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Advancing Electric Mobility in Trinidad and Tobago:

Results from Local Public Consultations

Augusto Cesar Bonzi Teixeira
Graham King
Bhopendra Maharaj

Inter-American Development Bank
Infrastructure and Energy Sector

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THE UNIVERSITY OF THE WEST INDIES

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This report is part of the knowledge agenda developed by the Energy Division of the Inter-American Development Bank that aims to develop new knowledge products and technical assistance programs for the countries of Latin America and the Caribbean. The knowledge products generated are intended to inform, guide, and offer a menu of recommendations to policy makers and active participants in energy markets, including consumers, public utilities, and regulators. The report was prepared under the general direction of Marcelino Madrigal (Chief of the Energy Division). The team leader of the work is Augusto Cesar Bonzi Teixeira, and the members are Dorri Agostini, Irati Jimenez Dorronsoro, Karla Arias Marin, and Lenin Balza. The authors of the report are Augusto Cesar Bonzi Teixeira, Graham King and Bhopendra Maharaj.

The team appreciates the comments and review by the Rocky Mountain Institute (RMI) for their support in providing editorial revision and insights from the results of electromobility consultations in other countries. These contributions were made by Raquel Soat, Manager, and Aradhana Gahlaut, Senior Associate, of Carbon-Free Transportation, under the leadership of David Gumbs, Director, of Islands Energy Program, and E.J. Klock McCook, Principal, of Carbon-Free Transportation.

Executive Summary

The electrification of the transport sector has the potential to directly reduce a country's greenhouse gas emissions (GGHs) and thus help the fight against the impacts of climate change, and improve people's quality of life with the reduction of air pollution such as particulate matter, nitrogen oxides (NOX), sulfur dioxide (SO_2) in urban centers. Moreover, the electrification of the transport sector presents a great opportunity to improve public transportation services to the population.

It is against this backdrop that the Government of the Republic of Trinidad and Tobago (GROTT) has included the transport sector in its Nationally Determined Contribution (NDC) as part of the country's Paris Agreement, and other key national priorities such as Vision 2030 – The National Development Strategy for Trinidad and Tobago 2016-2030. Vision 2030 call for investing in strategic infrastructure – that is, infrastructure that is growth enhancing and stimulates economic activity, to be funded through innovation avenues such as a green infrastructure investment.[1]

This report elaborated by the University of West Indies (St. Augustine campus) and the Inter-American Development Bank (IDB) aims to provide insights about a series of consultation processes with stakeholders in the country.

The results indicate that, according to the stakeholders' responses, the most important categories to accelerate deployment of electro mobility in the T&T are: (1) Institutional and Political leadership, (2) Financial, Economic, and Tax incentives, (3) Infrastructure and Standards, (4) Communications and Outreach, (5) Business Model, and (6) Regulatory Arrangements. These categories are explained in the document, and for each of these, policy considerations are presented for review by the GORTT, acknowledging that the acceleration of electro mobility is a gradual process, and different policies are adequate to each phase of the process.

This document is organized as follows: the first chapter introduces the topic of electro mobility with the background, and it is followed by the second chapter presenting the recent developments in this field internationally and in T&T. The third chapter delves into the results of the consultations held in the country, which is the core part of the document. Finally, the fourth chapter presents policy considerations to accelerate electro mobility in T&T with a set of next steps activities.

The authors would like to position this report as a contribution with insights to the efforts the GORTT is already doing in the deployment of electro mobility in Trinidad and Tobago. The investments in green and resilient infrastructure will then contribute to the sustainable development of the country and improve the quality of life of the local society.

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[1] Trinidad and Tobago Vision 2030. https://www.planning.gov.tt/sites/default/files/Vision%202030-%20The%20National%20Development%20Strategy%20of%20Trinidad%20and%20Tobago%202016-2030.pdf

1. Introduction

A partnership was established between the University of West Indies (UWI) Department of Mechanical and Manufacturing Engineering and the Inter-American Development Bank (IDB) with the objective of supporting the Government of the Republic of Trinidad and Tobago (GORTT) in advancing the deployment of electromobility in the country. The support consisted of carrying out public consultations with local stakeholders and later sharing the results publicly.

This activity aims to complement the initiatives in the country, such as the development of an electric vehicle (EV) strategy, which is currently under development under the leadership of the Ministry of Planning and Development (MPD). The results of the consultations are now being made public to increase the visibility of this subject and to further encourage electrification of the transport sector in Trinidad and Tobago.

1.1 The rational for electric mobility

A global transition to electric mobility is accelerating, driven in many territories around the world by policies and legislation as well as manufacturer commitments that will gradually reduce or eliminate the sale of traditional internal combustion engine (ICE) vehicles in the coming decades. The reduction in costs of the batteries has also accelerated this process. The factors motivating this change include:

(i) decarbonizing the transportation sector to improve air quality in cities, reduce greenhouse gases (GHGs), and ultimately mitigate climate change.

(ii) enhancing the quality of public transportation services; and

(iii) improving balance of trade and energy security of countries by reducing imports of petroleum products.

The transport sector is currently responsible for 23% of global energy-related GHG emissions and 18% of global human-caused emissions. In the past decade, transport has been recorded as the largest energy consuming sector in 40% of countries globally and the second largest in most other countries. [2]

As such, the electrification of the transportation sector is an important component of Nationally Determined Contributions (NDCs), or commitments made in accordance with the Paris Climate Agreement that guide national strategy. 75% of the NDCs identify transportation as a source of GHG emission reduction and three NDCs specify targets to reduce GHG emissions in countries**.** NDC-led national strategies tend to promote zero-emissions vehicles (ZEVs), most notably plug-in battery electric vehicles (BEV).

[2] https://ndcpartnership.org/transport-and-climate-change-how-nationally-determined-contributions-can-accelerate-transport

Most advanced in this legislation-led transition is Norway, which has banned the sale of new petrol and diesel cars from 2025[3]. The UK[4] follows with a ban from 2035, with Canada and the State of California in the United States also from 2035. At COP26 held in 2021 in Glasgow, several countries and leading automakers signed a pledge to phase out gasoline and diesel-powered motor vehicles by 2040 and replace them with electric cars and trucks (UNFCCC, 2021). The pledge includes agreements on new opportunities for clean growth, green jobs, and public health benefits from improving air quality; and that the transition could boost energy security and help balance electricity grids as part of the transition to clean power. It also commits the signatories to supporting a global, equitable and just transition so that no country or community is left behind.

During the past 10 years, the sales of EVs has grown considerably, facilitated by more widespread private and public sector investment in charging infrastructure.

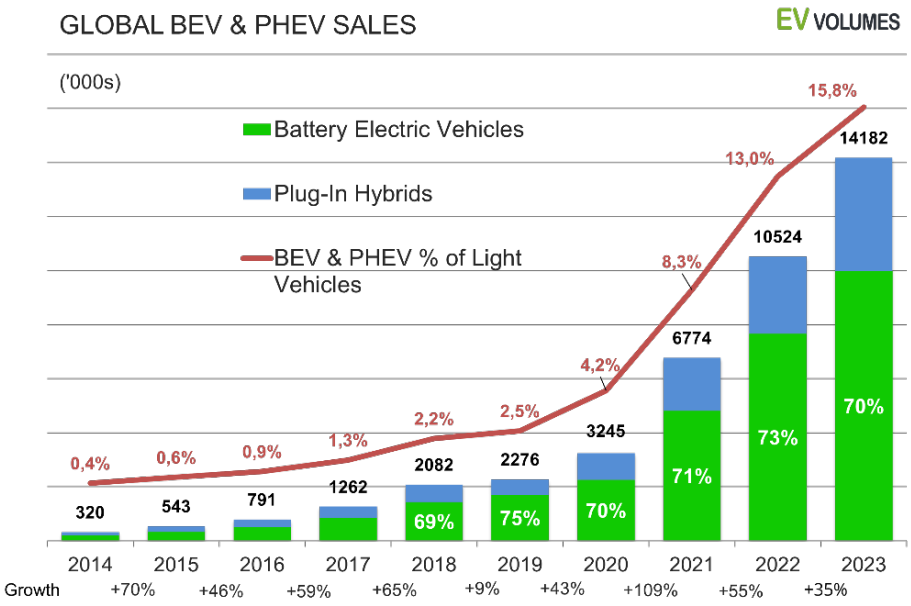

Figure 1 - Global BEV and PHEV Sales ('000) Source: ev-volumes.com

In response to pincer movement of burgeoning demand and legislative deadlines, legacy and emergent manufacturers alike are rushing a plethora of new models to the market. This is leading to much enhanced consumer choice and aggressive sales growth rates. Many manufacturers have established targets for transitioning their models to BEVs. Over the coming years, a wider range of BEV model types, at a wider range of price points, will be available to consumers, fuelling growth in BEV sales.

[3] https://elbil.no/english/norwegian-ev-policy/
[4] https://www.reuters.com/world/uk/britain-delays-ban-new-petrol-diesel-cars-2035-pm-sunak-2023-09-20/

Ford, BMW, Bentley, and Mercedes have made pledges as early as 2030. Volkswagen has over 50 new EV models planned and has announced a target of 70% EV sales in Europe by 2030. Hyundai and Kia have together committed to 34 new EV models by 2025. Toyota also expects to produce 3.5 million EVs annually by 2030.

Manufacturer	BEV Plans
Bentley	2030
BMW	50% by 2030
Buick	2030
Ford	50% by 2030
GM	2035
Genesis	2025
Honda	2040 (80% by 2035)
Hyundai	2045 (Carbon neutral)
Kia	1.2m BEV sales by 2030
Lincoln	2030
Lexus	2030
Mercedes-Benz	2030 (no new ICE vehicles)
Mitsubishi	50% by 2030
Nissan	40% by 2030 (North America)
Stellantis	50% by 2030
Toyota	3.5m BEV sales by 2030
Volkswagen	50% by 2030
Volvo	2030

Figure 2 - Selected Auto Manufacturers Electrified Plans (Sources: Consumer Reports[5] and Forbes[6])

The electric mobility transition brings with it many advantages, primary among them being vehicles with zero tailpipe emissions and the opportunity for low or zero direct carbon emissions from transportation. Environmentally, in a like-for-like substitution of an ICE vehicle for a BEV, the BEV benefits from higher energy efficiency. Electric motors are quieter and produce no harmful tailpipe emissions,

[5] Consumer Reports. 2023. Automakers Are Adding Electric Vehicles to Their Lineups. Here's What's Coming. https://www.consumerreports.org/cars/hybrids-evs/why-electric-cars-may-soon-flood-the-us-market-a9006292675/ Accessed February 21st 2023

[6] Forbes. 2021. Every Automaker's EV Plans Through 2035 And Beyond. https://www.forbes.com/wheels/news/automaker-ev-plans/

reducing ambient air pollution[7]. Electric powertrains are less complex than ICE equivalents, requiring fewer parts and servicing needs (e.g., no oil change, no engine to service), thus, simplifying maintenance. EVs are also more efficient than ICEs, making them less carbon intensive even if the electricity used to charge them is coming from non-renewable sources. In certain models, electric vehicles are roughly three times as efficient as an ICE vehicle[8]. However, by varying the source of electricity generation used to charge a BEV, the upstream carbon produced from fuel production can be lowered. As nations around the world make the transition to low-carbon electricity generation, the unitised indirect carbon produced by BEVs will decrease. Thus, a BEV being used in 2025 will emit less carbon per km than the same vehicle in 2023.

