

ELECTRIC MOBILITY:

DEVELOPMENTS IN LATIN AMERICA AND THE CARIBBEAN
AND OPPORTUNITIES FOR REGIONAL COLLABORATION

2018



ELECTRIC MOBILITY: DEVELOPMENTS IN LATIN AMERICA AND THE CARIBBEAN AND OPPORTUNITIES FOR REGIONAL COLLABORATION

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<http://movelatam.org/transicion/>



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Glossary

This glossary has been compiled by the Lead Authors of this report drawing on glossaries and other resources available on the websites of the following organizations: International Energy Agency [1], Intergovernmental Panel on Climate Change [2], United Nations Environment Programme [3], United Nations Framework Convention on Climate Change [4].

Car sharing: it is a short-term vehicle rental service, for example by the hour.

Carbon dioxide equivalent (CO₂e): a way to place emissions of various radiative forcing agents on a common footing by accounting for their effect on climate. It describes, for a given mixture and amount of greenhouse gases, the amount of CO₂ that would have the same global warming ability, when measured over a specified time period.

Charging station: infrastructure to supply or commercialize electric energy to charge the batteries of electric vehicles or plug-in electric vehicles.

Climate change: note that the United Nations Framework Convention on Climate Change (UNFCCC), in its Article 1, defines climate change as: ‘a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods’. The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition and climate variability attributable to natural causes.

Decarbonization: the process by which countries or other entities aim to achieve a low-carbon economy, or by which individuals aim to reduce their consumption of carbon.

Electric mobility: for the purposes of this report, it refers to any means of transport of people or goods that results in a vehicle powered by electricity and does not contain a combustion engine.

Electric Vehicle (EV): a plug-in, battery electric vehicle. It is sometimes also termed as “battery electric vehicle”. Electric vehicles do not have an internal combustion engine.

Electrification: for the purposes of this report, it is understood as a conversion or replacement process, by which, electricity replaces other energy vectors for a given application. For example, the replacement of an internal combustion vehicle by an electric vehicle.

Flex fuel: a vehicle that has one fuel system but can mix different types of fuels, such as gasoline/ethanol, in the same tank, in any (or a wide range of) mixtures.

Greenhouse gases: the atmospheric gases responsible for causing global warming and climate change. The major greenhouse gases are carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). Less prevalent, but very powerful, greenhouse gases are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and Sulphur hexafluoride (SF₆).

Hybrid vehicle: contains both an internal combustion engine and a motor with battery pack. In contrast to a plug-in hybrid electric vehicle, it does not provide the capability to connect to an external source to charge the batteries. Instead, the batteries are charged by the internal combustion engine or a regenerative braking system.

Mitigation: in the context of climate change, a human intervention to reduce the sources, or enhance the sinks of greenhouse gases.

Nationally Determined Contribution (NDC): Submissions by countries that have ratified the Paris Agreement which presents their national efforts to reach the Paris Agreement’s long-term temperature goal of limiting warming to well below 2°C. New or updated NDCs are to be submitted in 2020 and every five years thereafter. NDCs thus represent a country’s current ambition/target for reducing emissions nationally.

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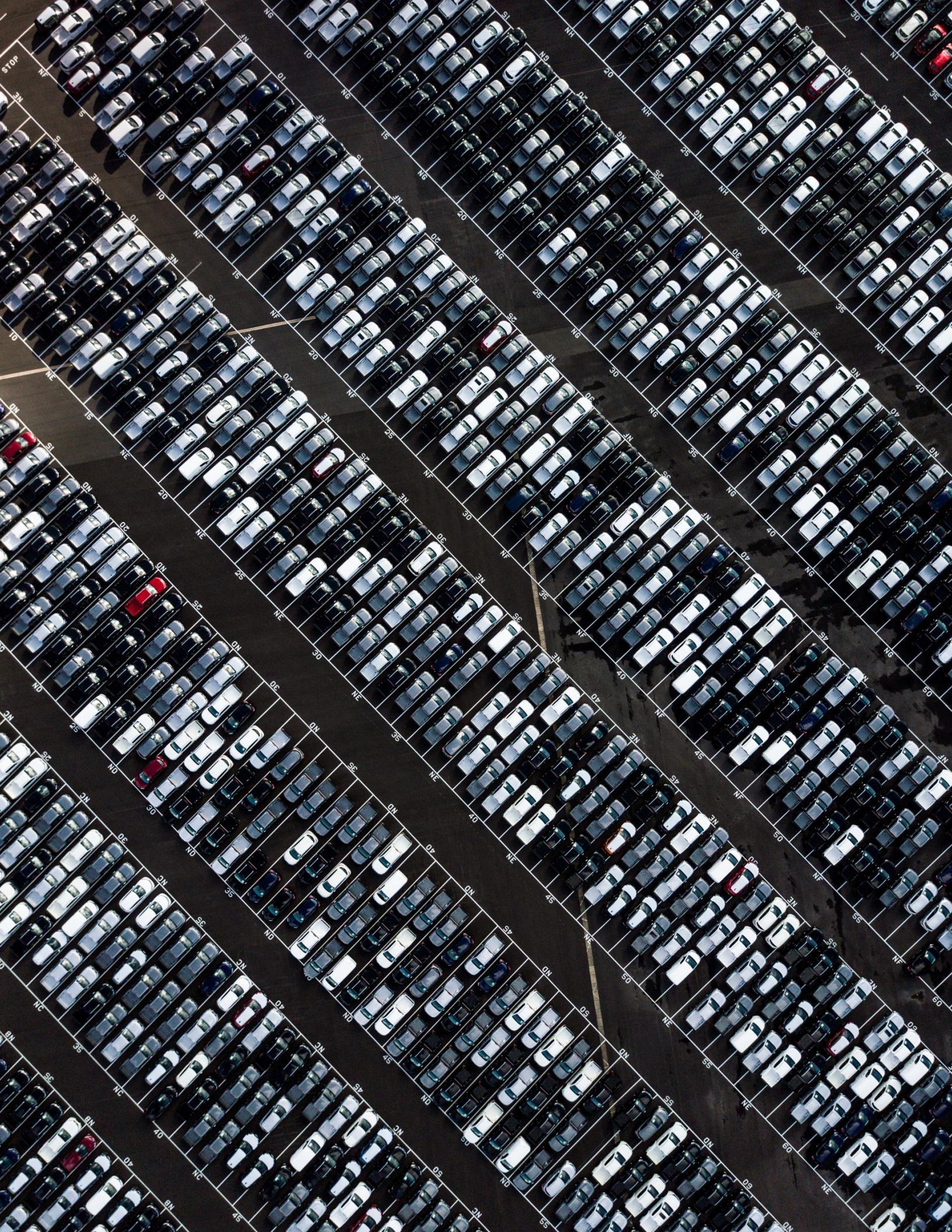
Paris Agreement: on the 12th of December 2015, Parties to the United Nations Framework Convention on Climate Change (UNFCCC) reached a landmark agreement to address climate change and to accelerate and intensify the actions and investments needed for a sustainable low carbon future. The Paris Agreement builds upon the Convention and – for the first time – brings all nations into a common cause to undertake take ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. As such, it charts a new course in the global climate effort. [4]

Plug-in hybrid electric vehicle (PHEV): contains both an internal combustion engine and a motor with battery pack. It provides the capability to connect to an external source to charge the batteries.

Short-lived climate pollutants (SLCPs): compounds in the atmosphere that cause warming and have lifetimes roughly below 20 years, including black carbon, ozone, methane, and many hydrofluorocarbons.

Acronyms

AAVEA	Argentinian Association of Electric and Alternative Vehicles
ABVE	Brazilian Association of Electric Vehicles
AC	Alternate Current
ALAMOS	Latin American Association of Sustainable Mobility
AMIA	Mexican Automotive Industry Association
ANDEMOS	Colombian Association of Automotive Vehicles
ASOMOVE	Costa Rican Association of Electric Mobility
CAF	Latin American Development Bank
DC	Direct Current
FIA	International Automobile Federation
GHG	Greenhouse gases
GtCO ₂ e	Giga metric tons of carbon dioxide equivalent
Hz	Hertz
ICCT	International Council on Clean Transportation
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
km	Kilometer
KWh	Kilowatt-hour
NDC	Nationally Determined Contribution
UN	United Nations
UN Environment	United Nations Environment Programme
UN Habitat	United Nations Human Settlements Programme
UNFCCC	United Nations Framework Convention on Climate Change
WHO	World Health Organization



Foreword

Decarbonization of transport sector represents one of the main challenges in order to meet the reduction targets as defined by the countries, through their Nationally Determined Contributions within the context of the Paris Agreement.

The electrification of transport systems is presented as an assertive action to transform our mobility while improving our quality of life. Undoubtedly, the transition to electric mobility is one of the greatest revolutions that is happening in many countries of the European Union. Latin America and the Caribbean must continue strengthening their efforts to be part of this transforming change.

The European Commission jointly with the Office for Latin America and the Caribbean of UN Environment, have supported the cities and countries of this region to accelerate the deployment of electric mobility over the last two years, through the MOVE platform.

MOVE has introduced electric mobility in the national agendas and promoted a sharing space where international experts provide their knowledge from different angles of this technology transition.

Urban development in Latin America and the Caribbean, the high rate of motorization and the impact of emissions from transport on public health and global warming, demand a transformation of transport systems.

We hope this report will shed light on the main trends and achievements reached until today in various countries of the region, in terms of electric mobility. With this work, we want to tell the region and the world that Latin America and the Caribbean are already moving forward with firm steps towards the transformation of transport.

Jolita Butkeviciene

Director for Latin America and the Caribbean
International Cooperation and Development
European Commission





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Executive summary

This short regional brief confirms that electric mobility is advancing in Latin America and the Caribbean. The following should be as main highlights:

First of all, as the majority of countries in the region ventures into electric mobility, they put to test technology, basic incentives, as well as the first round of charging infrastructure – predominantly slow charging units.

Second, countries are advancing at their own pace. Some are leading the transition to electric mobility, others dabbling with caution. While, a smaller group is still in the waiting phase.

