV-related industries.
- Phase 2 (Years 3-4): Substitution of fuel imports with local assembly and manufacturing of EVs.
- Phase 3 (Years 5 and beyond): Encouraging local production and export of EVs and their components.

Specific Focus on Different Vehicle Segments: The policy provided a specific focus on different vehicle segments i.e., modes. Acknowledging the dominance of 2-3 wheelers i.e., motorcycles and rickshaws in Pakistan, the policy provides incentives for local manufacturers to shift toward producing electric two- and three-wheelers. Import duties on EV components are reduced to 1%, and sales taxes are waived to make e-bikes and e-rickshaws affordable.

Regarding cars (4-Wheelers), the policy targets a significant shift to electric passenger cars by offering a range of tax and duty reductions. These include zero registration fees, exemption from federal excise duties, and concessional import duties for manufacturers. The goal is to make 30% of new car sales electric by 2030.

In the domain of heavy vehicles i.e., buses and trucks: the government proposes lower import duties and taxes to support local assembly and manufacturing for manufacturing of electric buses and trucks. Given the high initial cost of electric buses, commercial operators are encouraged to adopt them by leveraging financing schemes, and EVs are prioritized for Bus Rapid Transit (BRT) systems.

Customs Duty Exemptions, Tax Reductions, and Subsidies: The policy advocates for leveraging incentives include customs duty exemptions, tax reductions, and subsidies for local EV manufacturing.

Inter-Ministerial Committee and a National Center for Electric Vehicles: The establishment of an Inter-Ministerial Committee and a National Center for Electric Vehicles is also proposed in the policy to oversee the EV industry's development and promote research and innovation.

Charging Infrastructure and Ecosystem: The previously missed aspect of charging infrastructure has been considered as important requirement in this policy and a robust plan for developing EV charging infrastructure is proposed. This includes the installation of fast-charging stations in major cities and along highways, with a focus on creating an ecosystem that eliminates range anxiety for users.

Limitations of the NEVP 2019

Undoubtedly, the policy being the first of its kind is a significant effort for promotion of Electric mobility culture in the country wand provides specific focus on various modes of commuting; however, the policy lacked with respect to cost barriers for electric buses and trucks and had limited immediate impact for 2-3 wheelers. It is because the policy had ambiguities in implementation timeline consequential of bottlenecks in infrastructure development.

Infrastructure Development Bottlenecks: The development of charging stations, especially in rural areas, could face significant delays. The policy's focus on major cities and highways overlooks smaller towns and rural regions, where electric vehicle adoption might lag without adequate charging infrastructure.

Cost Barriers for Electric Buses and Trucks: The policy acknowledges that the cost of electric buses and trucks remains prohibitively high. Even with incentives, electric buses are four times more expensive than their fossil-fueled counterparts, making large-scale adoption unlikely without substantial government support or external investment. The policy's reliance on future cost reductions without specifying financial safety nets for the early years could delay the widespread deployment of these vehicles.

Limited immediate Impact for 2-3 Wheelers: Although 2-3 wheelers form the largest share of Pakistan's vehicle market, the policy's emphasis is on incentivizing new production rather than converting existing vehicles to electric. The lack of focus on retrofitting options could slow down the overall shift, especially for owners of older motorcycles and rickshaws who may not afford new electric models.

Ambiguity in Implementation Timeline: While the policy sets phased targets, it lacks clear details on how the government intends to overcome the challenges in setting up local manufacturing units or resolving issues in the existing supply chain. Furthermore, the policy does not clarify how these ambitious penetration goals will be met, especially given Pakistan's nascent EV market.

It has been observed that since the formation of the Inter-Ministerial Committee, only two or three meetings have taken place. This is largely due to the inclusion of high-ranking ministers and government officials who are often unavailable. Similarly, the National Center for Electric Vehicles has not yet become operational as intended. These issues reflect a lack of government commitment to providing effective administration, leadership, and regulatory oversight.

Overall, the National Electric Vehicle Policy presents a solid framework for encouraging EV adoption across various vehicle categories. However, while the proposed incentives for 2-3 wheelers, passenger cars, and

commercial vehicles are promising, significant hurdles remain. High upfront costs, limited retrofitting options, and infrastructure bottlenecks may impede the policy's success in the near term. To ensure its long-term viability, the government will need to address these challenges through sustained investments, clear regulatory frameworks, and public-private partnerships.

