EV Market Segmentation Analysis

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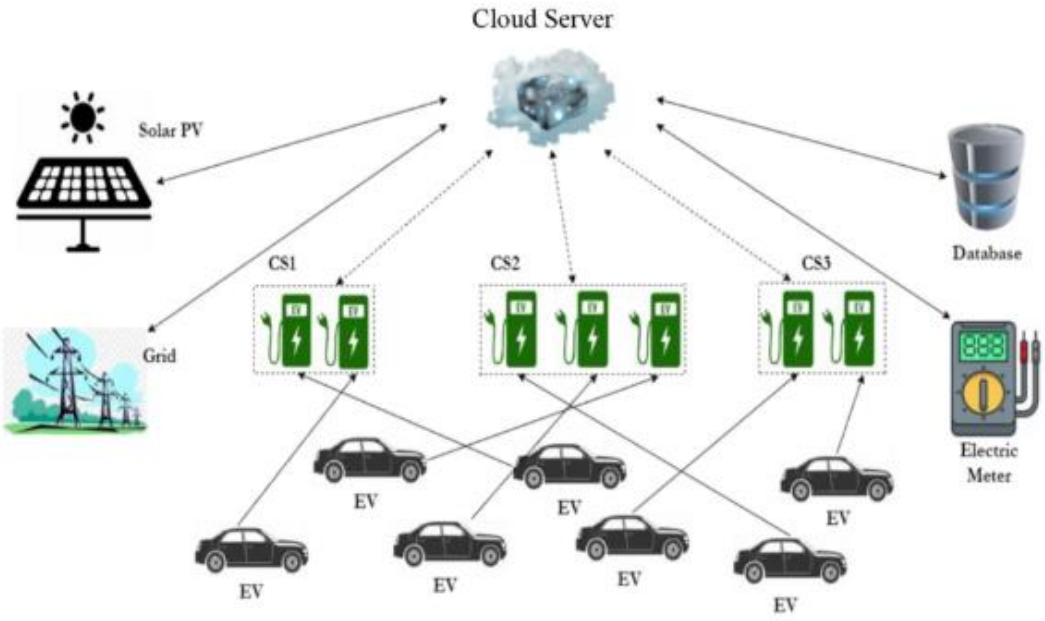
Project Link: -https://github.com/lavanyaravilla/EV-Market-Segmentation-Analysis

Introduction

The world's transportation sector is undergoing a revolution, transitioning from polluting fossil fuels to clean electric vehicles (Khan et al., 2018). As this transition accelerates, accurately forecasting power consumption becomes crucial for managing charging stations effectively. By utilizing a comprehensive review of current technology and research in fast charging infrastructure, as well as considering the economics of charging facilities, stakeholders can develop a model



Below is the picture (A, B) depicts charging station facility and EV Ac charger output

