BUENOS AIRES, ARGENTINA: CITY ROADMAP FOR THE UPTAKE OF ELECTRIC VEHICLES FOR URBAN LOGISTICS

This project has received funding from the European Union Horizon 2020 research and innovation Programme under grant agreement no. 875041

PROJECT PARTNERS

ABOUT

This document describes the roadmap for the uptake of electric vehicles for urban logistics

TITLE

Buenos Aires, Argentina: City Roadmap for the uptake of electric vehicles for urban logistics

CONTRIBUTERS

Ari Rizian (TUB)
Maximiliano Parisi (GCBA)
Andrés Gavilan (ICLEI)

REVIEWERS

María Rosa Muñoz B. (WI)
Constanza Urbina (WI)

DISCLAIMER

The views expressed in this publication are the sole responsibility of the authors named and do not necessarily reflect the views of the European Commission

LAYOUT

Yasin Imran Rony, WI

PICTURES

All the pictures are provided by the SOL+ partners

June, 2024

Executive Summary

Argentina is already one of the most urbanized countries worldwide, with 92% of its population living in cities. This is a significant increase compared to 1960, when 74% of people lived in urban centers. Specifically, Buenos Aires concentrates almost 40% of the country's population. The city constitutes a metropolis in constant evolution and movement, characterized by high levels of commuting accompanied by an intense and continuous movement of freight and goods throughout its territory, especially to the city center increasing levels of automotive congestion generate critical environmental impacts, affecting the health of the population, through noise and air pollution, as well as increasing the energy consumption and the GHG produced by the road transport.

In Buenos Aires, the field of Urban Logistics has been traditionally a space taken up by the private sector. However, following initiatives of European cities, the urban logistic field has gradually been internalized by the local government and is now becoming part of the political agenda. A recent study conducted by the Interamerican Development Bank (IDB) and the Universidad Nacional de San Martín (UNSAM), show how logistic operations in the City of Buenos Aires contribute to increasing traffic congestion, higher levels of GHG and pollutant emissions. Some of the main problems presented by Urban Logistics in Buenos Aires are i) lack or misuse of infrastructure, ii) lack of regulations or enforcement, and iii) inefficient logistic operations.

To face this situation, the local administration must carry out measures that generate greater efficiency in urban logistics, mainly in the last mile logistics, to shorten trips and optimize shipments. Simultaneously, regulation of loading and unloading spaces and schedules is required, to avoid increasing negative externalities such as congestion, air pollution, noise pollution and road stress.

Nowadays, Buenos Aires has adopted the Climate Action Plan 2050, the main plan in which sustainable mobility initiatives aim to have a carbon neutral, resilient and inclusive city by 2050. The city also adopted in 2017 the National action plan for transportation and climate change that seeks to adapt transport infrastructure and reduce greenhouse gas emissions. In 2018 Argentina initiated the development of its National Electric Mobility Strategy with the support of UN Environment. That same year, the Traffic Law was amended by Decree, incorporating different categories of EVs and the requirements for their homologation. The adoption of electric mobility for urban logistics is undoubtedly an element to be considered in the medium term. Despite all current initiatives and the ongoing adaptation of policy frameworks, the deployment of low-carbon and electric vehicles for urban logistics in Buenos Aires is still underdeveloped and its potential remains untapped. Some identified main barriers are i) insufficient capacities in the private sector, ii) limited funding and financing options, and iii) lacking regulatory framework for EVs.

As part of relevant electric mobility pilot projects in Buenos Aires, SOLUTIONSplus aimed to provide technical and financial support and demonstrative experience to reduce knowledge gap on the deployment of urban electric mobility solutions. The pilot implemented by Correo Argentino and Sero Electric aimed to test the performance and capabilities of LEV (light electric vehicles) for small and medium parcel distribution around different Hubs / Distribution Centers located in the metropolitan region of Buenos Aires. The second pilot developed by Asociación Sustentar aimed to test 2 locally produced LEV (light electric vehicles) to support the harvesting, distribution and logistics needs of two agro-ecological gardens located in the city of Escobar.

The proposed city roadmap for the uptake of electric vehicles for urban logistics in Buenos Aires used the actual scenario and conditions for the uptake and deployment of electric vehicles for urban logistics, defining the targets and the pathway with specific actions, budgets, timeframes, and outputs to achieve the set goals.

