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MARKET SEGMENTATION ANALYSIS OF ELECTRIC VEHICLE MARKET IN INDIA

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Code link -
https://colab.research.google.com/drive/1MnEUT1We41KTlf-ufyqOkl52pLMa8dKh?usp=sharing

Overview :

India's automobile industry holds a significant position globally, ranking fifth in terms of market size. It has witnessed consistent growth in production and sales. However, the industry faces various challenges such as economic slowdown, consumer purchase delays, and weak rural demand. These factors have adversely affected the sector. To address concerns related to the environment and energy security, transitioning towards green mobility is crucial. Currently, 97% of vehicles in India run on petrol and diesel, leading to pollution and carbon emissions. Shifting to greener alternatives like electric vehicles and alternative fuels is necessary to reduce emissions and dependence on imported oil.

The government has introduced initiatives and incentives to promote green mobility, and there is an expectation of increased demand for sustainable transportation options. Embracing green mobility will not only contribute to a cleaner and more sustainable environment but also create opportunities for technological advancements and job creation within the automobile industry.

The growth and importance of the automobile industry in India are notable. It is the fifth-largest automobile market globally, with 3.82 million units sold in 2019. The industry's production volume has been steadily increasing, driven by rising demand for vehicles. This sector significantly contributes to India's Gross Value Addition (GVA), promoting economic growth and employment opportunities.

However, the automobile industry has faced challenges, including an economic slump, delayed consumer purchases, liquidity crunch, and weak rural demand for two-wheeler passenger vehicles in FY20. To counterbalance the decline in domestic demand, Original Equipment Manufacturers (OEMs) have increased vehicle exports. Nevertheless, these challenges highlight the need for a resilient and sustainable approach to ensure long-term growth.

The environmental impact and energy security are critical considerations for India. The country has committed to reducing greenhouse gas (GHG) emissions as per the COP21 agreement. Currently, 97% of vehicles in India run on petrol and diesel, contributing to pollution and carbon emissions. Moreover, the dependence on imported oil exposes the country to price fluctuations and energy security concerns.

To achieve India's GHG emission reduction targets, a swift transition towards greener mobility technologies is imperative. Green mobility encompasses electric vehicles

(EVs), hybrid vehicles, and alternative fuels such as biofuels and hydrogen. Encouraging the adoption of green mobility not only reduces carbon emissions but also addresses energy security concerns.

- India's automobile industry ranks fifth globally in terms of market size.
- The industry has experienced consistent growth in production and sales.
- Challenges such as economic slowdown, consumer purchase delays, and weak rural demand have impacted the industry.
- Transitioning towards green mobility is crucial to address environmental impact and energy security concerns.
- Currently, 97% of vehicles in India run on petrol and diesel, contributing to pollution and carbon emissions.
- Shifting to greener alternatives like electric vehicles and alternative fuels is necessary to reduce emissions and dependence on imported oil.
- The government has introduced initiatives and incentives to promote green mobility.
- Increased demand for sustainable transportation options is expected in the future.
- Embracing green mobility will contribute to a cleaner environment and create opportunities for technological advancements and job creation.

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Market Segmentation Analysis :

The electric vehicle (EV) market can be segmented based on various factors. Here are some common approaches to market segmentation for electric vehicles:

1. Vehicle Type:

- - Passenger Cars: EVs designed for personal use, ranging from compact cars to luxury vehicles.
- - Commercial Vehicles: EVs used for commercial purposes, such as electric buses, delivery vans, and trucks.

2. Range and Battery Capacity:

- - Short Range: EVs with a limited driving range, suitable for urban commuting and shorter trips.
- - Medium Range: EVs with a moderate driving range, suitable for longer commutes and occasional road trips.
- - Long Range: EVs with an extended driving range, preferred by frequent travelers and those seeking maximum range flexibility.

3. Price and Market Segment:

- - Affordable/Entry-Level: EVs with a relatively lower price point, targeting cost-conscious consumers and first-time EV buyers.

- - Mid-Range: EVs with a moderate price range, appealing to a broader customer base seeking a balance between affordability and features.
- - Luxury/High-End: EVs with premium features, advanced technology, and a higher price point, targeting affluent consumers who prioritize luxury and performance.

