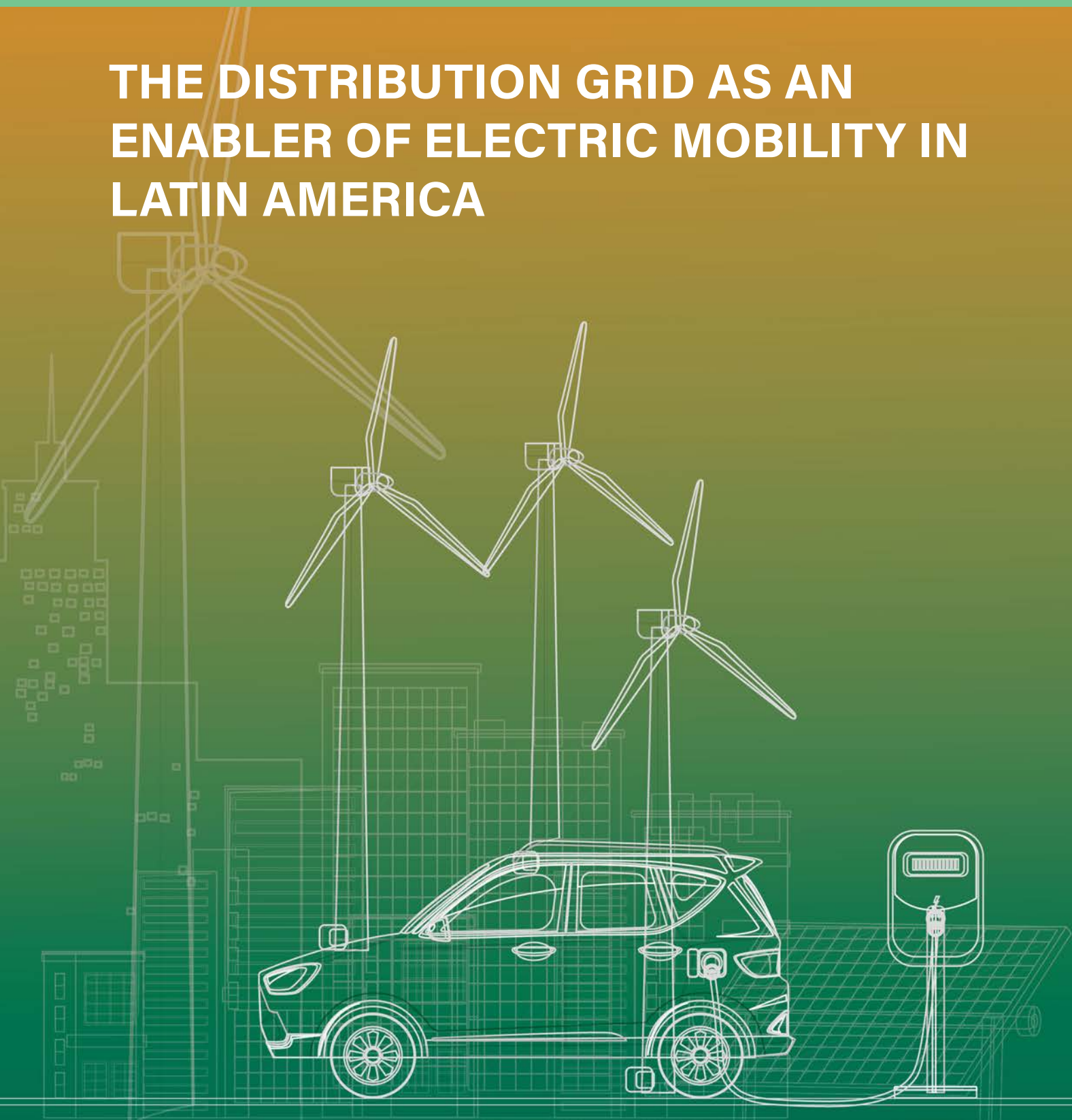


EXECUTIVE SUMMARY DSO BRIEF

THE DISTRIBUTION GRID AS AN ENABLER OF ELECTRIC MOBILITY IN LATIN AMERICA



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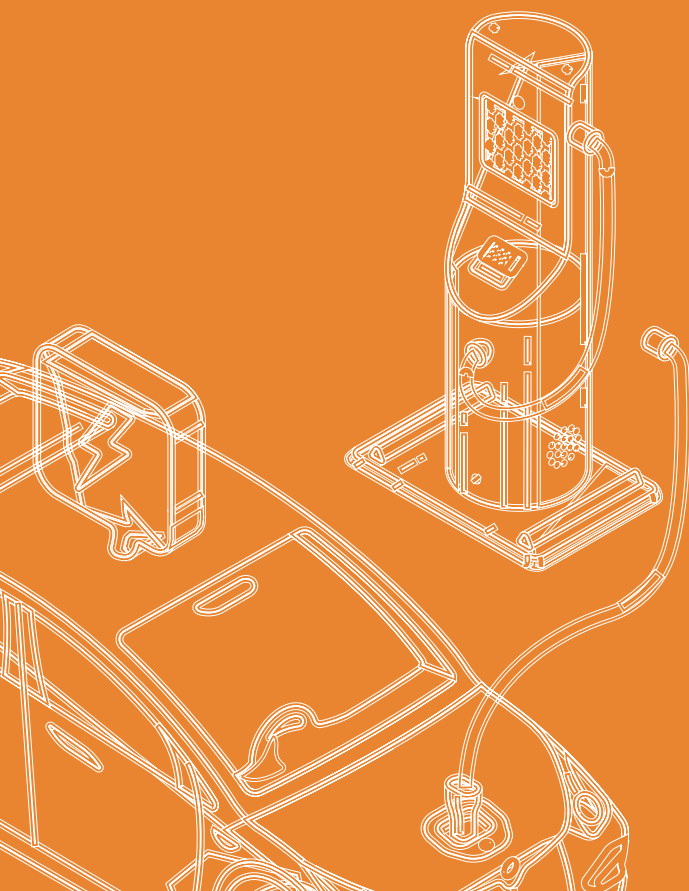
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01

Electric mobility has experienced growth of more than 260% in the most representative countries of Latin America (Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru, Dominican Republic, and Uruguay) over the last two years. This trend has been driven by a combination of factors, including environmental concerns, the reduction in battery costs, and an increase in the availability of electric vehicle (EV) models. However, the electric vehicle market is still emerging compared to developed countries.

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development phase. Brazil already has about 2250 public charging points, while in Mexico there are around 1631, this same trend is observed in Chile (471), Costa Rica (400), Colombia (347), Argentina (149), and Uruguay (97). Energy companies are playing a crucial role by investing in the expansion of this infrastructure, reflecting the growing awareness of the importance of charging infrastructure to support the transition to electric mobility in Latin America.

The impact of public policies on the development of electromobility in Latin America is very important, as they can facilitate or hinder the transition to cleaner, more efficient, and sustainable transportation. Countries that have adopted public policies with comprehensive incentives or focused on promoting EV achieved better performance in sustainable mobility. Some of the aspects that public policies can influence are:

- The supply and demand of electric vehicles, through economic, tax, regulatory, and normative incentives that stimulate their acquisition and use.
- The charging infrastructure, through the promotion of public and private investments, the definition of technical standards, and the regulation of the charging services market.
- The integration of electric mobility with the energy system, by promoting renewable energy generation, demand management, and optimization of the electrical grid.
- The social and territorial inclusion of electric mobility, through the development of electric public transportation systems, the promotion of electric micro-mobility, and attention to the needs of the most vulnerable population.

- The innovation and industrial development of electric mobility, by supporting research, technological development, training, and creation of local value chains.

