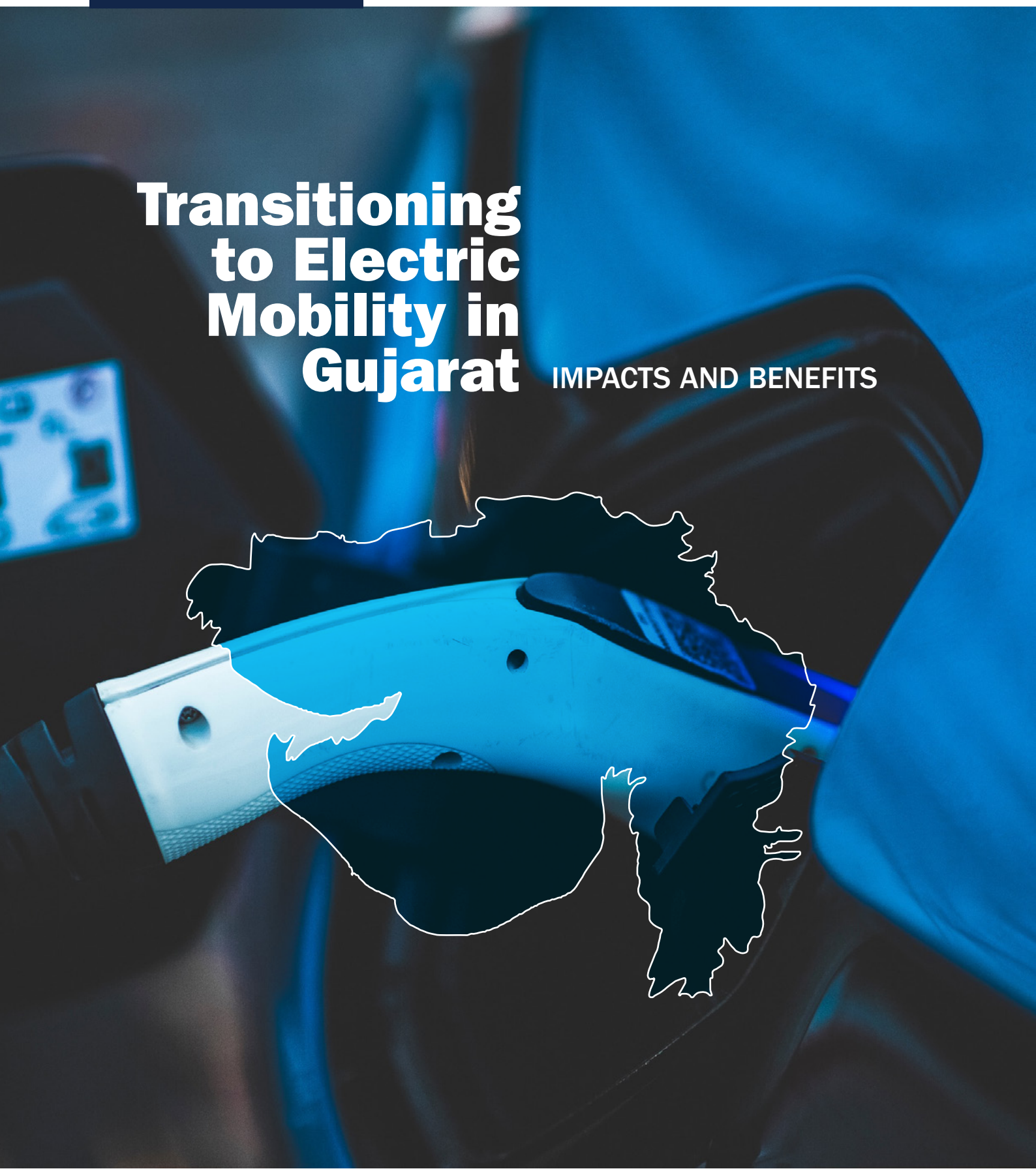
REPORT FEBRUARY 2021

Transitioning to Electric Mobility in Gujarat

IMPACTS AND BENEFITS



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Executive Summary

Across India, states are implementing electric vehicle (EV) policies to support the country's goals on electric mobility, climate change, and air quality.[1] EV sales need to drastically increase to advance electric mobility in India by 2030, according to analysis by the Indian government.[2] Gujarat has made progress on transportation electrification. Yet, a Gujarat State EV policy is needed to keep up with market trends as well as reap the economic, environmental and societal benefits of a robust EV market.

Over the past two decades, Gujarat has emerged as an investment destination for major automobile players. The state is on course to become India's leading auto hubs in the next few years and presents tremendous opportunities in automobile and component manufacturing. Gujarat is uniquely poised to leverage its strength as a growing auto hub in the global shift towards EVs. EV manufacturing will open new opportunities across a range of products and services such as EV components, batteries, EV chargers and charging infrastructure. Additionally, transportation electrification aligns well with the "Make in India" and "Atmanirbhar Bharat" (self-reliant India) campaigns.

Presently, over 15 states have notified or draft EV policies.[3] Karnataka was one of the first states to approve its policy in 2017, while Gujarat initiated a draft policy in 2019. The draft Gujarat EV Policy aims to sell 100,000 EVs, approximately 7% of overall sales, over a three-year period.[4] The policy also provides incentives for charging stations and manufacturing.

This report examines the transportation market in Gujarat, the status of electric mobility adoption in the state, and the potential impacts of the draft Gujarat EV policy. The report addresses job growth; co-benefits for the environment, air quality, and energy security; and challenges to EV deployment. Lastly, the report presents the key takeaways based on research and analysis of the EV market and makes the case for the adoption of a strong EV policy in the state of Gujarat.

The key takeaways of this report, based on research and analysis of the EV market and draft Gujarat EV policy are:

1. **Need for a Gujarat Electric Mobility policy**. Shifting to electric vehicles will have major economic, environmental and social benefits in Gujarat. To keep up with market trends, Gujarat should formally release its EV policy, while national policies continue to evolve. A state policy with clear targets can continue to be tailored while highlighting Gujarat's priority on EV for economic growth and environmental goals.

2. **Significant economic opportunities with clean air and climate benefits**. The Gujarat EV Policy would achieve 2 billion clean vehicle kilometers, accounting for reduction of 0.3 million tons of CO_2e emissions; save 98 million liters in terms of oil import (petrol and diesel) and reduce consumption of 26 million kilograms of compressed natural gas; and lead to savings of more than ₹2 billion ($27.4 million) in terms of avoided emissions over the projected three-year period of the draft policy.

3. **Job creation and "Make-in-India" opportunity**. With a large automotive manufacturing base in Gujarat, the adoption of e-mobility will introduce new high-skilled jobs in the manufacturing of batteries, EV powertrain, components, and charging infrastructure. The additional consumption of electricity will in turn create jobs in the power and renewable energy sector. Gujarat can demonstrate leadership to grow its EV market and create jobs by investing in high-end technology, securing a local supply chain from the start, and providing a complete mobility solution, not just a vehicle.[5] This will boost and instill confidence in the local automotive industry, as well as align well with the national Make-in-India campaign.

4. **Strengthen inter-departmental coordination**. A planned and structured implementation is key to achieving the targets specified under any policy. Clarifying inter-departmental coordination will serve to streamline policy implementation and advance EV deployment. A state-level EV Steering Committee can provide the structure for departments including Gujarat State Road Transport Corporation, Road Transport Authority, Gujarat Energy Development Agency (GEDA), power utilities, city municipal corporations among others to plan, implement and modify the EV policy (See Figure 1).

5. **Enhance distribution company (DISCOM) engagement.** Develop utility EV programs and policies that advance electric mobility, allow for streamlined EV grid infrastructure investments, grid connections, land availability, and ensure attractive and stable tariffs for EV. Frontloaded investments into charging infrastructure and the EV grid by utilities can lead to large pay-offs in the long term, as is being quickly recognized in many US states, Europe and other international examples.

6. **Encourage partnerships with business and civil society**. To leverage limited government resources, developing partnerships with businesses, OEMs, academic institutions, civil society, are crucial to grow the electric mobility market.