4. Geographic Segmentation:

- - Regional Focus: Segmentation based on specific geographical areas or markets, considering factors such as infrastructure, incentives, and consumer preferences. For example, EVs designed specifically for urban environments or tailored to regions with high EV adoption rates.

5. Customer Lifestyle and Preferences:

- - Urban Commuters: EVs designed for efficient and eco-friendly commuting in densely populated urban areas.
- - Outdoor Adventurers: EVs equipped with off-road capabilities, longer range, and enhanced durability, appealing to customers with active lifestyles and a need for versatility.
- - Tech Enthusiasts: EVs with advanced technology features, connectivity options, and smart vehicle integration, targeting customers who value innovation and cutting-edge features.

6. Charging Infrastructure:

- - Home Charging: EVs designed for customers who have access to home charging facilities, with potential for overnight charging and convenience.
- - Public Charging: EVs optimized for longer journeys and reliance on public charging stations, emphasizing fast charging capabilities and interoperability with various charging networks.

Statement of the Problem:

1. Total vehicles: India has approximately 330 million vehicles, making it the third-largest nation in terms of road network.
2. Total 4-wheelers: There are around 7 million 4-wheelers registered in India, including those that fall under the category of LMV (Light Motor Vehicles).
3. Total 2-wheelers: India has a total of 210 million 2-wheelers registered, including both 2-wheeler transport and non-transport vehicles.
4. Total Electric Vehicles: Out of the 330 million registered vehicles, only 2,541,372 are electric vehicles, accounting for just 0.77% of the total. The majority of these electric vehicles are in the 2-wheeler segment.

5. Average Number of EVs per person: When dividing the number of EVs by the population, the result is 0.001805465, indicating a very low penetration rate. However, with favorable EV policies implemented by many state governments, the percentage of EVs is expected to rise to 25% by 2025 and approximately 80-90% by 2050. Given India's large population and extensive road network, the percentage of EVs is projected to increase significantly in the coming years.

Sales Trends:

Electric Vehicle (EV) Sales by Vehicle Category: As of the end of FY2022, the cumulative EV sales in India had reached 1,090,641 units. In FY2022, the annual EV sales surpassed 400,000 vehicles, with electric two-wheelers (E2W) accounting for over 55% of the market share, followed by passenger electric three-wheelers (E3W P) with approximately 35% market share.

EV Sales by State: Between FY2014 and FY2022, the top states for EV sales in India were Uttar Pradesh, Maharashtra, Karnataka, Bihar, and Delhi, which collectively accounted for more than 60% of the market share. In terms of FY2022 sales, the leading states were Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, and Delhi.

Please note that the information provided is based on the data available and is accurate as of the mentioned timeframe.

Market Overview :

The adoption of electric vehicles (EVs) in India shows an uneven distribution across vehicle categories. While the numbers of EVs are increasing, the majority of the additions come from the three-wheeler segment, accounting for approximately 79% of the overall EVs on the road. Two-wheelers contribute around 17%, while four-wheelers make up only 3% of the total EV market share.

Insights from various EV selling companies shed light on the reasons behind this distribution, categorized by the type of EV:

2-Wheelers:

- Two-wheelers have gained significant traction in the EV market, with several factors driving their adoption.
- Cost-effectiveness and affordability compared to other EV categories make two-wheelers an attractive option for consumers.

- The shorter commuting distance and lower power requirements of two-wheelers align well with the current capabilities of EV technology.
- Availability of a wide range of models and manufacturers offering competitive pricing and features has also contributed to the growth of this segment.

3-Wheelers:

- The three-wheeler segment has experienced substantial growth in the EV market.
- Three-wheelers are commonly used for short-distance transportation services, such as last-mile delivery and public transportation.
- Government policies and initiatives promoting the adoption of EVs in the commercial and public transportation sector have played a significant role in driving the growth of three-wheeler EVs.
- The cost savings on fuel and maintenance, along with lower emissions, make EV three-wheelers an attractive option for commercial vehicle operators.

4-Wheelers:

- The adoption of EVs in the four-wheeler segment has been relatively slower compared to two-wheelers and three-wheelers.
- Higher upfront costs, limited charging infrastructure, and range anxiety are some of the factors inhibiting the widespread adoption of EVs in this category.
- The lack of affordable and diverse options in the four-wheeler EV market has also contributed to the slower growth.
- However, the government's push for EV adoption, along with ongoing advancements in battery technology and infrastructure development, is expected to drive the growth of four-wheeler EVs in the future.