Third, countries that are moving faster have created national strategies that involve several public bodies and, strategically, the private sector. These countries have understood the value of going beyond one ministry and the national government. There is still a gap in the engagement of consumers, which may come further ahead.

Fourth, critical efforts are emerging not only at the national government level, but also in local governments. Some municipalities have opted for faster and more substantial actions than national governments, with a strong focus on electric buses and electric taxis.

Fifth, the region has favorable conditions for electric mobility: three large vehicle producers operate in the region (Argentina, Brazil and Mexico) and three countries have large lithium reserves (Argentina, Bolivia and Chile) – critical material for the battery of electric vehicles. Chile also has vast copper reserves. Moreover, Latin countries have one of the highest shares of renewable-based electricity production. While Caribbean countries, are in the process of phasing out fossil-based electricity. Therefore, beyond the import of vehicles produced in other latitudes, there is an opportunity to industrialize electric vehicle manufacturing and in the processing of raw materials for electric

mobility, in agreement with the best international practices.

Sixth, stakeholders in electric mobility play a crucial role in the adoption of the new technologies. In each country and in the major cities, there are electric utilities who have shown their commitment, by investing in various pilot projects and installing electric vehicle charging infrastructure. It is essential to present the case to the private sector, so they can be part in this technology transition.

The market is still small at this stage. The fleet of plug-in electric vehicles in most countries does not reach the four digits, except for Colombia and Mexico. Most of the electric bus fleets are in demonstration stage and are modest, with exception of Chile. The question that looms is what should be done to expand the market and make buses, taxis and electric vehicles the "new normal"?

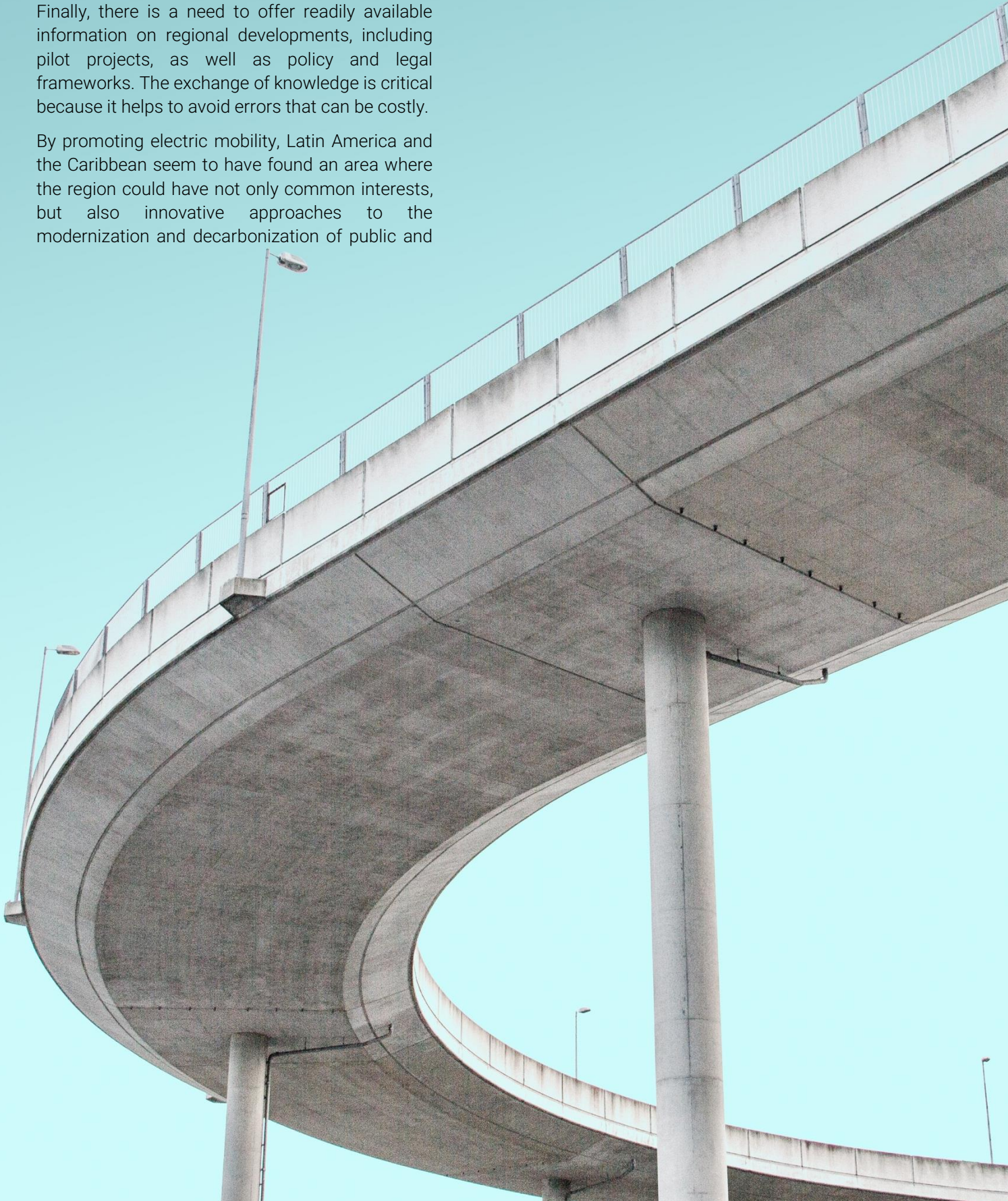
At least two broad areas are necessary: incentives and collaborations. At the national level, countries should strengthen programs to provide temporary incentives and help reduce the initial price of electric vehicles, whenever necessary. This may require passing electric vehicle laws in some markets, as well as to accelerate the deployment of charging infrastructure. In addition, cultural resistance to change needs to be addressed and in particular to adopt new technologies in a sector that has maintained the same technology throughout the twentieth century. It is encouraging to see the creation of new consumer groups dedicated to electric mobility. Future collaborations should include the consumer's perspective.

The second area of work is collaboration between the Governments of the region to learn from each other, and to ensure that the lessons of the most advanced countries in the region are well disseminated. Collaboration can be structured around policy frameworks (such as fuel regulations or minimum vehicle efficiencies and maximum permitted emission levels, among others), financing mechanisms, and more generally,

national plans. What works? Collaboration could be built around governance of electric mobility to ensure that governments, the private sector and users have new spaces for technical encounters. Finally, there is a need to offer readily available information on regional developments, including pilot projects, as well as policy and legal frameworks. The exchange of knowledge is critical because it helps to avoid errors that can be costly.

By promoting electric mobility, Latin America and the Caribbean seem to have found an area where the region could have not only common interests, but also innovative approaches to the modernization and decarbonization of public and

private transport in the region with high benefits for the quality of life of its inhabitants.





1 Introduction

Electric mobility is growing exponentially across the world. Latin America and the Caribbean is no exception. While this region is not on the forefront of this technology transition, there are already significant accomplishments. For example, this year, Colombia broke the record with more than a thousand electric vehicles in circulation – the highest figure in the region so far. Chile presented a new tender for Transantiago (Santiago bus operator), which raises a new model of contractual structure for the massive incorporation of electric buses in its public transport system [5]. Bogota, Loja, Santiago, Mexico City, as well as several other cities Brazil, already have electric taxi fleets. Uruguay, Brazil and Mexico installed fast charging interprovincial corridors for electric vehicles. Costa Rica approved the first comprehensive national law for the promotion and incentive of electric transport in 2017 [6]. Furthermore, during the International Motor Show in Sao Paulo, different civil entities from the region formed the Latin American Association of Sustainable Mobility (ALAMOS, given its acronym in Spanish), with the aim of promoting electric mobility at a regional level [7]. These are just a few of the developments related to electric mobility in the region, so far unprecedented. The question ahead is no longer whether electric mobility will reach a large scale in Latin America and the Caribbean, rather when.

In the framework of the XXI Meeting of the Forum of Ministers of Environment of Latin America and the Caribbean, held in October 2018, in Buenos Aires, Argentina, Costa Rica presented a proposal for a “Dialogue on Electric Mobility”, which was supported by Argentina, Barbados, Belize, Bolivia,

Chile, Colombia, El Salvador, Grenada, Guatemala, Honduras, Mexico, St. Lucia and Uruguay. This dialogue aims to promote joint learning in regard to strategies and regulatory frameworks for electric mobility, development of financial instruments and new business models, facilitate capacity-building and knowledge-sharing, promote joint-collaboration in pilot projects, as well as to explore synergies and opportunities with other fields of knowledge, with emphasis on innovation and the creation of new jobs.

The current analysis builds on the basis of a previous study published by UN environment and the Mario Molina Chile Center in 2016, through the MOVE platform, titled “*Electric Mobility: Opportunities for Latin America*” [8]. Our previous report characterized the status of transport systems in the region, and identified the main barriers and drivers influencing the development of electric mobility. The current report aims to provide an update on the main events and achievements in the region related to electric mobility and to present the basis for discussion on the regional agenda in this area, over the coming years. It is worth emphasizing that many of these regional developments were difficult to glimpse just two years ago when the first report was published.

In the following sections, the background for electric mobility in the region is presented, followed by a general description of the current state and of the development of electric mobility in several leading countries of Latin America and Caribbean. The document ends with conclusions and recommendations for regional collaboration related to electric mobility.



2 Background

Latin America and the Caribbean represent one of the most urbanized regions in the planet. According to UN Habitat, about 80% of the population lives in cities and the number of cities has increased six-fold over the last 50 years [9]. Motorization rates have also been increasing, the projections indicate that the vehicle fleet in the region could triple over the next 25 years, reaching over 200 million units in the year 2050 [8].

Taking into account that the current transport systems have a strong dependence on fossil fuels, the transport sector represents one of the largest consumers of energy in the world and produce a significant impact on greenhouse gas emissions and in public health – due to exposure to air pollutants and the emission of noise from internal combustion engines [10].

While electrical mobility becomes another piece within a wider puzzle – sustainable mobility and low-carbon cities. Electric Mobility can play a catalytic role in this transition by enabling countries and cities in the region to leapfrog to more efficient and significantly less polluting transport technology.