Many countries in Latin America have implemented incentives to encourage the adoption of electric vehicles. These include tax exemptions, discounts on the purchase of electric vehicles, and preferential parking policies. Regulations are also evolving to promote electric mobility as a key factor in achieving CO2 emission reductions. Local governments also have an important role in ensuring that city planning defines the enablers for the growth of networks, promoting space for substations, underground lines, and construction norms in dense regions.

The following table summarizes the comprehensive framework of policy, regulation, and incentives for electromobility in a sample of Latin American countries:



Countries that have adopted public policies with comprehensive incentives or focused on promoting EV achieved better performance in sustainable mobility.

Table 1: Framework of Policy, Regulation, and Incentives for Electromobility.

Areas	Componentes	Argentina	Brazil	Colombia	Ecuador	Mexico
Standardization and Interoperability	Energy efficiency					
	Operation of electric vehicles					
	Charging infrastructure					
	Vehicle-to-grid communication					
	Emissions from light vehicles					
Circulation and Reliability	Access to exclusive HOV or bus					
	Preferential/free parking					
	Exemption from vehicular restriction					
	Discounts on circulation payments					
	Charging infrastructure					
Expansion of Offer and Facilitation of Acquisition for Users	Subsidies					
	Tax exemptions					
	Post-purchase discounts					
	Income tax credits					
Generation of Environments Promoting Electromobility	Shared transportation services					
	Secondary use for batteries					
	Leasing					
	Environmental commitments					
Interrelation with Electricity Sector	Distributed generation					
	Dynamic tariff by time of use					

Source: Kerrigan (2022). Políticas públicas relacionadas con la electromovilidad en

Despite evident progress, the adoption of electric vehicles in Latin America faces significant challenges. The initial barrier has been the high initial cost compared to internal combustion vehicles, but price reduction also depends on greater competition in the market by importers and sellers, which drives the need to implement strategies to reduce the price gap and promote tax incentives, so that electric vehicles are more accessible to consumers. In addition, the lack of public awareness about the technology, its benefits, and the perception of limited initial autonomy, requires educational programs to boost consumer acceptance and confidence.

It is also essential to ensure an efficient and accessible charging network, promote battery manufacturing, drive battery management and recycling projects, provide specialized technical training, develop a local supply chain that encompasses components and services linked to electric vehicles, grant tax exemptions, provide incentives for electric mass transportation, and

set more ambitious goals in emission reduction, among other initiatives.

All this requires a stable framework that attracts the necessary private investments and allows the recovery of investments with a reasonable profit. The remuneration model of electric utilities as key players can be decisive in undertake investments and it should be valued that the investments made are recognized from a real asset base (RAB) scheme, so adjustments may be required in the regulatory models of those countries where the remuneration scheme allocate a significant risk to the distributor that their investments are not fully recognized by the Regulator.



02

BENEFITS AND ADVANTAGES OF ELECTRIC MOBILITY IN LATIN AMERICA

A prospective study conducted by Enel Group - in collaboration with Deloitte - for eight Latin American countries found that in 2021, the transport subsector contributed between 31% and 48% of the total emissions of the energy sector, making it one of the niches where GHG emissions can be reduced the most. The results projected establish that reductions of up to 96% can be achieved if decisive policies are implemented in the electrification of mobility.

Additionally, In a region that often faces air quality problems and noise pollution from traffic noise,

the adoption of electric vehicles can significantly contribute to improving the quality and life expectancy of people. The greatest impact due to its importance is on health. In 2016 alone, more than 80,000 people in Latin America died from diseases related to fossil fuel emissions. The complete transition to electromobility would produce savings of 30 billion dollars in public health in the Latin American and Caribbean region. Likewise, the effect that exposure to permanent noise has on health is important. The electric vehicle can help in the reduction given that the noise generated by the electric vehicle can be up to 20db lower at low speeds than that of a combustion vehicle and can reduce the impact in highly populated areas.