Overall, the uneven adoption of EVs across vehicle categories in India can be attributed to factors such as cost-effectiveness, suitability for specific use cases, government policies, charging infrastructure availability, and consumer preferences.

ELECTRIC PV SALES IN FY2023	
Company	**Units**
Tata Motors	31,203
MG Motor India	4,412
BYD India	867
Hyundai Motor India	780
Mahindra & Mahindra	398
BMW	382
Kia India	311
PCA Auto India	193
Mercedes-Benz India	152
Volvo Auto India	137
Audi	105
Mercedes-Benz AG	94
Porsche AG	63
Jaguar Land Rover India	23
Others	424
Total	**39,544**
Data: Vahan	

TOP 20 ELECTRIC 3W OEMs IN FY2023	
Company	**Units**
Mahindra Last Mile Mobility	35,013
YC Electric	29,753
Saera Auto	21,853
Dilli Electric	16,480
Champion Polyplast	13,948
Mini Metro	12,084
Unique Int	10,709
JS Auto	8,019
Energy Electric	7,206
Allfine Industries	6,642
Vani Electric	6,430
Thukral Electric	6,195
Hotage Corporation	5,969
Bestway Agencies	5,867
Lectrix EV	5,258
Khalsa Agencies	4,539
Bright Autozone	3,667
Kinetic	3,557
Atul Auto	3,544
Arrow Automotive	3,148
Total	**2,09,881**
Data: Vahan	

TOP 20 E2W OEMs IN FY2023	
Company	**Units**
Ola Electric	1,51,344
Okinawa Autotech	94,133
Hero Electric	89,165
Ampere Vehicles	83,659
TVS Motor Co	80,565
Ather Energy	76,277
Bajaj Auto	28,098
Okaya EV	13,069
Revolt Motors	12,887
Pur Energy	11,541
Being India	10,705
Jitendra New EV Tech	8,443
Twenty-Two Motors	5,790
Kinetic Green	5,390
Goreen E-Mobility	4,816
Chetak Technology	4,231
KLB Komaki	3,768
Lectrix EV	2,812
Ammo Mobility	2,256
Mew Electricals	2,107
Total	**6,91,056**
Data: Vahan	

Two-wheeler EVs perfectly align with the mobility needs in India due to the following factors:

- - They have a lower upfront cost compared to four-wheelers and lower operating costs.
- - Two-wheelers are well-suited for commuting in high traffic areas.
- - They are ideal for short-distance commutes within cities or villages.

The rise in adoption of three-wheeler EVs can be attributed to:

- - Three-wheelers serve as a solution for affordable last-mile connectivity, which drives their higher adoption.
- - As three-wheelers are a source of income for many Indians, their low operating costs make EV variants more appealing, leading to further uptake.

There is a greater adoption of EVs in the commercial/public segment due to the following reasons:

- - Indian customers prefer public transport, making it likely that public transportation will play a significant role in reducing CO2 emissions.
- - With low vehicle ownership, commercial fleets are expected to transition to electric vehicles due to their lower operating costs.

The introduction of EVs in shared mobility is driven by:

- - Indian customers being price-sensitive, with shared mobility offering a cost-effective way to commute.
- - EVs have even lower operating costs, making the overall cost of vehicle sharing more affordable for customers, leading to higher adoption.