Improve air quality

There is growing evidence of the negative impact of pollution on public health. According to the World Health Organization (WHO), nearly 850,000 deaths in the Americas occur due to environmental factors [11]. Air pollution is the main environmental health risk in the region [12]. It is estimated that 80% of the cities of the planet do not meet the air quality standards defined by the World Health Organization (WHO) [13]. Therefore, facing the challenge of improving air quality emerges as an area of common interest in Latin America and the Caribbean. As is the case in the rest of the world, much of the air pollution comes from transport and for the first time, countries in the region have concrete opportunities to cope with this structural problem: the accelerated deployment of electric

mobility technologies has the potential to support cities to improve air quality and to reduce the associated costs in public health.

Modernize public transport

Cities in the region have experienced a rapid urbanization—an urban growth rate of 93% since the 1950s— that has led the region to have one of the highest urbanization rates of growth worldwide. At present, 80% of the population lives in cities (compared to 40% in the 1950s) [14]. The growth and improvement of public transport has not occurred at the same pace and this has generated high levels of road congestion, resulting in an increasingly obvious demand for better quality and less polluting public transport services. While it is true that these changes require structural reforms, modernization of buses (most common mean of land transport in several countries in the region) offers a pragmatic starting point towards a transformation that could improve the daily lives of millions of people. Electrification, as a mean to modernize bus fleets is occurring faster than previously expected. According to Bloomberg New Energy Finance (BNEF), “buses will go electric faster than light duty vehicles” [15].

Reduce carbon emissions

According to UN Environment’s Emission Gap Report 2017, light-duty and heavy-duty vehicles are the segments with the greatest greenhouse gas emission mitigation potential in the transport sector. This same report identifies, based on estimates from the International Clean Transport Council (ICCT), that improvements in vehicle efficiency (including a transition to electric mobility, as well as modal change) can achieve a reduction of emissions of 0.88 GtCO_{2e} per year for heavy-duty vehicles and 2.0 GtCO_{2e} per year for light-duty vehicles. [16]

In October 2018, the Intergovernmental Panel on Climate Change (IPCC) launched a special report on the impacts associated with global warming of

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1.5 °C and options for reducing greenhouse gas emissions. This report calls for a quicker pace in climate action, particularly in the transport and electricity-production sectors. [17]

Countries from Latin America and the Caribbean have set climate change mitigation targets in the context of the Paris Agreement. The region accounts for about 10% of global GHG emissions, being transport one of the main GHG emission sources and with one of the fastest rates of growth. Therefore, clean electric mobility can help not only to improve air quality and to modernize collective transport, but to reduce emissions and thus countries meet their mitigation targets. For example, 66% of Latin American countries include the transport sector in their Nationally Determined Contributions (NDC) [18]. Since then, technology has advanced at a faster rate than anticipated. Therefore, electric mobility becomes a concrete opportunity to explore as a region. For example, the new link between transport and electricity can help to stimulate more electricity generation based on renewable sources. In fact, Latin America has one of the highest shares of renewable-based electricity production in the world [19].

Creating innovation ecosystems

The world is going through a multifaceted technology transformation – some speak of a "fourth industrial revolution" [20]. There is an opportunity to create enabling conditions for the economies of the region to take advantage and build upon the current changes. As is the case of new systems of innovation related not only to clean technologies but also to digital technologies. Electric mobility creates a space to explore new industries, services and therefore new jobs. At the same time, innovation can stimulate synergies in the modernization of public transport. For example, there are great needs in the region to innovate to improve the quality of the service and security of passengers in public transport and to integrate the gender dimension. The combination of digital technologies and electric mobility can provide positive spillovers in the creation of new business and services. Such is the case in pioneering countries in electric mobility, where new ventures start to appear. For example, car sharing software applications or electric vehicle charging networks, to name a few.



TAXI

3 Electric mobility developments in the region

The transition to electric mobility has grown exponentially in recent years. In September 2018, a record was reached with four million electric vehicles sold at the global level [22]. Even though the level of development of the technology among countries is dissimilar, adoption levels are still incipient in most of the world. China leads by volume in the production and deployment of electric mobility. – in terms of electric vehicles as well as charging infrastructure [23]. Asian cities stand out for their commitment to electric mobility, especially in terms of public transport i.e. buses and taxis [24]. Meanwhile, countries in Europe with lower sales volume, stand out for a high penetration percentage of electric mobility. In September 2018, Norway reported that more than 45% of car sales were electric vehicles [25]. Several manufacturers have announced short-and medium-term strategies to provide electric vehicles as well as charging infrastructure.

Although Latin America and the Caribbean is not leading this transition, significant accomplishments can be named in this area. This year, Colombia broke the record with more than a thousand electric vehicles sold – the highest to date in this region. Chile presented the main

characteristics of the new Transantiago tender (Santiago's bus operator), which sets the new contractual structure model for the massive incorporation of electric buses in the public transport system of the city [5, 26]. Bogota, Loja, Santiago and Mexico City already have electric taxi fleets. Uruguay, Brazil and Mexico installed interprovincial corridors for fast charging of electric vehicles. Moreover, at the end of 2017 Costa Rica approved the first comprehensive law for promotion and incentive of electric transport [6].

It is important to clarify that this brief report maps relevant initiatives related to electrical mobility in Latin America and the Caribbean. Given the rapid deployment and atomized availability of information, some projects might have been left out of the analysis. If so, this was not deliberate. In fact, in the last part of this report, it is recognized that it is important to improve the follow-up of this technological transition. Having made this

clarification, a brief is presented on the main advances in electric mobility in some countries and cities of Latin America and the Caribbean.

3.1 Argentina

Argentina launched the development of its national electric mobility strategy in May 2018 with the support of UN Environment. Compared to other Latin American countries, the country was lagging behind in terms of incentives and infrastructure for electric mobility. However, they have recently increased the efforts to make the electric mobility opportunity more visible in this matter. Currently, Argentina is formulating specific legislation on electric vehicles, establishing the conditions for installation and operations of charging centers, and at the same time, exploring possible options for the local development of the electric mobility industry. Due to the country large lithium reserves and its recognized industrial history in the region, the commitment to transport electrification extends beyond the environmental aspect of sustainable mobility: Lithium batteries are already being assembled with imported cells and investment options are being explored to enter the value chain of lithium, including the possibility of manufacturing battery cells¹.



Figure 1. Photograph during a workshop in Buenos Aires to launch the development of the National Electric Mobility Strategy of Argentina, May 30, 2018.

Policy and legal framework

In 2016, the Inter-Ministerial Working Group of Sustainable Transport was created, convened by the Ministry of Transport of the Nation and integrated by the then Ministry of Environment and Sustainable development (today, Secretary), the Ministry of Production, the Ministry of Energy and

the Secretary of transport of the city government. This working group led to the formulation of two decrees. The Executive Decree 331/17, establishes, among other things, benefits for automotive companies through the decrease of import tariffs for hybrid and electric vehicles, as well as fuel cells for a maximum of six thousand units in a period of 36 months, depending on whether the vehicle is

¹ Information Supplied by Mariano Luis Jimena

mounted or not in the country. The second decree, Executive Decree 51/18, applies to imports of electric buses and establishes a reduction on import tariffs for up to 350 units and up to 2,500 chargers of power greater than or equal to 50kW [27].

In this moment several legislative initiatives are being discussed through bills. For example, the deputy Juan Carlos Villalonga presented a pilot project at the end of 2017, with the purpose of establishing a new Vehicular electric mobility law [28]. The Argentine Association of Electric and Alternative vehicles (AAVEA) [29] also presented a citizen initiative bill, in August 2017, to promote the development and use of electric vehicles and sustainable mobility systems in Argentina [30]. Furthermore, the Association of Automobile Manufacturers of Argentina (ADEFA), integrated by automotive companies in the country, presented in 2018 a formal request to the Ministry of Production to exempt electric vehicles from luxury tax. At the provincial level, the congresswoman Rosío Antinori presented a project for the promotion of the industrialization of electric and alternative vehicles in the province of Buenos Aires [31].

Citizen participation

In 2012, the non-governmental organization AAVEA (Argentine Association of Electric and Alternative vehicles) was formed [32]. Aside from their local work on the national electric mobility agenda, AAVEA has been one of the main promoters in the conceptualization of the Latin American Association of Sustainable Mobility (ALAMOS), integrated by other similar organizations from the region [32].

Electric vehicles and charging infrastructure

At present, there are three brands of electric vehicles being offered in the Argentinian market: Renault Kangoo ZE, Mercedes Benz GLC 350e

(plug-in hybrid) and Nissan Leaf. the company Andreani, a local logistics company, is conducting a pilot test using two electric vehicles Renault Kangoo ZE. This project is being monitored in collaboration with the Government of the city of Buenos Aires. [33] Furthermore, as part of the Clean Mobility Plan 2035 of the city of Buenos Aires, which seeks to promote the penetration of alternative technologies in the transport sector, Renault loaned two Kangoo ZE to the city government of Buenos Aires for its evaluation – the vehicles were incorporated into the city's transit fleet. For this test, the electric company Enel contributed with two charging centers. [34] On the other hand, the oil refinery company YPF, together with a private consortium, plans to install a network of 220 fast charging points [35]. Similarly, in November 2018, the province of San Luis inaugurated the first electric route in the country, with four centers of public charging in a distance of 212 km [36].

Electric public transport

Within the Clean Mobility Plan 2035 of the city of Buenos Aires, a pilot project of battery electric buses is being carried out, which will incorporate for a one-year period, eight units of different technologies on bus lines 12, 34, 39 and 59 [37]. This test seeks to evaluate the technical-economic and environmental feasibility of these buses in order to establish normative and economic frameworks that promote the inclusion of such vehicles in the public transport system. The evaluation of these vehicles has the support of the Development Bank of Latin America (CAF). The results will be key to decide whether or not to include more electric buses in the metropolitan area of Buenos Aires, which has more than 18.000 buses in operation and represents one of the largest fleets in Latin America [38].

3.2 Brazil

Brazil is one of the largest vehicle manufacturers in the world. The country has opted to incorporate biofuels to supply transportation – predominantly ethanol. As a result, flexible fuel vehicles in the last 15 years increased to more than 60% of cars and light commercial vehicles in Brazil run on flexible fuel engines, which represents 35 million vehicles [39]. Therefore, for some, electric mobility is perceived as a complement to biofuels, rather than a substitute for fossil fuels.