The transition to electric mobility also presents economic and social benefits that can contribute to the sustainable development of the region, leveraging available resources and promoting autonomy in the energy matrix. Latin America

is rich in natural resources, including renewable energy sources such as hydroelectric, solar, wind, and marine energies. Electric mobility facilitates the integration of these resources into the energy matrix, promoting diversification, reducing dependence on fossil fuels, and strengthening energy security.

Regarding electric mobility, economic opportunities arise for countries in the region, leading to new production chains and businesses, as it implies an industrial reconversion that stimulates the adaptation of the automotive industry and generates new job and entrepreneurship opportunities in activities such as battery manufacturing and recycling, charge management, and new businesses in mechanics and review of electric vehicles. This process not only drives technological innovation but also creates high-quality local jobs, strengthening the industrial and technological infrastructure of the region.

On the other hand, the reduction of dependence on fossil fuels through electric mobility can have a stabilizing impact on energy prices, reducing the economic vulnerability of the region. In addition, solar generation presents better energy efficiency compared to the surface used by energy crops, such as ethanol. This not only avoids direct competition with food crops but also contributes to reducing pressure on their prices.

Electric mobility can improve the competitiveness and productivity of companies that use vehicles, by reducing their operating and maintenance costs, and increasing the availability and reliability of transportation services.

On the other hand, the massification of electric vehicles encourages the installation of smart charging systems that can be managed to take advantage of periods of lower electrical

demand. This flexibility contributes to efficient management of the electrical distribution infrastructure and improves the integration of intermittent renewable sources.

Finally, with electric mobility, an improvement in efficiency is projected due to the change in energy (electrification of demand), resulting in a decrease in the growth rate of energy consumption in the transport sector.

To materialize these benefits, it is necessary for Latin America and the Caribbean to move from pilot projects to the massification of low-emission transport, through comprehensive, coordinated, and participative planning that involves different public and private actors, and that considers the needs and characteristics of each country and region.

03

DRIVERS OF ELECTRIC MOBILITY IN LATIN AMERICA

The development of electromobility is an opportunity to relaunch industrial support policies for regional vehicle manufacturing, complementary infrastructure, and control systems, with an integrative vision that takes into account new realities of urbanization, technological developments, and demographic transition. The opportunity is unique to grow not only in vehicle assembly but also to take advantage of the region's benefits, such as the availability of lithium (Argentina, Chile, Peru, and Bolivia) and graphite (Brazil), to establish a processing and battery assembly industry.

Additionally, the development of a recharging network for electric vehicles is crucial to promote electric mobility. Various approaches have emerged globally to address this challenge, which may be of interest when defining different actions in Latin America:

- Public Development through Government Investment
- Public-Private Collaboration
- Private Business Models
- Subscription Models and Flat Rates
- Incentives for Companies and Businesses
- Residential Charging Development
- Strategies for Urban Areas
- Smart Charging Programs
- Electric Shared Vehicle Initiatives
- Integration with Renewable Energies
- Digital Charging Service Platforms
- Agreements with Battery Manufacturers

- Collaborative University Pilot Projects
- Education and Awareness Programs
- The DSO as a Enabler of Technology

The path to sustainable mobility may vary depending on the region, the country's idiosyncrasies, strategic plans, and its financial and industrial capacity. Although there are no pure development models, some key drivers that have boosted development in other regions can be identified, as (i) Political Drive, (ii) Regulation and Collaboration, (iii) Infrastructure Development, (iv) Financial Incentives, (v) Innovation and Industrial Collaboration, and (vi) Gradual Approach.

04

IMPORTANCE OF THE DISTRIBUTION GRID IN ELECTRIC MOBILITY

The impact of the total electrification of mobility on system demand is estimated to be between 6% and 25% of the total electricity demand of national systems, so a gradual evolution is necessary to adapt to the new demand. To meet the growing electrification of consumption that electric mobility entails is the need for a modern, digital, automated, secure, resilient, flexible, sustainable distribution grid with sufficient hosting capacity, which will require new investments that should be supported by the regulatory frameworks of Latin America, generating certainty in returns and allowing efficient planning that encourages innovation and technological improvements.