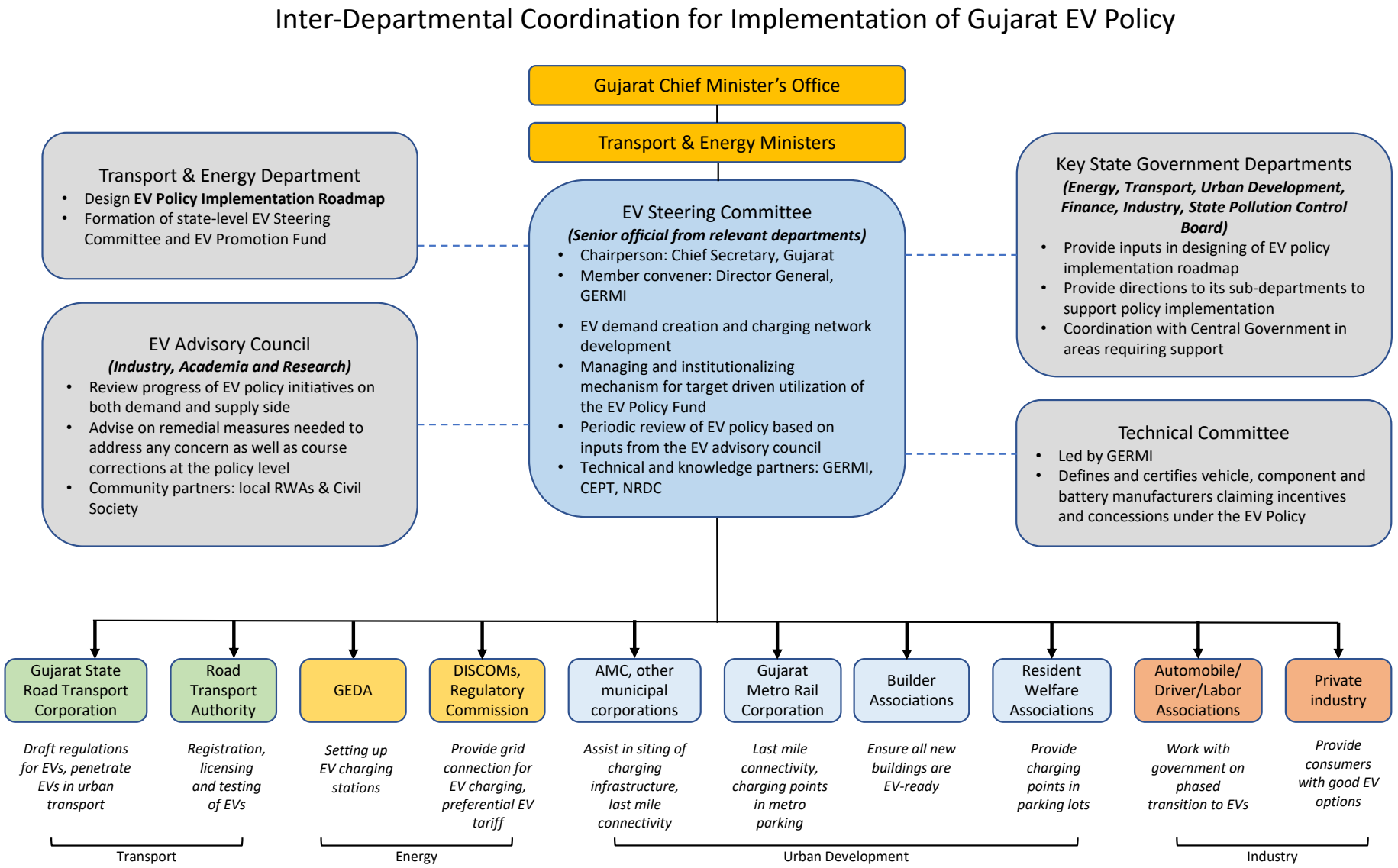
7. **Incentives to grow the EV market**. To maximize the economics of electric mobility, Gujarat can introduce policy interventions at the state- and city-level such as additional incentives for using clean energy for EV charging and setting up a single window clearance system to attract investments for "Ease of Doing Business". These incentives would aim to create a critical, self-sustaining mass of EVs, manufacturers, service providers and stakeholders.

8. **Strong and integrated city actions on electric mobility**. Congestion pricing and other non-fiscal incentives such as mandatory procurements of EVs by state agencies, reserved parking spaces, and low emission zones in major cities can enhance EV adoption as well as improve air quality and traffic congestion.[6] Updating the General Development Control Regulations (GDCR) to account for charging points in housing societies, commercial establishments, and shopping complexes is also critical.

9. **Expedite land identification and availability**. Gujarat can facilitate land for charging infrastructure through incentives, such as long-term leases and lower interest rates. A database of suitable and available land in the major cities of Gujarat may be developed after due verification from the respective authorities. Standard Operating Procedures can be developed for deploying public charging infrastructure, and periodic evaluation of its performance.

10. **Focus on freight electrification**. Gujarat can take a lead on EV freight vehicles (medium- and heavy-duty) given the high-level of industrial and commercial activity, especially around ports and dedicated industrial zones. Specialized pilots and use-case specific strategies may be developed for transitioning Gujarat's commercial fleet to EVs.

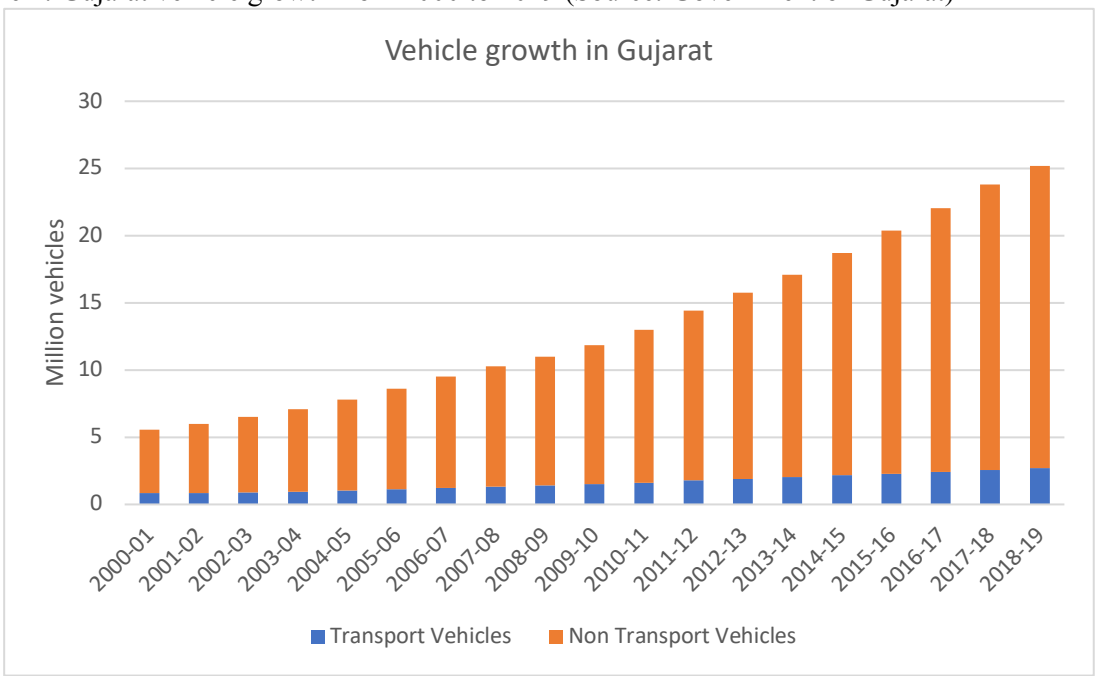
Figure 1: Proposed state-level inter-departmental coordination for accelerating EV adoption (Source: NRDC and GERMI, 2021).



Automobile Market in Gujarat

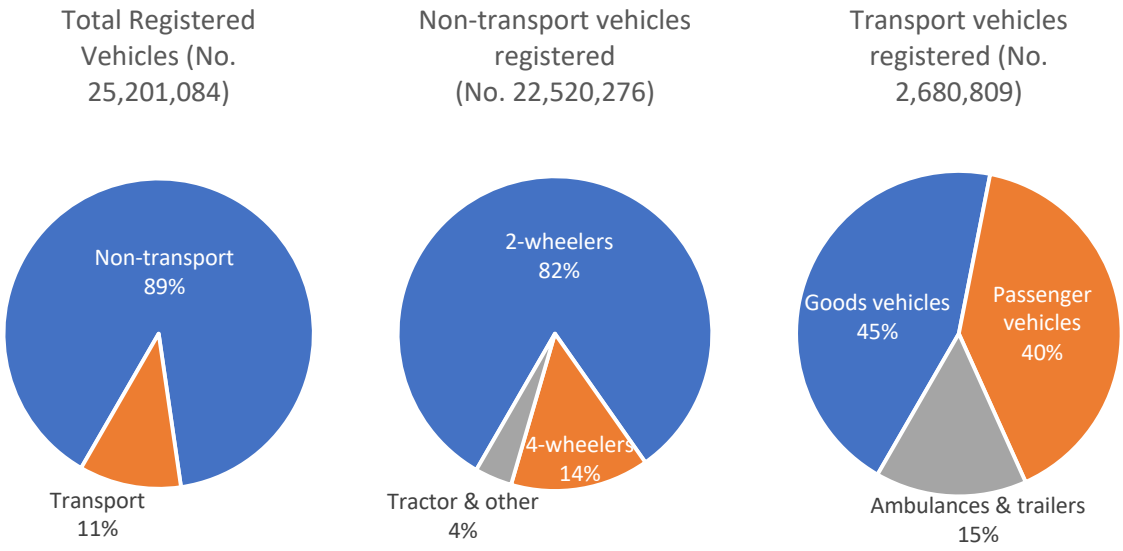
Gujarat has increasingly urbanized over the past three decades. Additionally, over the past two decades vehicle registration has increased in Gujarat's urban areas.[7] The number of vehicles on the road in Gujarat has grown from 5.6 million to 25 million between 2001 to 2019 (Figure 2).