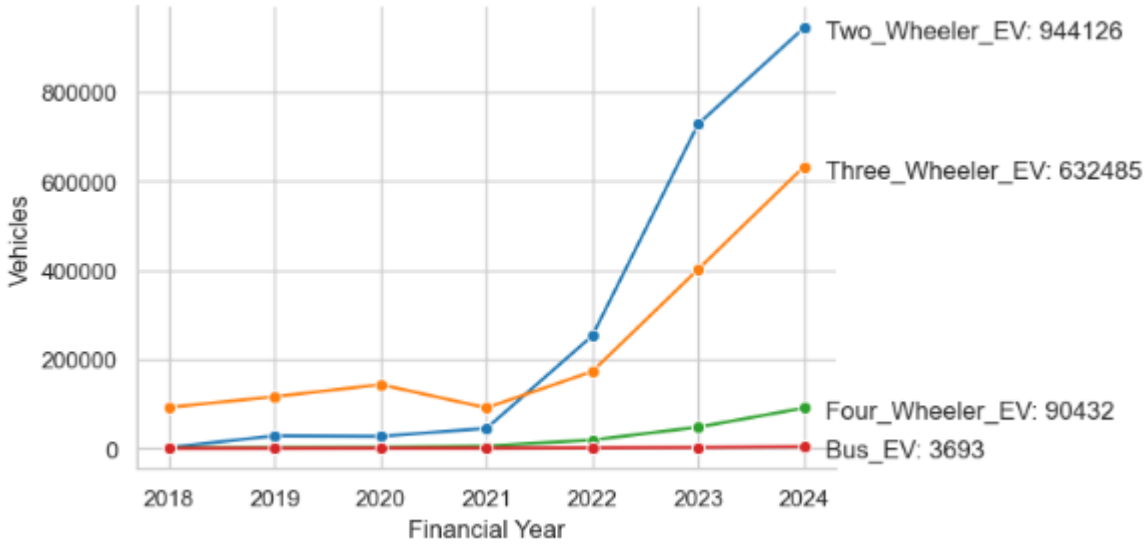
A

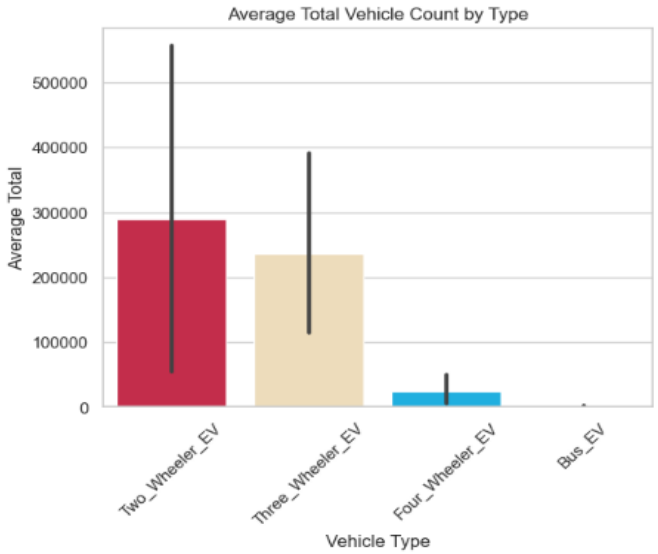
B

Market Overview:

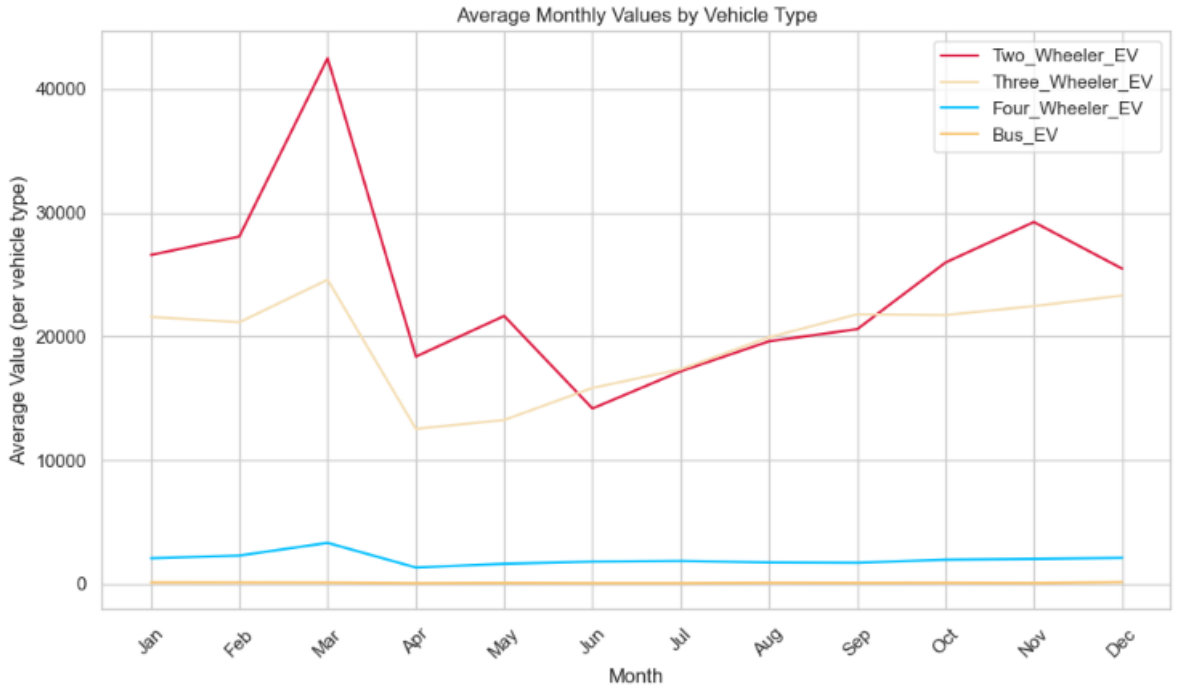
This analysis investigates key factors like vehicle types, strategic locations, and efficient charging infrastructure to optimize the launch of a new electric vehicle start-up.