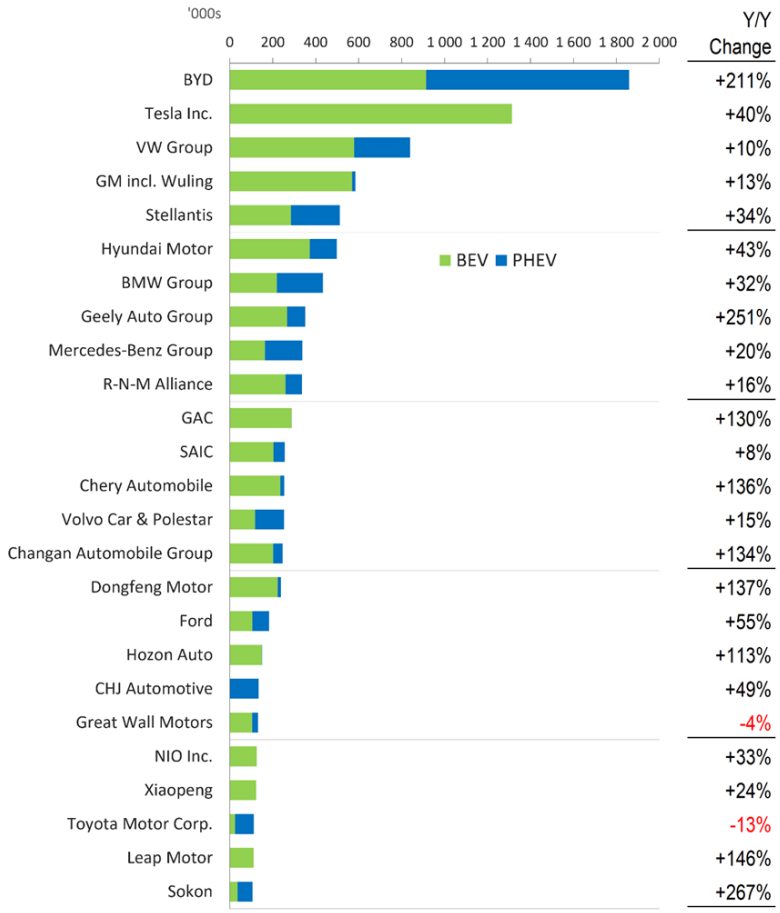

Figure 3 - Aggregated BEV and PHEV Sales by Brand (Source: ev-volumes.com)

[7] "London's Secret Fix for Air Pollution: Making Drivers Pay Up", Bloomberg Green, October 11, 2022 https://www.bloomberg.com/graphics/2022-london-ulez-emissions-zone-electric-vehicles/?leadSource=uverify%20wall (Accessed April 2023)
[8] Source: https://www.nrdc.org/bio/madhur-boloor/electric-vehicle-basics

1.2 The challenges for electric mobility

Like any transition, the rise of BEVs is also highly disruptive and can present challenges, which are: (i) the need to invest in charging infrastructure, in particular in countries with large geographies and distances, and considering the existing network of gasoline stations was built over decades, (ii) the performance of EV and the range-anxiety perception in the countries with large and mountainous geography, (iii) the competition with ethanol in certain countries such as in Brazil and the US which uses the product as a direct fuel or blended with gasoline; (iv) the need to disseminate the new technology and explain to the population how an EV works, and (v) the high acquisition and import costs of EVs, especially in countries with low-medium per capita income.

According to Mohammad et all (2022), on the supply chain side, high-capacity batteries, most commonly using a Lithium Ion (Li-Ion) chemistry, have accelerated the demand for commodity materials and with the rapid growth in battery demand due to the expanding BEV market, material supply shortages have become a reality. The EV market is a nascent industry, and as such it is still volatile. The battery is the most expensive component of a BEV, and while prices have fallen significantly since the inception of the EV market, their cost remains a barrier to adoption.

Another consideration is that in situations in which there is a higher concentration of BEVs in a geographical area, the stability of the electrical grid must be considered. Public charging stations must be carefully planned and managed to ensure that no part of the grid is overloaded. For home charging, the capacity of distribution lines and transformers in neighbourhoods is potentially a limiting factor, and there is a risk that charging habits will add to grid peak load demand unless controls and incentives that distribute charging times are implemented.

1.4 Implementation model: Concept of "S" curve

The growth of electrification of transportation will likely follow the adoption of innovation and technology model or the Bass model (S-shaped curve, Bass diffusion of innovation model) presented next. The Bass model illustrates how new products are adopted and uses a mathematical theory to describe the diffusion of frequently purchased products and from sociology and consumer behavior, how word of mouth is applied to sales of new products.[9] The timeframe can be divided into three different phases (the early adoption, take-off, and saturation) and different policy options should be used in each of these phases. The specific duration of each phase depends on each country's context.

[9] The Bass model – also known as Gompertz model – is described as a useful tool for forecasting the adoption (first purchase) of an innovation (more generally, a new product) for which no closely competing alternatives exist in the marketplace. A key feature of the model is that it embeds a "contagion process" to characterize the spread of word-of -mouth between those who have adopted the innovation and those who have not yet adopted the innovation. Source: The Bass Model: marketing Engineering Technical Note accessed at: https://faculty.washington.edu/sundar/NPM/BASS-Forecasting%20Model/Bass%20Model%20Technical%20Note.pdf

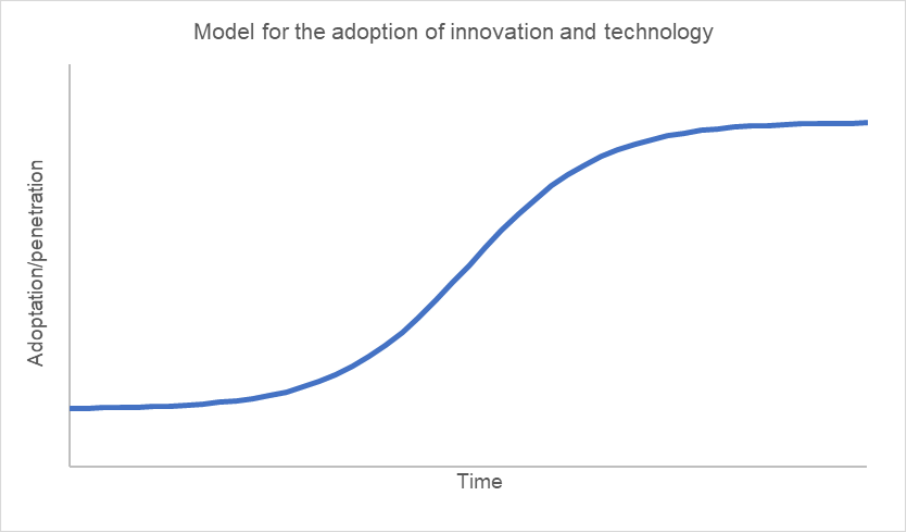

Figure 4 -Introduction of innovation according to the Bass model

This S-shaped curve was the case in the adoption of other technologies in households of the United States such as: electric power, automobile, landline telephone, cellular phone, and household appliances such as the electric stove and the refrigerator.

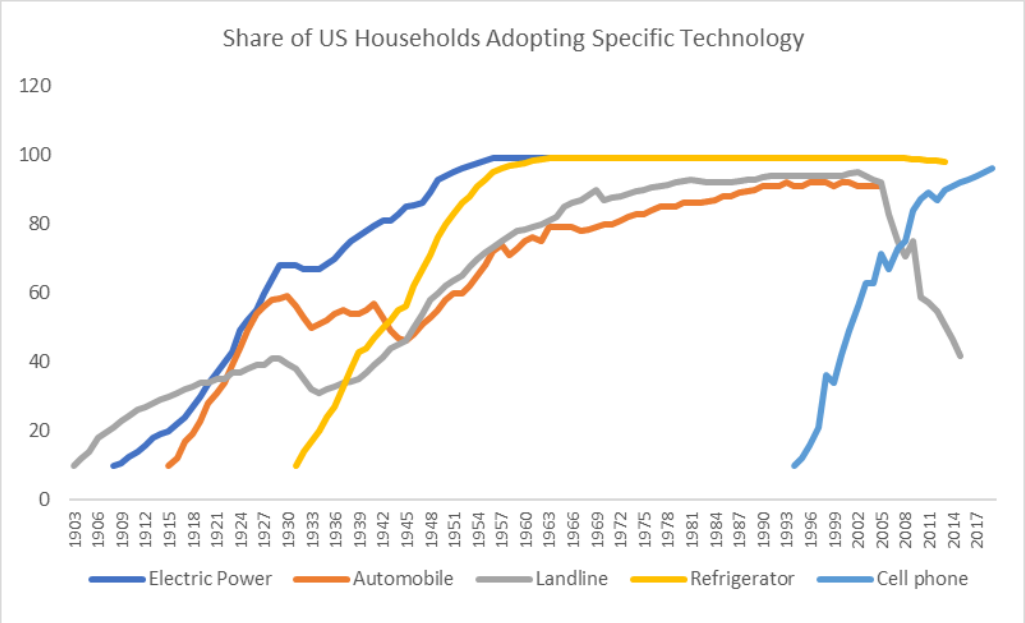

Figure 5 - Technology adoption by households in the USA. Source: Visual Capitalist (2020)

These technologies follow a three-phase approach of: (i) an early adoption phase where the technology is not available or accessible to everyone, and when the growth is small and at a slow pace. This phase is followed by (ii) a period of rapid growth called the take-off phase with a significant increase in sales as the standards become established, which in turn attracts competition. In the long-run the (iii) the consolidation (or saturation) phase where there is a cool-off period with very small growth, and the technology gets stable at high penetration. An alternative to this phase is when technology is replaced by a new one, for example, the decrease in use of landline telephones replaced by mobile phones.

Applying this model to the deployment of electric mobility, the three phases that would be expected are:

- In the **early adoption phase,** the short-term fiscal impact of electric mobility is limited due to the small share of EVs in the total car fleet. In LAC, for example, it is less than 1% of new car sales. In this regard, adjustments in the current tax regimes create interest with the early adopters. The early adoption phase usually kick starts with the introduction of an electric mobility strategy and action plan and can last 5 to 10 years depending on the country. The incentives are the main governmental costs in this phase (due to the forgone revenues), and they are usually small due to the low penetration. To offset these incentives, small adjustments in policies and tax regimes that are already in place can work in the short term in LAC due to the reduced costs or disturbance compared to the current regimes.
- The **intermediate take-off phase** is when there is fast adoption of electric mobility activities in a country. There are still no countries in the LAC region at this phase, and even internationally there are few. One of the countries with higher penetration of EVs is Norway where in 2020 EVs (including BEV and PHEV) represented about three quarters of new vehicle sales. In this phase of EVs deployment, incentives are gradually reduced or eliminated. For example, to offset the initial revenue loss from lower gasoline and diesel consumption, California introduced a small increase in the registration of new vehicles. In this context, the takeoff phase is the time in which countries must begin to review their tax and revenue streams related to the transportation system and to introduce tax reforms that are sustainable on the long term. In this phase, countries can introduce small tax adjustments as technology advances and new types of revenues become more acceptable.
- However, in the **long term**, more structural reforms must be put in place in countries that have high dependency on tax revenues from gasoline and diesel. In this phase, incentives are eliminated (as technology has evolved and acquisition costs are competitive) and the government costs are the reduction of taxes on gasoline and diesel. There are policy options available to government authorities to compensate for the loss of revenue, but these would require advance planning to restructure existing tax regimes in the transportation sector, and eventually in the electricity sector. The size and magnitude of this

restructuring will depend on the fiscal strategies and the dependency on fuel taxes. The policy options of decarbonization need also to be integrated to a broader set of fiscal policy reforms a country needs to introduce.

