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## **POLICY BRIEF: THE PROMISING ROLE OF ELECTRIC TWO- & THREE-WHEELERS IN INDIAN CITIES**

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India is uniquely positioned to scale up the deployment of electric vehicles (EVs), leapfrogging traditional mobility models that perpetuate congestion, air pollution and oil dependence, while enhancing innovative business models and driving down costs of components' manufacturing. As India undergoes a deep economic transformation, rapid growth in passenger and freight demand will necessitate a shift towards more sustainable transport solutions. Two and three-wheelers (2/3Ws) have enormous relevance to Indian cities, and electrifying them holds immense potential to transform commuting and transport of goods. This shift promotes affordable, equitable and accessible options while also decarbonizing the transport system in the country. India's experience serves as inspiration for other countries to pursue similar efforts in this direction.

## INTRODUCTION

India has a significant dependency on oil, where 90% of carbon dioxide (CO<sub>2</sub>) emissions from transportation come from the road sector [1], and poor air quality is a widespread issue in both rural and urban areas [2]. On counterpart, around 50% of Indian households own bicycles, motorcycles and scooters [3] and 2/3Ws account for over 80% of vehicle sales in the country [4]. In this context, the country has decided to lead the electrification of 2/3Ws. This approach is recognized as a readily achievable step towards clean mobility in India due to these vehicles' market readiness, cost competitiveness, ease of charging, and potential for emission reduction [5]. Also, national policies, such as the Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles (FAME II) scheme [6], include substantial budgetary allocations for demand incentives for e-2/3Ws.

In 2023, approximately 7.5 million e-2Ws were sold worldwide and India accounted for nearly 900 thousand units, being the second-largest e-2W market globally, second only to China, which saw sales of almost 6 million units. 20% of 3Ws sold globally were electric, and nearly 60% of those sold in India. The country overtook China to become the biggest market for e-3Ws in 2023 (580 thousand sales in India against 320 thousand from China) [7].

Beyond providing support for several EVs, India's efforts aim at catalysing the market and generating employment, enabling the development of a supportive ecosystem for EVs and crossing thresholds of economic viability to foster mass adoption of e-mobility. The government's initiatives and schemes are bolstered by global trends and a suite of additional policies at the central, state and city levels, also supported by the population and international partners [8].

## SUPPORT MECHANISMS FOR REALIZING INDIA'S AMBITIOUS GOALS

Two and three-wheelers are rapidly growing in low and middle-income countries. In India, they are used for urban transportation, last-mile delivery, freight, ride-hailing, personal use, and passenger transport. Factors influencing their ownership include population density, socio-demographics, household structure, and travel patterns. For instance, 2W ownership is particularly high in densely populated areas due to their ease of maneuverability and limited parking spaces [9]. However, 2/3Ws often rely on outdated technologies, making them energy-inefficient and polluting, especially considering the source of energy used by the country. Adopting e-2/3Ws therefore constitutes a significant potential to revert this scenario [10].

In 2022, India updated its Nationally Determined Contribution (NDC), raising its target to reduce emissions intensity of GDP to 45% by 2030 from 2005 levels and aiming for 50% of its installed electric power capacity to come from non-fossil fuel sources by 2030 [11]. Regarding the transport sector, the country has come up with several measures and instruments in order to enhance the manufacturing and adoption of e-2/3Ws.

- **Policy support:** The FAME II scheme came to an end on 31st March 2024, and it was replaced by the subsidy scheme called Electric Mobility Promotion Scheme [12], which focuses on providing affordable and environment friendly public transportation options for the masses. It will be applicable mainly to those e-2W and e-3Ws registered for commercial purposes, but further, privately or corporate owned registered e-2W will also be eligible. To encourage advanced technologies, the incentives will be extended to those vehicles which are fitted with advanced batteries. Additionally, the Production Linked Incentive Scheme for National Programme on Advanced Chemistry Cell Battery Storage [13] aims to boost India's manufacturing by establishing Giga scale ACC and battery production facilities, emphasizing domestic value addition and promoting the Make in India initiative. Beyond that, local

incentives, tax benefits, the Go Electric campaign [14], and international cooperation have all supported EV demand in recent years.

**- Industrial development and employment:** The Phased Manufacturing Programme (PMP) [15] has been adopted to encourage domestic manufacturing and strengthen the EV supply chain. The EV industry can reshape the Indian employment landscape and it shall create opportunities across multiple new areas, from scientists and new entrepreneurs to changes in the automotive sector workforce and the entire value chain [16]. To bridge the national gap of specific skills required for designing, manufacturing, and maintaining EVs, the government is partnering with many stakeholders, aiming at providing skilling, upskilling and re-skilling programs and initiatives for individuals in various e-mobility-related roles [17].