Figure 2. Photograph of a DC fast charging unit installed as part of the electric corridor Sao Paulo and Rio de Janeiro [47]

Credits: BMW

Policy and legal framework

With regard to policy formulation, there are currently 21 bills in Parliament related to electric mobility: the PLS 454/2017 bill, for example, establishes a ban on fossil fuel-based vehicles for the 2060. In May 2018, a Parliamentary Front for the Defense of Electric Mobility in Brazil was established. One of the objectives of this front is to create a National Electrical Policy [42]. In July 2018, the government announced the launch of "Rota 2030", a new automotive regime that defines an incentive program based in credits and a set of rules for car manufacturers [39]. In addition, an executive decree was signed that reduces the "tax on industrialized products" (IPI) to a range between 7% and 20% depending on the efficiency of the vehicle. Before this measure, IPI used to be 25% for electric vehicles and 13% for hybrids [43].

Since 2015, electric vehicles are exempt from the import tariff of 35% and hybrids have a reduction ranging from 0% to 7%, depending on the capacity of the petrol engine and the energy efficiency [44].

In January 2018, the Senate passed a bill that obliges electric companies to install charging stations in strategic points in every city. The bill is waiting for an amendment (regarding the installation regulation of the charging units), then the Infrastructure Commission of the House of Representatives will decide its final approval [39].

Citizen participation

There are two associations which promote electric mobility in Brazil: first, the Brazilian Association of Electric Vehicles (ABVE), formed by members of the automotive industry and components [45]; second, the Association of

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Innovative Electric Vehicle Owners (ABRAVEi), formed by representatives of civil society. ABRAVE is part of the Latin American Association of Sustainable Mobility (ALAMOS) [46].

Electric vehicles and charging infrastructure

According to the International Energy Agency, the fleet of electric vehicles in 2017 in the country was less than 700 units [40]. Nevertheless, according to the Brazilian Chamber of Deputies, eight thousand electric vehicles and hybrids have been produced in the country since 2012 [41].

This year, EDP (electric company) and BMW Brazil inaugurated an interstate fast charging corridor for electric vehicles of 434 km, connecting Sao Paulo and Rio de Janeiro, which makes it the largest charging corridor for electric vehicles in Latin America [48]. The National Electric Energy

Agency (ANEEL) recently approved a specific regulation that allows the possibility of negotiating charging prices for electric vehicles. A private consortium between the Chinese electric vehicle manufacturer, BYD, and the local bus manufacturer, Marcopolo, already started producing battery electric buses in Brazil.

Electric public transport

Since April 2018, there are two of these electric buses operating in Campinas, where they are produced [49]; another pilot project of electric buses is currently operating in Rio de Janeiro [50]. In terms of electric taxis, pilot projects are running in Sao Paulo (2013), Rio de Janeiro (2014), Campinas (2015), Belo Horizonte (2017). The city of Palmas and Curitiba also plan to introduce electric taxis [51].

3.3 Chile

Chile has become a referent for electric mobility in Latin America: the country launched the National Electric Mobility Strategy and an Electric Mobility Consortium and will have one of the largest electric bus fleets in the world after China. Chile has one of the oldest fuel-saving labelling programs in the region, which has expanded to electric vehicles [52] [53]. The country also wants to take advantage of its large lithium and copper reserves, which are widely used for batteries and other components of electric vehicles. As a consequence, in 2018, the Factory Promotion Corporation (CORFO) launched the Energy Transition and Advanced Materials for Lithium Development Center [54].



Figure 3. Photograph of the arrival of the 100 electric battery buses that will operate in Santiago, Chile [64]

Credit: Metropolitan Public Transport Directory of Chile

Policy and legal framework

Launched at the end of 2017, Chile's National Electric Mobility Strategy was the result of the work of three ministries: energy, environment and transport. Despite having less than 200 electric vehicles in 2017, the strategy raises the objective of electrifying 100% of public transport and 40% of private vehicles for 2050 [55]. During the launch of the strategy, 20 local organizations provided support and fulfilled their own individual commitments related to electric mobility [56]. In addition, the *Route Energy 2018-2022* was launched by the Chilean Ministry of Energy in May 2018, with the goal to increase ten times the current fleet of electric vehicles in the country for 2022. *Route Energy 2018-2022* also defines the

regulation and standardization of electric vehicles charging and their interoperability as a priority [57].

Chile established a public-private consortium of electric mobility in order to create the conditions for the country to become a leader in this area. This consortium has the support of the Ministry of Transport, the Mario Molina Research and Development Center, Sofofa (the Chamber of Industry), Enel (Chile's largest electric group), CORFO, UN environment and VTT Technical Research Center of Finland. In May 2017, the consortium hosted the first International Conference on Electric Mobility and Public Transport [58].

Electric vehicles and charging infrastructure

With regard to charging infrastructure, Enel has installed a network of 27 public and private charging stations in Santiago, Valparaíso, Viña del Mar and Concepción (including fast and semi-fast charging centers) since 2012 [59]. Enel is also working on a national roadmap for charging electric vehicles ("*Ruta Chile de Electrolíneas*") to deploy public charging units in existing filling stations. The first phase of implementation will focus on Santiago and the second will extend coverage to places outside the capital [60]. Engie (another electricity group in Chile) has installed 10 additional public charging stations and is expected to install 20 more this year [61]. At the beginning of 2018, the Superintendence of Electricity and Fuels of Chile (SEC) issued an official communication that allows any commercial activity to install public charging stations for electric vehicle, opening the field to new companies other than electricity distribution and retail companies [62] [63].

Last year, Chile hosted the E-formula, the electric car race that gave visibility to these vehicles. This was organized by the FIA and the race was complemented with efforts to promote and teach about electric mobility, including activities for children [74].

Electric public transport

The main momentum for electric mobility in Chile focuses on electric buses. Transantiago, the public entity in charge of operating the bus system in the capital of Chile, began testing the first electric bus thanks to an alliance between Enel and the Chinese manufacturer BYD. The first electric bus began

operating in May 2016 and more than 10,000 passengers have used it so far [65]. In autumn of 2017, Engie [66] and Enel [26] acquired three additional electric buses to demonstrate the technology in the run-up to a Transantiago public tender, aimed at introducing 90 electric buses as part of a further fleet renewal. Despite the annulment of the bidding (due to reasons independent of vehicle technology) in early 2018 [67], the new government and local partners reaffirmed their interest on electric public transport by raising their ambitions. In July 2018, Enel, Metbus (bus operator) and BYD announced an association to introduce 100 electric buses more to operate in Transantiago. As part of this initiative, 30 bus drivers have been trained to operate electric buses [68]. It is worth noting that the baseline for the new diesel buses to be introduced in Santiago de Chile follow the Euro VI standard [69]. This means significantly raising the bar, both in terms of vehicle efficiency and reducing air pollutant emissions, as well as reducing the initial capital cost gap with electric buses².

In July 2018, the Ministry of Transport and Telecommunications (MTT) of Chile approved the operation of 60 electric taxis in Santiago [70] -50% will be owned by Engie [71]. The MTT is developing another tender to introduce 125 electrical taxis more in Valparaíso. Chile has been experimenting with electric taxis since 2015, through a pilot project led by Enel [72]. In 2017, Enel also acquired a fleet of 25 Nissan Leaf and sold them to its employees at a preferential price through a subsidy provided by the company [73].

² Euro VI vehicles, including Euro VI diesel buses, have a higher initial cost, but provide better vehicle efficiency and significantly reduce car emissions, which has a significant impact on the quality of Air of the cities. The increase in the initial costs of reference technology makes it possible to reduce the cost gap

with electric buses, which tend to have a higher cost of capital. On the contrary, the reduction or lack of fuel standards tends to increase the cost gap with electric bus fleets, affecting their financial viability.

3.4 Colombia

Colombia is a pioneer in urban mobility in Latin America. The country is currently working on its National Electric Mobility Strategy, with support from UN Environment. In 2018, the country broke the record with more than a thousand electric vehicles in circulation – the highest figure in the region so far.



Figure 4. Photograph of the articulated electric bus being tested in Medellín since early 2018 [90]

Credit: Secretaría de Movilidad de Medellín

Policy and legal framework

With regard to tax incentives, Law 1819 was passed in 2016 and grants a differentiated value-added tax (VAT) of 5% for vehicles parts and chargers for electric and hybrid vehicles [90]. Executive Decree 1116 was enacted in 2017 by the Colombian Ministry of Trade, Industry and Tourism. It establishes tax benefits by 2027 of 0% and 5% import tax for electric and hybrid vehicles, respectively. It also grants 0% import tax to EV chargers. [91]

In March 2018, the text of the electric mobility law was approved in the second debate in the Plenary of the Senate (Bill 075) to promote electric vehicles [93]. The text includes a definition of electric vehicle and establishes the value of the applicable tariffs; taxes cannot exceed 1% of the commercial value of

the vehicle. Moreover, it proposes to establish a discount in the “technical-mechanical check-up” of the car and the assessment of emissions. According to Bill 075, the Government will be required to issue mandatory insurance policies for electric vehicles which will have a lower differential rate. Additionally, public entities and commercial establishments that offer parking spaces to the public will be required to assign a minimum of 2% of the total parking spaces to electric vehicles. Municipalities will also be required to provide at least five public fast charging stations under functional conditions.

In July 2018 the Government approved the national green growth policy for 2030, with one of the goals being the introduction of 600.000 electric vehicles

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by year 2030 by that year. More specifically, according to this policy, it is expected to deploy 400,000 electric light-duty vehicles, 60,000 electric taxis, 69,017 electric government vehicles, 15,235 electric buses and 13,000 trucks. [94]

Furthermore, in March 2018, the Colombian government launched the process to design a National Strategy for Electric Mobility with support from the UN Environment [92]. Since then, a multi-stakeholder participative process has taken place, led by the government (represented by the Ministry of Energy and Sustainable Development, Ministry of Transport and Ministry of Mines and Energy) with participation from private sector and

Colombian citizens. This strategy is expected to be launched before the end of 2018.

