

TECHNICAL NOTE N° 1 ELECTRIC MOBILITY IN LATIN AMERICA AND THE CARIBBEAN Monitoring Electromobility

September 2024

Latin American Energy Organization (OLADE)

Electric Mobility in Latin America and the Caribbean

Monitoring Electromobility

Technical Note No.1

September 2024

OLADE's Directorate of Studies: Fitzgerald Cantero Piali Fabio García Lucero Fabricio Ramos Sarango Katherine Segura González

Methodological note

This Technical Note was prepared mainly with: official primary information provided by member countries, information available from OLADE and secondary sources.

This is the first of a series of Technical Notes that OLADE will publish monthly on the relevant topics of the energy agenda in Latin America and the Caribbean.

This Technical Note presents a Monitor of Electric Mobility in Latin America and the Caribbean. This Monitor will be updated every six months and an updated overview will be published.

The electric light vehicle (EV) fleet includes: i) 100% battery electric vehicles (BEVS) and ii) plug-in hybrid vehicles (PHEVs).

Information on electric buses and charging infrastructure is also included.

A projection of different scenarios is carried out for both the vehicle fleet and electric buses, as well as the need for a new generation installation with its consequent investment.

Acknowledgements

Special thanks to the professional Advisors of the Energy Information System of Latin America and the Caribbean (sieLAC) of OLADE and to the Energy Ministries and Secretariats of the member countries of the Organization.



Content

1.	Intr	oduction	4
2.	Elec	ctromobility in the world	8
3.	Elec	ctromobility in Latin America and the Caribbean	9
3	3.1.	Electric light vehicle fleet in Latin America and the Caribbean	9
3	3.2.	Electric buses in Latin America and the Caribbean	. 12
3	3.3.	Charging stations	.14
3	3.4.	Projections of electromobility growth in LAC: Scenarios	.15
3	3.5.	Regulations related to electromobility in LAC	. 18
4.	Con	nclusions	. 21

Figure Index

Figure 1. Total primary energy supply matrix of LAC vs. the world5
Figure 2. Evolution of LAC's electricity generation matrix
Figure 3. Potentials of direct renewable energy sources in LAC
Figure 4. Worldwide sales of electric vehicles in millions of units
Figure 5. Evolution of the electric light vehicle fleet 2020 - 2024 (first semester)
Figure 6. Ranking of the 5 countries with the highest number of electric vehicles in the first half of
2024
Figure 7. Number of electric vehicles in the first half of 2024, other LAC countries11
Figure 8. Number of electric vehicles per capita as of the first half of 2024 in LAC12
Figure 9. Evolution of the electric bus fleet in LAC 2020 - 2023
Figure 10. Ranking of the LAC countries with the highest number of electric buses in circulation as
of 2023
Figure 11. Ranking of the LAC countries with the highest number of charging stations as of 2023.
Figure 12. Projection of the electric bus fleet in LAC to 203016
Figure 13. Projection of energy required by the electric vehicle fleet in LAC to 203017
Figure 14. Projection of installed capacity to supply the electric vehicle fleet in LAC by 203017

Table Index

Table1. Growth of electromobility in LAC by 2030 - Scenarios	
Table2. Instruments to promote electromobility	
Table3. Standardization and operability.	
Table4. Circulation and reliability.	
Table5. Other types of incentives	



1. Introduction

The progress made by Latin America and the Caribbean (LAC) in terms of the penetration of renewable energy sources in its electricity generation matrix is clear, especially in recent years, since the signing of the Paris Agreement and the formulation of the Nationally Determined Contributions (NDCs) of the countries subscribing to the Agreement.

Currently, electricity accounts for about 20% of final energy consumption in the region and electricity generation is responsible for 20% of CO_2 emissions from the energy sector (sieLAC-OLADE, 2024).

On the other hand, the transport sector is the largest consumer of energy, with about 40% of total energy consumption and at the same time the one that contributes with the highest share of CO_2 emissions from the energy sector (43%), in addition to being one of the sectors with the lowest relative energy efficiency, due to the internal combustion engine used by conventional vehicles.

In this context, many of the region's countries have included in their energy sector strategies and roadmaps the following: intensifying the development of renewable energies, designing energy efficiency policies, and implementing measures to decarbonize the transport sector.