**- Funding mechanisms:** Subsidies are playing an important role in the development of charging infrastructure and EVs adoption in India. These incentives resulted in reductions in the cost of ownership (TCO) of e-3Ws in 2023. While the upfront price of an e-3W (auto-rickshaw) was 55% higher than its gasoline equivalent, it becomes over 50% cheaper to own after 8 years, and over 40% cheaper even without subsidies [18]. Also, the country has been working towards business models that mobilize investments equitably distributing financial risks among financiers, fleet operators, OEMs, and consumers. The charging infrastructure has also experienced significant expansion in recent years through public-private partnerships that aim to tackle barriers including high capital investment, lack of affordable land in dense urban areas, limited power distribution capacity, and long charging times. Besides, financial structures to support cities, such as dedicated funds or lease out land options for installing EV chargers, and international cooperation are actively being developed [19].

**- Innovative business models:** The country is developing innovative business models and identifying actions to de-risk investments and enhance capital access [20]. A notable example is the leasing model, which distributes the initial capital cost into predictable annual payments, making e-2/3Ws more accessible. Furthermore, local financing institutions and non-banking financial companies are offering loans and extending credit lines to low-income borrowers for e-2/3Ws [21]. Although the upfront costs of EVs are generally higher than those of internal combustion engine (ICE) counterparts, the operational and maintenance costs over their lifetime are typically lower. e-2/3Ws have already become cost-competitive with ICE vehicles in fleet-based models, offering significant potential for EV penetration [22]. In response, mobility service providers in India are also

scaling the EV market across major cities by reducing upfront costs through renting and battery swapping options, which are particularly viable for e-2/3Ws due to their smaller battery packs.

The commercial use of rickshaws presents a key advantage for electrification, as drivers are already incentivized to minimize operating costs, and fleet operators are motivated to innovate for greater efficiency [23]. Moreover, the country has recently revised its taxi regulations to include motorcycle-based ride-hailing services, enabling cities and state governments to issue two-wheeler taxi permits that maximize the utilization of idle assets [24]. Finally, with e-commerce in India projected to contribute 3.5% of GDP by 2030, there are substantial opportunities to adopt e-2/3Ws for logistics purposes [25].

**- Addressing the just dimension:** A just mobility transition is necessary to decarbonize the transport sector, addressing social and economic dislocations and increasing the adaptive capacities of cities [26]. In India, 2/3Ws constitute a significant portion of the vehicle fleet due to e.g. their flexibility, maneuverability in congested traffic, and low operating costs. However, without proper management, their widespread use could increase traffic accidents, congestion, energy consumption, and pollution.

Also, women in India heavily rely on 2Ws for daily commutes, while e-rickshaws and cycle rickshaws are key for last-mile connectivity. This highlights the need to preserve 2/3Ws role as a structural part of the transport system during electrification, ensuring it increases accessibility, safety, affordability, and inclusiveness. Despite recognising the need for gender equality and opportunities, the job market in India remains imbalanced, where the automotive sector has historically been male-dominated with women forming less than 15% of the workforce [27]. In this sense, the country is working to increase the number of women entrepreneurs and women in the EV industry. Also, initiatives in cities like Kochi and Surat, which support women's participation in public and paratransit transport, also exemplify this commitment [28].

## MAIN INSIGHTS AND RECOMMENDATIONS

Indian efforts can be seen across many dimensions and this requires multi and high-level coordination between different actors, both vertical (national, regional and urban local bodies) and horizontal (sectors such as industry, transport and energy). Based on India's ongoing efforts, the following recommendations aim to facilitate wider knowledge sharing and implementation in other countries and regions:

### For local and regional governments (LRGs):

- Collaborate with government authorities and the private sector to reduce regulatory barriers, high upfront costs, and lack of charging infrastructure by installing charging networks and improving access to affordable financing.
- Engage local and underserved communities in designing, planning, and implementing urban mobility facilities and infrastructure. Follow with public communication and consultation with affected groups, including paratransit, to address concerns, raise awareness, and enhance acceptance.
- Improve data on 2/3Ws use, focusing on gender and underserved communities to support legislation promoting transportation systems tailored to regional profiles and incomes.
- Leverage the transition to enhance accessibility and create a more inclusive workforce with adequate representation for women and marginalized communities.
- Provide friendly and equitable infrastructure for e-2/3Ws and integrate them into public transport.
- Promote the integration of digital technologies—including apps, online platforms, and smart systems—into the e-2/3Ws experience to streamline processes, enable real-time updates, boost widespread EV adoption, and enhance efficiency, ridership, and accessibility.
- Share and replicate good practices and map early adoption opportunities to enhance EVs adoption, as seen in many Indian cities prioritizing green procurements, emission-free zones, and high e-fleet utilization, especially focusing on last-mile and delivery operations.
- Provide incentives and encourage companies to adopt electric fleets preferably for “last mile” and urban freight transport.
- Provide incentives and complementary measures to boost the local economy, including subsidies for clean vehicles and support for e-2/3Ws-related businesses, from shops and manufacturers to ancillary services.