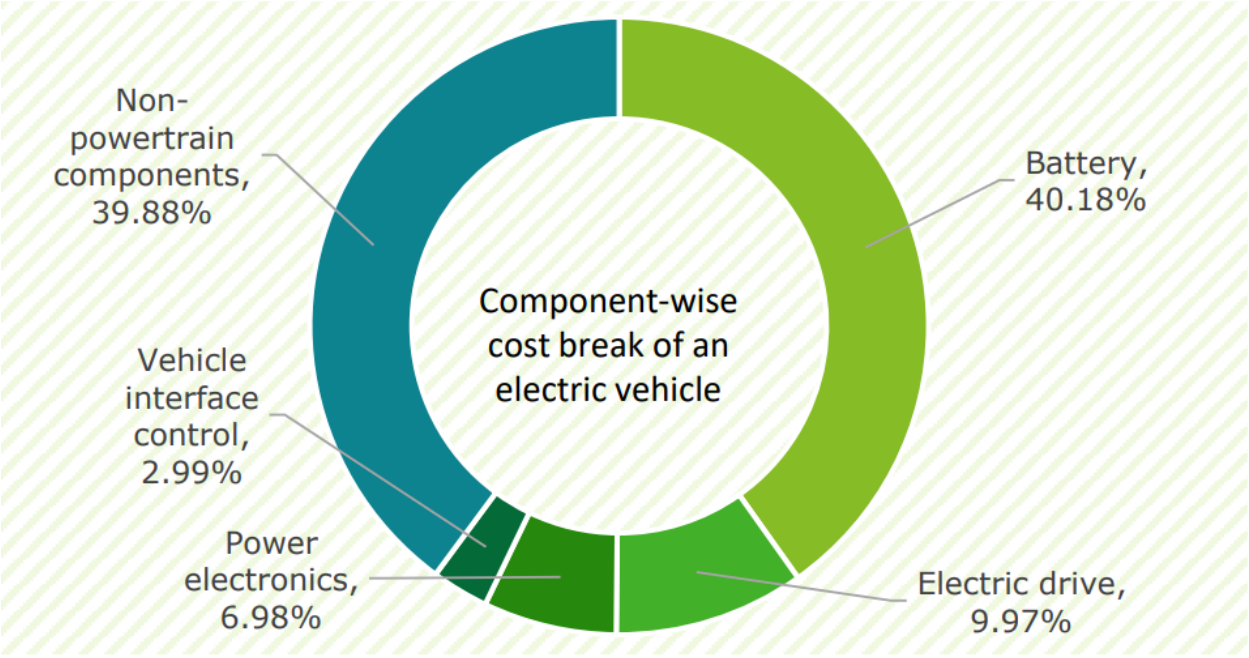
Regarding electric cars, they can be categorized into three distinct types based on their powertrain:

- - Battery Electric Vehicles (BEVs) run solely on a battery and electric drivetrain. They are fully-electric, rechargeable from an external source. Examples in India include Hyundai Kona Electric, Mahindra e-Verito, Mahindra e2o, and Tata Nexon EV 2020.
- - Hybrid Electric Vehicles (HEVs) are powered by both fuel and electricity. The car's braking system generates electric energy to recharge the battery through regenerative braking.
- - Plug-in Hybrid Electric Vehicles (PHEVs) have a larger battery capacity than HEVs and can be charged from an external source. They can operate in electric mode for a certain distance before switching to the combustion engine.

Overall, the adoption of EVs in India is driven by their suitability for specific mobility needs, cost-effectiveness, and the push towards reducing carbon emissions.

Cost Breakdown :

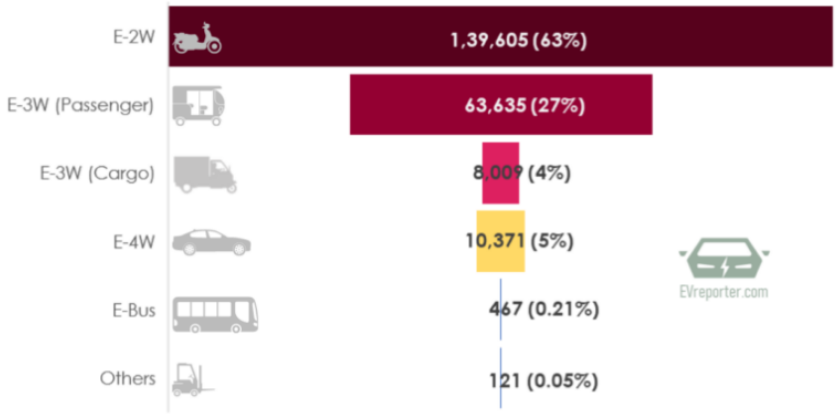
The price of an electric vehicle is presently higher compared to a traditional vehicle with similar characteristics and performance. One of the primary factors behind this is the elevated cost of the battery, which constitutes approximately 40% of the total cost of an EV. Despite significant declines in battery prices over the past decade, they still remain at a level that poses challenges in achieving cost parity between EVs and conventional vehicles. The battery serves as the predominant cost element for an electric vehicle, and industry experts anticipate that this share will decrease to 18% by 2030, potentially enhancing the affordability of electric vehicles.