Electric vehicles and charging infrastructure

According to data from the National Transport Registry (RUNT), processed by the Colombian Association of Motor Vehicles (ANDEMOS), there were 781 electric vehicles, 221 plug-in hybrid and 349 hybrid vehicles registered in Colombia between 2011 and October 2018 – meaning more than one thousand plug-in electric vehicles in the country. On the other hand, a greater amount of electric motorcycles has been registered, reaching a total of 2,108 units over the same period. [75]

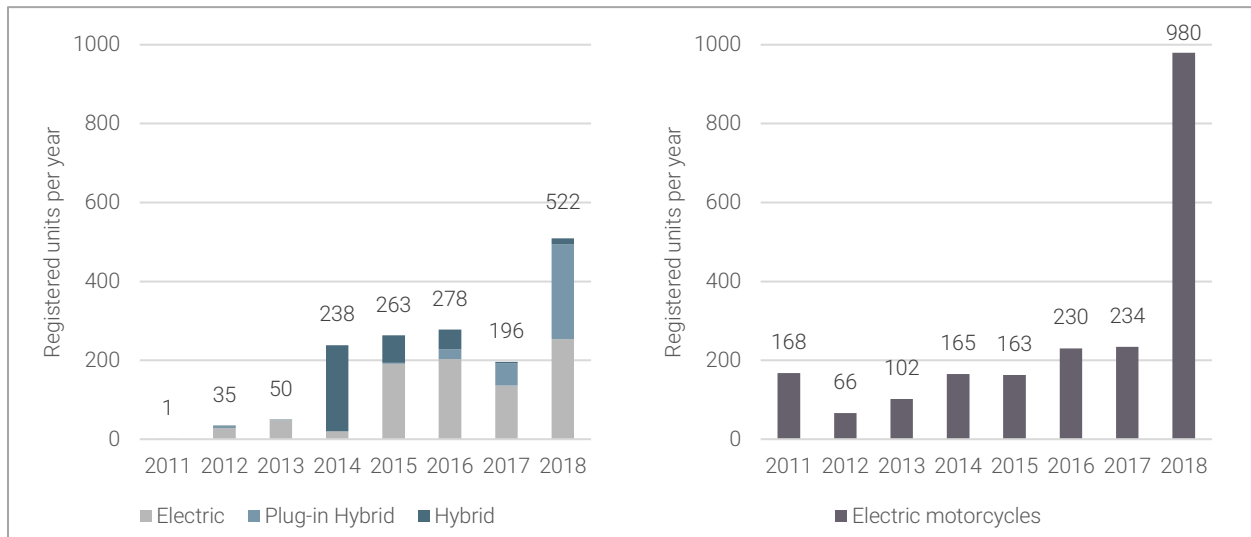


Figure 5. Annual registration of electric, plug-in hybrid and hybrid vehicles (left) and electric motorcycles (right) in Colombia from 2011 to October 2018 [75]

Enel Codensa (electric utility) has a network of electric vehicle public chargers – including one fast charger [83]. The electric utility also signed an agreement with Terpel, a local fuel distributor, to jointly deploy electric public chargers in gas stations [84]. Enel Codensa also launched a pilot project, along with a local venture, Car-B, and Grupo success (Colombian supermarket chain) to provide an electric vehicle exchange service (also known as "Car sharing"), making use of an online application for mobile phones [85].

Moreover, Empresa de Servicios Públicos de Medellín (EPM) – public service utility – has a network of 93 charging units, including five fast chargers [85]. Celsia, another electricity company, has also installed a network of nine public charging stations [88]. And, in the city of Pereira, the Energy Company of Pereira (EEP) is working on the creation of an electric vehicle charging corridor [89].

Electric public transport

In terms of electric public transport, two articulated battery electric buses are being tested in Bogota and Medellin. On one hand, In Bogota, the technology has been evaluated by the Mayor's Office of Bogota since June 2017, as part of the Transmilenio bus rapid transit system [76]. On the other hand, in Medellin, another articulated bus was introduced in early 2018 through a pilot project promoted by EPM, the Mayor's office of Medellin and the buses enterprise Metro (bus operator) [79] [90]. EPM has been testing with other electric bus topologies in Medellin, including a 12-meter electric bus, as well as two 8-meter electric buses [93]. More recently, it was announced in the city of Cali, the introduction of 125 electric buses from the

Chinese manufacturer Sunwin, in partnership with the multinational company Siemens [80]. Celsia, also presented two electric bus prototypes in the city of Cali in 2017 [87].

In August 2013, a pilot project was launched in the city of Bogota for the operation of 50 electric taxis. The project was backed up by the Municipality of Bogota and the electric utility Enel. The pilot project provided a 10-year taxi license to drivers, a monthly stipend during the first year and an exemption from traffic zone restrictions (locally known as "*pico y placa*"). [81] To date, 43 electric taxis are in operation in Bogota [82]. Moreover, EPM and the City Government of Medellin, are planning to introduce 1,500 electric taxis (500 each year) by the year 2020 [78].

3.5 Costa Rica

Costa Rica is the first country in the region to pass a comprehensive law to promote electric mobility – locally known as Law 9518. During the presidential inauguration speech in May 2018, president Carlos Alvarado stated that Costa Rica will lead decarbonization of the economy and become one of the first countries to be free from fossil fuels. At the center of this agenda is the electrification of transport, given that the country already relies on nearly 100% renewable electricity. The main source of greenhouse gas emissions comes from mobile combustion in transport.



Figure 6. Photograph of an electric vehicle owner during the Second Edition of the Electric Mobility Festival in San Jose, Costa Rica

Credit: ASOMOVE

Policy and legal framework

The country has been promoting electric mobility since the mid-nineties through several decrees published by the Costa Rican Ministry of Energy and Environment (MINA E), granting fiscal incentives to hybrid and electric vehicles through Executive Decrees No. No. 33096/2006 and 37822/2013 [95]. It was until December 2017 when Congress approved Law 9518, promoted by former Congresswoman Marcela Guerrero. This law grants tax incentives to several modalities (cars, buses, motors) for public, private and institutional fleets. The law creates a mandate for the State to electrify at least 5%, of the bus fleet every two years and it mandates the State to deploy electric

charging infrastructure. It also opens the door to public-private partnerships for the deployment of charging points. The focus on the law is on 100% use of electric cars (battery electric and fuel cell technology) [6].

In November 2018, the Government issued a new set of Executive Decrees and a directive, as complement to Law 9518, in order to extend fiscal and non-fiscal incentives to up to five years for second hand electric vehicles. In addition, the new Executive Decrees aim (1) to promote procurement of electric vehicles as part of the Government's fleets, (2) to promote simplification of existing tax exemption procedures and (3) to derogate previous

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to hybrid vehicles within a 12-month timeframe. [96]

Citizen participation

Advocates of clean technology and climate action have led the momentum of electric mobility in Costa Rica. Electric mobility citizen festivals have been held in 2017 and 2018 with a strong focus on consumer education. These events are organized "by users for users" and led by citizen organizations, such as Costa Rica Limpia and the Costa Rican Association of Electric Mobility (ASOMOVE).

Electric vehicles and charging infrastructure

Nowadays, the country has four commercial models of electric vehicles available in the local market: BMW i3, Nissan Leaf, Hyundai Ioniq and a model from BYD. Plug-in hybrid and hybrid vehicles are also sold in the country. On the other hand, the country also has Tesla vehicles imported independently. In 2018, the Government of Costa Rica received a donation from the Government of Japan, resulting in the introduction of 20 Mitsubishi Outlander plug-in hybrids and 29 Mitsubishi i-MiEV electric vehicles [97].

In December 2018, GrupoICE (group of State-owned electricity companies), launched its fleet of 100 battery electric vehicles. As part of this endeavor, it was announced that 110 charging units would be installed in the company's facilities across the country. This project had a total cost of USD 3.5 million [98].

The country currently has a network of almost 40 slow public charging stations [99]. Nonetheless, GrupoICE is in the process of deploying a national fast charging network (including 28 fast chargers),

as required by Law 9518. The first of this charging units was installed in September 2018 – also becoming the first to be deployed in Central America [100]. In November 2018, the state post company *Correos de Costa Rica* also announced their plan to electrify its delivery fleet, which implies the introduction of 348 electric motorcycles in the mid-term [101].

Electric public transport

In June 2018, a public private initiative (locally known as IETP-Bus) was launched to promote and coordinate the introduction of electric buses in the country. This initiative is supported by MINAE, Costa Rican Ministry of Transport, GrupoICE, UN Environment, German Cooperation Agency GIZ, CRUSA Foundation, Inter-American Development Bank, as well as local citizen groups, such as *Costa Rica Limpia* and ASOMOVE. [102] The initiative coordinates development of various ongoing efforts, such as a donation of three battery electric buses, provided by the German Ministry of Environment – these buses will be tested through a pilot project in commercial bus lines in 2019. UN Environment, with support from CRUSA Foundation, is providing technical support to create enabling conditions for a commercial scaleup of electric buses in the country. In parallel, local company Ad Astra, is testing a hydrogen fuel cell bus in the province of Guanacaste [103].

In 1997, CNFL (a subsidiary of GrupoICE) imported its first battery electric bus. Since then, other electric vehicles were tested as part of the fleet of this subsidiary. In 2001, an International Electric Vehicle Rally was organized, covering a total of 324 km in nine stages [104]. In 2014, CNFL purchased another electric bus for demonstration purposes [105].

3.6 Mexico

Mexico is a pioneer country in terms of charging infrastructure, with more than 2,000 charging stations deployed – a record in the region. The country has one of the largest fleets of plug-in electric vehicles (electric plus plug-in hybrid vehicles). Moreover, Mexico has a global track record in the automotive industry. Hence, the country has the potential to play a significant role in the region in the production and assembly of electric vehicle and auto parts.



Figure 7. Photograph of a public charging unit installed by the Federal Commission of Electricity in Mexico [107]

Credit: gob.mx

Policy and legal framework

At a federal level, battery electric and hydrogen vehicles are exempted from a federal duty on new vehicles. The Federal Commission of Electricity (CFE) also provides a separate meter for private charging in households³. Most of the Mexican states also provide an exception from the annual vehicle property tax. [108] Plug-in electric and hybrid vehicles are also exempted from road space

rationing (or vehicle restriction) and environmental verification in Mexico City [109].

