



Urban Pathways

EVALUATION MODEL FOR PUBLIC TRANSPORT SYSTEM IN LATIN AMERICAN CITIES IN THE CONTEXT OF THE NUMPS IN URUGUAY AND ECUADOR



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Project concept

Project aims

The Urban Pathways project helps delivering on the Paris Agreement and the NDCs in the context of the New Urban Agenda and the Sustainable Development Goals. It has established a facility in close cooperation with other organisations and networks active in this area to support national and local governments to develop action plans and concrete implementation measures to boost low-carbon urban development. This builds on UN-Habitat's role as "a focal point on sustainable urbanisation and human settlements including in the implementation and follow-up and review of the New Urban Agenda". The project develops national action plans and local implementation concepts in key emerging economies with a high mitigation potential. The local implementation concepts are being developed into bankable projects, focusing on the access to urban basic services to create a direct link between climate change mitigation and sustainable development goals.

The project follows a structured approach to boost Low Carbon Plans for urban mobility, energy and waste management services that deliver on the Paris Agreement and the New Urban Agenda. The project works on concrete steps towards a maximum impact with regards to the contribution of urban basic services (mobility, energy and waste management) in cities to global climate change mitigation efforts and sustainable and inclusive urban development. This project makes an active contribution to achieve global climate change targets to a 1.5°C stabilisation pathway by unlocking the global emission reduction potential of urban energy, transport and resource sectors. The project will contribute to a direct emission reduction in the pilot and outreach countries, which will trigger a longer term emission reduction with the aim to replicate this regionally and globally to make a substantial contribution to the overall emission reduction potential.

This project implements integrated urban services solutions as proposed in the New Urban Agenda providing access to jobs and public services in urban areas, contributing to equality and social coherence and deliver on the Paris Agreement and the Sustainable Development Goals. This is the first dedicated implementation action oriented project, led by UN-Habitat to deliver on inclusive, low-carbon urban services. Securing sustainability and multiplier effect, the project aims to leverage domestic and international funding for the implementation projects that will follow from this initiative



Urban Pathways



Urban Pathways Project and Replication Cities

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BACKGROUND

Urban mobility plays a key role in delivering on national objectives under the Paris Agreement, the Sustainable Development Goals and the New Urban Agenda. National governments play a key role in shaping urban mobility policy, planning and investment through, for example, the regulation and taxation of vehicles and fuel use, through the transfer of power to local authorities, and through the management and appropriation of national land transport funds.

The complexity of urban mobility systems requires a strong policy framework on the national level that supports integrated urban design, enables the shift to low-carbon mobility and fosters the take-up of innovative vehicle technologies and mobility services.

In this context, the project SOLUTIONS-Plus, funded by the European Union's Horizon 2020 research and innovation program under grant agreement No 875041, establishes a global platform for shared, public, and commercial e-mobility solutions to kick start the transition towards low-carbon urban mobility. The project encompasses city level demonstrations to test different types of innovative and integrated e-mobility solutions, complemented by a comprehensive toolbox, capacity development and replication activities.

This report aims to support the project with the identification of strengths and gaps in the ongoing processes for the construction of the National Urban Mobility Plans (NUMPs) of

Ecuador and Uruguay and gives further recommendations related with sustainable public transport and electromobility opportunities in those regions.

The support includes an evaluation model for sustainable public transport that can be integrated in the NUMPs and to provide advice to decision makers on the national level (e.g. from the Ministry of Transport and the Ministry of Urban Development) in the process of defining and implementing electromobility as a key component of the NUMPs.

The co-development processes in the SOLUTIONSplus living labs will highlight policy, regulatory, fiscal and operational issues that could inform an NUMP documents at all relevant levels, including:

- a. **National Urban Mobility Plan**, as strategic framework to structure sustainable urban mobility and coordinating mechanisms within government, and
- b. **National Urban Mobility Policies**, as concrete measures for sustainable urban mobility, and
- c. **National Urban Mobility Investment Programs**, to deliver on the objectives and priorities outlined in the NUMP and specify investments from the national level to assist cities in delivering on their individual Sustainable Urban Mobility Plans (SUMPs).

WHAT IS A NUMP?