The motivation to enhance the use of EVs in many developing countries also arose from various gaps identified in the smooth implementation of electric vehicles, from the extensive background study carried out. The lack of adequate charging infrastructure is the biggest barrier preventing the full–fledged development of EVs. Apart from analysing the optimal locations for their placements by the government, their infrastructural uptake is a less explored domain as of now Based on the figure, sales of Two Wheelers and Three Wheelers show a significant change from 2022 to the present day. However, Bus EV sales appear to be consistent across all seven years. So to start up a a business on should focus on Two or Three wheeler

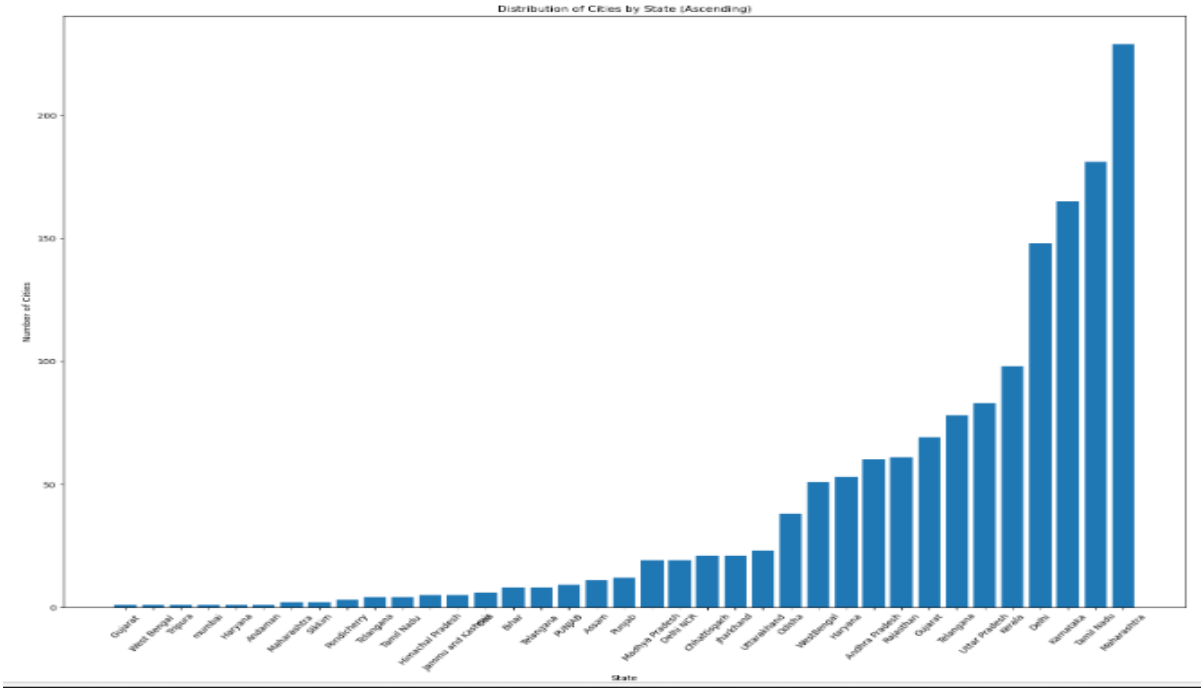




There is a notable shortage in the number of EV charging stations in India, which directly relates to the magnitude of the future EV fleet on highways, the efficiency of wireless systems, and also to the longevity and expenses of charging lanes. Some of the other major limitations of EVs are limited active battery duration, a significantly long charging time apart from the rapid charging ones, and insufficient dedicated parking spaces or grid energy availability. One of the many possible solutions to this problem is planning the EV journey to optimize the trip.