In the case of the implementation of electric mobility, there is already an exponential growth pattern for EVs, as rising sales track along an S-curve. Led by Northern Europe and China, and driven by policy and cost reductions, it is taking around six years for EVs to go from 1% to 10% of new car sales. The next stage is quicker still: In leading countries, it is taking another six years to get to 80%"[10].

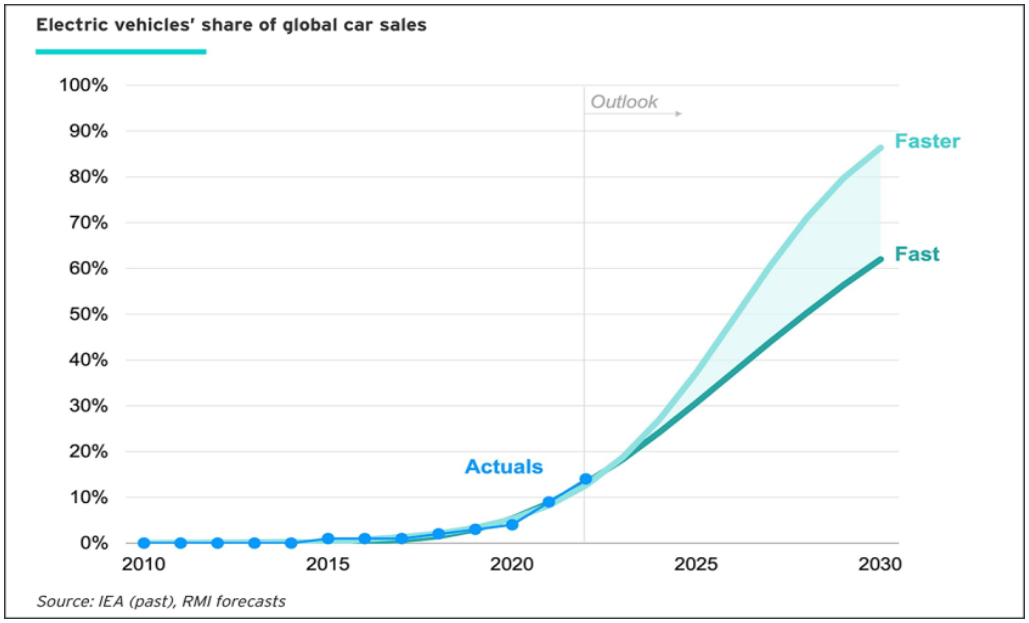

Figure 6 - RMI's X-Change: Cars: The end of the ICE age[10].

However, moving from one maturity phase to another is not an obvious process. According to Moore (2014) the challenges faced by companies transitioning from early adopters to intermediate phase (referred in his book as early majority or the pragmatists) are characterized by: (i) the willingness of the early adopters to take risks and try new products as they are the enthusiasts and visionaries; (ii) while at the intermediate phase, the early majority have different expectations, tend to be more skeptical and require more evidence before making a purchase decision. This will in turn require different policy options for each phase in the deployment of electro mobility in T&T, and these are presented in chapter 4 of this document.

[10] RMI X-Change: Cars (2023). The end of the ICE age.

2. Recent developments

This chapter presents the recent development of electro mobility in the Latin America and Caribbean (LAC) region and the conditions for electro mobility in Small Island Development State (SIDS). The chapter also provides the context for electro mobility in Trinidad and Tobago.

2.1 Electric mobility advances in Latin America and the Caribbean (LAC)

Over the last decade, electric mobility activities have advanced considerably in the LAC region. This advancement – via the development of electric mobility policies, regulations, long-term plans, incentives – is most notable in public transport systems, as the LAC region has the largest number of electric buses outside of China.

Electric buses

In 2023 the LAC region had a total of 5,084 electric buses[11], of which 1,064 were trolleybuses and 4,020 battery buses, which is subdivided into: (i) 940 midi e-buses (8-11 meters), (ii) 3,004 standard e-buses (12-15 meters), and (iii) 76 articulated e-buses (greaten than 18 meters). The total number of electric buses has increased considerably over the last 6 years, as in 2017 there were only 725 electric buses in the LAC region.

There are five countries leading the way for electric buses in the region: (1) Chile with 2,043; (2) Colombia 1,590; (3) Mexico 654; (4) Brazil 398; and (5) Ecuador 106. Moreover, the city of Santiago in Chile is by far the largest city in the region with electric buses, with a total of 2,000 followed by Bogota in Colombia. That is not surprising considering that the country has a national ambition that by 2035, 100% of the vehicles purchased for public transportation systems must be zero emission. Mexico City has the third largest fleet in LAC with 580 electric buses. BYD is the largest bus manufacturer in the region, with 2,271 out of the 5,084.

Additional countries of note in the LAC region include Barbados, which is aiming for 100% electric bus and government fleet by 2030, Chile with a goal to phase out ICE sales by 2035, Costa Rice targeting 70% zero-emission buses and taxis by 2035, Antigua and Barbuda aiming for 100% electric new vehicle sales by 2030, and Dominica promoting the import of hybrid vehicles.[12] Barbados and Bermuda have also made significant strides in public bus electrification over the past few years, with approximately 85% and 70% of the fleets being made up of electric buses, respectively[13][14].

Given the small island context, the transition narrative of Barbados is of particularly interest, as it aims to transition to electric vehicles by 2030 to reduce dependence on imported fossil fuels and mitigate climate change. According to IFC's new Regional

[11] Source: https://www.ebusradar.org/en/
[12] Source: https://www.ifc.org/en/stories/2023/electric-vehicles-accelerate-barbados-energy-transition
[13] Source: https://www.gov.bm/articles/progress-update-new-electric-public-buses
[14] Source: https://energy.gov.bb/barbados-transport-board-has-10-additional-electric-buses/

Private Sector Diagnostic, "in addition to Barbados' "fossil-fuel free by 2030" strategy, Antigua and Barbuda is targeting 100 percent of new vehicle sales to be electric by 2030, and Dominica is promoting the import of hybrid vehicles"[15]. In Barbados, due to recent policy changes, electric vehicles (inclusive of BEV & HEV) accounted for over 20% of vehicle imports in Barbados for 2021 through Q1 2022.

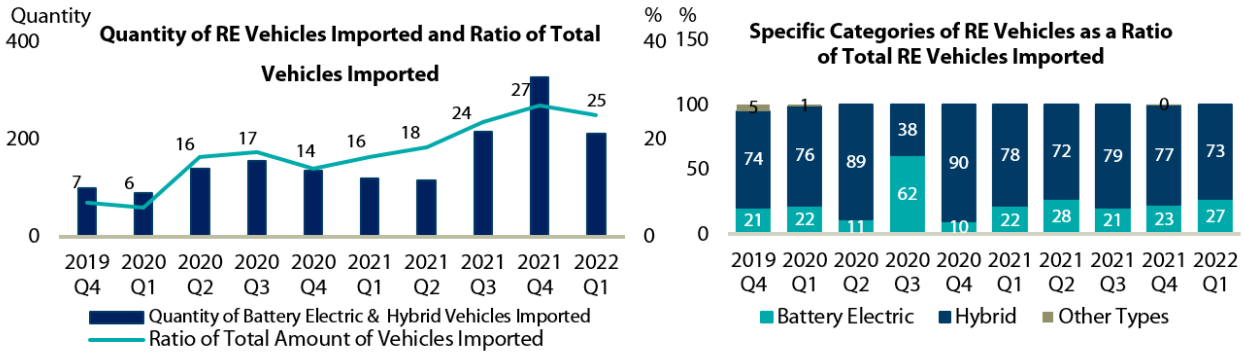

Figure 7 Source: Central Bank of Barbados: Transitioning Fully to Renewable Energy.

Role of Innovation

Innovation and new business models have played a key role in this accelerated deployment of electric fleets. In a recent study[16] conducted by the IFC and C40, the authors Courreges (IFC) and Graham (C40), argues that Latin America's secret lies in innovative public-private partnerships (PPPs) or concessions models in which the fleet providers finance, procure, own, and maintain the equipment, and provide e-bus fleets to operators or municipalities under stable long-term contracts, thus "unbundling" ownership and operation. "The 'unbundled' model allows all parties to do what they do best," says the report. This model is different from the ones found in other global cities, in which buses are owned by either a public authority or a single private operator, which procures, operates, and maintains the fleet as per contract requirements. "For different reasons, neither of these players is ideally positioned to lead a large-scale, investment-led transition to electrified fleets without changes to underlying business models," argues the study.

Similarly, for private cars, a unique business model has played out in Barbados with the founding of the company, Megapower. What started as a garage importing second-hand and ex-demo EVs turned into a supplier for large EV brands such as Nissan, BYD, SAIC, and MG as well as a national deployer of publicly accessible charging stations[17]. The public services company (PSC) partners with key

[15] https://www.ifc.org/en/stories/2023/electric-vehicles-accelerate-barbados-energy-transition
[16] https://www.ifc.org/wps/wcm/connect/industry_ext_content/ifc_external_corporate_site/infrastructure/resources/leading%20a%20clean%20urban%20recovery%20with%20electric%20buses
[17] https://www.forbes.com/sites/jamesellsmoor/2018/12/20/the-electric-vehicle-revolution-is-alive-in-barbados/?sh=169515535ff8

stakeholders such as financial institutions, the local utility (Barbados Light and Power), and the Government to improve the vehicle landscape in Barbados.

The leadership of Governments in furthering the transition through strategy and legislation has expanded electric mobility accessibility in the region. Bermuda and Barbados are examples of Governments introducing exemptions for EVs from import duty, improving the upfront cost of these vehicles and making them more price competitive with ICEs.

The Government of Jamaica established an EV Council to support the review and implementation of EV policies, regulations, and incentives. The Council consists of representatives from the Ministry of Science, Energy, and Technology, other public institutions, utility, regulator, and private sector automobile industry. It is this ability of Governments to remove key roadblocks, assist in systematic planning of infrastructure, and convene important stakeholders that makes their commitment and involvement essential to the e-mobility transition.

Electric passenger cars

The sale of electric passenger cars is also increasing in LAC, albeit from a very low base when compared to other countries. According to Bloomberg New Energy Finance (BNEF)[18], the LAC region registered nearly 25,000 EVs sold in 2021, more than doubling the 2020 level. In 2023, this trend has just continued to escalate. In countries like Chile and Dominican Republic with smaller EV markets plug-in EVs have reached 0.7% of total car sales in 2023.[19]. Brazil saw a large 700% YoY growth in monthly BEV sales from 800 sold in July 2022 to 6000 in December 2023, with nearly 20,000 BEVs sold in 2023 and total plug-in sales reaching 2.4% of total vehicle sales.[20] Columbia (2.9%), Uruguay (3%) and Costa Rica (11.6%) lead the region in the percentage of plug-in sales.[21] While the overall percentage of sales may not be as impressive, Mexico has also seen about 20,000 plug-in vehicles sold in 2023.[22]. Barbados also boasts nearly 17% of all car imports on the island as electric.[23] In Bermuda, over 400 EVs are registered on island (Bermuda Ministry of Transport) including an entirely electric mini car rental system for visitors. Despite these large increases, the LAC region lags other regions as EVs were 20%, 15%, and 4.5% of sales in Europe, China, and the U.S. in 2021, respectively.