According to one of the main funders for NUMPs in Latin American, Euroclima+, a National Urban Mobility Policy or Program (NUMP) is an action-oriented strategic framework for urban mobility, developed by national governments, adopted to improve the capacities of cities to plan, finance and implement projects and measures designed to meet the mobility needs of people and businesses in and around cities in a

sustainable manner. It builds on existing policies and regulations and aims to harmonize relevant laws, regulations, sectoral strategies, and support and investment programs towards an integrated approach oriented towards the benefits of cities and their inhabitants. It also takes due account of the principles of participation, monitoring and evaluation (Euroclima+ 2020).

METHODOLOGY

The revision of the NUMPs for further recommendations entail two parts:

- 1) the analysis of how public transport is included within the NUMPs and possible sustainable dimensions, categories, and indicators for its assessment
- 2) the revision of the available documents and meetings with relevant stakeholders that oversee the process of the NUMPs and how how electromobility is included in the NUMPs.

The available documents are as follows:

For Quito:

- Fase No. 3: Táctica: Análisis y profundización estratégica – Contenidos de las Guías Transversales y Técnicas
- Anexo 2 – Diagnóstico de la Electromovilidad en Ecuador

For Uruguay:

- Guía para la planificación de la movilidad urbana sostenible en Uruguay
- Guía de Movilidad Eléctrica de Uruguay

STATUS OF THE NUMPS

The NUMPs in Latin America are supported by the Initiative Euroclima +, a program of the European Union for environmental sustainability and climate change for Latin America. This program intends to reduce the impact of climate change in the region by promoting mitigation and adaptation to climate change, resilience and investment. The Urban Mobility component of Euroclima+ destined 9,3 M€ in 2018 for 19 projects distributed among 12 countries in Latin America. The implementation agencies are GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) and AFD (Agence française para el desarrollo). In the case of Ecuador, the UE, through the AFD as implementation agency, assigned 500.000 Euros to the Ministry of Transport and Public Works for the construction of the NUMP, intended to finalize in 2020. In Uruguay the assignation was 1 M€ for three years process (2018 – 2021).

The implementation agency is the GIZ. In the following sections a detailed analysis of the current status is explained.

NUMPs Ecuador

Funded by the French Development Agency, Mobilize Your City and Euroclima+ under the project “National Development of Low Carbon Emissions”, the NUMP started in 2019. According to the website of [Euroclima+](#) the objective of the project was to define a national strategy for a low carbon mobility, capable of being applied to the local autonomous governments to reduce considerably the effect of the GEI, while maintaining equity and accessibility to the population. The NUMP for different political and technical reasons could not be finished in the planned period. Therefore, the new schedule for the deliverables are as follows:

Phase 1: Initiation	Phase 2: Strategies	Phase 3: Tactics	Phase 4: Final Proposal
Diagnosis and benchmarking of the NUMP 21/04/2021	Strategic vision, definition of objectives and goals 22/08/2021	Tactical Analysis and deepening of the proposal 19/05/2022	Synthesis of the NUMP Guidelines publication 06/2022

The NUMP is composed by four big axes:

- 1) Planification and research for a sustainable urban mobility (sum)
“The National and Urban Plans of SUM achieve quality, coherence and the necessary articulation based on effective, plausible and timely information”.
- 2) Governance, Capacity Development, and rights assurance
“to set up the integrated management system for sustainable urban mobility”.
- 3) Modes of Transport and Technology
“to contribute to the improvement of people’s quality of life and the distri-

bution of goods, under sustainable systems, methods and mechanisms, with the maximum use of available technology.”

- 4) Financing of the sustainable urban mobility
“Ensuring the financial sustainability of urban mobility.”

The cross-cutting themes are three:

- a) Universal access
- b) Resilience (combating, mitigating, and adapting to the adverse effects of climate change)
- c) Gender perspective

The implementation process it is expected in a period of 30 years.

Preparation 2025	Initiation 2030	Advancement 2040	Consolidation 2050
<ul style="list-style-type: none"> Political Decision of the National and Local Governments Essential systems for governance, planification, research and follow-up Development of a baseline 	<ul style="list-style-type: none"> The systems are operating The local plans are adjusted to the National Plan The SUM culture in progress 	<ul style="list-style-type: none"> Processes of SUM started in intermediate and big cities Impacts of SUM on life's quality are tangible Learning and Findings 	<ul style="list-style-type: none"> Processes started of the SUM in all the cities The life's quality improved by the SUM The country ready for new challenges

During the preparation of the NUMP content there were several workshops with different stakeholders from the national and local level, civil society organizations, private sector and academia. The proposed themes that the NUMP should at least contain are the following:

1. Improvement, concordance and articulation of the Land Use Plans, the Land Management Plans and the Mobility and Land Models
2. Creation or modification of a specialized institutional unit for the SUM
3. Criteria and guidelines for the financing of programs and projects related with the SUM
4. Criteria and guidelines for the cross-cutting of climate change commitments related with mobility
5. Mechanisms and procedures for the exercise of rights and citizen participation
6. Sustainable Urban Mobility Plans (SUMP)

The NUMP will also contain three specific technical guidelines chosen among the following topics:

1. Procedures for the control and monitoring of air quality and GHG emissions
2. Integrated fare collection systems and fares policy
3. Systems or procedures for fleet control
4. Mechanisms or procedures for the pro-

5. motion of road safety
5. Methods for working with stakeholders
6. Methods for formulating by-laws
7. Mechanisms for project financing
8. Regulation of light vehicles
9. Urban logistics

NUMP Uruguay

Understanding the impact of mobility on the quality of people's lives, social welfare, and environmental care, Uruguay developed the National Urban Mobility Plan. The general objective of this project is to lay the foundations for a national policy on sustainable urban mobility. The project has various participatory instances where five representative cities are selected as part of the national sustainable mobility policy project and serve as a sample to design measures to be implemented for sustainable urban mobility.

The specific objective of the guide is capacity building to strengthen the development of sustainable mobility within the framework of land planning.

Departmental governments are the protagonists in sustainable mobility planning. Therefore, the objective is to provide departmental government technicians with comprehensive tools for planning and implementing Sustainable Mobility strategies in cities and territories. The guide offers tools to governments that can address specific sectoral land use

plans or complementary mobility tools to the guidelines of local projects.

The document had the first instance in a public project called MOVÉS that seeks a national policy for efficient and sustainable mobility. Later, REDES, a private consultancy, obtained the contract to develop the guide. Intermediate participatory workshops accompanied the entire development of the guide with stakeholders.

The project covers the following aspects:

1. General concepts of SUM
2. The process of planning SUM policies
3. Measures for SUM
 - a. Pedestrians' promotion
 - b. Bicycles
 - c. Public Transport Systems
 - d. Road management and disincentive to the use of private transport
 - e. Freight transport and urban logistics
 - f. Urban development, land use and public spaces
4. Design criteria
 - a. Road design
 - b. Pedestrian infrastructure
 - c. Cyclists' infrastructure
 - d. Public transport infrastructure
 - e. Intermodality elements

After the publication of the guide, the process continues with training workshops for all the country's intendancies.

Institutions related to the project:

- Ministry of environment
- Ministry of Economy and Finance
- Ministry of Industry, Energy, and Mining
- Ministry of Transport and Public Works
- Ministry of Housing and Territorial Planning
- Euroclima plus Program
- German cooperation agency GIZ
- MOVÉS public initiative project

- Private consultancy REDES = Authors of the guide.

The document can be downloaded [here](#)

The Guide for Urban Electric Mobility

The Guide to Electric Urban Mobility in Uruguay is framed within the NUMP project, which seeks to support the development of a National Policy for Sustainable Urban Mobility (P-MUS), with the leadership of the Ministries of Industry, Energy and Mining (MIEM); Environment (MA); Housing and Land Management (MVOT); Economy and Finance (MEF); and Transport and Public Works (MTO), as well as the Office of Planning and Budget (OPP). Funding is provided by the European Union, through the EUROCLIMA+ Program, and management and technical assistance by GIZ.

The document was aimed to be a guide containing the state of the art in electric urban mobility for freight and passengers transport, as well as recommendations for the promotion and implementation of electric mobility at city level in Uruguay.

The electric modes that are considered within this guide are:

Collective Public transport modes:

- Electric buses (micro buses, midi buses, standard buses, articulated buses)
- Trams
- School transport

Light and Individual public transport modes:

- Electric taxis
- Transport on demand by apps
- Three and four-wheelers vehicles

Individual private transport:

- Private vehicles
- Motorcycles
- Three-wheelers, bicycles, cargobikes, e-scooters

Freight transport:

- Heavy duty vehicles: 16,5 ton and 24 ton
- Light duty vehicles: up to 6 ton

- Last mile vehicles: pick-ups of four wheels, three-wheelers, motorcycles, bicycles, cargobikes

Charging infrastructures

GENERAL ANALYSIS AND RECOMMENDATIONS FOR THE NUMPS

The promotion of sustainable transport modes in the national policies is a key action for achievement of climate change goals. In this sense, public transport (PT) systems with low emission technologies, non-motorized transport and other cleaner transport modes should be prioritized by national and local governments.