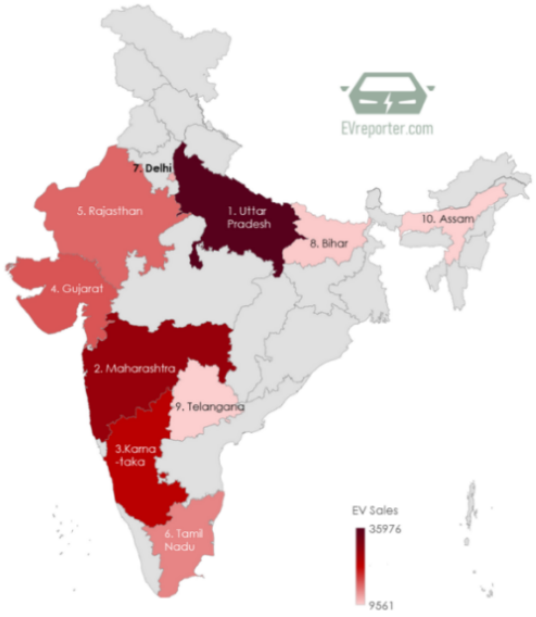
Competition in the Indian electric vehicle (EV) sector is intensifying as both established companies and start-ups vie for market dominance. Major players are introducing new EV models to gain a competitive edge, while start-ups are securing funding and expanding their presence. Tata Motors, a key player, has introduced its advanced EV technology called ZIPTRON, which powers their upcoming electric cars.

ZIPTRON boasts a highly efficient permanent magnet AC motor and a robust, waterproof battery system, prioritizing performance and durability. Morris Garages Motor India has also entered the Indian EV market with the launch of its first electric internet SUV, offering a substantial driving range of 340 km on a full charge to meet the rising demand for long-range EVs. Beyond these specific examples, competition in the Indian EV sector is driven by companies investing in research and development, launching new models, and expanding their market reach to untapped cities. The goal is to establish a strong presence in the growing EV market and cater to the evolving needs and preferences of consumers. Overall, the competitive landscape in the Indian EV sector is fostering the development of innovative and technologically advanced electric vehicles, thereby accelerating the adoption of sustainable mobility solutions in the country.

Category wise EV sales in Q1 FY 22-23 (April 2022 to June 2022) :

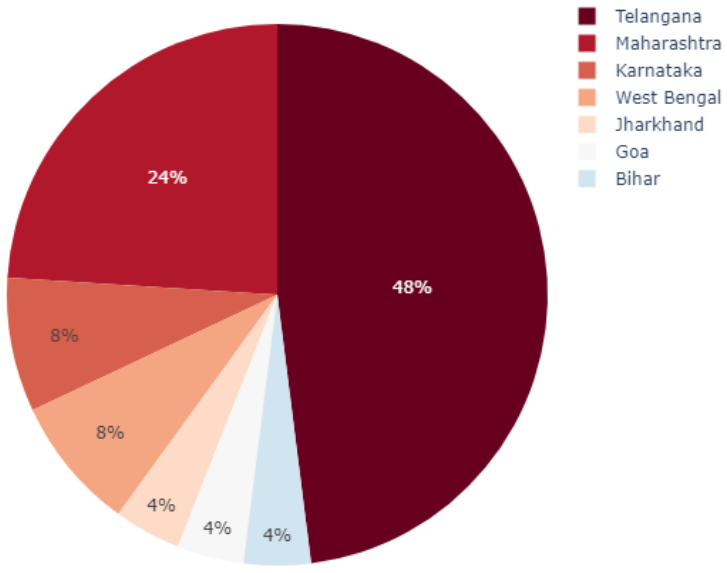


Electric Vehicles REGION-Wise Sales Trend :