2.2 Electric vehicles in Small Island Developing States (SIDS)

According to Maharaj and King (2020), conditions in SIDS present appealing benefits to the deployment of BEVs, but also particular challenges. Specific characteristics of SIDS that lend themselves to BEV adoption are:

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[18] https://about.bnef.com/blog/electric-vehicles-start-gaining-traction-in-latin-america/
[19] Latin America 2023 EV Sales Report, Part 1 – Clean Technica
[20] BEV Sales Shoot Past All Expectations in Brazil in December, Rise 700%! – Clean Technica
[21] Latin America 2023 EV Sales Report, Part 3 – Clean Technica
[22] Latin America 2023 EV Sales Report, Part 2 – Clean Technica
[23] https://www.ifc.org/en/stories/2023/electric-vehicles-accelerate-barbados-energy-transition

i) Short point-to-point trip distances. In SIDS, long distance (e.g. inter-city) road trips are less common than in continental nations. Average daily driving distance is little different from that of other countries, at 64 km in Trinidad[24] compared with 52 km in the UK (UK Government: Department for Transport, 2020) and 80 km in the US1 (USOHP, 2020). However, the longest point-to-point distance in Trinidad and Tobago is 217 km, and the occurrence of such a journey is an improbable limit case.

ii) Lower average speeds and generally shorter drives at highway speeds allowing BEVs to remain in their more efficient operating window.

iii) Tropical and sub-tropical climate. Many SIDS lie in ±23 degrees latitude, and as such have consistently warmer weather. Since colder temperatures, below about $10°C$, significantly degrade vehicle range, this is not an effect that SIDS suffer.

iv) Many SIDS are heavily dependent on imported fossil fuels and are making concerted efforts to move to energy independence through electrification with renewable generation. While increased EV adoption results in less road fuel imports, without renewable generation to supplement additional electricity there will still be fossil fuel imports from the electricity sector.

v) SIDS are often highly vulnerable to climate change effects, despite being miniscule contributors to the volume of carbon in the atmosphere. To speak to the importance of decarbonization, it is important for SIDS to exemplify the energy transition through electrification and renewables.

vi) SIDS often have narrow roads and, in some cases, hilly island topography along with high humidity. This leads to a requirement for specific vehicle model types – smaller vehicles with high power that are resistant to corrosion. EVs provide more power-density due to a powerful electric motor, making them good candidates for such a geography.

2.3 Electric vehicles in Trinidad and Tobago

Trinidad and Tobago has included the decarbonization of the transport sector in its Nationally Determined Contributions (NDCs) part of the Paris Agreement. T&T's NDC is based on its Carbon Reduction Strategy and the National Climate Change Policy. As a component of its NDC, T&T has committed to unconditionally reduce its public transportation emissions by 30% or one million, seven hundred thousand tons (1,700,000) CO2e compared to 2013 levels by December 31, 2030.

It is estimated this reduction in T&T will be achieved by: (i) improving national public transport systems, (ii) promoting vehicle energy efficiency, fuel efficiency and fuel switching, (iii) promoting alternative fuels, (iv) reducing private vehicle use, and (v) improve data collection and information sharing systems. The Strategy for

[24] Calculated by dividing the average annual mileage for light vehicles by 282 days per year of usage.

Reduction of Carbon Emissions in Trinidad and Tobago, 2040 (2015) estimates that the transport sector represents 5% of the country's GDP and 7% of the country's GHG emissions. In the business-as-usual case, the transport sector is predicted to grow exponentially between 2013 and 2040, resulting in a 310% increase in carbon emissions.

It has been reported that in Trinidad and Tobago, there are more than one million cars on the roads, a figure that is increasing by over 2,000 per month[25]. Although this is likely an overestimate due to limited deregistration of scrapped vehicles, taking the figure as a baseline, and with a population of about 1.4 million, the ratio of cars to population is about 714 per one thousand people. This is an exceptionally high rate of car ownership when compared with Canada (636), Western Europe (620), Mexico (343) or Brazil (213). Other SIDs such as Bermuda (350)[26], Jamaica (131)[27], Dominican Republic (435)[28], and Barbados (442)[29] are also estimated to have lower car ownership than Trinidad and Tobago.

2.4 Opportunities in Trinidad and Tobago

Shared transportation in Trinidad and Tobago presents an important opportunity for decarbonization. Public transportation consists of a mix of publicly and privately operated services. The public transportation company, the Public Transport Service Corporation (PTSC) serves fixed routes using a mix of mid-sized and large transit buses. The majority are diesel (about 198 vehicles), but approximately 72 are powered by locally produced compressed natural gas (CNG). However, the majority of mass transit passengers use 'maxi-taxis' or 'route taxis'. Maxi-taxis are privately owned 15-25 seat, licensed minibuses operating fixed routes with fixed fares. Apart from a small proportion of CNG vehicles, maxi-taxis are diesel. Shared route taxis are privately owned cars with 9 seats or fewer, that follow roughly defined routes originating from official taxi stands. Route taxis are mainly gasoline vehicles, with a growing proportion of hybrid gasoline models which offer significant reductions in fuel consumption.

In line with the Trinidad & Tobago NDC, which includes a commitment to reduce CO2 emissions from public transport by 30% by 2030, government officials have announced a plan to purchase 270 electric buses[30], and a Request for Proposals (RFP) has been issued. By incentivizing decarbonization of high mileage, mass transit vehicles, valuable gains in both CO_2 reduction and air quality can be achieved.

Focusing on the decarbonization of mass transit and shared taxis, which tend to have a high usage rate in both time and distance, can afford the greatest benefits in

[25] Over 1 million cars on T&T's roads - Trinidad Guardian
[26] Bermuda Census 2016
[27] Knoema World Data Atlas
[28] Calculated using motor vehicle registrations (Statista), and 2020 Population in Dominican Republic
[29] Official says too many poor choices made with vehicle imports over the years – Barbados Today
[30] "Sinanan: Electric buses, new rural maxis coming in 2022", Newsday, December 30 2021 https://newsday.co.tt/2021/12/30/sinanan-electric-buses-new-rural-maxis-coming-in-2022/

carbon reduction. It also supports an equitable transition, with transport users from across the income spectrum able to access clean and efficient, zero emissions transportation.

In Trinidad and Tobago, the growth of EV registrations has been slow and inconsistent but is now accelerating. The first registrations of EVs in Trinidad and Tobago were in 2016, although some EVs were used grey market imports from as early as model year 2012. These figures show that sales growth has not shown a smooth increase, contrary to patterns in more developed markets. Two factors have driven sales: (i) model availability; and (ii) the import and motor vehicle tax structures.

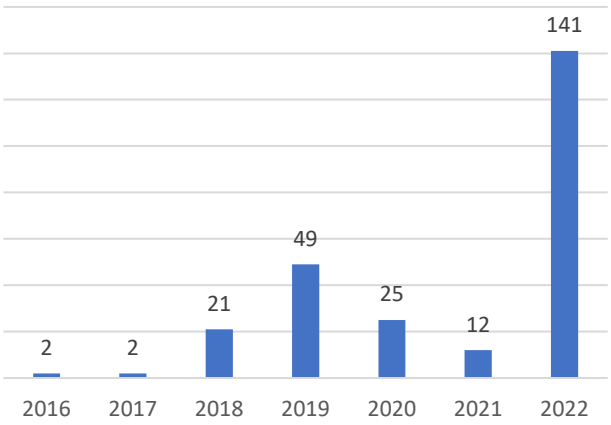

Figure 8 - Registrations of Electric Vehicles in Trinidad & Tobago 2016-2022 By Year

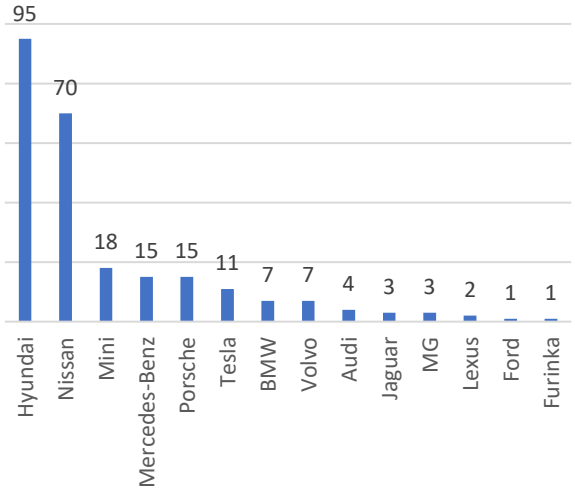

Figure 9 - Registrations of Electric Vehicles in Trinidad and Tobago 2016-2022 by Brand

i. EV model availability has constrained registration growth in Trinidad and Tobago**.** Before 2018, no EVs were available in the country through franchised dealers. Only 4 EVs were registered before that date, and those were grey market or personal imports. In 2018, the Hyundai Dealer (Massy Motors) started to sell the Ioniq EV and this vehicle constituted 60% of EV registrations in 2018-2019. Sales, whilst still a tiny fraction of overall vehicle sales demonstrated 100% growth in 2018-2019. However, 2020 saw sales drop right back to 2018 levels, due partly to the disruption of the pandemic, and partly to franchised dealers' lack of EV stock. Grey market imports have stepped in to fill the gap, with non-franchised dealers offering a wide range of model options at competitive prices.

ii. Government incentives have catalyzed the increase in hybrid vehicle registrations. From a historical perspective, in 2016, the government introduced aggressive incentives for low emissions vehicles, with full duty and tax waivers on registrations of EVs below 179kW motor power and for hybrid vehicles below 2000cc. This led to a dramatic uptick in hybrid vehicle registrations, but it had minimal impact on EV registrations, with only 99 in

the five years that this incentive was in place. In 2021, the tax and duty waivers were cancelled, except for commercial EVs. Although more EVs were starting to become available on the market, this adjustment caused new EV registrations in 2021 to fall to less than 25% of those in 2019. At the start of 2022, taxes and duties were once again waived on EVs, now without the 179kW motor power restriction. The registration figures shown in the previous figure demonstrate the impact – an immediate spike in EV registrations, validating the effectiveness of this incentive as a policy measure. This growth may, however, be dampened by the re-introduction in April 2022, of the same waiver on hybrid vehicles below 1600cc, which once again made hybrids in this class cheaper than EVs available on the market.

	2016	2017	2021	2022
Hybrid vehicles **< 2000cc** **< 4 yrs. old**	0% Import duty 0/cc Motor vehicle tax (MVT) 0% VAT	35% Import duty $37.50/cc MVT 12.5% VAT	35% Import duty $37.50/cc MVT 12.5% VAT	35% Import duty $37.50/cc MVT 12.5% VAT
Hybrid vehicles **< 1600cc** **< 4 yrs. old**	0% Import duty 0/cc MVT 0% VAT	0% Import duty 0/cc MVT 0% VAT	20% Import duty $3.75/cc MVT 12.5% VAT	0% Import duty 0/cc MVT 0% VAT
Electric vehicles **> 179 kW** **< 4 yrs. old**	20% Import duty 0/cc MVT 12.5% VAT	20% Import duty 0/cc MVT 12.5% VAT	20% Import duty 0/cc MVT 12.5% VAT	0% Import duty 0/cc MVT 0% VAT (< 2 years old)
Electric vehicles **< 179 kW** **< 4 yrs. old**	0% Import duty 0/cc MVT 0% VAT	0% Import duty 0/cc MVT 0% VAT	20% Import duty 0/cc MVT 12.5% VAT	

Figure 10 - Trinidad & Tobago Hybrid and Electric Vehicle Duty and Tax Regime 2016-2022. Highlighted cells show zero rated (Source: Own elaboration)

2.3 Battery Replacement Cost

The high cost of EV batteries and vehicle import taxes may discourage consumers from buying electric vehicles. The cost of electric vehicles is significantly influenced by the batteries that power them, which can account for 30-40% of the total price of an electric vehicle[31]. In T&T, consumers may face additional risk when purchasing used or grey market EV imports due to battery degradation. As a result, consumers

[31] https://www.instituteforenergyresearch.org/renewable/electric-vehicle-battery-costs-soar/#:~:text=Batteries%20account%20for%20about%2030,price%20of%20an%20electric%20vehicle.

in this market may consider purchasing an ICE vehicle instead, where replacement components are much less expensive.