The promotion of sustainable public transport should include process of monitoring and evaluation of its sustainability. If there is not a baseline, the definition of actions for the improvement of PT systems could be erratic and inaccurate. Therefore, an evaluation framework is mandatory for an efficient planning and management of PT systems in the cities.

In the WP3, a basic evaluation framework was applied for six Latin American cities, including Quito and Montevideo. This framework used four sustainability dimensions: the environmental, the social, the economic and the system effectiveness dimensions. In our criteria a key aspect for achieving sustainability in PT systems, is the participatory approach and the institutional governance. Therefore, we propose a fifth dimension called “governance and comprehensive planning” with its respective indicators for enabling the integrity of a sustainable PT system. The following sustainability evaluation model for Latin American PT systems is proposed to be included in the regional NUMPs:

Dimension	Subdimension	Indicators
	System capacity	Formal public transport split/share Informal public transport split/share Transfers per day per person per mode
		Public Transport Fleet Size Index passenger per km (IPK)

System Effectiveness	Transport Supply	Frequency Operating time of formal PuT Average speed Exclusive lanes for public transport every 100.000 inh Average travel time per day per person
	PT Support system	Payment automatization
Social	Accessibility	Transport network coverage Average user trip distance Percentage of accessible stations/vehicles Average household distance close to PT stop/station
	Safety and security	Transport related fatalities in formal PT Transport related fatalities in informal PT Ratio of annual number of recorded incidents Gender violence in PT in a yearly basis
	Gender Inclusion	Percentage of drivers between 50 and 65 y-o Percentage of female drivers in PT fleet Campaigns for female safety/special PT services for female users
	Affordability	Portion of income devoted to public transport
	Rider comfort	Average public transport place occupancy rate (%) Percentage of bus fleet with air conditioning
	Customer services	Percentage of PT vehicles with on-board information systems Percentage of bus stops with reliable transit passenger information
	Transport expenditure	Annual operating cost per pkm
	Market penetration	Passenger km per capita

Economic	Operation efficiency	Annual Costs recovery Veh-km per day
	Operators' revenue	Users costs Costs subsidy
	Job's creation	Direct jobs per million passengers in formal transit Direct jobs per million passengers in informal transit
Environment	Air pollution & Climate Change	CO2 emissions PM10 emissions NOx emissions Average Bus fleet age CO emissions Share of PT passenger-km travelled by clean-fuels vehicles Cleaner technology in Transit
	Energy consumption	Daily consumption of energy in % MJ/pkm; electricity consumption per km MJ/pkm; fuel and oil consumption per km
	Integrated, comprehensive and inclusive planning	Availability of an O-D survey in the last 2 years for the city Availability of Sustainable Urban Mobility Plan (SUMP) based in O-D survey results and aligned with SDG and Land Use Plans Monitoring and evaluation methods of transit
Governance and Comprehensive Planning	Centralities and Regionalism	Existance of Regional Integration Plans
	Citizen Engagement	Percentage of transport projects that follow a public participation/engagement plan

Table 1. Sustainability Evaluation Model for Public Transport in Latin America

In the case of electromobility the opportunities of their implementation in the Latin American context are several: new business areas and the creation of job opportunities and capacity building, technology transfer and the

expansion of their benefits to a larger amount of people, the emissions reduction necessary to cope with the NDCs and the climate change agreements among others

