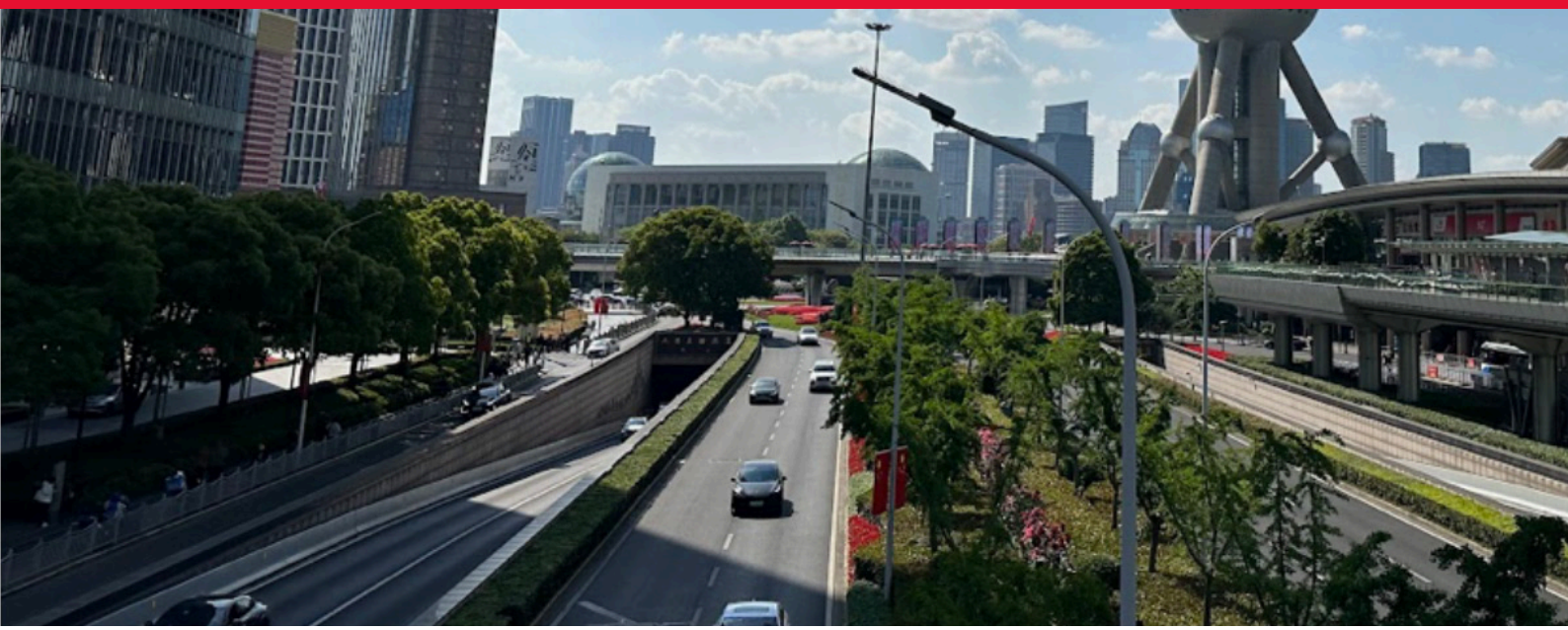
DEVELOPING SUSTAINABLE MOBILITY

Incentives for personal electric vehicles in the world

Examples from China and Rwanda



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FIA

Founded in 1904, the Fédération Internationale de l'Automobile (FIA) is a global advocacy and organizing body for automobile users and motorsports organizations. Representative of 243 member organizations across 147 countries, the FIA is administratively divided into both a sporting wing and an advocacy and research one. The aforementioned advocacy and research—officially the mobility wing—of the FIA works to promote the vested interests of its members through the development of "safe, sustainable, affordable and accessible" forms of personal automobile mobility.

PROBLEMATIZATION

As the transportation sector represents a significant share of global greenhouse gas emissions. We are thus trying to move away from fossil fuels and into renewables. This is also a great opportunity to rethink personal mobility, taking into account both the rights of road users and reduction of transportation's impact on the environment. Sustainable, affordable personal transportation systems enhance economic efficiency, access to essential services, and overall societal well-being by connecting people to employment, healthcare, education, and leisure activities. The FIA notably focused on the possibility of using different kinds of low-emission cars in this transportation transition, including biofuels, carbon-based e-fuels, electricity, and hydrogen-powered cars. They have concluded notably that EVs today are the prominent route for delivering sustainable personal transport, as the most advanced of these technologies EVs appear to be a critical component in helping reduce air pollution and greenhouse gas emissions and are a significant element in mitigated climate change.