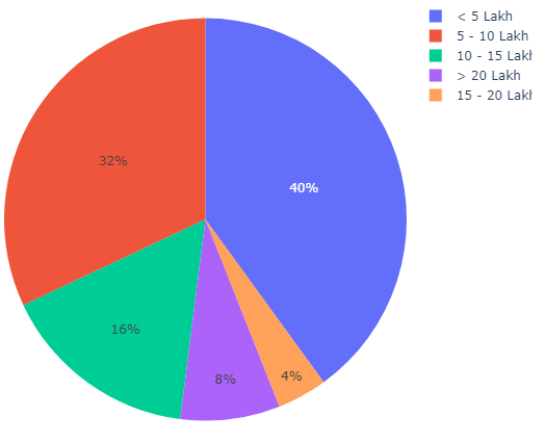


State	EV's Sold	%Share
Uttar Pradesh	35976	16.3%
Maharashtra	27908	12.6%
Karnataka	23467	10.6%
Gujarat	17406	7.8%
Rajasthan	16237	7.3%
Tamil Nadu	14358	6.5%
Delhi	11945	5.4%
Bihar	10012	4.5%
Telangana	9670	4.3%
Assam	9561	4.3%
All Other States	44108	19.9%

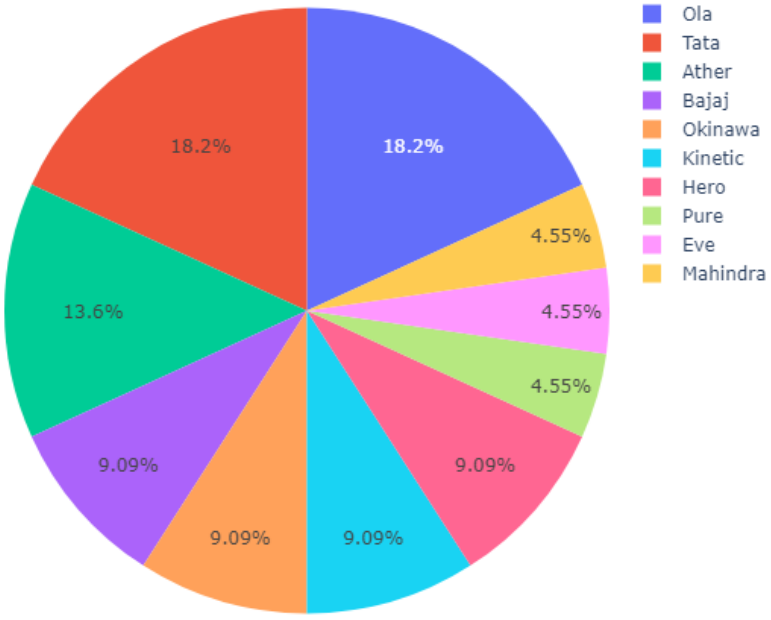
EV Ownership State Wise



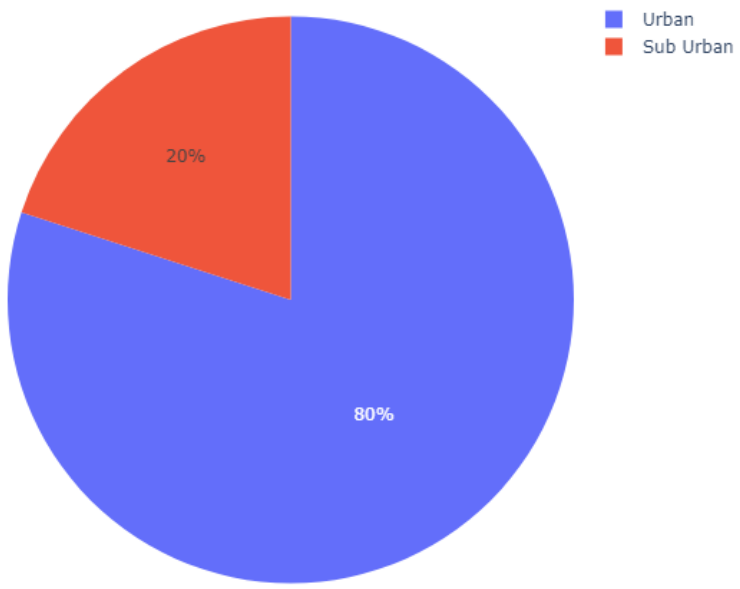
Annual Income of people who own EV



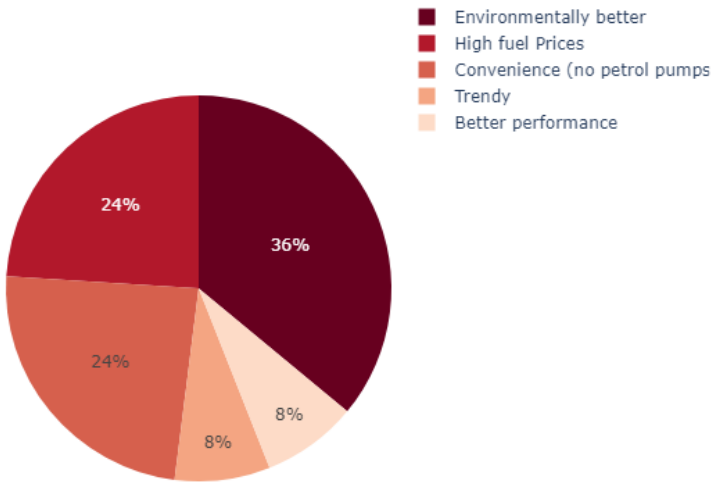
EV Manufacturar

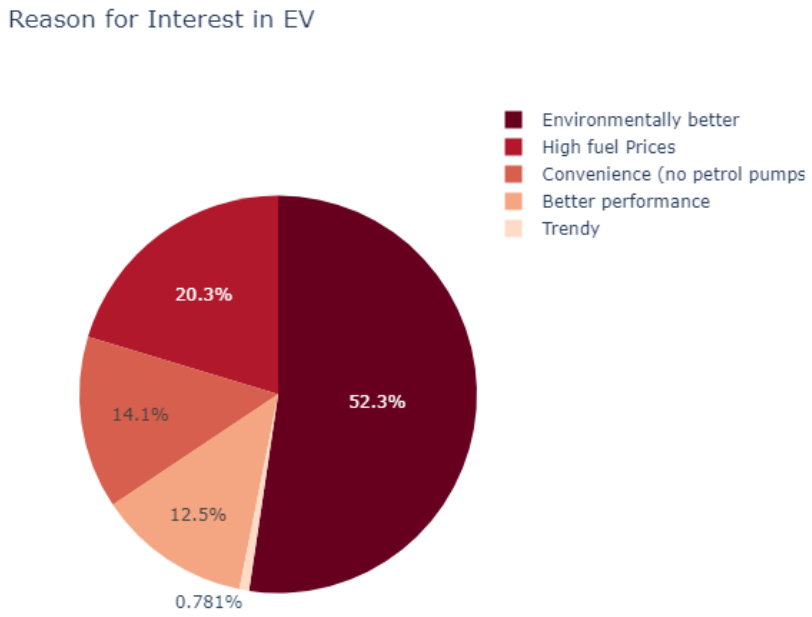


Area wise EV ownership



Reason of Purchasing EV





Marketing Mix :

In order to effectively target and capture the identified segments in the Indian EV market, it is crucial to consider the requirements of the marketing mix. The marketing mix comprises four key elements: product, price, promotion, and place.

Product: It is essential for companies to develop EVs that cater to the specific needs and preferences of each segment. This involves focusing on factors such as vehicle range, battery technology, safety features, and design. Customizing the product offerings based on the segmented market will enhance customer satisfaction and increase the likelihood of adoption.

Price: Pricing strategies should be aligned with the targeted segments. Conducting a comprehensive analysis of customer affordability and willingness to pay will help determine appropriate pricing levels. Additionally, considering government incentives and subsidies related to EVs can influence pricing decisions and make the products more attractive to customers.

Promotion: Employing effective promotional strategies is crucial to create awareness and generate demand among the identified market segments. This can involve a combination of traditional advertising, digital marketing, public relations, and direct marketing. Emphasizing the benefits of EVs, such as reduced environmental impact, lower operating costs, and government incentives, will help build interest and drive adoption.

Place: The distribution and availability of EVs play a vital role. Ensuring convenient access to EVs and charging infrastructure is essential. Collaborating with dealerships, establishing partnerships with charging station providers, and expanding the distribution network will make it easier for customers to purchase and use EVs. Moreover, leveraging online platforms and e-commerce channels can facilitate wider reach and accessibility.

By carefully considering these marketing mix requirements, companies can effectively position their EVs in the Indian market, meet the specific needs of customer segments, and drive the adoption of electric vehicles.

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