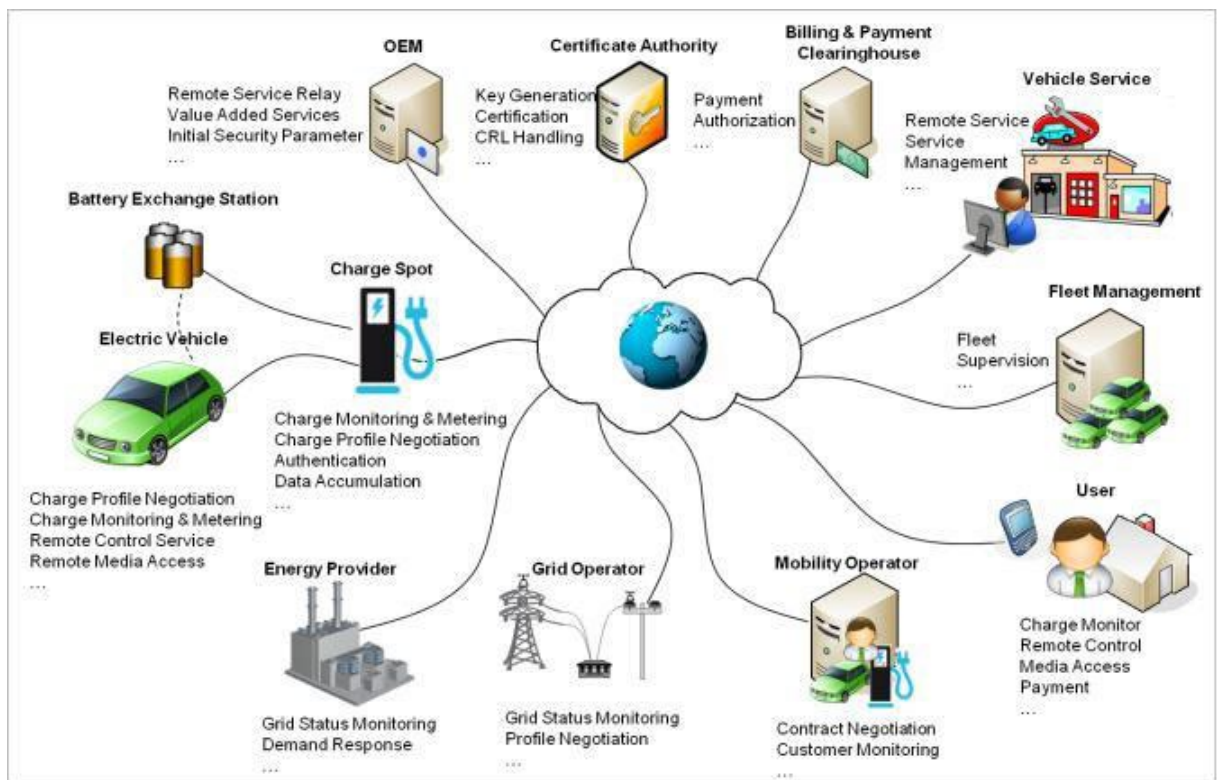


Fig. 1. Opportunities of electromobility deployment

Source: IEA 2020¹

1 <https://www.iea.org/reports/world-energy-outlook-2020/>

Electromobility Inclusion in the Ecuadorian NUMP

Regulatory and institutional framework

Ecuador has a series of incentives and regulations for the introduction of electric vehicles. However, these have not been taken advantage of by the various public and private actors. Table 2 summarizes these incentives.

Table 2. Comparison of electromobility incentives for selected Latin American countries

Incentive/country	Argentina	Brazil	Colombia	Costa Rica	Chile	Ecuador	México	Uruguay
IVA Exemption		X	X			X		
Circulation permit exemption		X		X			x	
Exemption of vehicular restriction programs			X	X	X		X	
Exemption of custom taxes			X	X		X		X
Exemption of taxes for special consumption				X		X		
Differentiated electric fares					X	X	X	
Exemption of environmental taxes					X	X		

Source: (ONU-Medio Ambiente 2016)

The communication and diffusion of these incentives should be part of the strategies of the entities in charge of their application.

For both the NUMP and the National Strategy of Electromobility, economic as well as social and environmental aspects should be considered with medium and long-term goals. For the development of strategies, the articulation between the government bodies should be strengthened in order to achieve cooperation and avoid contradictory policies. It is also essential to establish a state commitment and promote the involvement of civil society to ensure the long-term continuity of the national policies and strategies.

The so-called “Cumbre de Ministros” composed by the Ministry of Transport and Public Works (MTO), Ministry of Environment, and Ministry of Energy and Non-Renewable Resources (MEER), should not disappear af-

ter the launching of the NUMP, but to continue collaborating in the comprehensive and continuous articulation of their policies related with the NUMP and electromobility.