While electric vehicles do not involve short/medium-term power problems for regional low-voltage electrical systems, there are requirements for adaptation and expansion of the grid at medium voltage levels. From the experience observed in countries where electric mobility has greater penetration, nighttime charging will be the most used, so attention must be paid to the effect that peak hours could have on the system.

Considering the necessary power based on the charging patterns of EVs, investments in grids will be required to optimize the electrical infrastructure, in order to enable an interaction between the DSOs and electric vehicles as active participants in the electrical system that contribute to the stability of the supply, within the following parameters:

- **Node Congestion:** Based on instantaneous demand.

- **Simultaneity Factor:** The duration of low-power nighttime charging implies an increase in the simultaneity factor, which may require the punctual reinforcement of transformer centers and management systems, specially if intelligent charging systems capable of rationalizing demand at supply points are not used.

- **Low Voltage Generation Assets:** Provide power close to consumption points, which will decrease the need for transformation during charging, although during low demand hours they can produce reverse flow effects in transformer centers.

- **Electric Vehicle as a Flexibility Element:** Greater integration of low voltage generation assets with chargers and control centers of DSOs can make the necessary investments more flexible and reduce system costs.

- **Limits of the Grids Code and Other Regulations:** National grid codes define physical restrictions in terms of voltage and frequency variations that system operators must observe, and investments in grids reinforcement if these specific country limits are exceeded due to electric vehicle charging.

Furthermore, the dependence of electric mobility on the quality of the distribution grid is vital. This raises the need for DSOs in Latin America to have the appropriate incentives to make the required investments to improve the quality of distribution in the medium term, so that the new uses associated with the electrification of mobility have adequate system support that ensures capacity and continuity.

The distribution grid plays an enabling role in the recharging service. Therefore, the management of the DSO will be key in executing and rationalizing the investments that address the following needs:

- **Charging Infrastructure:** DSOs could be responsible for planning, building, and maintaining the charging infrastructure for electric vehicles in their service areas. This includes the installation of charging stations in strategic locations, such as public parking lots, shopping centers, urban areas, and highways. This requires appropriate regulatory signals that enable the development of these activities by the DSOs.

- **Energy Supply:** DSOs must ensure a reliable and high-quality energy supply for charging electric vehicles. This involves managing the available electrical capacity and planning to meet the growing demand for electric vehicle charging.

- **Integration of Renewable Energies:** Many distributors are working on integrating renewable

energy sources, such as solar and wind, into their electrical grids. This is important to ensure that electric vehicle charging is as sustainable as possible and to reduce greenhouse gas emissions.

- Special Rates for Electric Vehicle Charging:

DSOs, as established by the authorities, can offer basic information to create special electrical rates (binomial and with time differentiation) for electric vehicle charging, which can make it more affordable for vehicle owners to charge during certain hours of the day.

- Smart Grids Development: Smart electrical grids allow for more efficient energy and charging management. DSOs will need to invest in digital technologies that facilitate grid observability to rationalize investments and facilitate electric vehicle charging during off-peak hours and balance the load on the grid.

- Public Education and Awareness: Distributors can play an important role in public education and awareness about electric mobility. They can inform customers about the benefits of electric vehicles and provide information about the available charging infrastructure.

- Collaboration with Government and Industry: DSOs can collaborate closely with local and national governments, as well as with the automotive industry and other stakeholders, to develop technical regulations, policies, and regulations that transform the grid for electric mobility and establish alliances that promote the expansion of charging infrastructure and encourage the adoption of electric vehicles.

- Data and Charging Analysis: DSOs can collect data on electric vehicle charging, such as usage patterns and charging station locations. This data is valuable for infrastructure planning

and demand management.

- Technical Support and Customer Services:

DSOs can offer technical service and assistance to customers who wish to install chargers in their homes or businesses.