Figure 2: Gujarat vehicle growth from 2000 to 2019 (Source: Government of Gujarat)[8]



Two-wheelers are the largest segment of the automobile industry in India and were responsible for more than 61% of the total transportation gasoline consumption in 2014.[9] Figure 3 shows the breakdown of vehicle categories in Gujarat. Non-transport vehicles include: two wheelers (motorcycle/scooters, mopeds), jeeps, police vans, tractors, motor cars and station wagons. Transport vehicles include goods and passenger vehicles. Goods vehicles are truck/ lorries, tankers, three-wheelers, and other light wheelers. Passenger vehicles are school buses, buses, maxi cabs, private service vehicles, taxis, auto rickshaws, ambulances, and trailers.

Figure 3: Category wise vehicle population in 2018-2019 (Source: Government of Gujarat)[10]



Automotive Manufacturing and Scope of Growth in Gujarat

Gujarat has emerged as a key investment destination for major automobile players. States like Tamil Nadu, Maharashtra and Delhi NCR have been the largest auto hubs in India, however in the last few years, auto manufacturers like Maruti Suzuki, Honda, Tata, Hero MotoCorp and MG Motors have set up manufacturing plants in Gujarat. The state is set to become India's automotive hub within the next few years and presents an opportunity of billions of Rupees for several component manufacturers.[11] One out of every three passenger cars made in the country are manufactured in the state.[12] Gujarat expects to surpass the production capacity of the other top car manufacturing states, with an installed capacity to roll out 1.5 million units annually in the next two years.[13] Additionally, the government planned to increase the share of automotive industries in its overall engineering output from 3.7% in 2017 to 10% by 2020.[14] And the incremental manpower requirement in Gujarat for the manufacturing of engineering goods is expected to be 53,580 between 2017-2022.[15]

It is an opportune time for the state to transition to future oriented technology. EV manufacturing will open new opportunities across a range of products and services such as EV components, batteries, EV chargers and charging infrastructure. This will attract investments in the state to secure the supply chain through domestic manufacturing, reduce the dependence on vehicle and component imports, and develop the ecosystem for in-house manufacturing to align with the "Make in India" campaign. The renewed focus on innovation, design, development and competitive local manufacturing can meet the domestic demand and allow Gujarat to become a global leader.

The state has made limited headway in shifting to electric mobility. In line with "Atmanirbhar Bharat", the New Gujarat Industrial Policy 2020 has an added focus on key thrust sectors. One of which is EVs and its components, for industrial promotion.

Status of Electric Mobility Adoption in Gujarat

Gujarat has made some progress on transitioning to EVs without formalizing its state EV policy. The state has leveraged incentives provided under the Faster Adoption and Manufacturing of Electric Vehicles (FAME) India Scheme and initiated state-level programs to increase adoption of EVs.

Progress under FAME

The second phase of FAME scheme (FAME II) has increased the financial investment for EVs and mobility to ₹10,000 crore ($1.4 billion), more than a 10-fold increase from ₹895 crores ($122 million) under the past FAME I scheme.[16] As an upfront incentive to reduce the vehicle cost, 86% of the funds are set aside to be distributed, creating more opportunities for states and cities to transition to EVs.[17]

Electric Two-, three- and four-wheelers

Since the launch of FAME in 2015, a number of EVs have availed the incentives in Gujarat (Table 1). After Maharashtra, Gujarat accounted for the second highest sales of EVs under FAME I. However, under FAME II, the number of EVs deployed in the state has reduced significantly. This decline can be attributed to stricter eligibility criteria and the COVID-19 pandemic. It also implies that there exists a significant opportunity for an auto-hub like Gujarat to establish manufacturing facilities for electric vehicles with advanced battery chemistry, higher speed and longer range to cater to domestic and international markets.

Table 1: Segment wise number of EVs sold in Gujarat under the FAME India scheme (Source: Department of Heavy Industries (DHI)[18]

	Number of EVs	
Vehicle Segment	FAME I April 2015 – April 2019	FAME II April 2019 – January 2021
Two-wheelers	16169	573
Three-wheelers	4	73
Four-wheelers	15404	8
Total number of vehicles	31,577	654

Electric buses

In November 2019, 5,095 electric buses (e-buses) were sanctioned for deployment under FAME II across 64 cities.[19] The largest number of buses have been allocated for the state of Maharashtra for 775 buses followed by 600 buses each for Gujarat and Uttar Pradesh.[20] Further, in September 2020, the national government sanctioned another 670 e-buses under FAME II. Gujarat received 250 e-buses of the 670 sanctioned e-buses,150 e-buses for Surat Municipal Corporation and 100 e-buses for Rajkot Rajpath Limited. [21] The Department of Heavy Industries (DHI) sanctioned a total of 850 buses for Gujarat under FAME II (Table 2). Out of this, 11 e-buses are operating in Ahmedabad using swappable battery mechanism in collaboration with Ashok Leyland and Sun Mobility as of September 2019.[22]

Table 2: City-wise electric buses sanctioned for Gujarat under FAME II (Source: DHI)[23]

City / Government Agency	Total Sanctioned Buses
Ahmedabad	300
Surat	300
Vadodara	50
Rajkot	150
Gujarat State Road Transport Corporation (GSRTC)	50
Total, under FAME II	850

Charging stations

In early 2020, 228 charging stations were sanctioned for Gujarat, however on-the-ground deployment has not yet started.[24] Additionally in 2020, another 50 charging stations were sanctioned under FAME II for Surat Municipal Corporation.[25] Table 3 shows the total number of charging stations sanctioned.

Table 3: DHI sanctioned charging stations for Gujarat (Source: DHI)[26]

Charging Service Provider	Number of Charging Stations	Total
REIL	84	278
Ahmedabad Janmarg Ltd.	50	
EESL	94	
Surat Municipal Corporation	50	

Gujarat state-level initiatives

The state government has two main initiatives to accelerate the use of EVs: The Chief Minister Urban Bus Service Scheme and Gujarat Energy Development Agency (GEDA) E-Vehicle Subsidy Scheme.

Chief Minister Urban Bus Service Scheme

To support Urban Bus Services in Gujarat, the government decided to provide Viability Gap Funds (VGF) to Urban Local Bodies (ULB) in 2018.[27] The scheme covers eight cities with Municipal Corporations and all 22 Class A municipalities with populations over 0.1 million. For promotion of electric buses in major cities (Ahmedabad, Surat, Vadodara, Rajkot), viability gap funding of Rs.25/km will be given to ULBs. Under this scheme, a total of 350 e-buses are sanctioned for Ahmedabad Municipal Corporation. These buses are yet to be operational on the roads.

Source: Charge Zone

Gujarat Energy Development Agency (GEDA) E-Vehicle Subsidy Scheme

To provide capital incentives to electric two- and three-wheelers, Gujarat Energy Development Agency (GEDA) started a subsidy scheme in 2015 and 2018 respectively. Subsidies to set up EV charging stations were recently included in the scheme.[28]

- GEDA supported school and college students in the form of a subsidy amounting to ₹12,000 (previously ₹10,000) to buy battery-powered two-wheelers (e-scooters). The target was to provide assistance to 10,000 vehicles. Since 2015, subsidies to 7,923 two-wheelers have been provided.
- The state government provides assistance of ₹48,000 (previously ₹40,000) for the purchase of 5,000 battery-powered e-rickshaws for individual and institutional beneficiaries. Since 2018, 87 e-rickshaws have been sold under the scheme.
- The government plans to set up ten public charging stations to facilitate EV charging. A sum of ₹5 million was earmarked to set up these stations across four cities - Ahmedabad, Vadodara, Surat and Rajkot.

The government will set up 15 fast chargers for e-buses and plans to increase capacity to 50 fast chargers.

Draft Gujarat Electric Vehicle Policy

The draft Gujarat EV Policy 2020 targets planned migration to EVs including deployment of 100,000 EVs by March 2022.[29] The policy period is through March 31, 2022. The policy plans to provide capital subsidies on the purchase of EVs over and above the financial support provided by FAME II. The State Nodal Agency (SNA) for demand incentives is the Ports and Transport Department and the SNA to set up charging stations is the Gujarat Energy Development Agency (GEDA).