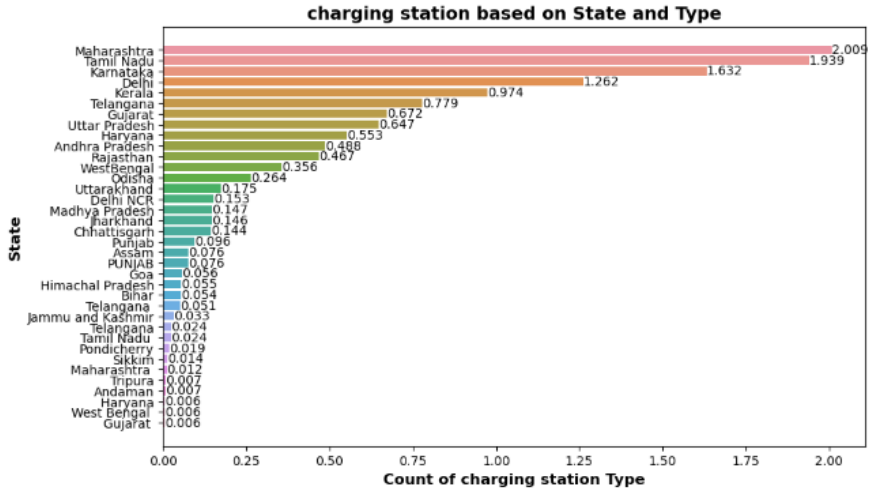


Given the sales surge in March and consistent performance in November and January, we recommend strategically timed promotional campaigns for two-wheeler EVs to maximize their impact.

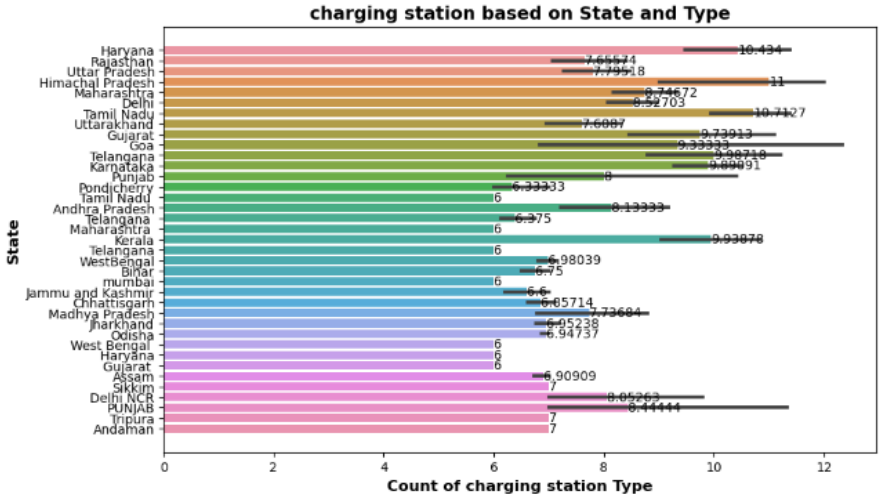


From the above Figure we can analyse that States like Karnataka, Maharashtra, and Tamil Nadu, with a higher concentration of cities, present promising opportunities for EV charging station deployment. Conversely, states like Andaman and West Bengal, with fewer cities, might require a more strategic approach considering the lower density of potential charging station locations.

Soaring fuel costs pose yet another challenge, growing in tandem with the widespread use of ICE vehicles, straining household budgets and impacting the overall economy. Thus, the advent of EVs can be justified to enhance the social and economic benefits in the transportation as well as energy sectors



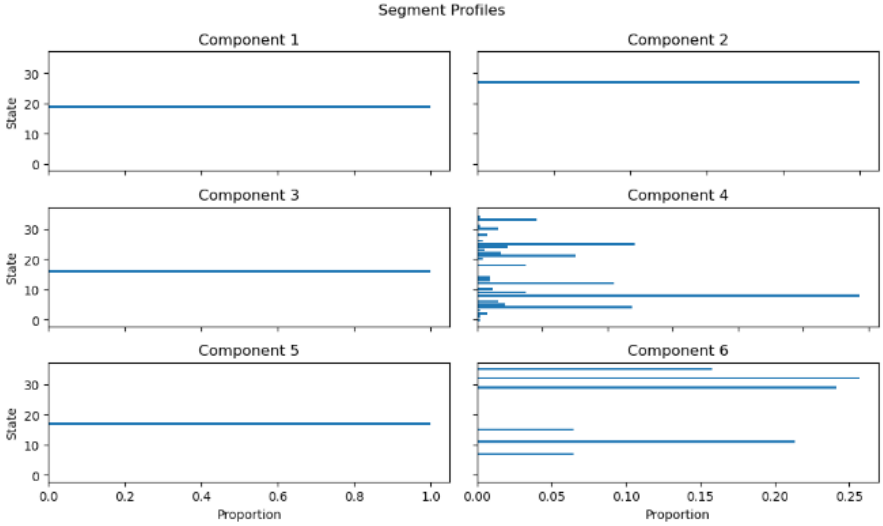
Various types and numbers of EVSEs throughout all the states and union territories of India, showing the emerging use of EVs so that EV users can conveniently locate charging stations and plan their routes accordingly. Furthermore, other citizens may be encouraged to own and use EVs for better environmental sustainability.