### For national governments (LRG):

- Establish demand- and supply-side policies to increase e-2/3Ws adoption. These measures should simplify procurement, enhance cost-competitiveness, and incentivize domestic manufacturing facilities.
- Support the EV industry and workforce development through job scaling mechanisms, funding training, incentives for EV skills development, and industry-academia partnerships.
- Provide incentive packages for e-2/3Ws demand, including exemptions, discounts, purchase credits, and enabling conditions for multi-level initiatives.

- Promote public charging infrastructure incentives and foster private sector investments in charging and innovative solutions, including battery swapping.
- Tailor policies and incentives to accelerate the digitalization of green technology for e-2/3Ws.
- Target government funding to reduce EVs' upfront costs and bridge the total cost of ownership (TCO) gap with ICE vehicles, enhancing commercial viability.
- Establish measures to attract long-term financing for e-2/3Ws adoption, including infrastructure investments and maintenance.
- Create risk-sharing mechanisms for consumer and fleet finance, working with FIs and multilateral banks to provide risk guarantees, building market confidence.

### For other key stakeholders:

- **Financial institutions (FIs):** Define long-term strategies for funding and distributing the financial risks involved in lending, owning, and operating e-2/3Ws. Also, promote a blend of funding instruments, such as innovative financial mechanisms (green bonds, loans, credit guarantees, dedicated funds, concessional finance debt, or equity offered at a below-market rate of return), leasing and partnerships with OEMs. Besides, it is crucial to contribute to innovative business models with suitable market actors.
- **The private sector, such as original equipment manufacturers (OEMs):** Foster partnerships industry-government-academia to create skilling and education programs and training, especially focused on EV manufacturing, maintenance, and innovation. Also, facilitate the roll-out of charging infrastructure, knowledge of EVs maintenance and battery management, through own initiatives, investments and start-ups support. Finally, be open to local solutions and implementation, by partnering with other companies and local businesses.

## CONCLUSION

The Government of India is steadily advancing towards an electric mobility ecosystem to fulfil its commitments to reducing emissions, ensuring energy security, and fostering industrial development, while promoting a just transition in the sector. The cities are following the same steps also with their own initiatives. Unlike many other regions, India's e-mobility adoption is prioritizing the growth of two- and three-wheelers. The electrification of these segments, combined with strategic planning and management are addressing the longstanding country's issues with high-emission vehicles, inadequate infrastructure, and informal transport systems. India's example can motivate other countries to intensify their efforts towards affordable and safe micro mobility and logistics solutions.

## GET TO KNOW: PUNE, INDIA

Pune is one of the fastest-growing cities in India, driven by a growing technology sector, a thriving student population, and increasing urbanization. The city has 3.4 million residents and was ranked one of the most liveable cities in the country. Among Indian cities, Pune has the highest rate of 2Ws ownership and second highest rate of car ownership [29].

In 2021, the Pune Municipal Corporation (PMC) established an "EV cell" to act as a centralized, structured governance body. This cell is designed to facilitate the development of the EV ecosystem in Pune and coordinate the efforts of government departments, industry, and residents. The Pune City EV Readiness Plan (Figure 1), prepared by PMC, outlines a series of targets and initiatives that both the public and private sectors will implement to achieve an EV-ready city in the near future. The plan includes short- and long-term actions such as infrastructure projects, policy and regulatory reforms, institutional and governance structures, and awareness and skill-building programs.

Nine main solutions were identified for the Plan: Single window clearance for the deployment of private charging and battery swapping stations; EV charging and battery swapping stations deployment plan; Upgrade of upstream infrastructure; Promotion of electric first- and last-mile connectivity and delivery services; Creation of low-emission zones; Retrofitting existing vehicles to EVs; Setting parking regulations for EVs; EV cell website and city EV dashboard; and Public awareness campaigns.



Figure 1: The Pune City EV Readiness Plan: Components of an EV-ready City

Under the Plan, the city has set preliminary EV adoption targets. One of the goals is to achieve an electric vehicle penetration rate of 35% for 2Ws and 25% for both passenger and goods 3Ws. Also, one of the targets is to require fleet aggregators—such as e-commerce companies, last-mile delivery/logistics providers, and mobility aggregators—to convert at least 15% of their total fleet to EVs by 2023, with the goal of reaching 50% by 2025.

Another key initiative provided by the private sector is the launch of a new manufacturing facility in Pune by Clean Mobility Solution India. This facility will locally produce the Zbee e-3W. The initiative, in partnership with the venture capital fund India Accelerator, aims to enhance first- and last-mile transportation services [30].



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