Table 4: EV adoption targets under the Gujarat EV Policy (Source: WRI India and GERMI, 2019)[30]

Vehicle Segment	EV Target Numbers
Two-wheelers	80,000
Three-wheelers	14,000
Four-wheelers	4,500
Buses	1,500

The following vehicle segments are included in the draft policy: two-wheelers, three-wheelers, four wheelers (commercial taxis, cargo electric vehicles with a Gujarat-based Road Transport Office permit) and buses. The policy is not applicable to low-speed EVs, which do not require RTO registration and private four-wheelers, in line with FAME II. Also, the demand incentives under the policy are not applicable to vehicles based on lead-acid chemistry batteries. Under the policy, the state is plans to exempt motor vehicle tax and vehicle registration fees during the policy period.


Source: Mitt Siddhpura, GERMI

Charging Stations Incentives

The state government plans to support the same number of charging stations over and above the number allocated by DHI to Gujarat. Fast charging stations and/or battery swapping stations are will be established at an interval of 25 kilometers on both sides of state highways. The government plans to exempt electricity duties for EV charging stations. Further, a special tariff is approved for EV charging: for LT connections, ₹4.10/kWh and demand charge of ₹25/installation; for HT connections, ₹4.00/kWh and demand charge of ₹25/kVA/month for all public charging stations.[31]

Manufacturing Incentives

All manufacturing incentives for the electric mobility sector will be provided as per the recently released Gujarat Industrial Policy 2020. As per the policy, Gujarat has identified 15 thrust sectors, including EVs and its components, for industrial promotion. The policy is offering land on lease and the de-linking of incentives from tax structure and replacing it with capital subsidy without any upper ceiling.

Highlights from Other State EV Policies
State EV policies differ in terms of targets, supply side incentives (manufacturing), and demand side incentives (consumer and charging infrastructure investments).

- Andhra Pradesh
  - Aims to have 1,000,000 EVs on the road by 2024.
  - Complete reimbursement of road tax and registration fees on sale of EVs until 2024.
  - Replace public transport buses in four cities to e-buses by 2024 and across the state by 2030.
  - Establish 100,000 slow and fast charging stations by 2024.
- Delhi
  - Seeks that EVs account for 25% of the total new vehicle registrations in the city by 2024.
  - Aims to have 1,000 e-buses by 2020.
  - Purchase incentive
    - 4-wheelers: ₹ 10,000 ($137) per kWh of battery capacity for the first 1,000 e-cars registered.
    - 2-wheelers: ₹ 5,000 ($68) per kWh of battery capacity
    - E-autos, e-rickshaws, and e-carts: ₹ 30,000 ($411) per vehicle
  - Incentive for scrapping and de-registering old highly polluting 2-wheelers.
- Karnataka
  - Aims to achieve 100% e-mobility in auto-rickshaws, cab aggregators, corporate fleets, and school buses/vans by 2030.
  - Local public transport bus fleets will introduce 1,000 EV buses.
  - Set up 112 EV charging stations in Bengaluru.
- Kerala
  - Aims to put one million EV units on the road by 2022 and 6,000 e-buses in public transport by 2025.
  - Incentives, such as state tax breaks, road-tax exemptions, toll-charge exemption, free permits for fleet drivers and free parking.
  - Viability gap funding (VGF) for e-buses and government fleets.
- Maharashtra
  - Increase the number of registered EVs to 500,000 over the policy period.
  - Generate an investment of ₹ 25,000 crores ($3.4 million) in EV and component manufacturing and create jobs for 100,000 people.
  - Exempts EVs from road tax and registration fees over five-year policy period.
  - Enable fuel stations to set up charging points through governing regulations.
- Tamil Nadu
  - Electrify five percent of buses every year by 2030, and substantially convert shared mobility fleets, institutional vehicles, and e-commerce delivery and logistics vehicles to EVs by 2030.
  - Convert all auto rickshaws in six major cities to electric vehicles within a span of 10 years.
  - EV-related and charging infrastructure manufacturing units will receive 100% exemption on electricity tax through 2025.
- Telangana
  - Make Telangana a major base for EV and energy storage systems (ESS) sectors and to attract investments worth $4.0 billion and create employment for 120,000 persons by year 2030 through EVs in shared mobility, charging infrastructure development and EV and ESS manufacturing activities.

Impact of Gujarat EV Policy

The transition to electric mobility (e-mobility) will improve air quality, address climate change, and create a more equitable and inclusive Gujarat. As EVs become more middle-of-the-road, the consumer is seeing more benefits compared to drawbacks. Though EVs are tagged with high upfront cost, inadequate public charging infrastructure, high recharge time and limited battery life, this notion is quickly changing with the costs dropping rapidly, optimal deployment of chargers, low impact on environment and savings on fuel, tax and maintenance costs.

This section covers some of the major impacts of the proposed Gujarat EV Policy in terms of emission reduction, fuel savings, financial benefits, job growth and other co-benefits that accompany the transition to transportation electrification. Annexure 1 can be referred for more details on calculation inputs and assumptions.

Emissions Reduction

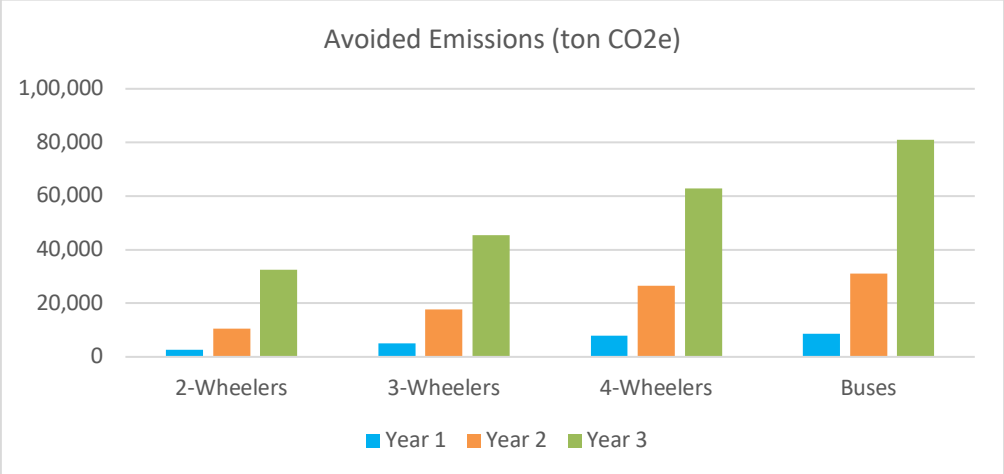
The draft Gujarat EV Policy targets deployment of 100,000 EVs over three years. This includes EV adoption targets of 80,000 two-wheelers, 14,000 three-wheelers, 4,500 four-wheelers, and 1,500 buses. Table 5 shows the forecasted growth in the number of EVs over the policy period.

Table 5: Forecasted yearly EV sales under the Gujarat EV policy CAGR 2018 (Source: Gujarat Regional Transport Office and GERMI analysis)[32]

Vehicle Segment	EV sales per year			Segment Totals
	Year 1	Year 2	Year 3	
2-Wheelers	6,825	19,480	53,695	80,000
3-Wheelers	1,544	3,898	8,558	14,000
4-Wheelers	567	1,341	2,592	4,500
Buses	161	414	925	1,500
Total EVs				100,000

The total avoided CO_2 equivalent (CO_2e) emissions per year is calculated using the total vehicle kilometers and the exhaust emissions per kilometer of vehicle travel. Figure 4 shows the vehicle segment wise avoided emissions per year. Overall, the proposed policy accounts for approximately 0.3 million tons of CO_2e emissions reduction in Gujarat.

Figure 4: Cumulative avoided CO_2e emissions per year (Source: GERMI analysis)[33]



Three cities in Gujarat, Ahmedabad, Surat and Vadodara, have also been identified as one of India's 122 non-attainment cities facing serious air pollution. These cities are required to develop and implement city action plans to improve local air quality under the National Clean Air Programme.[34] Adoption of EVs can reduce localized emissions from the transport sector and contribute towards meeting city-targets for air quality improvement.

Fuel Savings

EVs present a big advantage in terms of the fuel savings (petrol, diesel and CNG). India imported 143 million tons of crude oil from April to December 2020.[35] A 2014 survey revealed that 70% of diesel and 99.6% of petrol is consumed in the transport sector alone.[36] Transitioning to e-mobility presents an opportunity to clean the air in highly populated and polluted cities.

Table 6 shows the avoided fuel consumption per year. Overall, the proposed policy accounts for reduced consumption of fuel by 53 million liters of petrol, 45 million liters of diesel and 26 million kg of CNG in Gujarat over three years.

Table 6: Avoided crude oil consumption over three years (Source: EMBARQ, 2020).