To reduce the cost of replacement of EV batteries, import duties and taxes on Lithium-Ion batteries in Trinidad and Tobago could be reviewed. Currently, Trinidad and Tobago's import tax and duties on replacement EV Lithium-Ion batteries are relatively high at 35%, compared to its average Latin American counterpart at 17% with a range between 7% and 25% (see figure 11[32]). Although the government made a welcome in July 2023 to move to remove import duties on Lithium-Ion batteries for use in renewable energy systems[33], it is unclear whether the waiver also applies to replacement vehicle batteries. Explicitly extending the zero-rated import duty to EV and hybrid batteries would clearly signal the government's support and encouragement for consumers who are exploring or hesitant about switching to EVs.

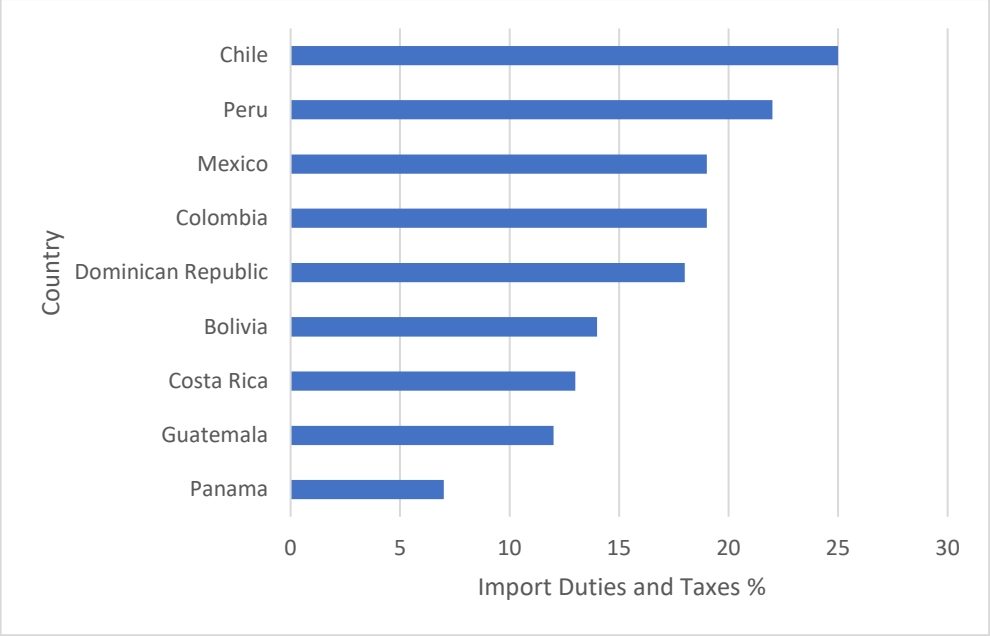

Figure 11 - Estimated Import Duties and Taxes for Lithium-Ion Batteries.

Trinidad and Tobago position across the maturity phases

Considering the S-shaped curve or Bass diffusion model presented in the previous chapter, Trinidad and Tobago is on the early stages of the first phase. Reflecting the low prices of gasoline and diesel in the country, Trinidad and Tobago would need to maintain adequate fiscal, and create non-fiscal, incentives to accelerate the

[32] Source: Dutify.com https://dutify.com/duty-rates-for-lithium-ion-battery
[33] https://tradeind.gov.tt/removal-of-import-duties-on-lithium-ion-batteries-used-in-renewable-energy-systems/

deployment of EVs, consistent with its national strategy and roadmap. Supply-side incentives such as EV sales mandates could be considered, as well. As discussed in the S curve model before, these incentives need to be adjusted over time, so that they are adequate for each of the three phases. As the countries entered in the second phase of deployment, they need to review and analyze the taxes in the gasoline and electricity markets to ensure consistency with the country strategy. However, as the framework that will be presented in the next chapter, other activities need to be introduced to develop a sustainable development of electro mobility in Trinidad and Tobago. These are described in Section 3.2 next.

3. EV public consultations in Trinidad and Tobago

3.1 Methodology and level of expertise of participants

A series of stakeholder consultations were conducted in Trinidad and Tobago, with the objective of complementing current efforts by the GORTT to develop an electro mobility strategy and accelerate deployment of electric vehicles. It is expected that the consultation can provide insights from stakeholders in the country, and so assist policy makers on this deployment. This chapter presents the demographics of the participants, the methodology used and the results from the consultations.

In total there were three separate virtual consultation sessions. The first consultation was with the private sector, mostly car dealers, rental services, and those involved in car maintenance. The second consultation was the civil society, including members of non-government organizations (NGOs), diplomatic corps, multilateral organizations, and academia. The third and last consultation was with the owners of EVs in T&T. Each session lasted 90 minutes.

There was a total of 74 participants in the three consultations in a gender-neutral survey. From this total, 26 (35%) were from the private sector, 30 (41%) from the civil society, and 18 (24%) were current EV users. The session with the civil society was the largest one of the consultations. The number of participants in the sessions was gender balanced, as 52% were female and 48% male participants.

Consultation round	**Level of Expertise of Participants (self-evaluation and anonymous)**				
	Limited I have not driven an EV or studied this subject deeply	Basic I understand the main EV subjects	Intermediate, I can speak easily on two subjects of EVs	Advance, I am quite proficient on at least 4 EV subjects	Expert, I can discuss advanced ideas on multiple EV subjects
Private Sector	4%	29%	38%	13%	17%
Civil Society	20%	45%	30%	0%	7%
EV Owners	8%	17%	42%	25%	8%
Total	11%	33%	36%	10%	10%

Figure 12 - Level of expertise for each consultation round.

At the beginning of each session the participants were classified regarding their level of expertise on electric vehicles. The objective was to assess the level of understanding on the subject and identify any correlation with the results. Overall, the total distribution presents a good dispersion of the results with a small skewness towards lower knowledge: 44% of the participants had “Limited” (11%) or “Basic” (33%) level of knowledge, 36% had “Intermediate” level of knowledge, and 20% had “Advanced” (10%) or “Expert” (10%) knowledge.

As expected, the third consultation with EV Owners had the highest level of understanding of EVs. In this consultation, 33% indicating they have either "Advanced" (25%) or "Expert" (8%) levels. Conversely, 65% of the Civil Society consultation indicated they have either "Limited" (20%) or "Basic" (45%) knowledge levels. The authors considered the EV owners may have been too humble in their self-classification, considering the level of sophistication and quality of the discussions held in the consultation, and their actual experience driving electric vehicles, some of them for a long period of time. On a relative basis compared to the other consultations, the percentage of EV Owners in the category of "Expert" of 8% is not consistent with the self-evaluated proportion of the Private Sector of 17% in the same category.

Limitations of the methodology

Despite the diversity of the participants in the three consultations, the results of this survey should be reviewed carefully when extrapolating from the sample to the population. This analysis could incur on *statistical selection bias* as the participants in the survey were not randomly selected, and *confirmation selection bias* as the third consultation with EV users who are already early adopters of the new technology. Therefore, the results of the consultation represent mostly the opinion of subject-matter experts (SMEs) and stakeholders, and not necessary the opinion of the Trinidad and Tobago general society. This limitation does not however invalidate the objective of the consultation which was to engage the stakeholders and consolidate their insights. Moving forward, a separate survey with a random sampling methodology would be suggested to gauge the broader public opinion.

3.2 Framework for the electrification of the transport sector

The IDB has been supporting several countries in the Latin America and Caribbean (LAC) region to develop and implement activities to electrify the transport sector as way to decarbonize the sector. Over the last 4 years, the Bank has supported 52 electric mobility initiatives. The primary lesson learned from these initiatives is that the most successful ones consider not a single action, but instead a range of actions in a framework of six categories.

The following electric mobility framework was used for the public consultations in Trinidad and Tobago as it summarizes the main elements from the country experiences and consolidates these elements in 6 categories:

1. **Institutional and political leadership**. This category includes the important role governments must introduce timely and fit for purposes public policies. It also includes the relevance of the political leadership to set the vision, ambitions, targets, and lead by example. The stronger cases translate this vision into national legislations.
2. **Business model** (role of the utility and private sector). This category determines the business model for developing and operating the charging infrastructure, the role of the electricity utility and the private sector in

providing the electric mobility services (including charging). It includes also new innovative business models for public transportation.

3. **Communication and outreach**. The experience of countries in LAC region demonstrates the importance of developing public campaigns and education activities, as it is required for any new economic activity. This is an area which is usually overlooked, but dedicated outreach activities are needed for a successful deployment of electric vehicles.
4. **Financial, economic and tax incentives**. Countries have put in place a wide range of fiscal and non-fiscal incentives to entice consumers to purchase EVs. The intensity of these incentives is dependent on the ambition and pace of the deployment in the given country and the fiscal space.
5. **Regulatory arrangements**. Considering the interface in the provision of electricity services and EVs, countries usually have to modernize their regulatory settings to contemplate regulations such as differentiated hour charging tariffs, and distributed generation using renewable energy.
6. **Infrastructure and standards**. Lastly, the development of a network of public charging stations for vehicles can increase visibility and create customer awareness and mitigate the range-anxiety perception. Developing the normative and regulations for charging infrastructure is also an important area for the deployment of EVs.

The prioritization and intensity of each area is country specific, but the experience demonstrate that a country introducing electric mobility must consider several of these categories and not an individual one. Therefore, policymakers would need to act in more than one of these categories to make an impact. Moreover, the emphasis of each area is dependent on the phase of maturity of the market; for example, in the early stages countries usually invest in communication and outreach activities together with economic incentives to get traction with the early adopters. As the country advances in the deployment of EVs, it must develop a network of charging stations to cope with the new demand.

3.3 Consultation results

The consultation conducted by the IDB and the UWI used this framework of six categories to analyze inputs from the participants. During the consultations participants were asked to indicate in order of preference the top 3 (out of the 6) categories they consider the most important for the deployment of EVs in Trinidad and Tobago. All responses were collected in an anonymous manner.

Ranking of top 3 categories

At the aggregate level, the category with the highest score (i.e., indicating the one the participants believe is the most important for T&T) was “Institutional and Political Leadership”. This was followed closely by a second category of “Financial, Economic

and Tax Incentives". These two categories being at the top of responses indicate the importance of adequate public policies for a successful deployment of EVs.

The "Institutional and Political Leadership" category represents the role of policy makers setting the vision, putting in place the policies and leading by example. Moreover, introducing adequate economic and financial incentives came in a close second position. This is particularly important as one of the largest barriers for fast deployment of EVs is the acquisition price (i.e., purchasing price) as there is evidence in the studies that when considering the total cost of ownership (TCO), EVs are more affordable than ICE vehicles. A study by Maharaj and King (2020) compared the actual and predicted energy use and running costs for an ICE and an EV in typical T&T driving conditions. It showed that even with the pricing structure at that time, EV costs 13% more in terms of capital costs, but the lifetime ownership costs are 7% less when compared with an ICE (Dolcy and Townsend 2022).

The third category mentioned by the participants was "Infrastructure and Standards" representing their perception that setting-up a network of public charging stations is an important condition for the deployment of EVs in T&T. This goes along one of the main concerns of interested buyers which is the range-anxiety, which represents the fear of drivers on the autonomy of vehicles (distance of travel with a single charge in the battery) would not be adequate for medium to long distances. Also included in this category is the need to have technical standards and norms at country level for the charging infrastructure as manufactures use different types of plugs and connections.