In September 2018, Mexico's National Electric Mobility Strategy was launched. The strategy was led by the Secretariat of Environment (SEMARNAT), in collaboration with an *ad hoc* working group, with the participation of SENER, the Ministry of Finance and Public Credit, the Ministry of Economy, AMIA, as well as electric vehicle industry representatives.

³ A "high demand household tariff" (locally known as "Tarifa DAC") is applied to residential consumers with an annual electricity consumption higher than 3,000 kWh. There is the possibility that new electric vehicle owners may be reclassified with the "high demand household tariff" in their households if their electricity consumption rises in order to charge the electric

vehicle. In response, the Federal Commission of Electricity allows the possibility to install a separate meter for the charging unit, maintaining the rest of the household electricity consumption unaltered.

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The strategy sets targets and short-term actions to promote electric vehicle production, to increase charging infrastructure and to gradually electrify new vehicles sold the country. With regard to the latter, the strategy sets the target to electrify 5% of new vehicle sales by 2030, 50% by 2040 and 100% by 2050. This means, the introduction of 500,000 light-duty and 7,000 heavy-duty electric vehicles between 2019 and 2030. [114]

Electric vehicles and charging infrastructure

In terms of public charging infrastructure, 2,017 public charging had been installed by September 2018 thanks to a national program, led by CFE and the Secretariat of Energy (SENER), funded by the Energy Transition Fund. The public charging program is implemented in collaboration with private sector and includes deployment of electric corridors in Mexico City, Guadalajara, Saltillo and Monterrey. [112] [111] Mexico also has an ultra fast electric vehicle charger in Cuernavaca, supplied by Tesla [113].

According to data processed by the Mexican Association of the Automotive Industry (AMIA,

given its acronym in Spanish), in the country, between the beginning of 2016 and June 2018, 590 battery-powered electric vehicles, 2,419 plug-in hybrids and 23,892 conventional hybrids were registered in the country. As shown in Figure 8, the volume of hybrid vehicles sold in Mexico is significantly higher than the number of electric vehicles. It is also worth noting, according to AMIA, more than a third of the sales of these technologies have happened in Mexico City. [107]

With regard to electric vehicle production, there are several ongoing initiatives to develop or assemble electric vehicles in the country. For example, there are two separate Mexican conglomerates working in the design and manufacturing of electric vehicles and expect to make a commercial launch by 2018. International vehicle manufacturers with operations in Mexico (e.g. Renault, Ford and BMW) have also announced their intentions to start the assembly of electric vehicle in the near future. Hence, for the time being, Mexico is not producing electric vehicles at a mass-scale.

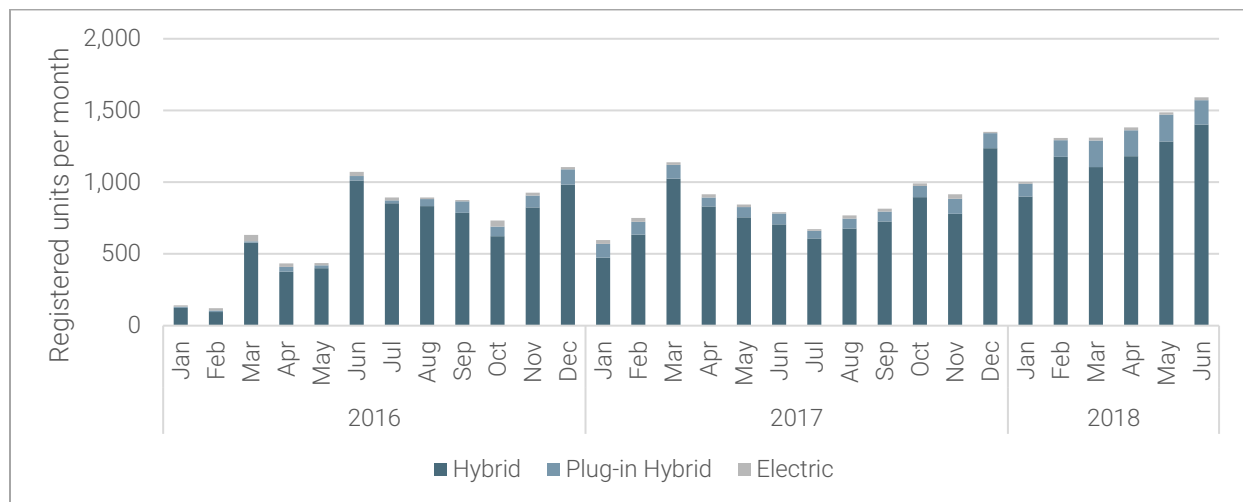


Figure 8. Monthly registration of electric, plug-in hybrid and hybrid vehicles in Mexico from 2016 to June 2018 [107]

Electric public transport

Regarding public transport, STE (Spanish acronym for Electric Transport Service in Mexico), introduced 20 electric taxis in 2015, as part of their fleet. The State of Aguascalientes also has a public fleet of 65 electric vehicles. The

Environmental Commission of the Megalopolis (CAME) has an ongoing demonstration project to introduce electric taxis in the 18 municipalities surrounding the Federal District [114]. In early-2018, ECOBICI introduced 340 pedal-assist

electric bicycles, becoming the first bike sharing program in Latin America to include electric units.

Despite Mexico having a network of trolley buses, no battery electric buses are in operation yet.

3.7 Panama

Despite electric mobility being still incipient in Panama, the country is currently developing its National Electric Mobility Strategy, with the support from UN Environment. Additionally, an electric bus is being tested in Panama City, with the aim of evaluating its potential for scaleup, as part of the city's bus fleet.



Figure 9. Photograph of the electric bus operated by MiBus in Panama, as part of the Electric Mobility Pilot Plan connecting May 5th Driveway and the Old Town

Credit: BYD Panamá

Policy and legal framework

With regard to fiscal incentives, Law 69, published on October 2012, grants incentives for the importation and sale of electric and hybrid vehicles, by providing exemption from the selective tax, regardless of the cost of the vehicle [116]. Nonetheless, this tax incentive was overdue since January 1, 2018⁴.

In August 2018, Panama launched the development of a national electric mobility strategy, with the support from UN Environment and in collaboration with the World Energy Council, Panama chapter. Based on this effort, a special high-level working group from the Government led by the National Secretariat of Energy (SNE) was created. Despite development of the strategy is just beginning, the Ministry of Environment, SNE,

⁴ By the time this report was written, Law 69 was being reviewed by the Panamanian Government before its re-enactment.

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Transit Authority, mass transit operators, academia and the private sector – including local electric utilities and vehicle – are jointly working since its inception. The strategy is expected to be published before the summer of 2019.

Electric vehicles and charging infrastructure

According to vehicle registration record, it is estimated that, 300 plug-in electric vehicles were registered in Panama from 2012, being most of them plug-in hybrid electric vehicles. In 2018, ENSA, an electricity distribution and retail company, purchased two electric vehicles and made them available to their staff to test the technology [114]. The company also plans to install public charging stations in Panama and to assist its customers in the installation of private charging units. Other local

companies already have or are planning to deploy additional electric vehicle charging infrastructure.

Electric public transport

Panama City has an Integrated Plan for Sustainable Urban Mobility, which includes a network of eight metro lines. In 2014, the country inaugurated the (electric) Metro Line 1 and in 2019 will inaugurate the second line. This plan envisions the integration of metro lines with a road mass transit system of buses. In this sense, the municipality of Panama, together with MiBus (bus operator of Panama City), have been testing the electric buses since the Fall 2017. In August 2018, they launched the first electric bus service. This is part of a pilot project promoted by the Municipality, MiBus and BYD to test and showcase the benefits of this technology [119].

3.8 Uruguay

Uruguay has become a pioneer country in the region when it comes to electric mobility. The country has an electric corridor and is currently experimenting with electric buses, taxis and utility vehicles.



Figure 10. Photograph of one of the electric taxis circulating in Montevideo, Uruguay [125]

Credit: Intendencia de Montevideo

Policy and legal framework

In 2014, the government created an inter-institutional alliance to carry out strategic actions aimed at developing regulatory, technical and fiscal instruments to stimulate the gradual electrification of the fleet of vehicles. As a result, the Ministry of Economy and Finance and the Ministry of Industry, Energy and Mining of Uruguay approved tax exemptions for electric vehicles for two years [126]. Other incentives for electric vehicles and hybrids include the reduction of "Internal Specific Tax (IMESI)" through Decree 246/012 to 5.75%, which is lower than that of conventional cars [127]. For its part, the Investment Promotion Law (Decree 02/12) offers some incentives for related investment projects including utility electric vehicles [128]. The Ministry of Industry, Energy and Mining is collaborating with the Ministry of Transport to reformulate the gasoline trust fund, in order to take into account, the number of kilometers covered by the transport units. Since 2006, Uruguay has operated a collective transport fund to promote low-carbon emission transport, and since 2016, the government has included electric buses under this program. The fund consists of government subsidies and has around US\$ 25 million [129].

Electric vehicles and charging infrastructure

In 2014, the Uruguayan state electric utility (UTE) acquired the first fleet of institutional electric vehicles in the region, comprised by 30 light commercial vehicles Renault Kangoo ZE [120]. UTE also provides an electric vehicle charging plan to their electricity customers, based on a specialized time-of-use rate [121].

By December 2017, Uruguay inaugurated the first electric route in the country and in Latin America (followed by Brazil in 2018). The project covers the tourist cities of Colonia del Sacramento and Punta

del Este, with charging stations every 60 to 70 km. It will extend to the Brazilian border and will cover the entire country in a second phase [130]. This project is the result of many years of work in cooperation between the Ministry of Industry, Energy and Mining, and the local government.

For the first season (2014-2015) and the second season (2015-2016) of the formula-E, Punta del Este was one of the stops of the world championship and returned in 2018 for the fourth edition [132]. In July 2018, the International Automobile Federation (FIA) Region IV also inaugurated the first "Hall of electric Mobility and Smart Cities" in Montevideo [133].