We are currently in a situation where we are witnessing a continuous rise in the adoption of electric vehicles, largely steered by a limited number of early adopters. The issue we encounter with this growth, is that there could be a plateau point in electric vehicle uptake once this initial group completes their transition. This could potentially present a substantial barrier to progress toward more sustainable personal automobility. The challenge at hand is thus to identify and understand the reasons that are preventing non-electric car users from transitioning to one. With this in mind, we will analyze the range of incentives to stimulate widespread adoption and evaluate their effectiveness in overcoming existing barriers to make personal automobility sustainable, affordable, and accessible to all.

The main goal of this project is to understand what the current barriers to worldwide adoption of electric vehicles are in these selected cases, and if they have been or can be overcome in a sustainable manner through incentives. We are looking at how incentive policies manage to make EVs more appealing to a wider audience that up until now would have not considered buying one. Incentives are not a perfect tool, and many questions revolve around them: are they targeting the persons who really benefit from them? Are there reasons to not implement incentives? Can they last in time? What are the most effective incentives and are they the same ones everywhere?

If the report was targeting automobiles at first, we quickly realized that, in many countries of the developing world, the car is not the only major mode of personal transportation, but that motorcycles are also, if not more present on the roads. Therefore it made sense for us to include the question of two-wheelers to our research.

The rapid development of the market when it comes to electric vehicles (EV) is a challenge for research. Data evolves quickly and trends can double or revert over the span of a few months, especially in emerging markets, where the volume of EVs is still small. It is from the understanding of this limitation that the need for study trips has revealed most necessary for us to seek the answers to our questions.

METHODOLOGY

In this study, we used a combined methodology which includes both qualitative methods and quantitative methods. Specifically, literature review, case studies, interviews, questionnaires, and data analysis are used. As the situation of the EV market differs around the world, we chose two representative countries—China and Rwanda—for case studies as well as fieldwork. Shanghai and Kigali were selected to be our destinations for deeper understanding of our study fields.

To gather consumer intentions regarding the purchase and use of electric vehicles, as well as their views on various incentive policies in Shanghai, we developed an online questionnaire. It contains five parts, including respondents' car usage and purchase intention, opinions on EVs, experiences of using an electric vehicle, opinions on incentive policies, and basic personal information. We conducted random sampling among individuals aged 18 and over residing in Shanghai. A total of 102 valid questionnaires were collected. Besides, we conducted interviews with local residents, EV dealers, and professional researchers in person. In Kigali, we interviewed key stakeholders and knowledge leaders from academic institutions, government agencies, private sector companies, and not-for-profit institutions. These conversations helped develop a comprehensive understanding of the state of the EV transition and the mobility market in Rwanda and the continent at large. Meanwhile, we collected information and materials from various resources, including academic journals, news coverage, policy documents, and professional reports from different institutions.

The final report has been organized into five main categories that follow a trail of cause to effect of incentives. These categories are as follows:

- State of EV market in the world
- Remaining barriers to EV adoption
- State of incentives
- Effectiveness of EV incentives
- Transferability

The findings in each part come from our literature research and two case studies, China and Rwanda. Where appropriate, an additional global analysis covering either Europe or the United States—as an example—was also developed and highlights the importance of both regions in the global e-mobility landscape.

FIELDWORK

We did fieldwork in two cities: Shanghai, China and Kigali, Rwanda. China is one of the leading countries regarding EV development globally with one the highest share of EVs in annual new car sales. Various incentives have been implemented in China and successfully contributed to the rapid growth of the EV industry and market. Shanghai has the highest domestic EV sales, as well as both national and local level incentives applied. As the economic center of China, Shanghai not only boasts a vast market but also hosts numerous EV manufacturers, forming a complete industrial chain. Moreover, the city's charging infrastructure network is relatively well-developed, and residents have a high level of acceptance for EVs. This city provides us with a comprehensive knowledge of China's EV development and the transition to market mechanisms without national incentive.

A roundabout in Shanghai, China.