However, this perception should be reviewed carefully as it could be a perceived challenge rather than an actual challenge**.** According to the international experience of EVs in other countries, about 90% of the EV charging is done at home or place of work of the owner. Only about 10% of the charging is done in public charging stations. Considering the limited territorial extent of T&T, there is no reason that the same pattern would not be found in T&T. However, the fact that "Infrastructure and Standards" being ranked by the participants as third area of importance, could indicate that a network of public charging stations would increase visibility and awareness of EV for the ordinary citizens, and therefore develop interest on EVs.

Other categories

The participants identified "Communication and Outreach" as the fourth most important category for attention. This is not surprising as any deployment of innovation requires a proactive effort to explain the new technology. The consultations also identified misperceptions on the use and operation of EVs which need to properly be communicated to the population. For example, in one consultation it was raised the concern that in the event of electricity outage, the consumer would be unable to charge the EV, and thus limiting the ability to travel. However, in such case of electricity outage, the gasoline pumps in the petrol stations would also not work, as almost all pumps at stations are electric.

The fifth category ranked at the consultations was "Business Model". This is not surprising, as in T&T the electricity sector has a single integrated public utility (T&TEC) with monopoly in the generation, transmission, and distribution activities[34]. Therefore – different to other countries – it may be *implicit* to the participants that the supply of electricity to vehicles must be provided solely by T&TEC. However, other countries in the LAC region have decided that the charging of EVs is a commercial activity like any other which should be open to competition by the private sector. Moreover, this category includes also new business models for public transportation, which is later presented in the policy considerations in the next chapter.

A similar consideration could be interpreted by ranking "Regulatory Arrangements" as the least important area perceived by the participants. The utilization of distributed generation (DG) in T&T is at its infancy and thus the option of consumers generating their own electricity via solar rooftop PV in their residences and then using this clean generation to power their vehicles seems a dim possibility by the participants in T&T, and therefore this could be the explanation for this item being ranked so low. Also included in the regulatory arrangements is the possibility of having tariffs differentiated per time of the day, and demand side management (DSM) to reduce consumption on peak hours of the day. These are features of a regulatory arrangement that are not yet available in T&T. Another explanation for the low ranking of this category is that these are very technical considerations, and some participants are not from a technical background.

3.4 Breakdown by type of users

The breakdown of the consolidated results by each consultation session (and therefore the role of the participants) did not present major differences. The two categories of "Institutional and Political Leadership" and "Financial, Economic, and Tax Incentives" consistently ranked as #1 and #2 across all three consultations. Similarly, the category of "Infrastructure and Standards" was ranked as #3 in two of the consultations and a close #4 in the third consultation.

The category of "Communication and Outreach" however presented varying results. EV Owners put this as their top #3 priority, while the Private Sector and Civil Society put them in a much lower position in the ranking, in positions #6 and #5 respectively. This could be interpreted in different ways: (i) the car dealers (private sector) have usually high level of awareness on this subject, and they may have extrapolated their own perceived knowledge on the subject to the general population (and therefore reducing the importance of having a national communication program; (ii) EV Owners believe they understand the challenges and misperceptions of EVs in the local market as they are discussing their EVs and ownership experience within a small group on a regular basis. EV owners are the frontline word-of-mouth marketers for EVs and they are aware of the knowledge gaps in the market that a public education campaign could address; and /or (iii) the car dealers believe a public

[34] Part of the generation is performed by the private sector with power purchasing agreements (PPA) with T&TEC.

education campaign may not be needed as they are the frontline information sharer and they should be the ones doing it. This is a layered result with lots of possible explanations and a next step would be to dive into this deeper to uncover the underlying reasons for this mixed result across the respondents.

Ranking	Private Sector	Civil Society	EV Owners
#1	Financial, Economic, and Tax Incentives	Institutional and Political Leadership	Institutional and Political Leadership
#2	Institutional and Political Leadership	Financial, Economic, and Tax Incentives	Financial, Economic, and Tax Incentives
#3	Infrastructure and Standards	Infrastructure and Standards	Communication and Outreach
#4	Business Model	Regulatory Arrangements	Infrastructure and Standards
#5	Regulatory Arrangements	Communication and Outreach	Business Model
#6	Communication and Outreach	Business Model	Regulatory Arrangements

Figure 13 - Ranking of categories for each consultation group.

Comparison with consultations in other countries

The results of these consultations in T&T are consistent with other international surveys in the areas of "Financial, Economic, and Tax Incentives" and "Infrastructure and Standards". As part of the analysis, the authors also compared these results to surveys in other countries. A survey in the US asked the question "Which, if any, of the following reasons describe why you would not consider purchasing a new or used electric vehicle?" and the top two answers were "Initial cost is higher" (32%) and "There are not enough charging stations" (30%). The concern of the second attribute of charging stations is more understandable in the US due to distances and high miles driven per car. This perception is interesting as in reality, most daily commutes are typically less than 40 miles – well within the capacity of an electric vehicle that will generally have a range of anywhere from 100 to 350 miles. In the same survey however, 65% are in agreement that "Electric cars are the future of motor industry".

A similar survey[35] in 2021 indicated the perceived disadvantages of hybrid and electric cars were: "Expensive" (59.4%), "Limited availability of charging stations" (50.3%), and "Time needed to recharge" (46.2%). Lastly, another survey confirms that American are very receptive to the idea of owing an EV, and the reasons they cite are higher purchasing price of and EV (60%), and concerns about a lack of charging stations (60%) or running out of charge while driving (i.e., range anxiety) (58%).

[35] https://www.carmax.com/articles/green-cars-trend

3.5 Consultation thematic analysis

A thematic analysis of the qualitative data revealed consistency between the participants' verbal responses and the survey results, and identified new emerging themes which did not fall explicitly into the six categories. Regarding the methodology, the audio recordings of the consultation sessions were converted into written transcripts and assigned codes. The codes were derived from the six electro mobility framework categories delineated in the previous Section as well as from the emergent themes that arose from the data analysis. The table next summarizes the outcomes of the three consultations. The emergent themes include the following:

- **Alternative Technology & Renewable Integration** - This involves adopting alternative fuel vehicles (AFVs) and electrified micro-mobility solutions that can reduce the dependence on fossil fuels and the environmental impact of transportation. Examples of AFVs include compressed natural gas (CNG) vehicles, while examples of electrified micro-mobility solutions include e-scooters. Renewable Integration refers to harnessing renewable energy sources and innovative technologies to power EVs and mitigate GHG emissions.
- **Vehicle Availability from Manufacturers** - this denotes the diversity and quantity of EV models that are manufactured and marketed by various automotive companies. It is a significant determinant that affects the diffusion and utilization of EVs worldwide. The past few years have witnessed a remarkable increase in EV model selection and sales, along with enhanced range and superior performance. However not all these new models are available in the Caribbean yet.
- **EV Performance & Reliability** - this denotes the functionality and dependability of EVs. It is a crucial factor that influences the satisfaction and confidence of EV owners and prospective buyers. Moreover, reliability issues with EVs may be anticipated since most automakers – some of these are not traditional brands – introduced fully electric models in recent years and issues that may eventually affect the vehicle reliability may not yet be known. In a local context, this encompasses the climate effects from the Caribbean on range performance as well as harsh road conditions on the dependability of the vehicle.
- **Public Transportation –** It denotes the system of buses, water taxis, and other vehicles that are available for people to use instead of their own cars. It is related to private vehicle ownership and electro mobility in several ways. Public transportation can diminish the demand for private vehicles by providing a more convenient, affordable, and sustainable alternative for urban mobility. Moreover, it can also benefit from electro mobility by adopting electric buses, trains, and other vehicles that have lower emissions and operating costs than conventional ones.

Theme	EV Owners	Civil Society	Private Sector	Total
Institutional and political leadership	8	2	12	22
Financial, economic, and tax incentives	7	11	9	27
Business Model	7	0	4	11
Communications and Outreach	5	2	6	13
Infrastructure and Standards	5	11	12	28
Regulatory Arrangements	5	1	4	10
Alternative Technology & Renewable Integration	3	7	3	13
Vehicle Availability from Manufacturers	2	7	2	11
EV Performance & Reliability	2	6	0	8
Public Transportation	4	0	0	4

Figure 14 - Themes identified in each consultation round.

The new emerging themes to be highlighted are the importance that civil society has placed on: (i) Alternative Technology and Renewable Integration which relates to the solutions of micro-mobility solutions; (ii) the concern on Vehicle Availability from Manufactures (in relation to accessibility of these vehicles in the Caribbean); and (iii) EV Performance and Reliability reflecting concern about range anxiety and performance of the new technology. However, these were not critical aspects as reported by the EV Owners and the Private Sector.

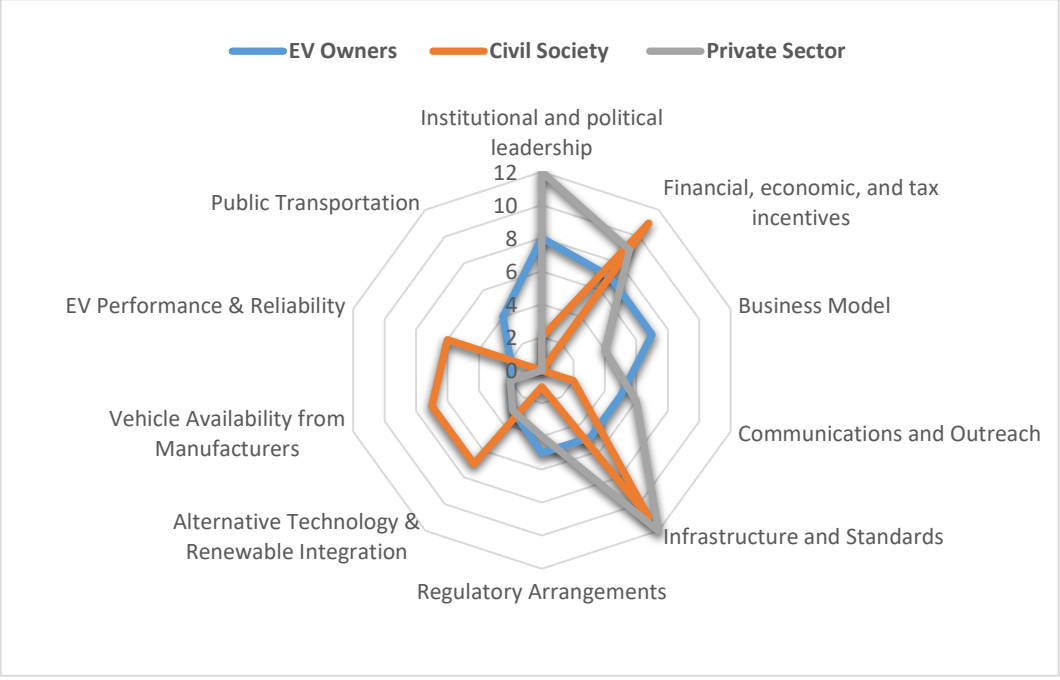

Figure 15 - Consultation thematic analysis.

3.6 Summary of the consultations

The results of the consultation have identified 4 categories as the main themes: (1) Institutional and Political Leadership; (2) Financial, Economic and Tax Incentives, (3) Infrastructure and Standards, and (4) Communication and Outreach. This conclusion is not surprising as illustrated by how other countries are developing their electro mobility programs. The thematic analysis has identified the similar categories but put Infrastructure and Standards in a more prominent position (higher number of mentions in the transcripts). The thematic analysis has raised also other themes which are part of the six categories, but reflected the specific concerns mentioned by the stakeholders and are: (i) Alternative Technology & Renewable Integration, (ii) Vehicle Availability from Manufacturers, and (iii) EV Performance & Reliability. The next chapter presents considerations for the policy makers in Trinidad and Tobago on how to translate these results into action in the country.