The transition towards electromobility and the reconversion of freight transport systems requires strengthening the links between the different key players, vehicle manufacturers and users involved in urban logistics activity. The city government believes that the shift towards electric mobility should occur in the first instance in public transport and urban logistics, focusing on micromobility / last mile solutions, as these solutions require less investment in infrastructure associated with battery charging.

The timeline for the proposed roadmap includes actions to facility 1) the scale-up of electric vehicles for urban logistics such as convert government fleet, public awareness campaigns, develop business models and develop technical standards between 2024 to 2029. To move to 2) the mainstream phase, the city roadmap proposes to strengthen battery recycling, promote the EV local manufacturing, built up of renewable energy capacity, roll out of public charging by 2030 and onwards.

The individual actions proposed for the future of the City of Buenos Aires are divided in 3 Focus Areas (FA1: Urban Planning, FA2: Regulatory Measures, FA3: Partnerships and Awareness) listed in the following table:

Table 1. Actions by Focus Area

Actions	FA 1	FA 2	FA 3
Regulation on loading and unloading in commercial areas	■	■	
Establishment of micro-hubs and cross-docking platforms in public and private parking buildings	■	■	■
Improvement of "cargo blue boxes" strategy to indicate loading and unloading areas	■		
Waiting spaces for food delivery drivers	■		
Implementation of nighttime loading and unloading (incl. noise impact assessment)		■	
Promotion of last mile deliveries with LEVs	■		■
Promotion of sustainable/green logistics plans in the private sector.			■
Calculation of urban logistics carbon footprint (incl. e-commerce shipments)			■
Capacity building and peer-to-peer exchange on urban logistics			■
Provision of road infrastructure for the safe circulation of LEVs	■		
Adoption of alternatives like packet stations, or parcel locker stations	■		
Establishment of Zero – Low – Ultra low – emission zones	■	■	

Table of Contents

Executive Summary 2
Table of Contents 4
List of Abbreviations 5
1. Background – Where are we now? 8
1.1. Urban and logistics context 8
1.1.1. Urbanization trend in Buenos Aires 8
1.1.2. Urban Logistics in Buenos Aires 8
1.1.3. E-commerce & pandemic impact on urban logistics 10
1.1.4. Climate Action Plans for Buenos Aires 11
1.1.5. Electric Mobility Uptake in Argentina 11
1.2. Current Policy Framework and Market Readiness for deployment of EV for urban logistics 13
1.2.1. Policy Framework 13
1.3. Barriers for the introduction of EVs for logistics in Buenos Aires 15
1.4. Demonstration project 15
1.4.1. LEV for parcel distribution – Correo Argentino / Sero Electric (Buenos Aires, Argentina) 17
1.4.2. Electric pick-ups for agro-ecological gardens – Asociación Sustentar (Escobar, Argentina) 19
1.5. Other low-carbon logistics initiatives in Buenos Aires 20
2. Approach – Methodology 22
3. The roadmap – Where are we going? 24
3.1. Vision 24
3.2. Objective 25
4. Implementation plan – How do we get there? 26
4.1. Focus area 1: Urban Planning 26
4.2. Focus area 2: Regulatory measures 27
4.3. Focus area 3: Partnerships and public awareness 27
5. Conclusion and next steps – what do we need? 28
6. References 29

Figures and tables

Figure 1. SOLUTIONSplus action lines in Latin America 16
Figure 2. LEVs funded by SOLUTIONSplus in Latin America 17
Figure 3. Sero Electric LEV used in the Correo Argentino operations 18
Figure 4.Main results pilot Buenos Aires 18
Figure 5. L7-category LEV from Codadir used in the agro-ecological gardens of Escobar 19
Figure 6. Main results pilot Escobar 20
Figure 7. Express Logística EV operations on Microhub (left) and commercial street (right) in Buenos Aires 21
Figure 8. Pilot vehicle of Correo Argentino (left) and SERO electric vehicle for urban logistics (right). 21

Table 1. Actions by Focus Area 3
Table 2. Overview of urban logistics in Buenos Aires 9
Table 3. Proposed actions by Focus Area 26