The support of other ministries for planning and implementation of the NUMP is also of great importance because of the indirect influence they could have in supporting electromobility. The Ministry of Economy and Finance (MEF) is the entity in charge of economic and financial policy, so it could be interested in the savings that the electrification of transportation could potentially mean, and it is also in charge of subsidies and fuel prices, which makes its coupling with electromobility policies of vital importance. Other ministries such as the Ministry of Foreign Trade (COMEX), which imposes import tariff policy and is responsible for customs control, or the Ministry of Industries and Production (MIPRO), which

sets standards and quality norms for products marketed in Ecuador, should also play a role in developing and carrying out the plan.

Regulatory entities belonging to the MTOP and the MEER, such as National Transit Agency (ANT) and the Electricity Regulation and Control Agency (ARCONEL), respectively, should be also involved in ensuring compliance with the plan.

It is important to keep in mind that electromobility is not the solution to many of the problems related to transportation, such as road insecurity, traffic congestion, inequality and lack of accessibility. More sustainable mobility should then be encouraged by improving and promoting public transport and active mobility. These could create synergies with the inclusion of electromobility, for example with the deployment of electric buses or electric bicycles.

Environmental regulations related with motorized vehicles

An important enabling factor for the development of electromobility is the existence of minimum environmental and energy requirements for conventional vehicles. This on the one hand reduces environmental impact and fuel consumption, but also puts electric vehicles in a more economically competitive position. Unfortunately, Ecuador's vehicle fleet is on average 16 years old Average age: 15,8 years (AEADE 2021), has low levels of energy efficiency, and requires obsolete emission limit standards.

Ecuador remains one of the most backward countries in the region in terms of vehicle emissions restrictions. The Ecuadorian technical regulation NTE INEN 2204 „Environmental Management. Air. Motor vehicles. Emissions permitted levels produced by road movable sources using gasoline” has not being updated yet, therefore, the required standards for gasoline and diesel motors are equivalent to Euro 3. The Euro 3 standard was implement-

ed in Europe in 2000, however, since then it has been replaced by stricter standards such as Euro 5 and Euro 6. Chile and Argentina require Euro 5 technologies for their vehicles, while Colombia and Mexico require Euro 4 . But, in order to achieve these standards in the country, it would be necessary to improve the quality of fuels that currently contain very high levels of sulphur. These are higher than 350ppm when 10ppm are required for Euro 5 [31] [32]. This is a complex issue to resolve, although Ecuador managed to substantially improve the quality of its fuels in 2012, experts agree that although the modernisation of refineries is of major interest to the state [33] it is unlikely that in the near future it will invest the necessary sums to renew its infrastructure.

The fact that fuels are highly subsidized in Ecuador further complicates the situation, which represents a large economic burden for the state, discourages the use of more efficient technologies and has created a culture of neglect towards fuel savings. The reduction or elimination of subsidies is a delicate issue for the government because it could affect the most disadvantaged population and also represents a very high political cost.

Standards are needed to prevent the introduction of substandard technologies into the vehicle fleet. Minimum requirements for vehicle energy efficiency and specific energy (energy per unit mass) of the batteries could be introduced. Thus, for example, vehicles powered by lead acid batteries could be avoided. The lifetime of batteries is of particular concern, and consideration could be given to requiring marketers to guarantee a certain minimum lifetime.

Another major concern is the final disposal of batteries after their useful life. There is a fear that they may end up in landfills or in the open and toxic materials may cause major environmental damage. Therefore, regulations and standards should be included to enforce and indicate battery disposal and recycling proce-

dures. If compliance with regulations cannot be guaranteed, vehicle importers could be required to return batteries to the country of origin once their useful life is over.

Electric vehicles in the NUMP:

Since the final documents are not available at the moment of finalizing this report, the specific recommendations are considered as a basis for a national strategy for sustainable mobility. Specific topics that should be addressed in the NUMP and the National Strategy of Electromobility are as follows:

Electric buses: the deployment of different sizes of e-buses depending on the available infrastructure and size of the cities are an opportunity for improving air quality and new business models. Examples are mini, midi buses, standard buses and articulated buses available in the market and adapted for specific travel demand in bus corridors.

Heavy duty vehicles: E-trucks of different

load capacity are now a reality in different regions. Given that Ecuador relies on diesel-propelled heavy-duty vehicles, here is a great opportunity for innovation of cargo fleet.

Light duty vehicles: Three and four-wheelers, cargobikes, e-scooters and its charging infrastructure should be considered for last-mile logistics.

Electric individual vehicles: taxis and private vehicles are included in this category. The guidelines should regulate their usage, charging strategy and deployment considering also final disposal of batteries after their life cycle (also to be applied for other e-vehicles).