4. Policy considerations for Trinidad and Tobago

This section presents policy options the GORTT could consider for advancing EV participation in the country. They follow the priorities identified in the public consultation, acknowledging it is outside the scope of this document to recommend a specific policy option, as this will depend on the country's vision, ambitions, and pace of the implementation. These elements are part of the broader strategy that the government is currently working on.

4.1 Category #1 Institutional and Political Leadership

Policies and measures[36] are usually structured in three categories (excluding the financial incentives) and take a variety of forms such as fuel economy standards, CO_2 emission standards, deployment roadmaps, and sales or stock targets and ambitions. The three categories are:

- **Legislation**: legally binding commitments such as regulations and standards.
- **Targets**: government targets incorporated in legislation, budgetary commitments, and NDCs.
- **Ambitions**: government goals or objectives (also known as unofficial targets) as set out in a policy document such as a deployment roadmap or strategy.

Trinidad and Tobago has an opportunity to set the national targets and vision for EVs. The importance of setting the vision and national targets is that these can become part of national legislation with dedicated budgetary resources and an implementation roadmap.

The importance of attracting the private sector

The introduction of this framework of targets, legislation, and ambitions would demonstrate the government's commitments toward the electrification of transport in the country, which in turn provides signals to foster private investments in the sector such as public charging stations and increased EV model availability from manufacturers. These activities are consistent with the framework presented in the document, category #1 Institutional and Political Leadership, which ranked as the first priority in the public consultations.

The GORTT can demonstrate EV leadership by converting to an all-electric government vehicle fleet, gradually replacing ICE vehicles with EVs. For example, the GORTT could create a comprehensive program to replace the vehicles from the executive, judiciary, and legislative branches, and even extend the initiative to state-owned enterprises (SOEs) in all sectors of the economy. In other countries, the public utilities have been a first SOE for this implementation. After crafting the initial EV strategy, GORTT could adopt an aggressive vehicle procurement policy which limits

[36] IEA. Global EV Policy Explorer (Last updated 23 April 2024). Accessible at: https://www.iea.org/data-and-statistics/data-tools/global-ev-policy-explorer

ICE procurement and prioritizes EV and low-emitting alternative fuel options. This can be done relatively easily, and this document acknowledges the GORTT is already adopting this approach, alongside setting the vision, the targets, and creating an enabling framework.

Examples of government fleet electrification

In 2020, Costa Rica acquired 330 EVs, which were assigned to 35 institutions. Furthermore, the Costa Rican Institute of Electricity has purchased 108 EVs for its own use, the Costa Rica post Office acquired 50 vehicles, and National Power and Light Company acquired 32 vehicles.[37] In December 2021 in the US, the Biden Administration issued an Executive Order calling for most federal vehicle purchases to be zero-emission vehicles (such as EVs) by 2035. This order affects about 380,000 federal vehicles as they need to be replaced. Agencies may need to acquire about 30,000 zero-emission vehicles each year to meet future fleet requirements. Moreover[38], Colombia incorporated electric motorcycles into the fleet of the Bogotá Police Department for patrolling and traffic enforcement. Brazil's capital, Rio de Janeiro, has deployed electric trucks for urban waste collection.

4.2 Category #2 Economic, Financial and Tax incentives.

The second category identified in the public consultation was related to the Economic, Financial and Tax incentives. There are multiple policy options for the introduction of incentives, and these options are not mutually exclusive; they can be combined and adjusted as the country advances on the three maturity phases. The policy options for EVs[39] are usually structured in five groups, as to: (1) reduce barrier to entry for EVs; (2) accelerate charging infrastructure deployment; (3) improve access to Level 2 (L2) charging; (4) reduce public DC Fast Charging (DCFC) prices; and (5) reduce opportunity cost.

These are some of the policy options to reduce barrier to entry for EVs:

- **Up-front purchase rebates** – increase the financial accessibility of EVs by lowering the up-front purchase price. Prioritizing equitable rebate programs ensures the incentive money is directed toward groups that would otherwise be unable to purchase an EV due to the cost barrier. For example, including an income limit to qualify for the rebate, a manufacture suggested retail price (MSRP) limit on the vehicle being purchased, and opening the rebate to new, used, and leased vehicles are all options. Oregon's Clean Vehicle "Charge Ahead" Rebate Program is a primary example, offering rebates for used and leased vehicles targeted at low- and moderate-income households[40].

[37] https://www.bnamericas.com/en/news/in-2020-costa-rica-reached-3106-electric-vehicles-and-was-the-latin-american-leader-per-capita
[38] https://theicct.org/wp-content/uploads/2022/04/EMDE-Latin-America-briefing-A4-v2.pdf
[39] These policy options follow a framework described in the paper: Racing to Accelerate Electric Vehicle Adoption: Decarbonizing Transportation with Ridehailing (RMI, January 2021)
[40] https://www.oregon.gov/deq/aq/programs/pages/charge-ahead-rebate.aspx

- **Feebates** – The feebate is a mechanism in which more-efficient vehicles benefit from rebates and less-efficient vehicles are subject to fees. A feebate program establishes a pivot point that distinguishes the rebate from the fee and represents the point where the feebate changes from granting a benefit to charging a fee and achieves a balancing position. The revenues from the fees (associated with less efficient vehicles) support expenditures (i.e., the rebates) in more efficient vehicles and therefore feebates can be considered as a transfer system and not a tax, as the fee paid by the more inefficient vehicles support can be used to be benefit of the more efficient ones. France and Singapore have used feebate-style programs to incentivize lower-emitting vehicles, basing the fee or rebate on CO_2 emissions.[41]
- **Reduce import duty and/or value added tax (VAT) for EVs and replacement EV batteries** – a temporary reduction on the import duty or VAT can accelerate the sale of electric vehicles and stimulate early adoption demand. Several countries such as Bermuda, Brazil, and Costa Rica have adopted this policy option[42]. A waiver of import duty, VAT and motor vehicle tax is currently in place for EVs and hybrid vehicles below 1600cc in Trinidad and Tobago, which has contributed to boosting penetration of EVs in the market. Waiver of duties and taxes on replacement EV batteries will instill consumer confidence by reducing the otherwise substantial cost of a potential battery replacement.
- **Promotion of used EVs** – Currently, EVs depreciate faster than gasoline vehicles. As a result, the price of used or off-lease EVs is much closer to that of equivalent gasoline vehicles. Because of the attractive economics, promoting the used EV market can be an immediate way to overcome the high-price premiums that EVs currently command. Promoting the used EV market can come in the form of rebates applicable to used vehicles or programs to reduce real or perceived risk associated with used batteries.
- **Scrap-and-replace incentives** – Incentives that require the trade-in of an old, inefficient, gas-powered vehicle in exchange for a rebate on an EV. This has the added benefit of increasing vehicle turnover as well as reducing the up-front cost of EVs. In Colorado, United States, the "Vehicle Exchange Colorado" program offers income-qualified consumers with a rebate to cover the cost of a EV when they recycle/replace an old or high-emitting vehicle[43]. Furthermore, incentives should be offered for the repowering of existing ICE vehicles by conversion to an EV powertrain. Kits required for these repowering conversions can be made duty and tax free.

[41] https://theicct.org/magic-of-feebate-programs-jun22/
[42] IEA Policies Database. https://www.iea.org/policies?topic%5B0%5D=Electrification
[43] https://energyoffice.colorado.gov/vehicle-exchange-colorado

- **Leasing EVs** – Leasing EVs can reduce the initial purchase barrier for EVs while introducing EV technology without long-term commitment. Fleets, specifically, can benefit from this structure as it offers flexibility in payment structures and the ability to swap for new vehicles more frequently. Moreover, there are several different leasing structures for short and long-term ownership of fleet vehicles[44].

4.3 Category #3 Infrastructure and Standards

The category *Infrastructure and Standards* was identified in the public consultation as the third most important one. This is not surprising as in every country, range anxiety is considered an important concern to drivers. Having a network of public charging stations can help decrease perceived range issues. However, investors often want to see higher EV adoption rates before investing in the infrastructure in order to have higher utilization rates. A focus to deploy adequate publicly accessible charging infrastructure is important to realize EV ambitions, and keeping pace with ambitious EV deployment requires significant investment in charging infrastructure.

Lessons learned from major EV markets demonstrate that the lack of strategic infrastructure development either by central government planning or incentivized by policy mechanisms, along with insufficient co-ordination across key players, e.g., various government entities, utilities, building operators and charge point providers, tends to lead to infrastructure concentrated in certain areas (often lacking in remote regions). Data on mobility patterns can help to understand charging patterns and behaviors to optimize EV network planning[45].

The policy options related to infrastructure and standards are:

- **Charger installation incentives** - Providing incentives for charging station installation can unlock more private investment by reducing the high up-front capital cost of construction and therefore reducing the payback period of investment. See the Utah Department of Environmental Quality's grant for workplace EVSE as an example.[46]
- **Utility rate-basing of make-ready charging infrastructure** - Utility companies can incorporate the cost of electrical infrastructure needed for charging station installations (make-ready) into the general customer electricity rate structure (rate base). Doing so shares the cost and risk with the operator and leverages the utility's capital, which likely has a longer investment horizon than the private market. See, for example, the San Diego Gas and Electric EV Charging Infrastructure Program, which designs and builds make-ready infrastructure for medium- and heavy-duty fleets in

[44] https://electrificationcoalition.org/resource/saving-money-with-ev-leasing/
[45] IEA EV Outlook 2022
[46] https://deq.utah.gov/air-quality/workplace-electric-vehicle-charging-funding-assistance-program

California.[47] In Grand Cayman, the Caribbean Utilities Company (CUC) launched the Electric Vehicle Charging Station Program, which partners with apartment complexes and corporates to provide community charging. CUC supplies the charging equipment and covers installation costs, as well as maintenance and equipment during the program.[48]

- **Streamline site development and other "soft costs"** - Barriers to widespread charging are not strictly financial. The difficult processes of arranging land leases, permits, grid connections, and code compliance all cost time and therefore money to the charging provider, slowing construction and reducing the number of viable sites. Simplifying and standardizing these processes can yield a large return on a small investment. In Delhi, a tender for public charging included pre-identified land parcels (assessed based on criteria for charging suitability) and prioritized achieving the lowest service charge for the end user to receive competitive bids. These inclusions reduce the site development barriers.[49]
- **Building at scale** - Building larger fast-charging station sites increases asset utilization, smooths the peak power—which generates the demand charges that are a large proportion of the final electricity bill—and spreads fixed costs over more chargers, resulting in a more profitable proposition for charging providers. This approach is used in China, where there are explicit government incentives to build charging stations at scale.

Moreover, these are specific policy options to improve public access to L2 charging:

- **Incentives for L2 installation at single family homes** - Financial incentives offered by the government and/or public utilities for home charging installation can be effective in overcoming the cost barrier to L2 charging. These incentives often come in the form of either rebates or tax credits and are based on the cost of charging installation. The Los Angeles Department of Water & Power, a California utility, for instance, offers a $500 rebate for home EV charging installation for its residential customers.[50]
- **Incentives for L2 installation at MUDs** - Because many drivers do not live in single-family homes with private parking, prioritizing L2 charging access in multi-unit developments (MUDs), such as apartment buildings, is crucial. The Smart Columbus Electrification Program is one example of a municipal

[47] https://www.sdge.com/business/electric-vehicles/power-your-drive-for-fleets
[48] https://www.cuc-cayman.com/fronthome/download_pdf?file=1686585001cuc_launches_ev_charging_station_programme_120623.pdf
[49] https://ev.delhi.gov.in/files/Accelerating-Electric-Mobility-in-Delhi8497bf.pdf
[50] https://www.ladwp.com/residential-services/programs-and-rebates-residential/electric-vehicles-evs/residential-ev-charging-station-rebate-program

program that improves MUD access to L2 charging by providing rebates to property owners for installing charging stations for their tenants.