Brand-exclusive charger in a parking lot in shanghai

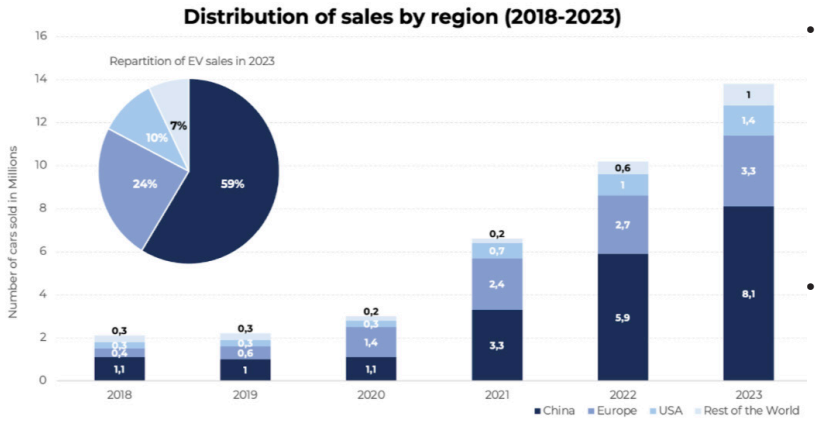
Rwanda has experienced significant growth in the e-mobility market in recent years. The nation has made substantial investments in infrastructure, positioning itself as a leader in Africa. It has emerged as the first African country to implement comprehensive EV policies since 2021, including financial incentives for consumers and companies, and usage incentives. In Kigali, the capital city of Rwanda, electric motorcycles are one of the main mode of transportation as they are mostly operated as taxis. As two-wheelers have a shorter lifespan and lower cost, they have become a pillar of the EV transition strategy in the country. Rwanda has shown to be a country with many barriers, but also a lot of opportunities and promising developments, as the vehicle market is growing fast.

Two competitor's battery swapping stations for e-motorcycles

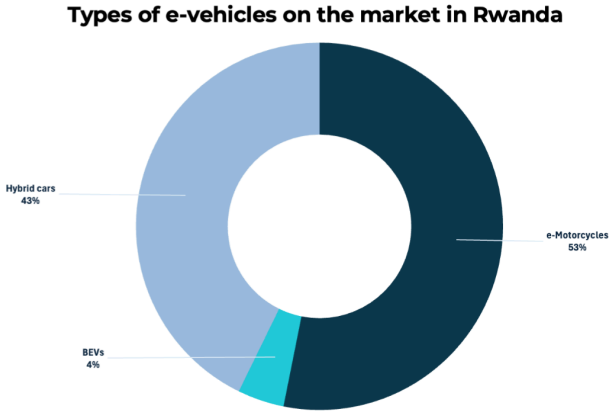
An EV charging station in Kigali

MAIN FINDINGS

PART 1: OVERVIEW OF THE CURRENT STATE OF EVs IN THE WORLD



- EV growth has really taken off since 2020, carried by sales in China, Europe and the United States.
- Battery Electric Vehicles are the leading type of electric vehicle sold globally, making up 70% of annual sales.
- China is the world leader in the EV market, accounting for nearly half of all global EV sales in 2023. They also dominate the manufacturing sectors for cars and batteries.
- Chinese brands dominate the EV market in China. They are also conquering other markets, with BYD being the leading manufacturer in the world, replacing Tesla as the leader of the market in the country. Tesla remains the most popular brand in Europe, followed by electric models from traditional European manufacturers.
- Europe boasts the most developed infrastructure, while the US grapples with slower-than-anticipated adoption.
- While some developing countries have started experiencing rapid EV growth in the past couple of years, significant disparities remain compared to the three main regions.
- In developing countries, two-wheelers can represent a large portion of the vehicle stock. Their transition to electric models is also essential to pursue environmental objectives. Air and noise pollution are urgent challenges in large cities of the Global South.
- There is a great potential for EV market growth in developing countries as the overall vehicle market increases fast. In Rwanda, it grows 12% every year.
- The secondhand market for EVs is still limited, especially in Europe, due to limited stock, concerns about battery range and the rapid evolution of EV technology that renders older models obsolete in the eyes of consumers.



Electric and hybrid cars and e-motorcycle together make for more than 7,000 electric vehicles in Rwanda.

MAIN FINDINGS

PART 2: REMAINING BARRIERS TO EV ADOPTION

Price

- EV prices are decreasing but there is still a gap of affordability at the entry level. Local mass production has allowed China to fill that gap.
- The lack of EV presence on the secondary market is a strong barrier to their spread in the developing world.

Diversity

- The EV market is catching up with the ICEV one in terms of diversity of design and price ranges. For the e-motorcycles, each company has a unique model.