Autonomous e-vehicles for personal use, autonomous buses & shuttles and autonomous car sharing/ride hailing: With the development of artificial intelligence and data deployment, autonomous vehicles are a reality. Examples of AVs benefits are efficient time consumption, decrease of private vehicles usage, reduction in logistics costs.



Fig. 2. Dart System (Dynamic Autonomous Road Transit) of Technical University of Munich in Singapore²

2 <https://www.tum-create.edu.sg/content/towards-ultimate-public-transport-system-0>

New air vehicles for light parcels: Providers of ride-sharing services CAN expand their services to goods transport as well. Packages can be delivered with drones and delivery

robots, and package delivery in the luggage compartment of one's own vehicle is also a potential everyday occurrence.



Hydrogen-fueled vehicles for Public Transport: FCEBs are electric propulsion buses powered by fuel cells, mainly hydrogen, instead of liquid fuels. Their cutting-edge technology is called fuel cell stack and is designed to produce electricity from hydrogen, with waste products of heat and water. Heat can be used to heat the cabin as well (Linscott and Posner 2021). Fuel cell buses are divided into vehicles in which the fuel cell serves either as a range extender to supplement an externally charged battery or as the sole energy source. Due to the high dynamic charges, fuel cells are only installed in buses in combination with electrical energy storage units, usually batteries. In its basic design, the drive train is like those in battery or trolley buses. The external supply of electrical energy via a charging sta-

tion or charger is generally provided for vehicles in which the fuel cell serves as a range extender.

Vehicle – To – Grid:

Electric vehicles (EVs) establish a physical link between two energy sectors - the power generation sector and the transport sector. EVs do not only use electricity but can also provide services to the electricity grid. The ability of EVs to store electricity and the possibility to control charging time (e.g. through smart grids or through differentiated tariffs) can contribute to a better matching of energy demand and supply (peak savings and load shifting). Large fleets of EVs can contribute to a better integration of variable power generation.

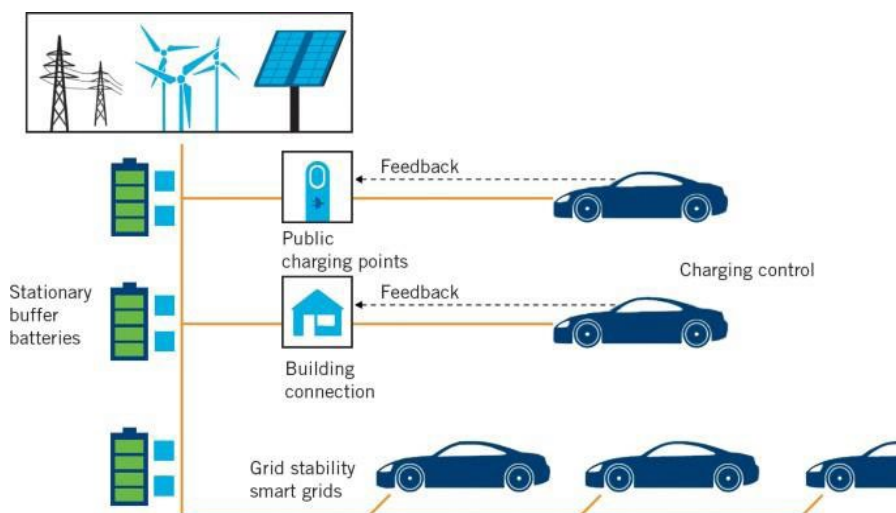


Fig. 3. Vehicle-to-Grid (V2G) scheme; Source: IEA 2020.

Charging infrastructure:

By law, only public electricity distribution companies are able to commercialize electricity, but in the Organic Law of the Public Service of Electric Energy (LOSPEE) under Article 25 it is established that the state, through MEER could delegate to private companies the commercialization of electricity „when it is necessary to satisfy the public, collective or general interest“ or „when the demand for the service cannot be covered by public or mixed companies“³. In this case, the state should consider the regulation of electricity resale prices and charging stations implementation, and requirements for commercialization (for example the most profitable location for the companies is not necessarily where the electric grid is sufficiently robust). On the other hand, smart charging grid could reduce costs and be attractive for the private sector. This would prevent any overload in the grid and optimize its usage.