- **EV-ready building ordinances** - The government can pass building codes that require a certain percentage of parking spaces in public or private buildings be made ready for eventual charger installation. Boulder County, Colorado, for example, requires new construction to have the necessary conduit and pre-wiring for EV chargers[51].
- **MUD tenant charging installation mandates** - California, Colorado, and other US states require landlords to approve tenants' requests to install EV charging at the tenants' expense, with certain limitations. These are known as "right-to-charge" laws. In early consultation documents of Bermuda's EV policy (known as EVolve Bermuda), the country is also exploring a right-to-charge requirement to increase access to MUD charging.[52] Mandates such as these may be powerful motivators for a driver to adopt an EV.
- **Charging packages** - OEMs and transport companies can work with charging providers to offer built-in or discounted charging for drivers who purchase a vehicle or use it on their platform and whose home can accommodate it. Uber and EVgo have partnered to offer drivers in the US reduced rates for those with Uber Pro Gold, Platinum, and Diamond status. Additionally, the ride-share company has partnered with Wallbox to offer discounts on residential chargers and installation costs, along with financing options.
- **Utility tariff reform** - Reform electricity tariffs to recover costs without penalizing low-utilization DCFC stations. Modified demand and energy charges or time-of-use rates that incentivize charging at times that benefit the grid are possible examples. This can kick off a virtuous cycle where lower electricity costs lead to more EVs on the road, which in turn brings more utilization to charging stations, further reducing electricity costs. Examples of utilities with these tariffs include PG&E, Southern California Edison, and Xcel Energy. Moreover, another option is time of use (TOU) which has different tariffs depending on on/off-peak time of use.
- **High-occupancy vehicle (HOV) lane access/ airport pickup priority** - Granting EVs preferential access to HOV or preferential lanes and airport pickup lines can reduce the amount of downtime ride hailing vehicles waste in traffic and queuing to pick up airport customers. Those reductions in downtime can cancel out the increased downtime EVs require over ICE vehicles to charge their batteries.

[51] https://drcog.org/sites/drcog/files/resources/Building%20Codes-%20Ron%20Flax.pdf
[52] https://forum.gov.bm/en/projects/evolve-bermuda-1

4.4 Category #4 Communications and outreach

This category includes the importance of implementing public campaigns for awareness and education on the technology characteristics of EVs. The public consultations have identified that there are several misconceptions about the operation and maintenance of EVs, which could be hindering their acquisition. Public education and awareness campaigns offer an opportunity to educate the public on topics such as charging costs, how to properly charge a vehicle, average vehicle ranges, typical EV costs, local emissions and public health benefits, EV maintenance costs, and more. In Bermuda, the EVolve Bermuda campaign has launched radio, TV, and social media ads dispelling common myths about EVs and encouraging Bermudians to participate in public consultations about national-level EV policies.

Collaborating to advance and increase the impact of the campaign messaging is critical. For example, involving key stakeholders that interface with consumers—such as car dealers, electric utilities, or community organizations—alongside government-led campaigns. In this area, the GORTT could also leverage the proximity with academic institutions to engage the new generation of users, or early adopters, and develop local technical expertise in EVs. For example[53], Chile developed a project to train, evaluate and certify electric bus drivers. Educational institutions have begun training future professionals for maintenance of electric buses. A training workshop on operation and maintenance of electric buses was held in 2019 in Peru; 55 local bus operators participated.

Trinidad and Tobago already has interesting examples of national communications and dissemination programs raising public awareness such as *Arrive Alive* which reduced traffic accidents in the country and received several awards for road safety.[54] The GORTT could consider similar campaigns to inform the public about the benefits of electro mobility and the functionalities of electric vehicles.

4.5 Category #5 Business model

While the business model category was ranked relatively low in the public consultation, it has the potential to – when properly designed – accelerate the deployment of EVs. This area included defining the role of the utility in the provision of power services to vehicles for example. Countries have adopted different models depending on their own characteristics and ambitions. However, the analysis starts by considering two perspectives, ranging from one extreme where governments grant monopoly and exclusivity in the provision of the electricity *service* to the utility with pre-defined regulated prices. On the other extreme are activities which are fully deregulated where prices are freely defined, and the services are provided by the market and the private sector.

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[53] https://theicct.org/wp-content/uploads/2022/04/EMDE-Latin-America-briefing-A4-v2.pdf
[54] https://www.cnc3.co.tt/ttps-gets-road-safety-award-from-arrive-alive/

While these two perspectives are the starting point, defining the business model will have to contemplate several other conditions. Some of these are: (i) whether the electricity supplied to the vehicles is from the grid or self-generation (e.g., solar rooftop PV); (ii) public charging (e.g., service stations) or private charging (e.g., individual private such as in houses, or commercial private in shopping centers, workplaces, and hotels); (iii) payment method if it restricts to proprietary and restricted payment methods or is open to multiple financial service interfaces), and (iv) dwelling time, defined by the time customers spend in store while the car is charging, which also defines the type and speed of charging (DC charging vs. L2 charging). Trinidad and Tobago will need to define the best model to serve its needs and consistent with the pace of deployment, the role of the utility T&TEC and the source of the investments to the charging stations.

4.6 Category #6 Regulatory arrangements

Lastly, the category of *Regulatory Arrangements* relates to the detailed regulatory framework which also includes the tariff design. With the advancement of distributed generation where consumers can generate their own electricity and then make a decision to consume it, store it, or put back in the grid, the design of the electricity tariffs should include these different options, in particular the tax characteristics of each option and the elasticity of demand depending on customer behaviors.

Moreover, with the deployment of demand management – DSM (or demand side response) strategies to reduce peak consumption via incentives and/or behavior changes, utilities have relied on designing electricity billing arrangements in which the price of electricity changes based on the time of the day, make electricity more expensive during "peak hours," when there is high demand, and less expensive during hours of low demand. These chargers based on time of use are important aspects to avoid charging electric vehicles during peak hours, and instead eventually in the future using the batteries of the vehicles as support to the grid during these peak hours (mentioned as vehicle to grid V2G). An important message is that the introduction of electric vehicles – and its impact on the grid – should not be seen as a separate analysis, but instead an integrated analysis with DSM and DG using renewable energy sources.

Case Study: Financing the transition of sustainable electric transportation in Ecuador.

In 2008, Ecuador introduced a Vehicle Renewable Plan (RENOVA) with the aim of replacing units in the public and commercial transportation sectors and has adopted national legislation (Energy Efficiency Act) that requires that all urban public transportation vehicles in continental Ecuador to be electric by 2025. This has created a window of opportunity to promote EV adoption and develop innovative business models. To reduce GHG emissions in the transportation sector, the government is working on a regulatory framework to promote

the investment and use of EVs by means of technical standards and tax incentives. The Ministry of Transportation and Public Works (MTOP) has been a key player in fostering the sustainable electric transformation in Ecuador as the regulator and supervisor of RENOVA, and the Electricity Regulation and Control Agency (ARCONEL) has introduced differentiated electricity rates for charging EVs.

For public transportation operators, EV technology offers the potential for significant operational savings, particularly for buses, as fuel and maintenance account for a significant portion of annual ICE vehicle costs. Based on a market study (IDB, 2020), despite the high subsidies to hydrocarbons in Ecuador, the energy cost per kilometer of an electric bus is estimated at approximately one third of that of a conventional bus (US$0.05/km vs. US$0.15/km). Similarly, the cost per kilometer for electric taxis is less than a quarter of that of a gasoline taxi (US$0.009/km versus US$0.04/km). Likewise, the maintenance costs of electric buses and taxis are estimated at half of that of an equivalent ICE vehicle (US$0.15/km versus US$0.30/km and US$0.03/km versus US$0.06/km, respectively). Current electricity costs (which are relevant to the charging cost) could locally support the commercial success of EVs if are accompanied by incentives to reduce the cost of capital, such as scrappage payments or the availability of credit at rates and maturities that make investments.

In this context, Ecuador will increase the financing available for private sector investment in EVs with a US$43 million Conditional Credit Line for Investment Projects (CCLIP) and an initial credit under this arrangement for US$33 million approved by the IDB. The objective of the credit line is to reduce fossil fuel consumption and GHG emissions by encouraging investment in EVs. The first operation of this credit line will promote the financing of private investment in EVs and will encourage the replacement of ICE vehicles. The project will include concessional resources from the Clean Technology Fund (CTF) as well as IDB resources to enable offering long-term credit to finance the acquisition of EVs. In addition, the operation has a gender-inclusive orientation that will benefit women entrepreneurs in the taxi sector. The loans will be channeled through the Corporación Financiera Nacional (CFN, National Financial Corporation), the public development bank that supports private activities in the country (IDB, 2020).

This first operation will also deliver scrappage certificates or bonds to those who, in addition to purchasing an EV, agree to withdraw their ICE cars from circulation, significantly enhancing the environmental benefits of the project. The management of the scrappage bonds will be coordinated by the MTOP. With these actions, the program takes an integral approach to the promotion of EVs. On the one hand, it tackles the issue of financing costs and terms by offering more affordable and longer-term credit to reflect the longer amortization period of EVs. On the other hand, it will foster the retrieval of more polluting vehicles from circulation, stimulating the renewal of Ecuador's automobile fleet. The project expects to finance the purchase of approximately 80 buses and 370 taxis in the country, which will provide a clean public transportation service. In addition, the program has an accompanying non-reimbursable technical cooperation component of approximately US$1 million to help fund the technical, financial, and legal structuring of the projects in support of national and municipal government agencies and transportation operators.

4.7 Next steps

Moving forward, and considering the results from the public consultations, the following activities could be considered by the GORTT to accelerate the deployment of EVs in Trinidad and Tobago over the next few years:

- Establish an Electro-mobility Council that is mandated with advancing the country's electro mobility strategy, creation and execution of an action plan, and initiating a broader public consultation process.
- Spur charging infrastructure investment through EV-ready building codes and ordinances, which include requirements for new construction.
- Carry-out a detailed study on the cost-benefit and cost-effectiveness of the previous and existing incentives granted by the GORTT for hybrid vehicles and EVs, to inform the next round of incentives and determine a stage-by-stage approach to reduce purchase price as a barrier to adoption as EV adoption grows. Rebates or incentives might take vehicle MSRP or an income-limit into account.
- Commit to government fleet electrification through an EV Strategy and supporting Vehicle Procurement guidelines.
- Extend purchase incentives for EVs to include all popular modes of transport (e.g., 2-wheeled modes and cars).
- Collaborate with key local stakeholders such as community organizations, the electric utility, and EV dealers to deploy a public awareness campaign that dispels misconceptions about EVs in the country.
- Partner with local academic institutions to establish re-skilling programs for industries that may be impacted by the EV transition (e.g., EV maintenance technician programs).
- Develop a circular economy program to define how to handle end of life of batteries, and a proper recycling program for EVs (and ICEs).
- Advocate for increased EV model availability for Trinidad & Tobago and the Caribbean region with OEMs (supportive measures such as national commitments and legislation also make the market more appealing).

Next steps for research:

- Conduct an expanded consultation to include groups such as the electric utility, regulators, gas station owners, non-EV owners, etc. to increase the scope of data collected and perspectives incorporated into the study.
- Consider what regulatory barriers, if any, exist to implementing charging infrastructure throughout the island— and how can these be mitigated. Moreover, identify what actions need to be taken and by which actors to create a suitable market for charging in the country.

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