Electric Vehicles Policy (2020-2025)

Contrary to National Electric Vehicle Policy (NEVP) of Pakistan, published in 2019, the Electric Vehicle Policy (EVP) of Pakistan (2020-2025) drafted by Engineering Development Board and approved by Government of Pakistan in April 2020 focuses specifically on two- and three-wheelers i.e., rickshaws and, heavy commercial vehicles (HCVs) i.e., trucks, aiming to facilitate a gradual shift without disrupting the existing automotive industry.

The policy outlines various incentives to encourage local manufacturing, investment, and market uptake of electric vehicles. Further, the policy introduces tariff incentives, reducing duties on EV-specific parts (motors, batteries) and promoting local production employing a phased approach. It is envisaged that EV supply chain be localized by offering incentives for assembly and production encouraging investments in EV infrastructure. Moreover, production of the EV batteries and motors locally is emphasized with special consideration for job creation and industrial growth.

Proposed Policy Interventions

Tariff and Fiscal Incentives for 2-3 Wheelers and Heavy Commercial Vehicles (HCVs)*:* The policy provides significant tariff reductions for electric two- and three-wheelers, which include motorcycles, scooters, rickshaws, and loaders. Custom duties on electric vehicle components such as motors, batteries, and drivetrains are reduced to 1%, while locally manufactured parts remain subject to the existing tariff structure of 46%. Additionally, the policy proposes a 1% sales tax for locally manufactured 2-3 wheelers and waives import stage sales tax on complete knock-down (CKD) units. Similar incentives are also extended to HCVs, which include trucks, buses, and prime movers. For these vehicles, the policy suggests reducing custom duties on non-localized parts and CKD imports to 1%, offering tax exemptions on registration and token fees, and facilitating financing through the State Bank of Pakistan's green banking guidelines.

Charging Infrastructure Development*:* A significant element of the policy is the development of charging infrastructure, which is recognized as a critical enabler for EV adoption. The policy outlines plan to install fast chargers in major cities and along motorways and highways every 15-30 kilometers. The provision of swappable battery facilities is also suggested for public charging stations to accommodate different categories of vehicles. To further ease infrastructure development, existing CNG and fuel stations are encouraged to establish EV charging facilities.

Localization and Promotion of EV Manufacturing*:* The policy encourages local manufacturing of EVs and their parts, offering duty and tax exemptions for the import of machinery and equipment related to EV manufacturing. Additionally, the government provides incentives such as five-year income tax exemptions for manufacturers of EV-related equipment and infrastructure. New entrants are allowed to import electric vehicles at a concessionary rate of 50% of prevailing custom duties, provided they establish local manufacturing within two years.

While the policy demonstrates a strong intent to shift towards greener technologies, there are notable challenges and limitations in achieving its ambitious goals.

Limitations of the EVP 2020-25

High Initial Costs and Limited Affordability*:* One of the primary limitations highlighted in the policy is the high upfront cost of electric vehicles, especially due to the expensive battery technology. While the policy provides some financial incentives, it does not fully address the issue of affordability for the average consumer. In particular, the lack of direct subsidies for consumers means that EV adoption may remain out of reach for many, particularly in the 4-wheeler and heavy commercial vehicle segments.

Infrastructure Gaps and Challenges*:* Despite the focus on developing charging infrastructure, the current state of Pakistan's road network, especially in less developed areas, presents a significant challenge for EV adoption. The policy relies heavily on existing fuel stations to set up EV chargers, but the lack of a dedicated EV charging infrastructure could limit the range and reliability of EVs, particularly for long-distance heavy commercial vehicles. Additionally, the policy mentions a lack of conformity assessment mechanisms in Pakistan, which could affect the standardization and quality control of EV equipment.

Environmental Concerns and Grid Dependency*:* While the policy aims to reduce emissions from the transport sector, Pakistan's reliance on fossil fuels for electricity generation means that the environmental benefits of EV adoption might be undermined. Without a shift toward cleaner energy sources for power generation, EVs could still indirectly contribute to pollution, limiting their potential environmental benefits. The policy also does not fully address the safe disposal of EV batteries, which can be hazardous to both human health and the environment.

Limited Scope for Hybrid and Advanced Vehicle Technologies*:* The policy largely focuses on electric 2-3 wheelers and heavy commercial vehicles, leaving hybrid and hydrogen fuel cell technologies unaddressed. While hybrid vehicles are more cost-effective and could serve as a transition towards full electrification, the policy overlooks incentives for this segment. This gap may hinder the broader adoption of green technologies across all vehicle categories.