Fuel type[37]	Vehicle type	Mileage (km/l)[38]	Avoided fuel consumption (million liters)			
			Year 1	Year 2	Year 3	Total over three years
Petrol	2-wheelers	50	1	4	12	17
	4-wheelers	11	3	10	23	36
CNG	3-wheelers	25	2	7	17	26
Diesel	buses	3	3	12	30	45

Financial Impact

The financial impact of moving to EVs is calculated in three parts in this section. For the state of Gujarat, financial impact of moving to electric vehicles can be calculated by assessing the cost of avoided emissions and revenue loss to the state and central government in terms of taxes collected from fuel sale. For consumers, the financial impact would be the high upfront cost and low operating and maintenance costs – all of which are clubbed in the Total Cost of Ownership (TCO) calculation in this section.

A. Cost of avoided emissions

Compared to conventional vehicles, EVs produce less emissions that contribute to climate change and air pollution. With zero tailpipe or direct emissions, EVs are becoming the preferred mode of transportation across the globe.

The Gujarat draft EV policy can account for savings of more than ₹2 billion ($27.4 million) by achieving the EV deployment targets (Table 7).

Table 7: Cumulative cost of avoided CO_2e emissions (Source: GERMI analysis)[39]

Vehicle Type	Year 1	Year 2	Year 3
2-Wheelers	17	67	203
3-Wheelers	31	111	285
4-Wheelers	50	167	395
Buses	55	195	509
Total Million (₹)	2,084		

There are a number of ways in which carbon emission can be priced in India. Introduction of an emission trading scheme, imposing carbon tax on economic activities like use of fossil fuels or charging a tariff on carbon intensive imports are some common examples being explored by various contrived across the globe.[40]

B. Revenue loss to government due to reduced fuel sales

As India levies 69% of the petrol and diesel cost as taxes and excise duty, reducing consumption will have an impact on the government exchequer.[41] The 69% taxes are a combination of central and state taxes. Out of this, the state of Gujarat levies Value Added Tax (VAT) accounting to 24.1% on petrol, 24.2% on diesel and 15% on CNG.

Table 8: Cumulative revenue loss to state exchequer from fuel sale (Source: GERMI analysis)[42]

				Revenue loss (Million ₹/year)		
Vehicle Type	Fuel	Fuel Price (₹/liter)[43]	Tax levied by Gujarat	Year 1	Year 2	Year 3
2-Wheelers	Petrol	83	24.1%	20	79	240
3-Wheelers	CNG	53	15.0%	53	16	81
4-Wheelers	Petrol	83	24.1%	83	59	198
Buses	Diesel	82	24.2%	82	64	231
Total Million (₹)				1,519		

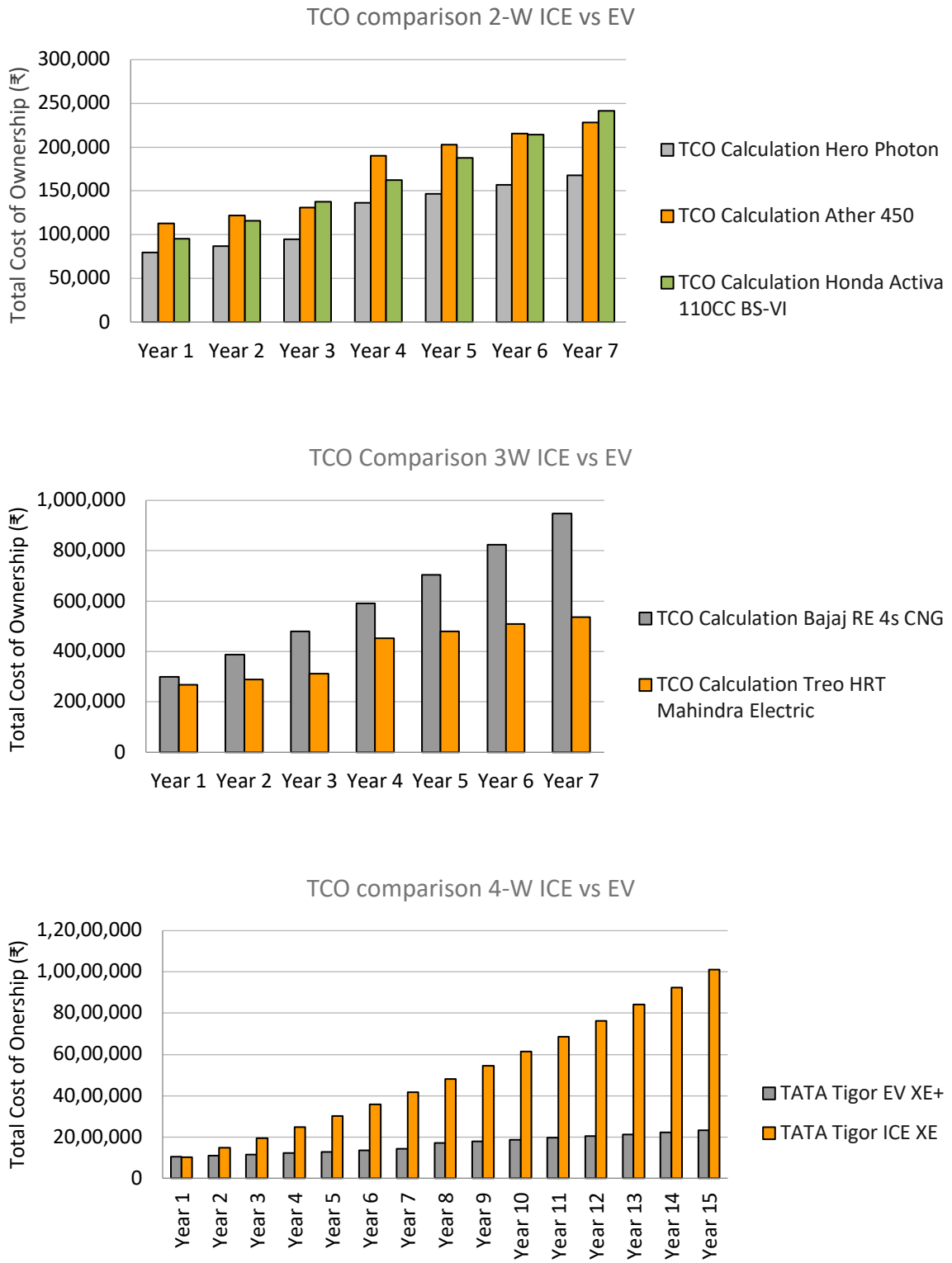
C. Total Cost of Ownership analysis and financial benefit over the life of the vehicle

While the price of an EV is higher than comparable petrol or diesel cars, its operating cost is significantly cheaper particularly over the lifetime of the vehicle. This combined with the capital subsidy from the national and state government, tax incentives, low electricity cost to charge EVs and reduced maintenance requirements, the consumer ends up spending less than a conventional petrol or diesel vehicle.

Figure 5 provides shows the total cost of ownership (TCO) over the life of an EV versus a conventional ICE vehicle for two-, three- and four-wheelers operating in Gujarat. For more details on the TCO calculation please refer to Annexure 1.

Source: Mitt Siddhpura, GERMI

Figure 5: TCO comparison of ICE vs EV for two-, three- and four-wheelers (Source: GERMI, 2021)[44]



EVs and Jobs

The Indian automobile industry is one of the country's largest employers and provides around 37 million direct and indirect jobs. With the country's average age of 28 years old, jobs are critical.[45] The auto industry has the potential to contribute about 12% of total GDP and create 65 million jobs by 2026.[46] Battery manufacturing could become a ₹85,900 crore ($12 billion) business in India by 2030.[47] EV battery charging and swapping would create a large number of jobs throughout the country.

With Gujarat already a base for the auto industry, EV manufacturing will open new opportunities across a range of products and services such as EV components, batteries, EV chargers and charging infrastructure. Further, it will lead to skill development and generation of millions of jobs for the local population across industries. Clean mobility solutions like EVs will also improve the energy demand in the state which will strengthen the electricity utility business and improve the demand supply balance for a renewable energy rich state like Gujarat.

With the transition from internal combustion engine (ICE) to EVs, the auto industry globally is at the cusp of revolution. Through a formal EV policy, Gujarat will not only attract investments in the state to secure the supply chain through domestic manufacturing but will also reduce the dependence on vehicle and component imports and develop the ecosystem for in-house manufacturing, aligning with the "Make in India" and "Atmanirbhar Bharat" (self-reliant India) campaigns. The renewed focus on innovation, design, development and competitive local manufacturing can support in meeting not only the domestic demand but also in making use of the domestic size and scale for Gujarat to become a global leader.