Above figure shows charging station and its type of Indian states and union territory.

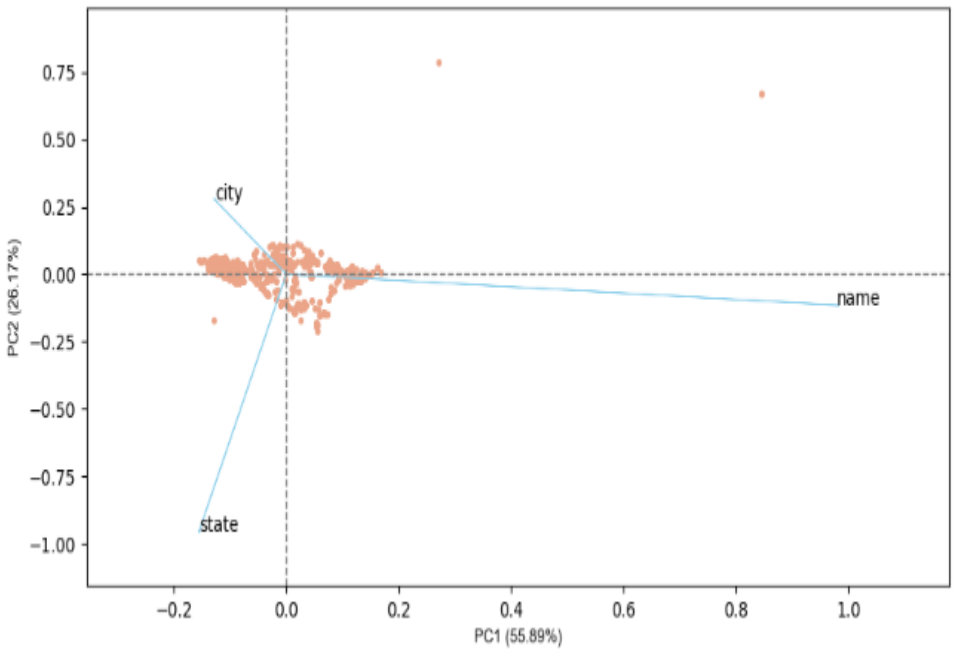
Profiling Segments.

The largest segment in the figure, containing 27 state attributes (like 'Andaman' and 'Maharashtra'), falls under component 4. This suggests these states share similar characteristics when it comes to charging stations. In contrast, other segments are much smaller and represent individual states for example: 'Jammu & Kashmir' (component 1).



Principle Component Analysis:

The segment separation plot (Below Figure) reveals distinct market segments. Interestingly, the perceptual map suggests respondent's judge attributes like "state" more independently, possibly reflecting positive or negative perceptions. One segment might perceive state-related factors less favorably, while the other prioritizes the availability of charging stations in their city, viewing it positively