Overall, EVP 2020-2025 indubitably takes an important step toward sustainable transportation by promoting electric two- and three-wheelers (rickshaws) as well as heavy vehicles (buses and trucks), it faces several obstacles. High costs, infrastructural deficiencies, and dependence on fossil fuel-based electricity pose significant challenges. A broader focus on hybrid technologies, improved road networks, and cleaner energy sources is crucial for the policy to achieve its long-term objectives effectively.

GAPS AND GAINS: NATIONAL ELECTRIC VEHICLE POLICY 2019 VS ELECTRIC VEHICLES POLICY 2020-2025

Scope and Focus: The NEVP 2019 policy is comprehensive, covering all vehicle types, while the EVP 2020-2025 policy narrows its focus to two- and three-wheelers and HCVs. This narrower focus is more feasible for immediate implementation given Pakistan's current infrastructure. Moreover, the broader scope of the NEVP 2019 policy provides more opportunities for EV adoption across vehicle types, but the EVP 2020-2025 policy takes a more realistic approach by focusing on sectors that dominate Pakistan's vehicle market.

Incentives: Both policies offer substantial economic incentives. The NEVP 2019 policy provides more extensive incentives for local EV manufacturing, including reductions in customs duties and tax exemptions. The EVP 2020-2025 policy similarly offers tariff incentives but focuses more on small vehicles and HCVs.

The NEVP 2019 policy includes a detailed phased approach to supporting EV manufacturing and export, while the EVP 2020-2025 policy is more practical, emphasizing local manufacturing and cost reductions for smaller vehicles and HCVs.

Infrastructure Development: The NEVP 2019 policy presents a detailed plan for rolling out charging stations across major urban centers and highways to alleviate "range anxiety" for EV users. In contrast, the 2020-2025 policy focuses more on localized charging solutions for two-wheelers and commercial vehicles, which is a more attainable goal in the short term.

Limitations: Both policies lack substantial financial support for consumers, which may hinder EV adoption due to high upfront costs. Furthermore, the NEVP 2019 policy's goal of achieving 30% EV penetration by 2030 was overly optimistic given the country infrastructure and market readiness. Contrary, the 2020-2025 policy is more cautious, adopting a phased approach that acknowledges the challenges of EV adoption, particularly for HCVs, but may delay the broader adoption of EVs across other vehicle types.

Undoubtedly, both the policies being novel of their kind provides a strong foundation for the adoption of electric vehicles in Pakistan. However, the success of this transition from conventional petroleum modes to electric vehicles hinges on addressing gaps in infrastructure, affordability, and the development of a local manufacturing ecosystem. Further refinement and more targeted interventions will be needed to ensure that the goals of sustainable transport, particularly concerning 2-3 wheelers, private cars, and heavy-duty vehicles, can be realized.

Therefore, to align with global trends and Pakistan's environmental goals, the electric vehicle policy of Pakistan should broaden its scope and expand its focus beyond two- and three-wheelers and HCVs, incorporating light commercial vehicles and cars to accelerate the transition to EVs.

Likewise, a cohesive national infrastructure development plan is needed, including public-private partnerships to ensure faster deployment of charging stations across the country.

The EV penetration targets should be revised i.e., should not be unrealistic like NEVP 2019 and be more achievable goals. Introducing hybrid vehicles could serve as an interim solution while the country scales up its EV infrastructure and production capabilities.

Undoubtedly substantial consumer subsidies or financing schemes to make EVs more affordable need to be provided to fasten the transition. Offering low-interest loans or lease programs could encourage mass adoption, particularly for low-income consumers which presently are unable to procure EVs in the country. It is because the average cost of an EV Two-wheeler is PKR 250,000 - 300,000 whereas identical petrol using motorcycle cost approximately PKR 125,000 - 200,000. Likewise, a petroleum three-wheeler rickshaw cost PKR 250,000 - 300,000 whereas an electric rickshaw cost PKR 415,000 - 550,000. Moreover, brand new electric vehicle cost around PKR 3.5 million to PKR 8 million. The prices of the electric vehicles are on average 20-30% above the petroleum-based competitors; thus way above the affordability limits of a low income household.