International Findings

The European Climate Foundation has estimated that through reducing oil demand by more efficient electric cars, employment will increase by 5,00,000 to 8,50,000 by 2030.[48] Oil production and distribution has a low employment intensity and crude oil price volatility adds uncertainty to an import bill. Energy security implications are discussed in the following section. Any shift in expenditure from buying imported oil to other expenditure choices would generate additional employment. As imported oil is replaced by electricity and batteries, large employment is possible in enhancing power-generation and distribution, and in battery manufacturing, including battery-recycling.

A U.S. report estimates that about two million additional jobs will be created by EVs by 2050.[49] A majority of the new jobs would be in the construction, utility and manufacturing industries, according to the analysis. The utility business will see the biggest increase in jobs due to an increased reliance on the electric transmission grid.

California Air Resources Board (CARB) reports on for existing or proposed regulations and calculates the jobs and macroeconomic impacts, the cost-effectiveness of the regulations, the monetary value of health and environmental benefits, and the impact on a variety of businesses, communities, and governments.

- For light-duty EV, net jobs increased by 0.1% in 2025, and 0.2% in 2030 compared to the baseline scenarios.
- For e- trucks and some buses, net jobs increase by 0.03% in 2040 (7,442 jobs) compared to the baseline scenarios.
- For zero emissions vehicle (ZEV) transit buses, small net increase in employment growth in later years.

Source: Charu Lata, NRDC

Indian Context

Due to the simplicity of the powertrain technology in EVs, less jobs are needed in the vehicle assembly than for ICE vehicles. However, the Indian auto market is expected to continue to grow as the country experiences rapid urbanization, rising incomes, and a growing workforce. Most global auto manufacturers (also operating in India) have plans to transition to EVs. As the Indian auto industry transitions an issue is how to attract new EV jobs to states in India that have traditionally been ICE auto hubs. Incumbent companies that have heavily invested in the ICE supply chain stand to be the biggest losers from the switch to EVs and are bound to resist change.[50]

In the course of transition to e-mobility, new high-skilled jobs in the manufacturing of batteries, EV powertrain, and charging infrastructure are likely to be created. Additional consumption of electricity will drive job creation in the power sector. Simultaneously, reduced consumption of oil would lead to a reduction in jobs created in the petroleum sector and in ICE vehicle manufacturing. However, it's important to factor in the job intensity of each of these activities in the economy.


Source: Charu Lata, NRDC

If EVs garner a share of 30% of new vehicle sales by 2030 in India, the domestic value-add generated in manufacturing, reduction in oil import bill, and environmental and health benefits far outweigh the loss in value- addition from the petroleum and automotive sectors. This EV 30% scenario would result in a slew of gains including 0.12 million jobs created in EV powertrain, battery and charger manufacturing and electricity generation sector.[51]

In line with a vision for "Atmanirbhar Bharat," or "self-reliant India," India's National Mission on Transformative Mobility and Battery Storage supports the deployment of battery storage in both e-mobility and across the power sector.[52] The Mission's objective is to reduce India's energy import dependence, by reducing direct oil demand, and increasing the uptake of renewable energy in the power sector. The Phased Manufacturing Program (PMP)'s role is to provide a roadmap to localize production across the entire EV value chain to increase the domestic value addition and create employment opportunities.[53] In order to get the demand incentives companies must gradually increase local sourcing of components for their EVs as stipulated in PMP. Department of Heavy Industry (DHI) has worked on a list of vehicle types and equipment that are involved in the manufacture of EVs and how the implementation of PMP will bring in a change in the Customs Duties.

EV Transition and Value Proposition

The transition to vehicle and transportation electrification will include tradeoffs. The value of other impacts will be affected by the percent of EV adoption and the amount of renewable energy used for the electricity generation, include climate mitigation and greenhouse gas (GHG) reduction, energy security and domestic value. Tradeoffs are assessed across several categories below.

Health

Air pollution is a major problem across India. With local air quality a growing concern in many cities, switching from diesel engines, which produce high levels of fine particulate matter (PM) and nitrogen oxide emissions, to electric powertrains will help improve air quality and public health.[54] The social costs of the health impact of outdoor air pollution were about $0.6 trillion/year in India in 2010 and the estimated cost of serious health consequences because of outdoor PM air pollution is about 1.7% of India's GDP.[55]

Extreme heat is another public health challenge for parts of India, including Gujarat. India's heat waves have accounted for over 22,000 deaths since 1992, according to the National Disaster Management Authority (NDMA).[56] The historic Ahmedabad heat wave in 2010 led to 1,344 excess deaths registered in the city during the month of May. More than 6,000 people have died because of heat waves in India since 2010.[57] During India's historic heat wave in 2015, responsible for over 2,300 deaths across the country, Ahmedabad reported fewer than 20 heat-related deaths thanks to a comprehensive early warning system and preparedness Heat Action Plan.[58] In Gujarat in 2019 during an extreme heat event two people died and 300 were admitted to the hospital due to excessive heat and dehydration.[59]

Climate

India was the seventh most affected country due to extreme weather events in 2019, according to the Global Climate Risk Index, which ranks countries according to their vulnerability both in terms of fatalities and economic losses.[60]

Implementing strong climate policies early would lead to EVs delivering high co-benefits.[61] Currently 15% of global energy-related GHG emissions come from the process of getting oil and gas out of the ground and to consumers.[62] With aggressive passenger (i.e., cars and two-wheelers) EV adoption of 30% of sales by 2030, India can reduce GHG emissions by 600 million metric tons in 2050 (8% of total GHG emissions in 2050).[63]

Source: Charu Lata, NRDC

With an arid to semi-arid climate, Gujarat experiences seasonal temperature variations and frequent heat waves during summer and inconsistent rainfall during the rainy (monsoon) season, resulting in recurrent droughts.[64] Extended monsoon, unseasonal rain, hailstorms and frequent cyclonic storms are expected to be permanent features of climate along Gujarat coast.[65]

Energy

Transportation electrification is expected to enhance energy security and decrease India's oil import bill. The diesel and gasoline that powers India's millions of engines have turned India into a large consumer of the world's crude oil. It spent $112 billion on imports of crude oil in 2018–2019 alone, around 4% of its GDP.[66] The Phased Manufacturing Program (PMP) under the National Mission on Transformative Mobility and Battery Storage as well as the recently launched Production Linked Incentives (PLI) scheme will support the deployment of battery storage in both e-mobility and across the power sector, with the objective of reducing India's energy import dependence, by reducing direct oil demand, and increasing the uptake of renewable energy in the power sector.[67] A CEEW report notes that the battery manufacturing industry in India can become bigger than the total amount spent on import of crude oil, and the revenue loss for governments from the taxes on the oil sector would be replaced by higher tax revenues in other economic sectors.[68]

If EV adoption reaches of 30% of sales by 2030, EVs can reduce India's annual crude oil import bill by $14 billion/year by 2030 and by $100 billion/year by 2050 (assuming a constant oil price of $40/barrel). However, the transition to EVs from ICE vehicles will result in lost revenue from petrol and diesel taxes for both central and state governments. Yet if viewed in a larger macroeconomic context, the consumer spending less on fuel is left with a higher disposable income, which, in turn, is expected to increase the consumption of other goods and services in the economy.[69]

Domestic Value

The EV ecosystem presents a market size of ₹ 2,12,456 crore ($29 billion) for batteries, powertrains, and charging infrastructure for a 30% passenger EV sales in 2030, in contrast to a 4% EV sales business as usual.[70] There can be further increase in value-addition and employment from battery recycling, construction of giga-factories, distribution and sale of electricity, installation and operation of EV charging infrastructure, and telematics products and services.[71] A recent CEEW-CEF study states that the EV transition will create a market opportunity for EV sales worth ₹18,000 crore ($2.5 billion) in FY21, which will increase up to an ₹ 3,39,000 crore ($ 46 billion) by 2030. In total, the transition has the potential to create a value add of ₹ 14,42,400 crore ($198 billion).[72]

Utilities

Utilities in the U.S. are recognizing that EVs can create benefits to their bottom-lines and their customers by increasing electricity sales, increasing the efficiency of the electrical grid through vehicle-grid integration (VGI), feeding more renewable energy into the grid and helping meet obligatory renewable purchase targets. In order to capture the direct and indirect values, electric utilities in the U.S. may offer incentives to charging station owners, such as equipment rebates or make-ready investments or they may invest in charging stations themselves, if permitted to do so by state legislation and regulation.

In China the national government's target setting and directives have been essential to having state-owned utilities invest directly in charging infrastructure while also entering into joint ventures with private infrastructure providers.

Smart charging of battery EVs (BEVs) can lower the cost of integrating renewables into the Indian power grid. The net revenue from BEV charging alone could cut the current utility financial deficits by 50%.[73]

Source: Charu Lata, NRDC

Challenges to EV Policy Adoption

India's growing EV industry faces an unclear future. The auto sector, which plays a significant role in the Indian economy, faced challenges and a downturn prior to COVID-19. Experts are uncertain as to how the country's EV sector will emerge from the pandemic. Some forecast stagnation, while others believe the EV sector can become a strong global manufacturing contender.[74] Transportation electrification across India is a national priority, however policies lack firm national timelines and objectives. Governmental and non-governmental actors are working to accelerate EV adoption and address the mismatch between the market outlook and the country's vision.[75]

Several impediments to widespread transportation electrification remain - evolving national policy, interagency coordination, industry interest and demand, available subsidies, and policy approval process.