On this last aspect, we will delve into this Technical Note.

Harnessing renewable energy sources through the use of clean energy carriers such as electricity, biofuels and, later on, green hydrogen, are reasonable strategies in a region that, in addition to the outstanding progress it has made in green energy generation, still has enormous potential for further growth.





Figure 1 shows this attribute of LAC, making it the region with the cleanest primary energy matrix in the world.



Figure 1. Total primary energy supply matrix of LAC vs. the world.

Figure 2 shows the growing importance of non-conventional renewable energies in the region's electricity generation matrix.

Figure 2. Evolution of LAC's electricity generation matrix.



Source: sieLAC – OLADE

The following maps show the potential of wind, hydro and solar generation in our region.

Source: sieLAC – OLADE, 2024.





Figure 3. Potentials of direct renewable energy sources in LAC.

Source: OLADE, own elaboration based on various sources.

On the other hand, our region has strategic minerals that are crucial for energy transitions, particularly for the development of electric mobility.

The main minerals for the manufacture of electric vehicle batteries are lithium, cobalt, nickel, manganese, copper and aluminum, which our region has in abundance. 25% of these minerals are produced in LAC.

Given this scenario, the region has comparative advantages and has the conditions to develop more efficient and cleaner transport systems, both in mass passenger transport and in private vehicles.

It is also an opportunity to promote regional production chains and develop conglomerates within the framework of this new electric mobility industry.

In LAC, electromobility is at an early stage of development, but is growing rapidly, as reflected in electric vehicle sales statistics for the last three years.

Although the advantages of electric mobility as a mechanism to mitigate climate change and improve local environmental conditions are evident, there are still technological, logistical, financial and regulatory barriers or challenges that must be overcome in order to achieve significant progress and the widespread use of electric vehicles in our region.



Among the main challenges, the following can be mentioned:

Information and training challenges

- To introduce the technical and scientific principles of electromobility in the curricula of universities and technological training institutes, in order to train professionals and technical specialists in this field.
- To collect and disseminate sufficient technical information that allows potential users of electric vehicles to evaluate the price-quality ratio of the different brands and the attributes of this type of vehicle offered in national markets.
- To know the real values of the parameters that characterize electric vehicles, such as autonomy and useful life of the batteries and energy efficiency, according to the topological and climatic conditions of our countries, that is, to adapt this information to domestic realities.

Regulatory and financial challenges

- To formulate laws and regulations that promote the use of efficient and environmentally friendly modes of transportation.
- To create tax incentives for the acquisition and use of electric vehicles.
- To eliminate, target or redirect subsidies for the consumption of fossil fuels in private transport.
- To provide financial aid and lines of credit that compensate for the high costs of acquiring electric vehicles, in relation to conventional internal combustion cars of similar performance.
- To seek mechanisms to reduce the replacement cost of batteries and other electric vehicle accessories.

Logistical challenges

- To implement a sufficient infrastructure for public recharging of batteries, which allows planning long-distance trips in 100% electric vehicles, so that their use is not limited exclusively to the urban environment.
- To encourage a network of specialized workshops that can provide electric vehicle owners with maintenance and repair services.



- To promote electric vehicle dealers to ensure a continuous stock of spare parts for the brands they market.
- To provide mobility and parking facilities for electric vehicles, such as exclusive traffic lanes and free parking.
- To have second use alternatives for the batteries of electric vehicles that have already completed their charging cycles.
- To promote interoperability and standardization of battery recharging points, both by type of electric vehicle and between neighboring countries.

2. Electromobility in the world

The transition of the transport sector towards electromobility is a trend in most parts of the world, especially in developed countries.

In 2023, around 40 million electric vehicles were on the road, of which 53% were in China, 28% in Europe, 12% in the US and 7% in the rest of the world¹.

The number of electric vehicles circulating in the world in 2023 is 30 times more than it was in 2015, when the Paris Agreement was signed. However, this amount represents only 2.8% of the world's total vehicle fleet.

In 2023, 8.14 million electric vehicles were sold in China, 3.2 million in Europe and 1.4 million in the US, which together represents 93% of global sales of this type of vehicle.