List of Abbreviations

AMBA	Metropolitan Area of Buenos Aires
GCBA	Buenos Aires City Government
IDB	Interamerican Development Bank
LEV	Light Electric Vehicle
LEFV	Light Electric Freight Vehicle
NDC	Nationally Determined Contributions
PANTyCC	National Action Plan for Transportation and Climate Change
UNSAM	San Martin University

Purpose	
Coordination	Technische Universität Berlin (TUB)
SOLUTIONSplus partners	Technische Universität Berlin (TUB) Local Governments for Sustainability (ICLEI) Wuppertal Institute (WI)
Contributors	Ari Rizian (TUB) Maximiliano Parisi (GCBA) Andrés Gavilan (ICLEI)
Reviewers	María Rosa Muñoz B. (WI) Constanza Urbina (WI)

1. Background – Where are we now?

1.1. Urban and logistics context

1.1.1. Urbanization trend in Buenos Aires

According to different estimations, it is expected that by 2050 90% of the Latin American population will live in urban environments. The UN grants this region the highest urbanization expectancies in the world. Argentina is already one of the most urbanized countries worldwide, with 92% of its population living in cities. This is a significant increase compared to 1960, when 74% of people lived in urban centers.

Buenos Aires has a metropolitan area that represents only 0.4% of the country's total territory but concentrates almost 40% of the country's population. The city is the economic and political capital of the Argentine Republic. It is the largest city in the country and the 7th most populated city in Latin America. With 15 million inhabitants, it generates up to 50% of the national gross domestic product. Located in the western coast of the Río de la Plata, the city constitutes a metropolis in constant evolution and movement, characterized by high levels of commuting accompanied by an intense and continuous movement of freight and goods throughout its territory.

The metropolis is composed of the autonomous City of Buenos Aires and 42 surrounding jurisdictions/ municipalities, which belong to the neighboring Province of Buenos Aires. The urban continuity of all these jurisdictions constitutes the so-called *Area Metropolitana de Buenos Aires* (AMBA). This federal and multijurisdictional structure represents a major challenge for its administration in general and in terms of transport planning and regulation -both for people and freight- due to a multiplicity of stakeholders and the lack of coordination between them.

The geographical and demographic characteristics of AMBA, its population distribution and the concentration of social and business activities in the city center, results in a constant flow of people and goods to the central area generating severe air pollution, caused by emissions from the transport sector. The radio-centric structure of the metropolis, low quality standards of transport services and infrastructure, and increasing levels of automotive congestion generate critical environmental impacts, affecting the health of the population, through noise and air pollution. Figures for 2014 show that the transport sector has more than doubled CO2 emissions compared to 1990. Over 90% of these emissions correspond to road transport (passenger and cargo). The International Energy Agency estimates that Argentina's per capita transport emissions is 1,052 kgCO2, which is higher than the regional average of 857 (non-OECD Americas).

1.1.2. Urban Logistics in Buenos Aires

In Buenos Aires, the field of Urban Logistics has been traditionally a space taken up by the private sector. For the public administration bodies freight vehicles and transportation of goods represented "problems" given their negative externalities: environmental impact, accidents, and congestion. Given the fact that

Urban Logistics has been (and still is) a blind spot for policy makers, the above-mentioned negative impacts are difficult to calculate and are often underestimated. Some of the causes behind this are the large information gaps, fragmented institutional structures resulting in atomized logistic operations, as well as complex and difficult exploitation & analysis of the data resulting from these operations.

However, following initiatives of European cities, the urban logistic field has gradually been internalized by the local government and is now becoming part of the political agenda. Cities working on the topic share a metropolitan vision linked to freight transportation, where it is necessary to look beyond jurisdictional boundaries and focus on flows, seeking regulatory harmonization. This vision also seeks to identify and understand cargo movements, operations & processes, involved stakeholders - their interests and the conflicts over public space.

The results of a recent study conducted by the Interamerican Development Bank (IDB) and the Universidad Nacional de San Martín (UNSAM), show how logistic operations in the City of Buenos Aires contribute to increasing traffic congestion, generating impacts on the environment with greenhouse gas emissions and noise pollution, as well as conflicts on public roads with other transportation modes (bicycles, pedestrians, public transport and others), resulting in a lower life-quality for dwellers. Inefficiencies in urban logistics generate increasing operating costs, affecting the economy and the pricing process, thus restricting the access of small and medium companies that do not have the scale to bear higher distribution and supply-chain costs.