Evolving national policy landscape

FAME II and the Phased Manufacturing Plan indicate a clear intent for India to transition to transportation electrification, with a focus on indigenous manufacturing.[76] Despite various support mechanisms and policy signals, there remains a mismatch between the market outlook and electric mobility targets.

Evolving national-level EV policies can make it difficult for states seeking to align their EV policy with national schemes. For example, the release of FAME II in April 2019 led to states redrafting their policies to better align state-level incentives with vehicle and battery technologies with the national program. Under FAME II, incentives allocated by the Department of Heavy Industries (DHI) to set up charging stations were released in August 2019, which led Gujarat to revisit the charging infrastructure incentives under the EV policy.

Industry interest and demand

India's 2030 EV sales ambitions translate into a total sale of 102 million vehicles. The aspirations are that 70% of all commercial cars, 30% of private cars, 40% of buses, and 80% of two- and three-wheeler sales in 2030 would be electric. However, the country is falling short of realizing the 2030 vison.[77]

Limited public charging infrastructure and range anxiety continue to inhibit transportation electrification and India needs an aggressive scale-up of charging infrastructure to achieve its ambitious EV sale targets. However, charging infrastructure providers face a 'chicken and egg' dilemma with whether to invest in charging infrastructure without certainty in EV deployment or demand for charging infrastructure.[78]

Though a number of e-mobility companies are already operating in Gujarat, and many new e-mobility startups have emerged in the state, the vehicle manufactures, charging service providers and fleet aggregators have yet to clearly communicate their interest and demand to the state government.

As the Gujarat EV policy focusses on EV deployment and the state already has a very strong automotive manufacturing base, the interest and eagerness shown by the industry will play an important role in accelerating the policy release. One of the key impediments to the development of demand for EVs, and therefore for battery storage in the e-mobility market segment is the lack of access to charging infrastructure.

Growth in the e-mobility sector will require early access to safe, reliable, accessible, and affordable charging infrastructure or battery swapping, appropriate for each market segment (buses, two/three wheelers, etc.). It will entail strengthening distribution infrastructure in critical load-growth areas. Experience of countries such as China and Norway indicate that availability of charging infrastructure was a key driver for mass EV adoption, that emerged through close coordination of the various stakeholders.[79]

Amount of subsidies

Among the several barriers to mass adoption of EVs, the high upfront cost is primary. At present EVs in the country are around 1.2 to three times more expensive than internal combustion engine (ICE) vehicles purely based on purchase cost.[80]

Gujarat's draft EV policy provides capital incentives over and above the national level subsidies for purchasing EVs and setting up charging stations. Allocating the subsidies in terms of the number of vehicles and chargers and amounts as well as ensuring equity for public transport modes especially three-wheelers has slowed the process in Gujarat.

The amount of subsidy for each vehicle category has been revised several times and the number of charging stations to be covered under the state policy has also been a point of discussion for long.

Inter-agency coordination at state level

Unlike the conventional transport sector policies, a number of agencies and departments are involved in the planning and coordination for transitioning to zero emission mobility. In the central government, as many as ten different agencies have policies to support e-mobility adoption, but there is no lead coordinating agency.

A broad example for this at the state level could be that the transport department looks at the vehicle deployment, energy department supports the installation and grid connection for charging infrastructure, urban development departments assist in siting the chargers appropriately and finance department allocates and monitors the financial incentives to advance e-mobility.

A clear inter-agency coordination process that defines the mechanisms to take electric mobility forward would be very helpful in this case. Though the draft EV policy defines the roles of some agencies and departments, most departments are waiting for the official policy to provide defined support.

Policy approval process
Policy making involves coordination between several stakeholders, including government departments, academic and research institutions, civil societies and others. As expected in any such extensive consultative process, there is a propensity for such a process to be long drawn. This is evident in the time it has taken for the state to launch the policy.

In a fast-evolving market, it becomes imperative to have some policy, instead of attempting to make a 'perfect policy'. Given the number of stakeholders and often contradictory needs, it may not be possible to have a policy that suits all. It is therefore suggested that the state come out with the policy, and then use a calibrated approach to iron out any difficulties. It is critical that the state and its various departments make a heuristic learnings approach to this new technological segment as soon as possible.

Key Takeaways

The key takeaways of this report, based on research and analysis of the EV market and draft Gujarat EV policy are:

1. **Need for a Gujarat Electric Mobility policy**. Shifting to electric vehicles will have major economic, environmental and social benefits in Gujarat. To keep up with market trends, Gujarat should formally release its EV policy, while national policies continue to evolve. A state policy with clear targets can continue to be tailored while highlighting Gujarat's priority on EV for economic growth and environmental goals.

2. **Significant economic opportunities with clean air and climate benefits**. The Gujarat EV Policy would achieve 2 billion clean vehicle kilometers, accounting for reduction of 0.3 million tons of CO_2e emissions; save 98 million liters in terms of oil import (petrol and diesel) and reduce consumption of 26 million kilograms of compressed natural gas; and lead to savings of more than ₹2 billion ($27.4 million) in terms of avoided emissions over the projected three year period of the draft policy.

3. **Job creation and "Make-in-India" opportunity**. With a large automotive manufacturing base in Gujarat, the adoption of e-mobility will introduce new high-skilled jobs in the manufacturing of batteries, EV powertrain, components, and charging infrastructure. The additional consumption of electricity will in turn create jobs in the power and renewable energy sector. Gujarat can demonstrate leadership to grow its EV market and create jobs by investing in high-end technology, securing a local supply chain from the start, and providing a complete mobility solution, not just a vehicle.[81] This will boost and instill confidence in the local automotive industry, as well as align well with the national Make-in-India campaign.

4. **Strengthen inter-departmental coordination**. A planned and structured implementation is key to achieving the targets specified under any policy. Clarifying inter-departmental coordination will serve to streamline policy implementation and advance EV deployment. A state-level EV Steering Committee can provide the structure for departments including

Gujarat State Road Transport Corporation, Road Transport Authority, Gujarat Energy Development Agency (GEDA), power utilities, city municipal corporations among others to plan, implement and modify the EV policy (See Figure 1 in Executive Summary).

5. **Enhance distribution communication (DISCOM) engagement.** Develop utility EV programs and policies that advance electric mobility, allow for streamlined EV grid infrastructure investments, grid connections, land availability, and ensure attractive and stable tariffs for EV. Frontloaded investments into charging infrastructure and the EV grid by utilities can lead to large pay-offs in the long term, as is being quickly recognized in many US states, Europe and other international examples.

6. **Encourage partnerships with business and civil society**. To leverage limited government resources, developing partnerships with businesses, OEMs, academic institutions, civil society, are crucial to grow the electric mobility market.

7. **Provide and enhance incentives**. To maximize the economics of electric mobility, Gujarat can introduce policy interventions at the state- and city-level such as additional incentives for using clean energy for EV charging and setting up a single window clearance system to attract investments for "Ease of Doing Business". These incentives would aim to create a critical, self-sustaining mass of EVs, manufacturers, service providers and stakeholders.

8. **Strong and integrated city actions on electric mobility.** Congestion pricing and other non-fiscal incentives such as mandatory procurements of EVs by state agencies, reserved parking spaces, and low emission zones in major cities can enhance EV adoption.[82] Updating the General Development Control Regulations (GDCR) to account for charging points in housing societies, commercial establishments, and shopping complexes is also critical.

9. **Expedite land identification and availability.** Gujarat can facilitate land for charging infrastructure through incentives, such as long-term leases and lower interest rates. A database of suitable and available land in the major cities of Gujarat may be developed after due verification from the respective authorities. Standard Operating Procedures can be developed for deploying public charging infrastructure, and periodic evaluation of its performance.

10. **Focus on freight electrification**. Gujarat can take a lead in deployment of EV freight vehicles (medium- and heavy-duty) given the high level of industrial and commercial activity, especially around ports and dedicated industrial zones. Specialized pilots and use-case specific strategies may be developed for transitioning Gujarat's commercial fleet to EVs.

Source: Charu Lata, NRDC

Annexure 1: Calculation Inputs and Assumptions for emission, fuel and cost saving83

1. Emission saving calculation:

To calculate the reduction in exhaust emissions by switching to e-mobility, the following assumptions have been taken (see Table below).

Assumptions for vehicle travel and exhaust emissions.