Charging and batteries

- Concerns about limited driving range, reliability, and battery lifespan continue to deter potential buyers. A lack of awareness and education about EV capabilities can perpetuate these anxieties.
- The density and reliability of charging stations outside urban areas remains a concern. Time constraints associated with charging also play a role, and might become a bigger issue as the EV stock grows.

Governance

- Limited government funding and capacity in developing countries can hinder the development of the EV sector, the charging infrastructure and other support systems.

Maintenance

- The perceived complexity of EV technology raises concerns about repair costs and availability of qualified technicians, especially in developing countries with limited experience in servicing EVs.
- The limited presence of EVs in Rwanda translates to a lack of qualified technicians and readily available spare parts and raises concerns about repair capacity

Geography

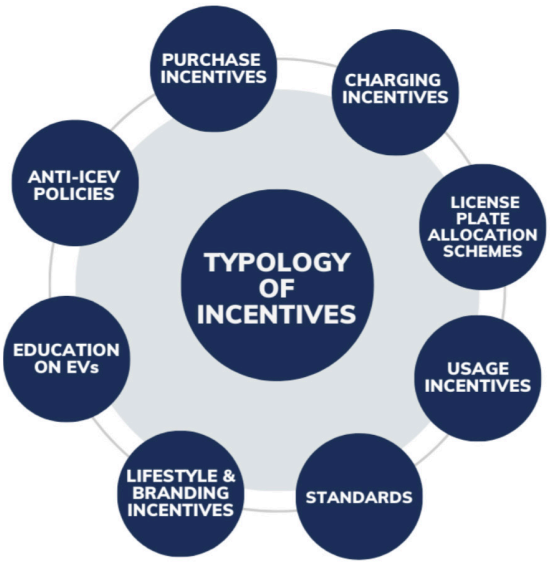
- The informal urban layout of cities in the developing world can be unfavorable to the possession and circulation of personal vehicles.
- The size of a country is a challenge when it comes to developing a national charging infrastucture, even for a country that does so much investment as China.

Source: Google Maps, 2024

A view of a neighborhood of Kigali. Vehicles have no space to circulate in those narrow, curved and steep alleyways.

MAIN FINDINGS

PART 3: STATE OF INCENTIVES IN THE WORLD



- Countries have diverse reasons for promoting EVs, including environmental concerns, reducing dependence on fossil fuels, and boosting domestic car manufacturing. China had both motivations, while Rwanda is trying to attract international investments into the country through its innovative EV policies.

- National governments, local authorities, and even private companies can offer a range of incentives, encompassing purchase subsidies, tax breaks, charging infrastructure development, and usage benefits. However, not all countries have a comprehensive EV policy that encompasses different types of incentives.

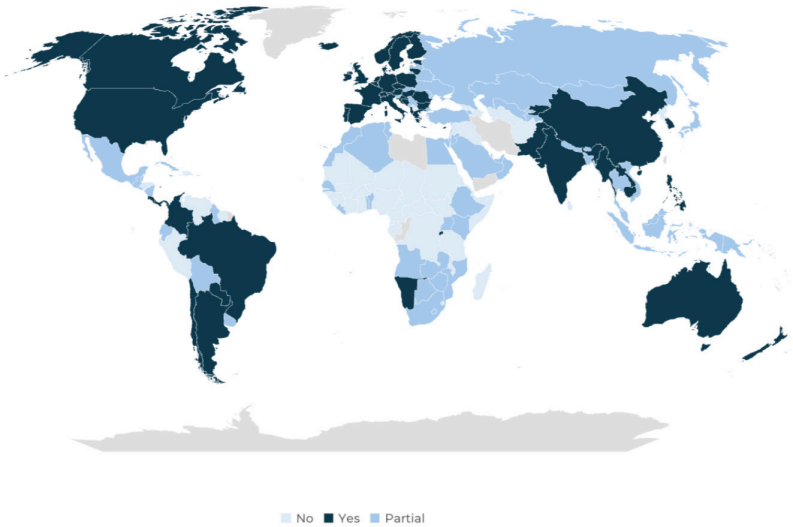
- In China different types and levels of incentives work together to form a comprehensive and holistic network of incentives. They mix purchase incentives, charging incentives, usage incentives, licensing schemes, setting up of standards.

- As the Chinese EV market matured and gained in competitiveness, purchase subsidies from the central government were reduced and local incentives focused on usage incentives.

- Rwanda, which does not have domestic manufacturing, focuses its strategy on tax and custom duty reduction on vehicles, parts, batteries and charging equipment. This targets both buyers and sellers.