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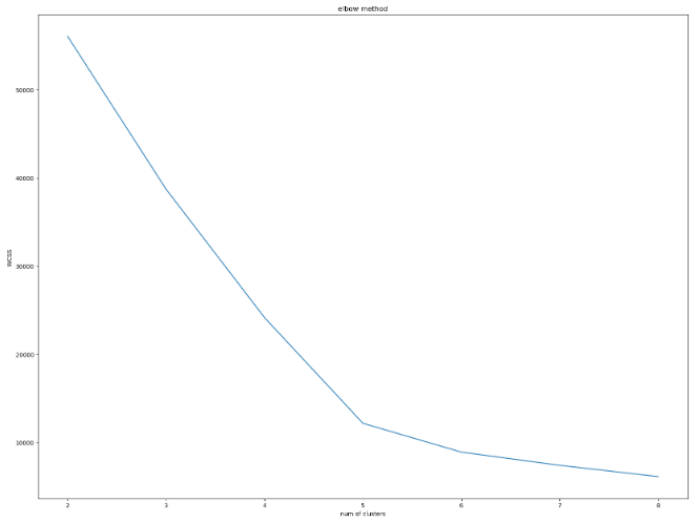
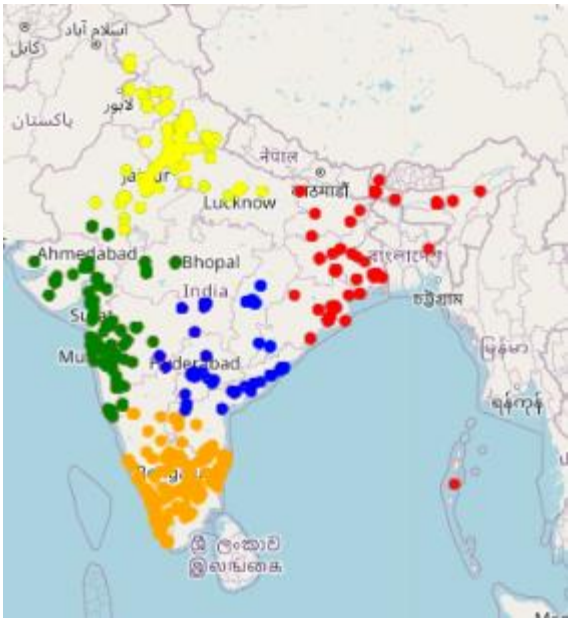
Extracting Segments Using K Means Algorithm

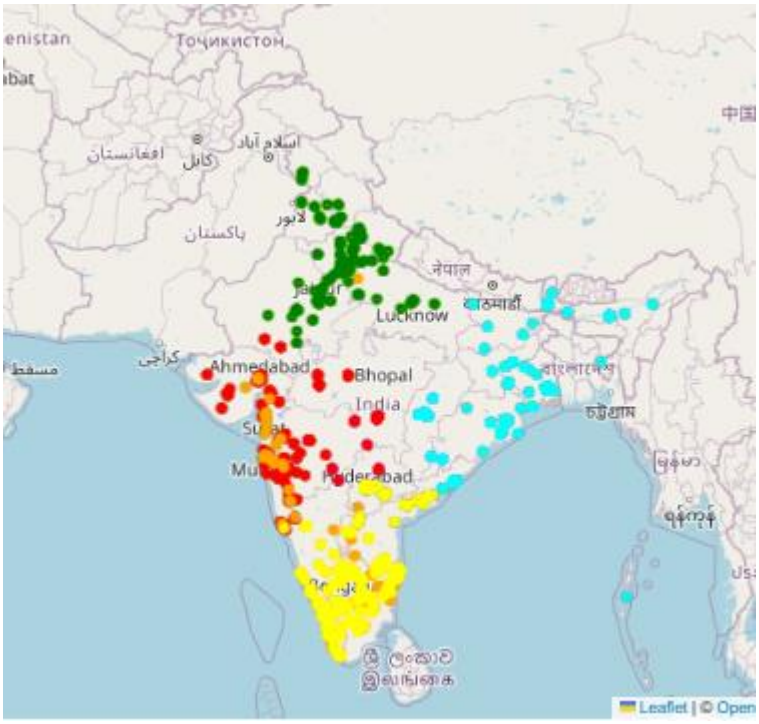


Leveraging the elbow chart, we've segmented states into 5 optimal clusters based on their latitude and longitude, as visualized in the map below. Each cluster is depicted with a distinct color, highlighting the spatial distribution of these segments with similar characteristics related to charging station deployment.



K-means clustering helps us do this! Places like Karnataka, Maharashtra, and Tamil Nadu ended up in the same big group. This suggests these states might have similar charging station characteristics, like the types (numbers like 13.0 and 18.0) available. It's interesting to see this large group covering a significant part of India!

Clustering Charging Stations by Type



While South India shows strong progress in EV charging infrastructure, focusing on a unique service like ultra-fast charging stations, mobile charging solutions, or value-added services for EV owners could be a winning strategy. Established competitors might exist, so consider offering something different or targeting a high-growth segment like two-wheeler EVs. Additionally, the lack of charging stations in some central and western border areas presents an opportunity to address a potential concern for potential EV buyers, easing their transition to electric vehicles.