¹ According to the International Energy Agency, the world stock in 2024 would be 57 million (Global EV Outlook 2024).



Figure 4. Worldwide sales of electric vehicles in millions of units.

3. Electromobility in Latin America and the Caribbean

Although on a smaller scale than in China, the U.S. and Europe, electromobility is making rapid progress in LAC, despite all the barriers and challenges mentioned above.

This is in response to the efficient and clean energy development policies that most countries are implementing, aimed at complying with their international commitments to mitigate climate change.

3.1. Electric light vehicle fleet in Latin America and the Caribbean

In the first half of 2024, in Latin America and the Caribbean, 249,079 light electric vehicles (PHEV and BEV) were on the road.

Although in absolute terms this is still a negligible vehicle fleet (0.3%) of the total), with the increase in supply, the drop in prices and tax incentives, LAC is emerging with great potential for growth in sales of 100% electric cars.

The fleet of electrified light vehicles has grown in the last 4 years (2020-2024) more than 14 times, with a very significant increase in the fleet of plug-in hybrid vehicles (PHEV) of approximately 17 times. Meanwhile, pure electric vehicles (BEVS) have increased 12-fold in this period.

Source: Global EV Outlook 2024 - IEA.



It should be noted that from 2023 to the first half of 2024, the region's 100% electric vehicle fleet has increased by 60%, so it is likely that by the end of the year it has doubled.





Source: OLADE, own elaboration based on information from national statistics.

In the first half of 2024, the countries with the largest presence of electric light vehicles (PHEV and BEV) in circulation were: Brazil, Mexico, Costa Rica, Colombia and Chile. Brazil is the leader with 152,493 units.



Figure 6. Ranking of the 5 countries with the highest number of electric vehicles in the first half of 2024.



Source: own elaboration based on information from national statistics.

Following the ranking of the top 5 positions, in the rest of the LAC countries, the leadership is held by Uruguay with 5,950 electric vehicles in circulation, surpassing larger and more populated countries such as Ecuador, Guatemala and Argentina.



Figure 7. Number of electric vehicles in the first half of 2024, other LAC countries.

Source: OLADE, own elaboration based on information from national statistics.



In terms of the number of electrified vehicles per capita, the ranking is led by Costa Rica with 34.3 electrified vehicles per 10,000 inhabitants, followed by Uruguay with 17.4, while Brazil ranks third with 7 electrified vehicles per 10,000 inhabitants.





Source: OLADE, own elaboration based on information from national statistics.

In the case of LAC as a region, the indicator of the number of electric vehicles per capita is 3.8 units per 10,000 inhabitants, which is still a fairly low value compared to that of China (241.4), Europe (183) and the U.S. (72.4).

3.2. Electric buses in Latin America and the Caribbean

In terms of the fleet of electric buses, LAC ranks highly in the world, with Chile being the country with the largest number of electric buses in circulation after China.

In the last 3 years, the total fleet of electric buses (including trolleybuses) in the region has increased by 160%, highlighting the growth in the number of battery electric bus units, with 386% in that period.





Figure 9. Evolution of the electric bus fleet in LAC 2020 - 2023.

Source: OLADE, own elaboration based on information from national statistics.

In 2023, there were 5,084 electric buses in LAC.

The ranking is led by Chile with 1,849 units followed closely by Colombia with 1,590 units. In the per capita indicator (units/million inhabitants), Chile and Colombia also lead, followed in third place by Uruguay.

Figure 10. Ranking of the LAC countries with the highest number of electric buses in circulation as of 2023.



Source: OLADE, own elaboration based on information from national statistics.



LAC as a region currently has 7.7 electric buses per million inhabitants, surpassing Europe (3) and the U.S. (0.9) but well below China (299.2).

3.3. Charging stations

The recharging infrastructure of electric car batteries is a relevant factor for the development of electromobility.

In 2023, there were 4,848 public charging stations in Latin America and the Caribbean.

Brazil and Mexico lead the ranking of the countries with the highest number of charging stations in LAC, far surpassing the countries that follow, such as Chile, Colombia and Uruguay.

However, regarding the indicator that relates the number of charging stations to the number of plug-in vehicles in circulation, the top 5 positions are occupied by Jamaica, Panama, Honduras, Chile and Argentina.