In addition to above, there exists a trust deficit with respect to durability and long-term operations of the electric vehicles especially in two and three wheelers vehicle segment. One reason stated while choosing among a conventional petroleum vehicle and EV is battery maintenance. It is utmost necessary that the said deficit be overcome via inclusion of private sector and end users in the policy drafting. Rigorous campaigns depicting benefits of these EVs and long-term durability be made to change people opinion.

Moreover, stronger regulations on EV battery disposal and recycling should be introduced to address environmental concerns associated with EV production and usage.

FEW EXAMPLES FROM GLOBAL BEST PRACTICES

Prior to proposing any recommendations pertaining to gaps in requisite regulatory reforms, monetary incentives, infrastructure needs, and awareness campaigns that can serve as catalyst and trigger the preference for the electric vehicle as mode of transport the long-lasting desire of the policy; it is important to examine what has been done globally with respect to adaption of electric vehicles.

Shenzhen, China

Shenzhen has become the world's first city to fully electrify its public bus fleet, a result of coordinated efforts between the local government, state-owned bus companies, and financial incentives. The city offers subsidies, easy financing options, and sets clear mandates for EV adoption.

Santiago, Chile

Chile has committed to making its capital city's public transport fully electric by 2040. The government provides financial incentives for bus companies to adopt electric buses, and it has developed a partnership with energy companies to build necessary charging infrastructure.

Norway

Norway provides significant tax exemptions for EV purchases, coupled with extensive charging infrastructure, which has made it a global leader in electric vehicle adoption. The government also set ambitious goals to end the sale of new petrol and diesel vehicles by 2025.

PRIORITIES MOVING FORWARD – ELECTRIC VEHICLE POLICY FOR ALL

Formulating a comprehensive policy to facilitate the induction of electric transport vehicles (EVs) in Pakistan, particularly public transport vehicles, requires a holistic approach that integrates regulatory, financial, infrastructural, and institutional measures. Drawing upon best practices from countries leading in EV adoption, the following step-by-step policy framework is proposed. The existing policies needs to be updated in light of the following recommendations which based on global best practices will help to align Pakistan electric vehicle sector with its people needs and expectations;

Regulatory Framework and Legal Interventions

To create a conducive environment for the adoption of EVs, Pakistan must enact and update legislation across multiple areas, ensuring a seamless and supportive framework for electric vehicle induction.

a. Legal Revisions in Existing Policy

- Update Fuel Tax Laws: Amend fuel tax laws to gradually phase out subsidies for fossil fuels while providing tax incentives for EVs.

- Inclusion in National Transport Policy: Ensure that electric public transport is integrated into the National Transport Policy, aligning with sustainability and emissions reduction goals. This approach is similar to the electric bus mandates introduced in Santiago, Chile, as part of the city's broader public transport strategy. These mandates aim to transition the public transport fleet to electric vehicles, promoting sustainable urban mobility and reducing emissions in line with global best practices.

- Enforcement of Emissions Standards: Implement stricter emissions standards for public and private vehicles, gradually phasing out older, highly polluting vehicles. In United States, California's Zero-Emission Vehicle (ZEV) Program serves as an excellent model. This program mandates that automakers sell a specific percentage of zero-emission vehicles, effectively driving the adoption of cleaner transportation technologies and setting a strong precedent for other regions.

- Mandate Zero-Emission Zones: Designate urban zones where only zero-emission vehicles (ZEVs) can operate, encouraging operators to switch to electric vehicles. Cities like Shenzhen, China, give electric buses priority at traffic signals, reducing travel time and improving operational efficiency.

- Update Vehicle Registration Rules: Modify the registration process to prioritize EVs through fast-track registrations and reduced registration fees. Several US states have made provisions for electric buses to have lower licensing fees compared to diesel or petrol buses.

- EV Adoption Targets: Set mandatory EV adoption quotas for public transport companies, with specific deadlines. For example, the European Union has set a goal that by 2025, at least 25% of new public transport buses must be electric.

- Phase-Out of Fossil Fuel Vehicles: Introduce a phased ban on the registration of new diesel and petrol public transport vehicles, similar to the bans implemented by countries like France and the UK, aiming for 2030 and 2040, adoption goals respectively.

b. Formulation of EV-Specific Regulations

- EV Licensing and Safety Standards: Develop specific safety standards for EVs and a certification process for public transport EVs.