- Developed car markets with established ICEV industries tend to have more EV incentives compared to developing countries with limited infrastructure and affordability challenges.

Presence of a comprehensive EV incentive policy, 2024.



Comprehensive EV incentive policies mix different forms of incentives: financial and non financial, at purchase and spread over time for usage.
Partial means only one type of incentive is in effect in the country.

MAIN FINDINGS

PART 4: EFFECTIVENESS OF INCENTIVES

- Purchase incentives are very important initially as they can significantly reduce the price and rapidly increase sales; however, they need to be accompanied by charging infrastructure policies to increase convenience.

- Purchase incentives are costly measures that become less effective as the market grows, however, fully abandoning them is a drawback in affordablity for lower income households.

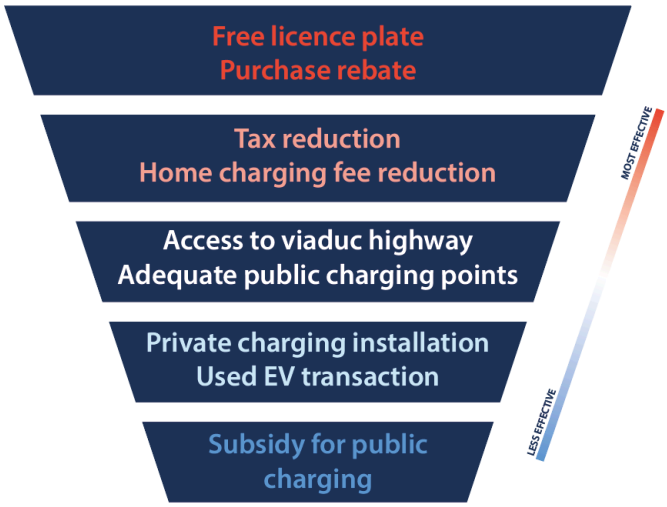
- Offering tax breaks on EV purchases or ownership (like Rwanda) can provide ongoing benefits to consumers and incentivize long-term EV ownership, without being too costly for governments.

- China's well-developed charging infrastructure network, especially in major cities, highlights the crucial role of infrastructure in overcoming range anxiety. Rwanda's lack of financement for building charging stations is making their development difficult outside the capital.

- Financing and loan options in Rwanda make EVs more affordable by addressing upfront cost concerns and aligning the weekly payment with what the customers – here the taxi drivers – can afford. It has been very successful, as since 2019 the e-motorcycle fleet in Kigali grew from non-existent to more than 4,000, over an estimated total of 20,000.

- Incentives that increase the driving convenience of road users can be more effective than subsidies, especially after the market is established and the prices have decreased. They are also better received.

- The most effective incentive in Shanghai is the licensing scheme, that reduces both ownership price and allows for more freedom when driving in the city. It was the most self-reported push for them to switch from an ICEV to an EV.



Most effective incentives among Chinese buyers from our survey.

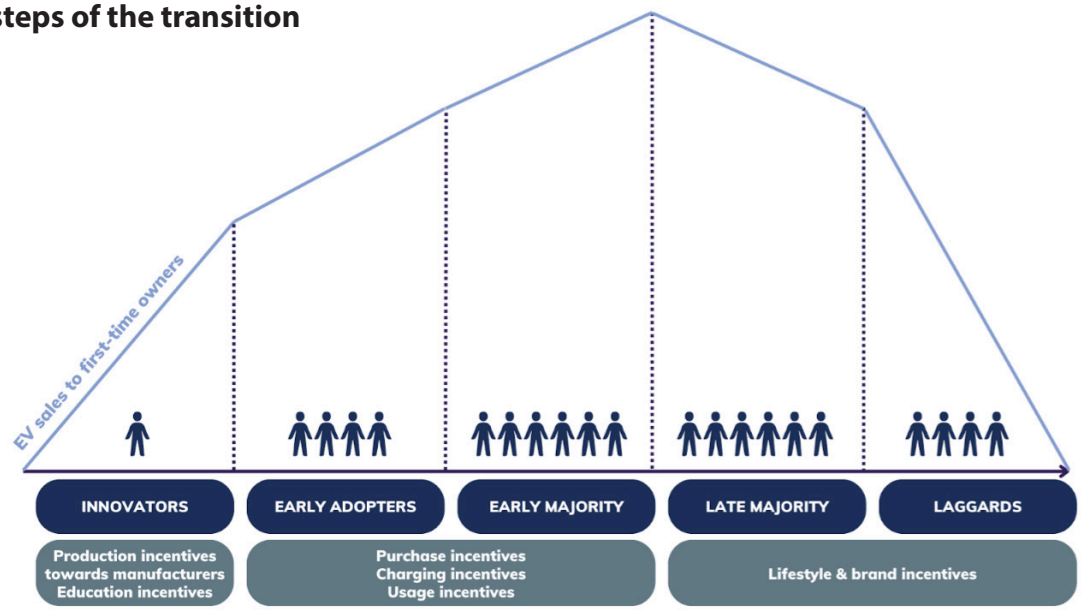
- In China's EV market, strong brand strategies emphasizing community building, targeted features, and competitive incentives have emerged as a powerful driver of consumer choice and price reduction.