- Grid Flexibility: In which the electric vehicle is part of the system, it allows providing auxiliary services for the stability and quality of the electrical supply, such as voltage compensation, congestion management, among others. This includes planning large-capacity vehicle charging centers, such as public transport, to balance the use of grids.

- Energy Storage: Although the battery of a vehicle does not have the storage capacity necessary to be relevant in an electrical system, millions of units will. When connected at low voltage, it will be a principal role of the DSO to give them entry into the system in a way similar to self-consumption, and integrate their services.

05

PERSPECTIVES OF ELECTRIC MOBILITY IN LATIN AMERICA

The future of electric mobility in Latin America is promising, with prospects for continuous growth and accelerated technological developments. Forecasts indicate that adoption of electric vehicles in the region will continue to grow in the coming years. As battery prices continue to decrease and charging infrastructure expands, more people will be attracted to this technology. For Latin America, a study by Frost & Sullivan points out that by 2025, around 114,700 hybrid vehicles will be sold throughout the region (+26% annually), while sales of plug-in hybrids could reach 20,300 units (+36% annually) and battery electric vehicles would reach 23,300 units (+50% annually).

On the other hand, electric vehicle technology will continue to advance with changes in charging systems that will allow energy to be returned to the grid, improvements in battery autonomy, and the need for superchargers of more than

300 kW that will allow faster charging times and enhanced safety features.

Innovation in battery chemistry and manufacturing will also play a key role in the development of electric mobility, improving energy density, reducing charging anxiety, and modifying the topology of charging networks.

Shared mobility, such as carsharing and electric ride-hailing, will play an important role in promoting electric mobility. These services allow more people to experience the benefits of electric vehicles without the need to own one, with various models depending on where the vehicles are located (station-based or free-floating), with parking regulation in cities being key.

It is expected that governments in Latin America will continue to implement policies supporting electric mobility, including tax incentives and favorable regulations. Changes in energy policy could also further boost the adoption of electric vehicles.



06

RECOMMENDATIONS

These recommendations seek to guide efforts towards successful, sustainable, and accessible electric mobility for everyone in Latin America.

- Investment and Cooperation: Sustained investment and cooperation among governments, companies, and civil society are urgently needed to strengthen the electric charging infrastructure. Public-private collaboration is essential to accelerate the deployment of charging stations and achieve an efficient transition to electric mobility.

- Education and Public Awareness: Implement educational campaigns to increase public awareness of the economic, social, and environmental benefits of electric mobility. General understanding of the technology and its advantages will significantly contribute to overcoming the barrier of lack of knowledge.

- Clear Incentives and Policies: Jointly with regulatory authorities, propose fiscal incentives and clear policies that encourage the adoption of electric vehicles. The reduction of economic barriers through tax exemptions and subsidies will boost demand, while effective regulations will support the orderly growth of the sector and infrastructure.

- Development of Local Industry: Promote local manufacturing of key components, such as batteries, to reduce costs and create employment. Establishing

strategic partnerships between automotive companies, technology providers, and governments will foster innovation and growth in the electric industry.

- Energy Planning: Integrate the planning of electric mobility with energy strategies. Evaluate and anticipate the impact of mass charging of electric vehicles on the electrical grid, prioritizing investments and updates to ensure a smooth, flexible, and sustainable transition.

- Research and Development: Encourage R&D in innovative energy storage technologies, improvements in battery efficiency, and innovative solutions to address current challenges.

- Commitment to Sustainability: Promote companies' commitment to sustainable practices. Driving the adoption of electric vehicle fleets in companies and key sectors will contribute to emission reduction and set a positive example for society.

As the demand for electric vehicles grows, governments must balance attracting consumers with incentives while addressing concerns about an effective charging station network. Investment in infrastructure, collaboration with stakeholders, adoption of technologies, and transparency are essential to create a robust ecosystem that supports the widespread adoption of electric vehicles. Only through a comprehensive approach can governments achieve a balance between incentives and the consumer's need for a reliable and accessible charging network.