- Charging Infrastructure Regulations: Legislate guidelines for EV charging station infrastructure, ensuring consistency, safety, and accessibility. This standardization, as seen in Germany, helps EV adoption by simplifying the setup of infrastructure.

- Battery Disposal and Recycling Laws: Implement strict regulations on battery disposal and recycling to address environmental concerns associated with EV batteries.

Monetary Incentives and Financial Facilitation

To drive the adoption of EVs, both consumers and public transport operators need substantial financial incentives.

a. Subsidies for Public Transport Operators

- Upfront Subsidies for EV Purchase: Offer direct subsidies (e.g., 20-30%) to bus and fleet operators for purchasing electric buses and vans, taxis, or rickshaws. India's FAME II scheme offers subsidies to encourage the production and use of electric vehicles in public transport.

- Low-Interest Loans for Fleet Electrification: Partner with financial institutions to offer low-interest loans for electric vehicles particularly public transport operators transitioning to EVs. These loans could be partially guaranteed by the government. China's government, for instance, collaborates with banks to offer easy financing options for electric bus fleets. Likewise, the UK's "Ultra-Low Emission Bus Scheme" provides funding for local transport authorities to replace old buses with cleaner alternatives.

- Subsidized Import Duties: Waive or significantly reduce import duties and taxes on electric buses, EV components, and charging equipment.

- Scrappage Incentives for Old Vehicles: Implement a scrappage policy that provides financial incentives to retire old, polluting public transport vehicles and replace them with EVs.

b. Taxation Reforms

- Reduced Sales Tax/ VAT for EVs: Introduce a reduced VAT or sales tax for EV purchases, particularly for public transport vehicles. Norway has successfully adopted this, making EVs more affordable by waiving Value Added Tax (VAT) on EV purchases.

- Income Tax Rebates for EV Owners: Offer income tax rebates for companies or individuals investing in electric public transport vehicles.

- Fuel Levy for Polluting Vehicles: Introduce or increase a fuel levy on diesel and petrol vehicles to create a financial disincentive for their use, pushing operators toward EVs.

c. Incentives for Local Manufacturing

- EV Parts Manufacturing Subsidies: Offer subsidies or tax incentives to local manufacturers of EV components like batteries, chargers, and electric motors.

- Reduced Import Duties on EV Raw Materials: Waive or reduce import duties on materials used in the local manufacturing of EV components.

Charging Infrastructure Development

Charging infrastructure is critical for the successful adoption of electric public transport. A dedicated approach to the establishment of reliable, accessible, and affordable charging stations is required.

a. Public-Private Partnerships (PPP)

- Incentivize Private Investment: Offer tax rebates or long-term low-interest loans to private companies investing in EV charging stations. Germany and the Netherlands lead in this area with extensive charging networks, which have been co-funded by the government and private investors. Likewise, In the UK, London's electric bus fleet is managed through collaborations between the government and private bus operators.

- Subsidized Land for Charging Stations: Provide subsidized or free land in strategic locations (bus depots, key urban areas) for the installation of fast-charging stations.

b. Mandate Charging Stations in Urban Planning

- EV-Ready Building Codes: Update building codes to mandate the installation of EV charging points in all new commercial and residential buildings, public parking lots, and bus depots.

- Highway and Urban Charging Network: Implement a national plan to deploy fast chargers along highways and key urban corridors, ensuring adequate infrastructure for public transport EVs.

c. Standardization and Interoperability

- Establish National Charging Standards: Define national standards for charging equipment to ensure interoperability and prevent technological fragmentation.

- Battery Swapping Stations: Introduce battery swapping stations for electric vehicles to reduce downtime spent on charging. Cities like Shenzhen (China) have implemented this, reducing the time spent off the road due to charging.

- Smart Charging Infrastructure: Encourage the deployment of smart charging systems that optimize charging times and reduce strain on the national power grid.

Grid and Energy Supply Integration

As EV adoption increases, so will the demand for electricity, necessitating a reliable and sustainable energy supply.

a. Renewable Energy Integration

- Solar-Powered Charging Stations: Promote solar-powered or hybrid charging stations, particularly in rural or off-grid areas.

- Incentivize Renewable Energy in Grid Expansion: Encourage the use of renewable energy in power grid expansion, offering subsidies for solar and wind energy projects that support EV charging.

Netherlands has a similar model where local governments work with private entities to ensure the grid can handle the demand from electric vehicle charging.

b. Grid Capacity Enhancements

- Grid Modernization Investments: Invest in upgrading the national grid to handle increased electricity demand from EVs. This can be achieved through smart grid technologies and decentralized energy generation.