Electric public transport

Electric taxis have expanded in the city of Montevideo. In January 2018, there were 24 electric taxis operating and 30 electric taxi licenses were launched; the latter included additional benefits for drivers, such as a discount on the license price and a subsidy for updating up to three conventional taxis per applicant [122]. The electric company, UTE, offers two fast charging stations for fleets of taxis [123]. In 2016, an electric bus was also introduced as part of the commercial fleet of Montevideo [124].

With the aim of introducing electric buses in the urban transport, the Ministry of Industry, Energy and Mining submitted a request for financing to the Green Climate Fund, in order to replace 10% of Montevideo's public transport fleet, approximately 120 vehicles. In September 2017, the Global Environment Facility (GEF) approved the project "*Towards a sustainable and efficient urban mobility system in Uruguay MOVES*" [131]. The objective of the project is to promote an efficient and low-carbon transport model in Montevideo, which can be replicated in other cities of Uruguay, based on the improvement of institutional capacities, the development of appropriate regulations and the utilization of innovative technologies.

3.9 Developments in other countries in the region

A brief description of the developments in other Latin American and Caribbean countries in terms of electric mobility is presented below. For reasons of information availability and time, the analysis is less exhaustive than in the previous section.

Barbados

Barbados has an electric vehicle charging infrastructure for the entire island, with more electric vehicle charging stations than service stations. This includes public charging stations in supermarkets, shopping centers, small businesses and homes. The country has a fleet of electric vehicles of more than 250 units (which is significantly higher than many Latin American countries at this time). [134]

Dominican Republic

The main developments in electric mobility in the Dominican Republic are the Metro and the cable car. Electric vehicles have started circulating in the country, many of them imported directly by consumers. Eco Messaging, a local courier company, uses electric motorcycles in its fleet [135].

In terms of policy, Law No. 253-12 establishes since 2012 a registration tax based on vehicle exhaust emissions (i.e. grams of CO₂ per km) [136]. Law No. 103-13 provides tax incentives for electric and hybrid vehicles, by reducing the import tax by 50% compared to conventional vehicles [137]. So far, 58 electric vehicles have been imported [138].

In 2017, the National Energy Commission and a Korean energy company KEPCO organized the first electric vehicle conference in the Dominican Republic. [139] KEPCO also announced its interest in deploying 160 public charging centers throughout the country, as part of an agreement with the National Energy Commission [140]. Since 2013, there is a law that provides incentives for cars that use non-traditional fuels. So far, the island has around 56 electric vehicles [138].

Ecuador

Ecuador has a fleet of electric taxis in the city of Loja, managed by migrants. EcoTaxi, the name of

the electric taxi fleet, received the support of the city's Municipality, the National Financial Corporation (CFN) and BYD [141]. There are 50 electric taxis operating in Loja, 35 are BYD [142]. With respect to electric buses, three BYD buses started pilot operations in 2018 in Quito (one of them is an articulated electric bus of 18 meters) [143]. In addition, a bus operator in Guayaquil, after testing an electric bus, announced its plan to replace 20 of its diesel buses with electric buses [144].

Currently, there are more than 240 electric vehicles in the country [145] and there has been an acceleration in sales in recent years [146]. In 2018, a Law for the Promotion of Production was approved, granting a 0% value-added tax on electric and hybrid vehicles and a 0% "special consumption tax" on electric passenger vehicles. This law will be valid for five years [147]. Since 2015, electric and hybrid vehicles of less than US \$40,000 are exempt from import duty [148].

In terms of charging infrastructure, a fast charging point was implemented in Loja (to charge electric taxis) [149]. In 2017, three electric charging centers were installed by KIA Motors and the Local Council in the Galapagos Islands to charge a fleet of about 25 electric vehicles [150].

El Salvador

In May 2018, El Salvador announced, through its Ministry of Foreign Affairs and the power distributor *Distribuidora de Electricidad del Sur* (DEL SUR), the launch of a plan to promote electric mobility as part of an effort to protect the environment. Other collaborators of this project are the Ministry of the Environment, the Customs Office and the Embassy of Colombia. DEL SUR is testing a Nissan Leaf, manufactured in Mexico [151].

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GIZ offered to help in the initial phase of market development, by collecting best practices and lessons learned abroad. It is noteworthy that DEL SUR is a subsidiary of the Public Companies Group of Medellín and seeks to be leaders in the creation of charging infrastructure in El Salvador. The private sector has organized at least three congresses that include, for the first time, electric mobility discussions. For example, the Association of Industrial Enterprises has included electric mobility in its annual energy congresses of 2017. In 2018, the city will host an international event on electric mobility [152].

Guatemala

Guatemala offers a tax benefit for electric cars: they pay an import fee of 5%, instead of the 25% that conventional cars pay. The energy company, *Egsa*, is also starting to get involved in this technology and plans to implement charging infrastructure over the next 5 years. For now,

electric cars on the market are Luka Electric and Renault Twizy [153]. In 2017, Luka Electric launched the first electric bus in Guatemala for 56 passengers, manufactured by *Anyuan* [154].

Grenada

The Government of Grenada has declared its intention to be a leader in electric mobility in the Caribbean [155]. In 2015, the company Grenlec, in charge of the electric service, launched a pilot project, which put into operation three electric vehicles (two Nissan Leaf and one Nissan five-seater E-NV200 Plus), as well as a limited number of charging stations [156]. The pilot was designed to test energy efficiency, range, cost savings, road performance and the environmental benefits of electric cars compared to cars with internal combustion engine.

3.10 Fiscal and non-fiscal incentives to electric mobility in the region

Table 1 presents a summary of the policy instruments to incentivize, promote and regulate the electric mobility in some countries of Latin America, as described in the previous pages:

Table 1. Summary of policy instruments to incentivize, promote and regulate electric mobility in some countries in Latin America (own elaboration)

Category	Policy instrument	Argentina	Brazil	Chile	Colombia	Costa Rica	Ecuador	Mexico	Panama
Purchase incentives	VAT rebate/exemption				✓	✓	✓		
	Import duty rebate/exemption	✓	✓		✓	✓		✓	
	Other	✓	✓			✓	✓	✓	✓
Operation incentives	Property tax rebate/exemption					✓		✓	
	Waiver on tolls or parking				✓	✓		✓	
	Other					✓		✓	
Other incentives	Waiver on driving restriction				✓	✓			
	Differentiated electricity tariffs						✓	✓	
	National Electric Mobility Strategy	✓		✓	✓	✓		✓	✓
	Regulation of charging stations			✓		✓			

✓ Complete incentive / Policy instrument approved and implemented

✓ Partial incentive / Policy instrument in design stage



4 Recommendations for regional collaboration

As has been stated, Latin America and the Caribbean have enabling conditions in terms of clean transport and electric mobility. Among them is to be the region with the highest percentage of electricity generation in the world with renewable sources. To this must be added a high use of public transport compared to the rest of the world [8], as well as abundant reserves of raw materials for the manufacture of batteries for electric vehicles. For example, lithium, in the case of Argentina, Bolivia, Chile and Peru; as well as, copper, in the case of Chile. Finally, the region has also established positive precedents in the collective transport agenda, for example, Bogotá, Medellín and Curitiba have become well-known international benchmarks. In August 2018, government representatives from several countries of the region gathered to explore areas of potential collaboration in the field of electrical mobility (see Annex 1).

In the framework of the XXI Meeting of the Forum of Ministers of Environment of Latin America and the Caribbean, on October 2018, in Buenos Aires, Argentina, a Dialogue on Electric Mobility was launched, which was promoted by Costa Rica and Argentina and supported by 14 countries in total (i.e. Argentina, Barbados, Belize, Bolivia, Chile, Colombia, Costa Rica El Salvador, Grenada, Guatemala, Honduras, Mexico, St. Lucia and Uruguay). The possible areas of cooperation, learning and dialogue raised in this regional agreement are the following⁵:

- Learning about the strategies and regulatory frameworks of electric mobility with emphasis on urban public transport and low emissions and resilient development country
- Financial instruments and/or business models that promote electric mobility
- Capacity building and knowledge and information exchange for the public and private sector, civil society, users and academia among others
- Collaboration for pilot projects in countries or cities
- Explore synergies and opportunities in areas such as public health and the creation of innovative jobs like recharging and digital services related to electric mobility.

As a complement, to stimulate the debate among countries in the region, this report states three major areas with potential for regional collaboration: (1) the creation of national strategies and public policy instruments, (2) the involvement of other actors beyond the environmental sector and (3) the generation of enabling conditions through capacity building and information as well as the development of systems to be able to evaluate the progress and thus extract lessons to adjust the strategies in the practice.

It should be noted that this type of collaboration requires flexible designs given that technologies advance at an accelerated pace, and governments, private sector and consumers will need to adapt their strategies and alliances to meet the objectives that their strategies seek to achieve in clean transport and electric mobility

⁵ For more information, see a transcript of the Dialogue of Ministers on electrical Mobility in Annex 2

4.1 National strategies and public policy instruments

One of the major areas of regional cooperation could address the development of public policy instruments to create favorable conditions for clean transport and electric mobility. While this area of work is mostly domestic – each country must define its own approach according to its reality – there are benefits of regional learning in this field as countries advance at very different rates. There are countries that already have the first versions of national strategy, i.e. Chile and Mexico, others that have them in an advanced state, like Colombia and Costa Rica, while other countries are initiating, like Argentina and Panama. However, many countries have not yet started.

This presents a valuable opportunity to design regional dialogues so that each country moves forward at their own pace and that those which are in a more advanced stage can share technical inputs with the rest of the region. Among the examples of public policy in this field, where some countries have expressed interest in dialogue, are:

- The basis for creating legislation for the promotion and incentives for clean transport and electric mobility
- Eco-labelling schemes for vehicles (cars and buses)
- Infrastructure for electric mobility. In this regard, there is an interest to learn more about

experiences on the creation of electric vehicle charging infrastructure (buses, taxis, private cars) as well as international experiences in battery matters.

- It has also been proposed to talk about standards and regulations for combustion vehicles, in a way that promote a greater efficiency and better emission control since the region still has low standards regarding air quality (as mentioned earlier)

At the same time, such dialogues on policy frameworks and public policies must incorporate the financing element:

- How to develop financial instruments to promote the acquisition of these technologies and to create the recharging infrastructure?
- How to create mechanisms to attract consumers?
- How to create incentives for private investment in this type of industry?