Lack of charging station in few parts of central India and west India near to borders might create anxiety in people in buying.

Most Tropical Forest regions EV charging infrastructures are not built yet.

Pros:

- **Unexploited Market:** Tropical forest regions likely have limited or no existing EV charging infrastructure, presenting a first-mover advantage for your company.
- **Government Incentives:** Many governments are offering incentives for companies investing in renewable energy and sustainable transportation solutions. You might be eligible for grants or tax breaks.
- **Environmental Benefits:** By providing charging infrastructure, you'll be facilitating the adoption of EVs, which can significantly reduce emissions in these ecologically sensitive regions. This could attract environmentally conscious customers and potential partners.
- **Potential for Innovation:** The unique challenges of tropical forest regions (e.g., remote locations, limited grid connectivity) might necessitate innovative solutions for charging infrastructure. This could lead to new technologies and business models for your company.

Cons:

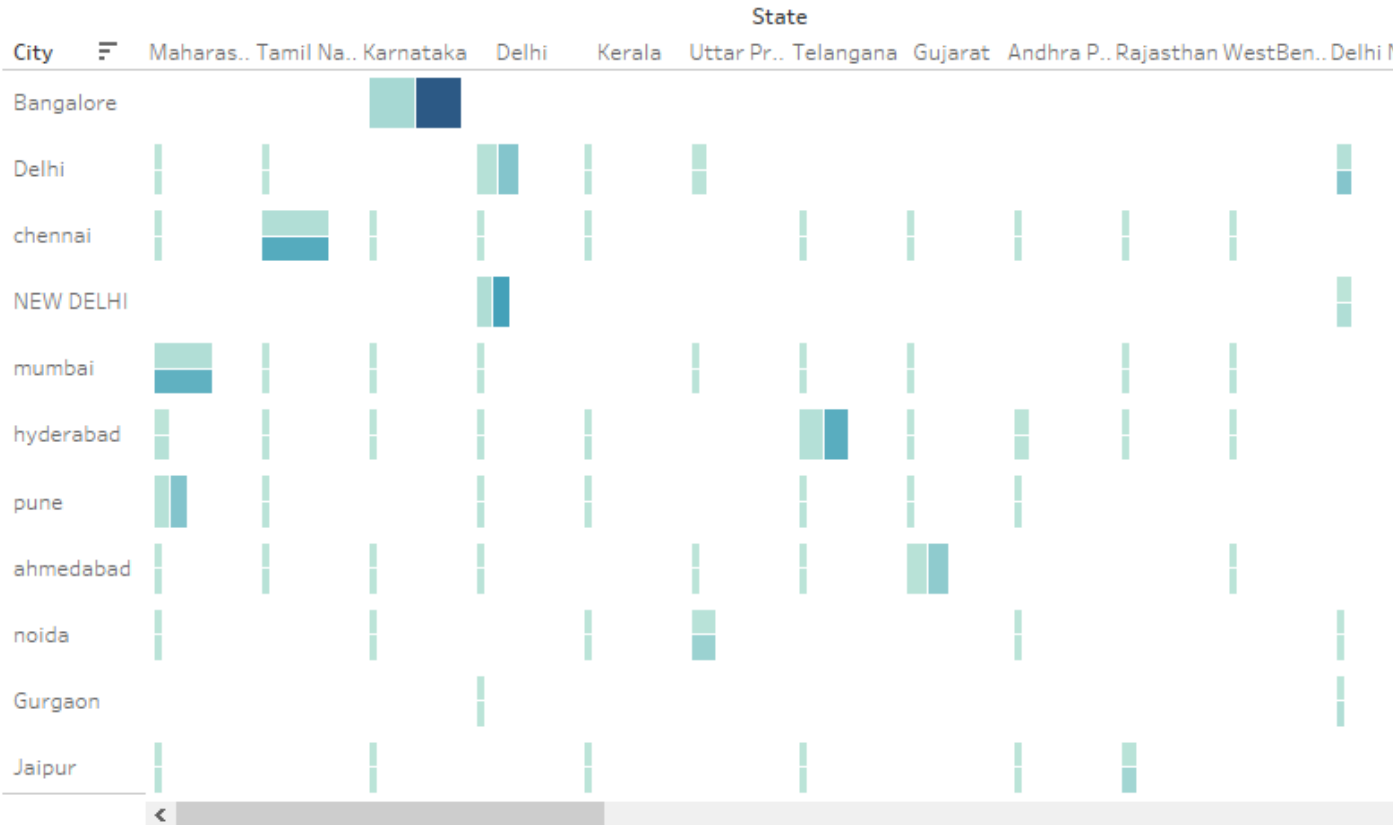
- **High Initial Investment:** Building charging infrastructure requires significant upfront costs, especially in remote areas where grid connection might be weak or non-existent.
- **Lower Demand Initially:** EV adoption might be slow initially due to factors like limited EV availability, lack of awareness, and potentially higher upfront costs for EVs compared to traditional vehicles.
- **Logistical Challenges:** Tropical forest regions often have challenging terrain and limited access to resources, which can make construction and maintenance of charging stations more difficult and expensive.
- **Grid Dependence:** If the region relies heavily on fossil fuel-based power generation, the environmental benefits of EVs might be diminished.