- Educating consumers about EV technology's advancements can significantly reduce adoption barriers, paving the way for wider EV acceptance, as demonstrated by China's experience.

- Anti-ICEV policies are effective as they are forcing the switch, but they can be poorly received by the public. Taxing ICEVs can finance the transition.

- The Chinese case shows that if mature enough, the market can continue to grow without subsidies.

Different incentives at different steps of the transition



MAIN FINDINGS
PART 5: POLICY TRANSFER AND TRANSFERABILITY

- With thin private and NGO sectors, the Rwandan Government has effectively capitalized on their "proof-of-concept" moniker as e-mobility organizations based in the country have expanded throughout the continent.
- In Rwanda, public policies developed in the country have been exported to neighboring EAC countries with similar success. However, their long-term political sustainability and support is undetermined.
- The role played by China's unique manufacturing capabilities in local EV growth makes it difficult to envision an exact policy transfer to other developing markets.
- However, individual policies that increase driving convenience for road users can be transferable at a lower cost than strong subsidy policies, while remaining quite effective.
- Some developing markets are still trying to somewhat replicate part of the Chinese industrial policy to increase EV adoption locally. They are still at an early stage though and their effectiveness cannot yet be estimated
- The development of the EV market in developing countries can also be attributed to the global growth of Chinese electric vehicle brands such as BYD or Wuling. This highlights the power of the country's corporate policy transfer apparatus.
- Incentives developed to promote the adoption of EVs may also experience similar degrees of success when applied to other vehicles powered by other sustainable fuel sources.

LEARNINGS

The FIA being a large organization operating in 147 countries with 242 member clubs as well as various other partners, they demanded that we do not make recommendations about what incentive we believe is best. Given the nature of the project as a global overview of incentives using the examples of China and Rwanda as a developed EV market, and a developing one respectively. Therefore, it is understandable given the scope of the project that we cannot make any one recommendation concerning the best course when it comes to incentives. However, it gave us great insights into the workings of incentives and who benefits from them. Therefore, one of the most important things to retain from all this work is that incentives often require important financial backing in order to be successful, which is something that developing countries may not be able to do without foreign investment. Furthermore, it is also important to remember that while one incentive may work well in a specific context but it may not be adapted to all situations, such as the license plate registration schemes that are incentivizing many to buy an EV rather than an ICEV in large Chinese cities. Since the market for cars in Rwanda is small, there is no need for such a policy.

Furthermore, we encountered many issues getting our hands on specific data concerning the deployment of EVs and how successful some countries are at developing a market for them. This stems from issues in getting standardized data from every country as well as to how open to sharing the information they are. This leads us to believe that if data was more open source when it comes to research, it would be easier to work with. In the field however, we have seen that there is always someone that has the data we are looking for.

This report also shows the importance of being able to meet with professionals in the field in order to get a better understanding of a city, or country EV deployment strategy. It is especially the case in countries for which there is less data, and less research about. Working with local professionals is crucial as it also enables countries such as Rwanda to build capacity such that they can then build policies that are tailored to their needs.

Finally, besides the urban nature of the project also highlights some broader elements of international cooperation as well as competition when it comes to establishing EVs. On the one hand, Rwanda tries to be a model country when it comes to EVs which led other countries in the East African Confederation to replicate the same policies for EVs, and on the other hand, we also have countries such as Thailand or India that are trying to build industrial capacity so that they can compete in the same way that China is using its industry to leverage a national, and potentially, international EV market.

People we have met in Rwanda are willing to intensify relations with academic institutions and critical actors in the mobility sector. This is seen through the development of the GIZ-backed Kigali Smart Mobility Lab, the willingness of private sector actors to meet with visiting researchers, and the current Government support for hosting global conferences on e-mobility issues.

FIND OUT MORE

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