This should be complemented with regional dialogues to stimulate ideas on mechanisms that encourage the private and entrepreneurial sector to develop business models that promote clean transport and electric mobility.

4.2 Exchange knowledge, build capacity and evaluate performance

In regional dialogues on electrical mobility, the call to share inputs and knowledge frequently arises. Where can the information be found? How can one know the contents of the Electric Mobility Law of a country in the region? How to obtain information about electric bus pilots? In other words, there is an opportunity to create dynamic information repositories in this area that are easy to access and that are updated regularly.

In addition, there is a growing need for technical capacity building. At the regional level, there are benefits that arise from collaborating in the development of education and research programs, as well as training of government technical personnel. Technical cooperation schemes can be developed between countries in the region, as well as the establishment of a collaborative space for pilot projects or demonstrations occurring in the countries or cities of Latin America and the Caribbean. Examples include massive online

courses, university courses and virtual expert conferences.

The MOVE platform was created by UN Environment for the region, with the objective of accelerating the transition to electric mobility. The platform offers mobilization of resources, educational materials and technical support in the design of national strategies of electric mobility and legislation. At the same time, it offers virtual and face-to-face meetings with experts on various subjects, in order to create a safe space to debate and evacuate doubts, especially, from government representatives.

Finally, it is crucial to assess the efforts to determine whether the results are the expected ones. The region could collaborate in the development of systems to evaluate performance and to collect lessons in order to improve the actions in this area.

4.3 Promote collaboration with relevant stakeholders

The previous dimension – the role of public policy to create favorable conditions – must be complemented with efforts to incorporate other actors who can enhance electric mobility. This means exploring innovative collaborative channels to engage other relevant stakeholders:

Other Ministries

In Many countries in the region tend to have the Ministry of Environment or similar government bodies focused on this matter as one of the first promoters of electric mobility. Nonetheless, there is an opportunity to coordinate with other national level governmental bodies with affinity towards electric mobility. In particular and given the close links between the air quality agenda, climate action and transport, the natural sectors to collaborate are the ministries of transport, energy and health. How can the integration of institutional work and national decisions be promoted in such a way as to generate the greatest benefits for citizenship? One could think of creating spaces for ministerial dialogues that can begin by bringing together the ministries of Environment and Transport – for example, a meeting of both at a high level – and then including other ministries, such as Energy and Health. In addition to the high-level work, spaces can be created for dialogue and the joint work of technical bodies that can define concrete actions to advance in the electrification of transport.

Local governments

At the same time, it should be explored how to involve other decision makers who have a direct impact on urban life, such as local governments and municipalities. In the region there are already positive precedents at the city level, as well as the compilation of lessons on the involvement of municipalities in the implementation of pilot programs of electric buses and taxis.

Private Sector

Is vital to emphasize the need to involve the private sector. Many electric vehicles companies – private

cars, buses and taxis – have already begun their insertion in this market and there is the risk of having government strategies on one side and business strategies on different side. Hence, potentially hindering development of these technologies – for example, incompatible visions in terms of charging infrastructure. Furthermore, the participation of actors from the financial and the insurance sector should be encouraged.

As shown in this report, electricity companies in practically all the countries in the region are leading or involved in many of the early efforts in the field of electric mobility. Therefore, it will be of great value to engage with them as part of regional dialogue and collaboration. There are already local experiences in the region, such is the case of Argentina, Chile, Colombia, Costa Rica and Panama, where *ad hoc* working groups have been created to bring together political decision makers and technical experts from public and private sector to discuss on relevant topics related to electric mobility.

Countries with industries related to the production of vehicles or mining should also consider the involvement of these industries as part of their bet on electric mobility. These actors can play a crucial role in improving the supply of technology in the region while creating new job and business opportunities associated to the sector. The new industrialization opportunities must be executed in accordance with international best practices.

Public transport operators should also be involved, and their capacities should be strengthened. So far, pilot projects have been implemented in some cities. However, a large-scale introduction of buses or electric taxis will require enabling conditions to allow an upscale. Moreover, the “windows of opportunity” to intervene public transport in the region tend to be scarce, given that in most cases, they are ruled by public tenders, which occur every 10 or more years per city. Therefore, it is vital to identify and prioritize in advance, which will be these windows of opportunity in public transport in

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the region, in order to prepare a fertile ground for the electrification of fleets in upcoming tenders.

Consumers

Finally, with regard to the involvement of key stakeholders, there is not only the technology offering side but also, the set of actors that buys them in real life, meaning: the consumers. This includes buyers and owners of electric vehicles and users of public transport. Given that the traditional emphasis focuses on partnerships between government and companies, it is easy for the role of consumers and users to be a "blind spot" in national strategies.

However, it is known that in every technology transition, from the adoption of personal computers and smartphones to photovoltaic solar panels and today, electric vehicles, the phenomenon of "*early adopters*" transcends borders: these are the users who help to make these new technologies contagious. In Norway, for example, a consumer who makes the transition to electric mobility persuades – on average – three people to do the same⁶. At the early stage of the transition to electric mobility technologies it is probable that the most enthusiastic sector is the users.

At a regional level, it is important to highlight the precedent set in the formation of the Latin American Association of Sustainable Mobility (ALAMOS, given its acronym in Spanish), integrated

by local citizen organizations from the region. ALAMOS can play a role from a bottom-up perspective in regional coordination and knowledge exchange with regard to electric mobility deployment.

Communication

These strategies of integration of different actors – State, municipalities, companies and users – may also consider dialogues with public interest groups, for example, non-governmental organizations and knowledge management centers, as well as communication experts. It is necessary to promulgate educational campaigns to overthrow the myths that persist in the public opinion. Cultural interventions are required to provide up-to-date information on these technologies as traditional opinion makers and the press often lack information and training to enable them to do this work. Countries in the region could collaborate on educational campaigns for different ages and demographic groups. In many debates on electric transport prevails the so call face the "cultural challenge" to show that this technological revolution is happening and that it is a myth to suggest that the advent of this technology is still far away and that it only occurs in the industrialized countries. In fact, an example is the city of Shenzhen in China, which with more than 12 million inhabitants has a 100% electrified fleet of buses.

⁶ Information provided by Christina Bu, General Secretary of the Association of Electric Vehicles of Norway.

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6 Annex

Annex 1. Technical workshop on clean transport and electric mobility, San Jose, Costa Rica



Between August 16 and 17, 2018, the "Regional Technical Workshop on Clean Transport and Electric Mobility in Latin America and the Caribbean" took place in Escazú, Costa Rica. The event was convened by the Ministry of Environment and Energy of Costa Rica and the Ministry of Environment and Sustainable Development of Argentina and counted with the participation of 11 countries from Latin America and the Caribbean. The work session was organized in collaboration with UN Environment and the NDC Partnership, with the support of Euroclima +.

The purpose was to discuss the strategic importance of clean transport and electric mobility and to identify regional collaboration opportunities in Latin America and the Caribbean, as well as to identify common perspectives in this area in preparation for the XXI Forum of Ministers of Environment of Latin America and the Caribbean, in Buenos Aires, Argentina. The event was participatory in nature and focused on publicizing the progress in each region, identifying opportunities, as well as the common challenges facing the region. Countries addressed the areas of common interest with the greatest potential for collaboration. It was proposed that the region explore collaboration on several fronts, complementary to each other.

First, it was agreed that the integration of different actors and institutions is important, beyond the Ministries of the environment. This includes other instances of the public sector, such as the Ministries of energy and/or Ministries of Transport, as well as the private sector and users. Second, the development of public policy instruments, the definition of national strategies, as well as the promotion of financial instruments or new business models that promote clean transport and electric mobility. Third, capacity building and knowledge and information exchange, through the development of education and research programs or training of technical staff of governments with regional scope, technical cooperation among countries in the region, as well as the establishment of a collaborative space for pilot projects or demonstration projects that occur in the countries or cities of Latin America and the Caribbean.

Finally, during the workshop it was determined that it will be of vital importance to monitor the progress in the deployment of clean transport and electric mobility in the region through monitoring, reporting and verification tools, in order to track the progress and to guide the commitments that could be acquired.

Annex 2. Transcript of the Dialogue of Ministers on Electric Mobility

DIALOGUE OF MINISTERS ON ELECTRIC MOBILITY

Buenos Aires, October 12, 2018

Latin America and the Caribbean face the growing challenge of air pollution, which has a high impact on the quality of life, in general and on health in particular. Much of this pollution comes from the transport sector and today, for the first time, there are electric transport technologies that can help countries to improve air quality and reduce the public health costs associated with this problem. At the same time, the countries of the region have set targets to reduce greenhouse gas emissions in the context of the Paris Agreement. Given that emissions in the region from transport are increasing, electric mobility can help countries improve their air quality and meet their nationally determined contributions (NDC, for its acronym in English).

Additionally, the IPCC has published a special report on the impacts associated with a 1.5°C global warming and the options to reduce emissions. This report motivates us to move forward at a faster pace in climate action, particularly in the transport and electricity generation sectors.

Many countries in the region have enabling conditions, including a high electrical generation with renewable sources (the highest percentage in the world on average), as well as a high use of public transport – especially buses. With support for electrical mobility, governments can send a positive signal to the private sector, the financial sector and consumers in order to explore national and international partnerships.

Our countries express their willingness to start collaborating in this field. Possible areas of cooperation, learning and dialogue:

- a. Learning with respect to the strategies and regulatory frameworks of electric mobility with emphasis on urban public transport and low emission and resilient development of the countries
- b. Financial instruments and/or business models that promote electric mobility.
- c. Creation of capacities and exchange of knowledge and information for the public and private sector, society, users and academia, among others.
- d. Collaboration for pilot projects in countries or cities.
- e. Explore synergies and opportunities in areas such as public health and the creation of innovative industries and decent work, such as recharging and digital services related to electric mobility.

Recognizing that the countries will advance in accordance with their capacities and their national circumstances, the signatories express our willingness to initiate a dialogue that allows exploring lines of cooperation, knowledge exchange, good practices, lessons learned and opportunities associated with electric mobility