Figure 11. Ranking of the LAC countries with the highest number of charging stations as of 2023.

Source: OLADE, own elaboration based on information from national statistics.

The previous indicator for the LAC region is 3.3 charging stations per 100 electric vehicles, which places it above Europe (1.3) and the United States (2.8), but below China (5.1).



That is, the region has been deploying charging infrastructure, although we must not lose sight of the fact that, in absolute terms, the size of the LAC electric vehicle fleet, compared to these other countries and regions, is still very small.

On the other hand, it is also very important to move towards fast-charging chargers, so that not only the charging time is as short as possible, but also so that long-distance trips can be programmed according to the autonomy of the vehicles. There is already charger technology that allows you to have a driving range of close to 300 km in 5 minutes.

3.4. Projections of electromobility growth in LAC: Scenarios

IEA studies² indicate that by 2030 there will be around 250 million light electric vehicles in the world.

In turn, a recent IDB study³ indicates that around 1.2 million electric vehicles would be sold annually in our region by 2030 and the stock would reach almost 5 million.

By 2030, China and other current leaders will be consolidated as mature markets, and emerging countries and regions such as Latin America and the Caribbean will be the markets that will grow most dynamically, increasing their relative share of the world market.

Projections indicate that by 2030, our region could account for 4% of annual sales of electric vehicles in the world. In that case, the total number of vehicles in the region would be on the order of 10 million units.

On the other hand, in order to have magnitude parameters, if we assume that the growth trend of recent years in the region is maintained⁴, in an optimistic scenario, the projections are as follows:

i) Considering that the number of BEVs and PHEVs in LAC has been doubling annually in recent years, if this trend continues, by 2030 the number of <u>light electric vehicles</u> could reach 20 million units.

² Global EV Outlook 2024.

³ Towards sustainable integration: the potential of electromobility in Latin America and the Caribbean.

Technical Note TN-2805, IDB, INTAL, October 2024.

⁴ The annual growth rate has doubled.



ii) In relation to <u>electric buses</u>, if the annual growth rate recorded in recent years for the LAC fleet is maintained (50.6% for battery buses and 1.6% for trolleybuses), by 2030, the region would have around <u>72 thousand units</u>. The main growth would be in battery electric buses.



Figure 12. Projection of the electric bus fleet in LAC to 2030.

iii) According to these projections, it is estimated that the <u>energy required</u> to supply this vehicle fleet until 2030 would reach 46,943 GWh, which represents 3% of the current total generation in the region.

Source: OLADE, own elaboration.



Figure 13. Projection of energy required by the electric vehicle fleet in LAC to 2030.

Source: OLADE, own elaboration.

- iv) The <u>installed capacity</u> needed to generate this new electric energy consumed by the electric vehicle fleet (BEVs, PHEVs and electric buses) in LAC by 2030 would be 11,405 MW, which is equivalent to 2% of the region's current installed electric generation capacity.
- v) This entails an additional effort to make <u>investments in renewable energy</u> of approximately US\$10 billion.

Figure 14. Projection of installed capacity to supply the electric vehicle fleet in LAC by 2030.



Source: OLADE, own elaboration.



That is, the growth will be exponential and, by 2030, the possible scenarios for the stock of electric vehicles in LAC are as follows:

- i) a conservative scenario, 5 million units;
- ii) an intermediate scenario is 10 million; and
- iii) an optimistic scenario that maintains the recent growth of the electric fleet, would reach 20 million.

In short, whatever the scenario, as shown in Table 1, the investment required in renewable energies to cover this new demand for transport electrification in the region will be substantial.

Scenarios/ Requirements	Stock electric vehicles (million)	Electricity <i>(GWh)</i>	Installed renewable energy capacity <i>(MW)</i>	Investment required (US\$ Millions)
Conservative	5	11,736	2,851	US \$ 2,5 00
Intermediate	10	23,472	5,703	US\$ 5,000.
Optimistic	20	46,943	11,405	US\$ 10,000

Table 1. Growth of electromobility in LAC by 2030 – Scenarios

Source: OLADE, own elaboration.