Both the NUMP and the National Strategy of Electromobility should consider specific charging infrastructure for different type of vehicles, the grid capacity, the existing infra-

structure that could be adapted as charging stations, i.e. telephone cabins, and the opportunities of new urban infrastructure to promote accessibility to all users, improve urban public spaces and create new business areas.

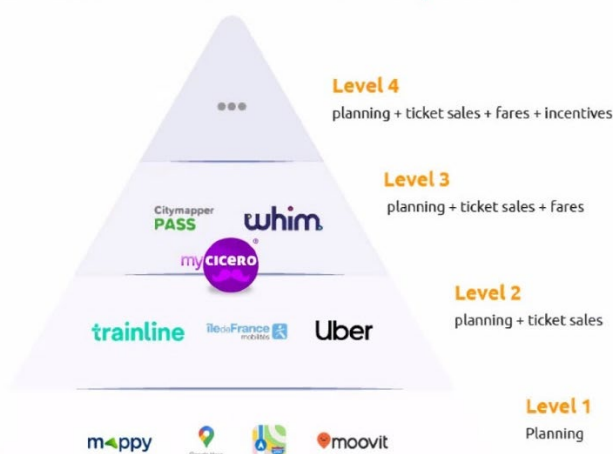
Other recommendations

- Promoting applied research and development to generate an electromobility business environment.
- Incentive to the training of specialized technicians and professionals
- Creation of a national observatory of electromobility since this area is in its initial phases. The inclusion of civil society, academia, public and private sector in the discussions for its reinforcement through information exchange platforms and other strategies, are recommended.

MaaS – Mobility as a Service: Deepening the MaaS concept and its linkage with AV e-vehicles, i.e. on robot-taxis, where people do not need to drive themselves anymore, connectivity would allow them to work while being in the car, watch a movie or just surf on the internet.

3 <http://www.regulacionelectrica.gob.ec/wp-content/uploads/downloads/2015/11/Ley-Org%C3%A1nica-del-Servicio-P%C3%BAblico-de-Energ%C3%ADa-El%C3%A9ctrica.pdf>

Mobility-as-a-Service Levels of Development



Electromobility Inclusion in the Uruguay NUMP

The National Strategy of Electromobility is a very comprehensive document that includes different electric vehicles, their opportunities, case studies and their challenges for their deployment. Concepts like Mobility as a Service (MaaS) and last – mile logistics have been also considered. Some general recommendations to strengthen both documents are the following:

- Inclusion of Vehicle -To-Grid opportunities
- Autonomous e-vehicles for personal use, autonomous buses & shuttles and autonomous car sharing/ride hailing
- New air vehicles for light parcels

Deepening of the MaaS concept and its linkage with AV e-vehicles, i.e. on robot-taxis, where people do not need to drive themselves anymore, connectivity would allow them to

work while being in the car, watch a movie or just surf on the internet.

Consideration of hydrogen-fueled vehicles for Public Transport

- Promoting applied research and development to generate an electromobility business environment. The creation of an electromobility research network could boost research in the country, linking academia with the public and private sectors, thus facilitating funding.
- Incentive to the training of specialized technicians and professionals
- Creation of a national observatory of electromobility since this area is in its initial phases. The inclusion of civil society, academia, public and private sector in the discussions for its reinforcement through information exchange platforms and other strategies, are recommended.

CONCLUSIONS

Electromobility offers an attractive opportunity for Ecuador and Uruguay (and other countries) to reduce dependence on fossil fuels. The energy consumption of vehicles could be covered by renewable energy sources, contributing to climate change mitigation and better air quality in urban areas.

However, to exploit the potential of electric mobility, the national state must promote, through public policies, the creation of favorable conditions that encourage the deployment of electric vehicles. To achieve significant results in public policy, it is necessary to create a strong institutional framework that promotes the articulation between the relevant actors.

Being the NUMP a national policy guideline, its local application will require permanent di-

alogue between the national entities in charge of the planning, and regulation of transport policies and the local governments.

The Pandemic has revealed in many areas of life how much many countries have slept through digitalization for many years. The pandemic “only” reinforces the mega-trend of digitalization and leads to the fact that the postponed change is now disruptive and not very controllable. Therefore, effective policies for digitalization should be addressed to guarantee a smart mobility in the cities. This will imply that the use of personal data should be regulated. Future mobility won't work without the use of personal data. Therefore, the establishment of effective, uniform regulations in the different regions should be of top priority.

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