Public Awareness and Capacity Building

For a successful transition to EVs, awareness, training, and capacity building are essential.

a. Public Awareness Campaigns

- Promote Environmental and Economic Benefits: Launch nationwide campaigns educating public transport operators and consumers on the environmental, economic, and operational benefits of electric vehicles. Likewise, organize public education campaigns to raise awareness about the benefits of EVs. Brazil has initiated awareness programs that engage citizens in EV adoption by explaining the economic and environmental benefits.

- Reduced Fuel and Maintenance Costs: Promote awareness about how EVs have lower operational costs compared to diesel or petrol vehicles. This was successfully highlighted in several cities in the US (e.g., Los Angeles), encouraging fleet operators to transition to EVs.

- Demonstration Projects: Pilot electric public transport projects in major cities to showcase success stories, building public confidence in the technology.

b. Capacity Building Programs

- EV Technician Training: Develop training programs for mechanics and technicians in the maintenance of electric public transport vehicles and charging infrastructure. Norway's policy includes state-supported training for professionals in electric vehicle maintenance.

- Public Transport Operator Training: Offer specialized training programs for operators transitioning to electric fleets, focusing on fleet management, energy optimization, and safety.

c. Research and Development

- Research and Innovation Centers: Set up state-backed research and innovation centers for EV technology, focusing on developing low-cost electric public transport solutions. Countries like Japan and South Korea fund EV-related research to make their public transport systems more efficient and environmentally friendly.

6. Institutional Coordination and Governance

To ensure the effective implementation of EV policies, institutional coordination is key.

a. Establishment of a National EV Taskforce

- Centralized Policy Implementation: Establish a national EV task force responsible for overseeing policy implementation, coordinating across government agencies, and liaising with industry stakeholders.

- Regional and City-Level Coordinators: Appoint regional and city-level EV coordinators to ensure local-level implementation, particularly in major urban centers like Karachi, Lahore, and Islamabad.

b. Periodic Policy Review and Feedback Mechanisms

- Annual Policy Review: Institute annual reviews of the EV policy to assess progress, address challenges, and incorporate technological advancements.

- Stakeholder Engagement Platforms: Establish platforms for ongoing consultation with public transport operators, manufacturers, energy providers, and consumers to refine and improve policy implementation.

International Cooperation and Financing

Leverage international cooperation for knowledge transfer and access to financing.

a. Bilateral and Multilateral Partnerships

- Engage with EV-Leading Countries: Partner with countries that have established successful EV ecosystems, such as China, Norway, and the Netherlands, to exchange knowledge, technology, and best practices.

- Access International Financing: Explore opportunities for concessional financing or grants from international institutions such as the World Bank, Asian Development Bank (ADB), and Green Climate Fund (GCF) for EV infrastructure and fleet transition projects.

CONCLUSION

Pakistan's transition to electric public transport requires a comprehensive approach that combines regulatory reforms, financial incentives, infrastructure development, and international cooperation. Current policies, though ambitious and segmental, show a clear intent to promote sustainable transportation by offering significant incentives for electric vehicle (EV) manufacturing, such as reduced customs duties and tax exemptions. The Electric Vehicle Policy (2020-2025) targets crucial segments like two- and three-wheelers, providing tariff reductions, while the National Electric Vehicle Policy (2019) outlines a phased plan for EV adoption, aiming to build necessary infrastructure. However, these initiatives are constrained by unrealistic targets, limited focus on larger vehicle categories, and an absence of a cohesive nationwide plan, especially for rural areas.

Despite these positive steps, several limitations hinder progress. The 2019 policy's ambitious goal of 30% EV penetration by 2030 is unattainable given the country's current infrastructure and market preparedness. Furthermore, the financial incentives for consumers, particularly lower-income individuals who dominate the two- and three-wheeler market, remain insufficient. A lack of focus on retrofitting existing vehicles and an underdeveloped charging network, particularly for heavy vehicles, further delay adoption. Additionally, slow government commitment and inconsistent policy implementation have stalled progress. To accelerate EV adoption, the report suggests a more realistic timeline, enhanced financial support for consumers, stronger public-private partnerships, and the introduction of hybrid vehicles as a transitional solution. Addressing these gaps is vital for Pakistan to successfully achieve its sustainable transport goals.

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