Additional Considerations:

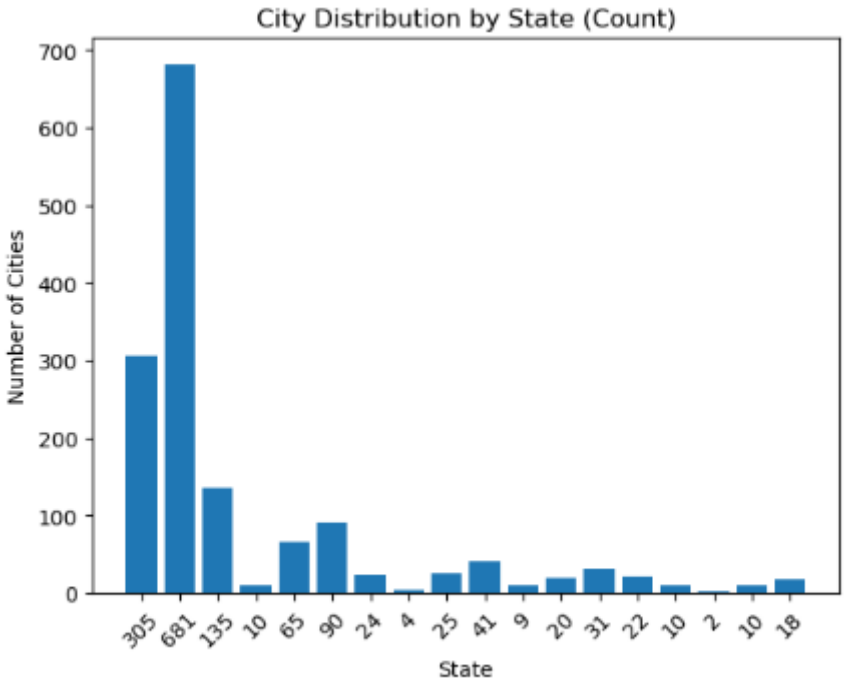
- **Focus on Sustainability:** Explore renewable energy sources like solar or hydro power for charging stations to maximize environmental impact.
- **Community Engagement:** Collaborate with local communities to understand their needs and ensure the charging infrastructure benefits them.
- **Partnerships:** Consider partnerships with government agencies, NGOs, or existing businesses to share costs and leverage expertise.

Overall:

Setting up an EV charging Infrastructure Company in tropical forest regions has both potential rewards and challenges. Carefully weigh the pros and cons, considering the specific region, available resources, and potential for innovation. Focusing on sustainability and community engagement can increase your chances of success while contributing to a positive environmental impact.



Many state capitals in India already boast established EV charging infrastructure.



There are 681 stations of type 7 followed by 305 stations under type 6.Type 10 ,4,9,2 charging types are very less built in India.

Conclusion:

Consider setting up in Central or Western and tropical India regions where charging infrastructure is lacking, offering a first-mover advantage. Existing players in competitive regions like South India likely to have a strong foothold, making competition fierce for a new company.

Data Source:

Society of Manufacturers of Electric Vehicles (SMEV) website (https://www.smev.in/).
https://www.kaggle.com/datasets