3.5. Regulations related to electromobility in LAC

In order to promote the development and progress of electromobility in LAC countries, governments have been implementing a series of regulatory instruments with incentives for the use of this transportation technology, such as: tax exemptions, preferential energy rates for electric vehicles, exemption from mobility restrictions and parking facilities in public spaces.

The issue of electromobility has also been included in the enactment of sectoral laws, such as those promoting energy efficiency and environmental protection; and international agreements on interoperability and standardization of electric car battery charging systems are being promoted, encouraging the creation of regional clean mobility corridors.

In the following tables, you can see the instruments and incentives that the different LAC countries have implemented in this area. The green check mark means that the country has it, the red x means that it does not have it and the yellow bar means that the item is slightly developed.



COUNTRY/INCENTIVE	SUBSIDY TO THE PURCHASE VALUE	EXEMPTION/RE DUCTION OF IMPORT TAX	EXCEPTION OF TOLLS/PARKINGS	EXEMPTION OF VECHICLE RESTRICTIONS	PREFERENTIAL ELECTRICITY TARIFF	CHARGING CENTERS REGULATION	ELECTRIC MOVILITY NATIONAL STRATEGY
Argentina	×	×	×	×	×	×	X
Bolivia	\checkmark	\checkmark	×	×	\checkmark	\checkmark	X
Brazil	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark	\checkmark
Chile	×	×	X	\checkmark	\checkmark	\checkmark	\checkmark
Colombia	\checkmark	\checkmark	\checkmark	\checkmark		\checkmark	\checkmark
Costa Rica	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Ecuador	\checkmark	\checkmark	\checkmark		\checkmark	×	\checkmark
El Salvador	\checkmark	\checkmark			×	×	X
Guatemala	\checkmark	\checkmark			×	\checkmark	
Jamaica	×	\checkmark	X	x	\checkmark		\checkmark
Mexico	\checkmark	\checkmark		\checkmark	\checkmark	\checkmark	
Panama	x	\checkmark	×	×	×	\checkmark	
Paraguay	\checkmark	\checkmark		\checkmark	×	\checkmark	\checkmark
Peru		×		×	×	×	X
Uruguay	√	\checkmark	×	×	 Image: A start of the start of	\checkmark	\checkmark

Table 2. Instruments to promote electromobility.

Source: OLADE, own elaboration based on information from national statistics.

Table	3.	Stand	ardiza	tion	and o	berabili	itv.
						F	· / ·

COUNTRY/INCENTIVE	ENERGY EFFICIENCY LAW	STANDARDS FOR THE FUNCTIONING OF ELECTRIC VEHICLES	CHARGING INFRASTRUCTURE STANDARDIZATION	I STANDARDS FOR COMMUNICATION AUTO-GRID	LIGHT VEHICLES' EMISSIONS 1 REDUCTIONS
Argentina	\checkmark	×	×	×	\checkmark
Bolivia			\checkmark	×	\checkmark
Brazil	\checkmark	\checkmark	\checkmark		\checkmark
Chile	\checkmark	-		×	\checkmark
Colombia	\checkmark	-	\checkmark	\checkmark	\checkmark
Costa Rica	\checkmark	✓	\checkmark	×	\checkmark
Ecuador	\checkmark	\checkmark	 Image: A set of the set of the	×	✓
El Salvador		\checkmark	×	×	\checkmark
Guatemala	\checkmark	×	\checkmark	×	 ✓
Jamaica	\checkmark			×	\checkmark
Mexico	\checkmark	×	\checkmark	×	\checkmark
Panama		×	×	×	
Paraguay	\checkmark	\checkmark	\checkmark	×	\checkmark
Peru	\checkmark	\checkmark	\checkmark	×	\checkmark
Uruguay	\checkmark	\checkmark	\checkmark		\checkmark

Source: OLADE, own elaboration based on information from national statistics.