Vehicle Segment	Average kilometers travelled /day (km/day)[84]	Number of operational days/year (days)	Average kilometers travelled /year (km/year)	Exhaust emissions (gCO_2e/ km) [85]
2-Wheelers (private)*	25	300	7,500	54
3-Wheelers	100	300	30,000	108
4-Wheelers (Commercial)**	190	300	57,000	245
Buses***	200	300	60,000	900

*Sales of private two-wheelers is much higher than sales of commercial two-wheelers in commercial purposes. Hence, for the calculation, only private 2 Wheelers are considered for simplicity in calculations

**Since private 4 wheelers will not be provided incentive support only commercial 4 wheelers are considered in the calculations

***Out of the total fleet of 8800+ buses, only 14 buses are run on CNG. Therefore, exhaust emissions for buses are assumed considering diesel as fuel.

To determine the reduction in emissions through the vehicles projected above, the total distance travelled by the vehicles is calculated.

$$\text{Cumulative distance travelled by a vehicle segment } \left(\frac{km}{yr}\right)$$
$$= \text{Average kilometers travelled per year } \left(\frac{km}{yr}\right) x \text{ Number of EVs on the road in that year}$$

The table below shows the cumulative distance travelled by EVs deployed per the Gujarat EV policy during the policy period.

Cumulative distance travelled by EVs

Vehicle Type	Distance travelled per year (million km/year)		
	Year 1	Year 2	Year 3
2-Wheelers	51	197	600
3-Wheelers	46	163	420
4-Wheelers	32	109	257
Buses	10	35	90
Total million km	2010		

$$\text{Avoided CO2e emissions by a vehicle segment } \left(\frac{gCO2e}{yr}\right)$$
$$= \text{Cumulative distance travelled by a vehicle segment } \left(\frac{km}{yr}\right) x \text{ Exhaust emissions } \left(\frac{gCO2e}{km}\right)$$

2. Fuel saving calculation

Fuel savings for each vehicle segment are calculated as follows.

$$\text{Avoided fuel consuption } \left(\frac{liters}{yr}\right) = \frac{\text{Cumulative distance travelled by a vehicle segment } \left(\frac{km}{yr}\right)}{Average\ mileage\ of\ vehicle\ segment\ (\frac{km}{liter})}$$

3. Financial Impact

A. Cost of avoided emissions

The total cost of avoided emissions due by moving to EVs can be calculated as follows. The value of CO2 avoided is assumed to be ₹6277.95/ton.[86]

$$\text{Cost of avoided CO2e emissions } \left(\frac{₹}{yr}\right)$$

$$= \text{Avoided CO2e emissions by a vehicle segment } \left(\frac{gCO2e}{yr}\right) x \frac{Cost\ of\ CO2e\ avoided\ (\frac{₹}{\text{ton}})}{1000000}$$

B. Revenue loss to government due to reduced fuel sales

The revenue loss to state exchequer is calculated as follows.

$$\text{Revenue loss for Gujarat in the form of reduced taxes from fuel sales } \left(\frac{₹}{yr}\right)$$

$$= \text{Avoided fuel consuption } \left(\frac{liters}{yr}\right) x\ Fuel\ price\ \left(\frac{₹}{liter}\right) x\ \%tax\ levied\ on\ the\ fuel$$

C. Total cost of ownership calculation:

Inputs:

TCO comparison for two-wheelers

Components	**ICE**	**EV**	
	Honda Activa 110cc BS VI	*Hero Photon*	*Ather 450*
Input Parameters			
Cost before GST	62,461	85,705	127,293
Ex showroom price incl. of GST	65,584	89,990	133,658
FAME II Incentive	0	17,000	26,732
Government of Gujarat (GoG) Top Up Incentive	0	8,500	13,366
Motor Vehicle Tax	3,748	2,571	3,819
Municipal Corporation tax	1,587	882	1,298
Third Party Insurance	5,000	4,675	5,778
Accessories	1,100	0	0
Battery Capacity (kWh)	0	3	2.67
Electrical Units consumed per full charge (kWh/charge)	0	4	4
Fuel Charge (INR/l or INR/kWh)	83	8	8
Kilometers per day (km/day)	25		

Mileage (km/l or km/kWh)	50	20	24
Engine Oil Price (INR/oil change)	250	0	0
Range (km)	0	91	105
Operational and Maintenance Costs (INR/year)			
Fuel Cost	12,456	3,000	2,465
Maintenance Cost (Engine Oil)	3,000	0	0
Service Cost	4,000	4,000	6,000

TCO comparison for three-wheelers

Components	**Treo HRT Mahindra Electric**	**Bajaj RE 4S CNG BS VI**
Input Parameters		
Cost before GST	309,979	180,000
Ex showroom price incl. of GST	325,478	189,000
FAME II Incentive	65,095	-
GoG Top Up Incentive	32,548	-
Motor Vehicle Tax	9,299	10,800
Municipal Corporation tax	3,125	1,825
Third Party Insurance	8,695	10,230
Accessories	0	5,000
Battery Capacity (kWh)	8	0
Electrical Units consumed per full charge (kWh/charge)	9	0
Fuel Charge (INR/kg or INR/kWh)	8	56
Kilometers per day (km/day)	100	100
Mileage (km/kg or km/kWh)	15	25
Engine Oil Price (INR/oil change)	0	1,000
Range (km)	171	0
Operational and Maintenance Costs (INR/year)		
Fuel Cost	16,000	67,140
Maintenance Cost (Engine Oil)	-	12,000
Service Cost	4,000	4,000

TCO comparison for four-wheelers

Components	**TATA Tigor EV XE+**	**TATA Tigor ICE XE**
Input Parameters		
Cost before GST	₹ 9,58,375	₹ 4,17,827
Ex showroom price incl. of GST	₹ 12,73,375	₹ 5,39,000
FAME II Incentive	₹ 2,15,000	₹ 0
GoG Top Up Incentive	₹ 1,07,500	₹ 0

Motor Vehicle Tax	₹ 28,751	₹ 25,070
Municipal Corporation tax	₹ 9,609	₹ 4,203
Third Party Insurance	₹ 10,000	₹ 10,000
Battery Capacity (kWh)	21.50	0.00
Electrical Units consumed per full charge (kWh/charge)	22.00	0.00
Fuel Charge (INR/l or INR/kWh)	₹ 8	₹ 83
Kilometers per day (km/day)	190.00	190.00
Mileage (km/l or km/kWh)	10.00	11.00
Range (km)	213	0
Operational and Maintenance Costs (INR/year)		
Fuel Cost	₹ 45,600	₹ 4,30,298
Maintenance Cost (Engine Oil)	₹ 0	₹ 1,500
Service Cost	₹ 4,000	₹ 4,000

Assumptions:

- The life for two-and three-wheelers is considered 7 years and four-wheelers as 15 years.
- The life for Li-ion batteries is considered 3 years, same as the warranty period
- Battery cost is considered as 50% of vehicle cost with 10% year on year (YoY) decline in cost
- Electricity tariff is assumed ₹ 8/kWh considering charging a mix of charging pattern at residence and public charging stations
- Fuel Charge in Ahmedabad as on 23/01/2021 is Petrol 83.04/L, diesel 81.72/L and CNG 55.95/kg
- Fuel charge, Electricity tariff and service costs increases by 5% YoY
- Municipal Corporation tax, accessories cost, third party insurance costs, engine oil costs and maintenance costs are assumed based on stakeholder consultations
- GoG incentive is based on draft EV policy of Gujarat
- Electricity units consumed for EVs is calculated considering pessimistic scenario including thermal and AC-DC conversion losses

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Resources Guide

India Focused Resources

Location is Everything: Approaches to Siting Electric Vehicle Charging Infrastructure for the Indian Context

https://www.nrdc.org/sites/default/files/location-everything-ev-issue-brief-20200127.pdf

Scaling up Electric Vehicle Charging Infrastructure: Lessons from China and the United States for the Indian Context

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Charging Forward on Powering Vehicles: Economic and Policy Drivers for Electric Vehicle Charging Infrastructure in India – Preliminary Results

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Stakeholder Driven Solutions for Financing Electric Mobility

https://www.nrdc.org/sites/default/files/financing-electric-mobility-202102-ib.pdf

International Resources

Best Practices for Commercial and Industrial EV Rates

https://www.nrdc.org/sites/default/files/media-uploads/best-practices-commercial-industrial-ev-rates_0.pdf

Driving Out Pollution: How Utilities Can Accelerate the Market for Electric Vehicles

https://www.nrdc.org/resources/driving-out-pollution-how-utilities-can-accelerate-market-electric-vehicles

Highlighted Blogs

- **Charging Ahead: Siting EV Charging Stations in Hyderabad, Anjali Jaiswal, Charu Lata and Rajkiran Bilolikar, December 2020**
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- **Moving Ahead with Electric Mobility in India, Charu Lata and Anjali Jaiswal, February 2020**
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