COUNTRY/INCENTIVE	ACCESS TO EXCLUSIVE LANES HOV OR BUS	FREE PREFERENTIAL PARKINGS	EXEMPTION OF VEHICLE RESTRICTIONS	TOLL DISCOUNTS	CHARGING STATIONS
Argentina	×	×	×	×	
Bolivia	×				\checkmark
Brazil	×	×	×	\checkmark	\checkmark
Chile	×	\checkmark	\checkmark	\checkmark	\checkmark
Colombia	×	\checkmark	\checkmark	\checkmark	\checkmark
Costa Rica		\checkmark	\checkmark	\checkmark	\checkmark
Ecuador	×		×	×	\checkmark
El Salvador	×	\checkmark	×	×	
Guatemala	×	\checkmark	\checkmark	×	\checkmark
Jamaica			×	×	
Mexico	×	\checkmark	\checkmark	\checkmark	\checkmark
Panama	×	×	X	×	\checkmark
Paraguay	×	\checkmark	\checkmark	×	\checkmark
Peru	×	\checkmark	\checkmark		\checkmark
Uruguay	×	×	×	X	\checkmark

Table 4. Circulation and reliability.

Source: OLADE, own elaboration based on information from national statistics.

Table 5. Other types of incentives.

COUNTRY/INCENTIVE	LEASING	ENVIRONMENTAL COMMITMENTS' AGREEMENTS
Argentina	×	
Bolivia		\checkmark
Brazil	×	\checkmark
Chile	×	\checkmark
Colombia	\checkmark	
Costa Rica	\checkmark	\checkmark
Ecuador	×	\checkmark
El Salvador		\checkmark
Guatemala		\checkmark
Jamaica	\checkmark	\checkmark
Mexico	x	\checkmark
Panama	×	\checkmark
Paraguay	\checkmark	\checkmark
Peru		\checkmark
Uruguay	×	\checkmark

Source: OLADE, own elaboration based on information from national statistics.



In general terms, most of the countries have regulatory frameworks that promote electric mobility to a lesser or greater extent, which indicates that there are very successful cases whose experiences can be replicated in other countries, which constitutes a potential in the region.

The analysis shows that one of the challenges facing the region is the freight infrastructure, especially the issue of interoperability through the standardization of auto/network communication, which is still at an early stage.

Likewise, it is observed that, in most of the countries analyzed, there are incentives through subsidies for the purchase of electric vehicles and there are exemptions in terms of reduction of import taxes. On the other hand, approximately 40% of the countries studied have preferential electricity tariffs.

4. Conclusions

Although there is still a long way to go for LAC to catch up with the most developed countries in terms of electromobility, the progress made by this transportation technology in recent years is notorious, as evidenced by the exponential growth in sales and the size of the fleet of electrified cars and electric buses in circulation.

One of the gaps for the development of electromobility in the region is the deficit in charging infrastructure. In some countries a vicious circle has been generated, where the deficit of charging infrastructure hinders the demand for 100% electric vehicles and at the same time the still relatively low supply discourages investment in charging stations.

Encouraging home charging of electric vehicles will help reduce dependence on the public street charging grid.

Due to the high availability of renewable resources that many LAC countries have for electricity generation, and the potential for further expansion, the region is ideal for the development of electromobility as an effective mechanism for reducing both local environmental pollution and global greenhouse gas emissions.

In addition to clean energy generation, countries need to invest in transmission and distribution networks to enable the expansion of vehicle charging infrastructure.



Countries such as Brazil, Mexico, Colombia and Chile stand out in terms of the absolute size of their electric vehicles; however, in relative terms to their population, countries such as Uruguay, Costa Rica, Panama and Chile deserve special mention.

Most LAC countries have implemented or are in the process of implementing regulatory and public policy instruments to encourage the transition of their transportation sector towards electromobility.

Nevertheless, a more ambitious goal is to have green international corridors, with sufficient and standardized freight infrastructure and related services.

More and more people are living in cities, almost 70% of the population will be living in urban areas by 2050⁵, so designing livable cities is an absolute necessity and mobility plays a central role in this, and the more sustainable it is, the better the quality of life for people.

It is essential to analyze these phenomena in depth, to seek synergies that will allow progress to be made in this direction, and to generate the necessary ecosystems to put on the agenda and implement the various measures that the issue requires.

This Technical Note aims to contribute to this debate based on the reality of Latin America and the Caribbean and contribute to the monitoring of this issue in our region.

⁵ Source: World Bank

https://www.bancomundial.org/es/topic/urbandevelopment/overview#:~:text=En%20el%20mundo%2C%20m%C3% A1s%20del,crecimiento%20y%20proporcionar%20servicios%20b%C3%A1sicos.