Table 2 displays the main problems of Urban Logistics in Buenos Aires and lines of action, divided into three main categories: Infrastructure, Regulatory Framework and Operations & Processes.

Table 2. Overview of urban logistics in Buenos Aires

Infrastructure	Regulatory Framework	Operations & Processes
"Blue boxes" (loading and unloading spaces) efficiency, misuse and lack of control.	Lack of interjurisdictional coordination.	The measurement of logistic operations efficiency is not standardized / homogenized.
Few docks in the city. High competition for the use of public space.	Lack of knowledge of regulatory framework.	Different types of vehicles used for logistics operations present a variety of challenges.
Local businesses do not have their own parking. Size of stores has no correlation with the volume of logistic operations they perform.	Fines are not effective in discouraging bad practices by logistics operators.	Logistic operations in BA have low scale and high frequency. Greater expansion and intensity due to e-commerce.
Geographical assessment to optimize the location of cross-docking and freight hubs.	Cross-docking, "microhubs" and new operational models require an enabling regulatory framework	Demand for food and beverages requires decentralized and inefficient logistics operations in thousands of retail stores.

Regarding local/regional planning and governance, a major challenge for the metropolitan region of Buenos Aires is to consolidate leadership for the coordination the different levels of government, jurisdictions and entities that constitute the metropolitan freight transport systems. The multi-jurisdictional nature of this region hinders the execution of an integrated planning, in which the efforts and initiatives of each one of the stakeholders are complementary to achieve strategic and long-term objectives. In addition, and to a greater extent than in passenger transportation, urban logistics and cargo transportation require broad consensus between the public and private sector.

The adoption of technology and the digitization of processes would enhance the efficiency of freight operations, including the last mile. An initial, but crucial step is generating standardized data on freight demand, supply, and flows among stakeholders. Once this foundation is in place, digitalization can take over to effectively manage and expand any initiative aimed at regulating these indicators. This step could potentially translate into a development of sustainable urban logistics plans or an open data resource for sustainable urban logistics. National level policies and plans, as well as guidelines and implementation manuals for regional and local government levels would enable replication and scale-up of good practices.

Among the national plans, the National EcoLogistics recommendations highlight the alignments for policymakers and stakeholders. The recommendations include aligning institutions and governance under different initiatives to facilitate open information sharing and improving technical support for the projects. It also recommends the establishment of an urban logistics observatory as a national entity to enhance strategies for addressing urban freight challenges. The observatory would support the development of tools for measuring and estimating emissions and externalities. Furthermore, it aligns with the PANTyCC to create economic incentives at various levels. Another key point is peer exchanges and capacity building. These elements need to be open and enable multilayer innovations involving operators, lawmakers, and experts (ICLEI, 2021).

1.1.3. E-commerce & pandemic impact on urban logistics

The city of Buenos Aires has not been an exception to a global increase in e-commerce and rapid delivery. This consumption trend has expanded during the COVID-19 pandemic, increasing the amount of delivery systems, leading to a growth of urban logistics within the transit network, thus increasing road congestion and emissions. Moreover, this new consumption model is turning each household into a potential destination/delivery point, modifying the traditional origin-destination logic for freight transportation, with all the challenges that this entails.

To face this new scenario, the local administration must carry out measures that generate greater efficiency in urban logistics, mainly in the last mile logistics, to shorten trips and optimize shipments. Simultaneously, regulation of loading and unloading spaces and schedules is required, to avoid increasing negative externalities such as congestion, air pollution, noise pollution and road stress.

Undoubtedly, the new consumption habits in cities are an opportunity to rethink infrastructure and urban design, improving the use of public space and promoting road safety, but also to reconsider the type of vehicles used for last mile distribution, fostering the uptake of low-carbon alternatives, such as cargo

bicycles and LEVs for urban logistics, replacing current ICE vehicle fleets and thus contributing to GHG emission reduction.

1.1.4. Climate Action Plans for Buenos Aires

The *Climate Action Plan 2050* is the main plan in which sustainable mobility initiatives (including electric mobility) as well as urban logistics efficiency can be framed in. In 2017 the City of Buenos Aires adhered to the commitment to become a carbon neutral, resilient and inclusive city by 2050.

Buenos Aires' CAP is the third and newest plan which provides a solid framework for implementing climate actions to improve air quality and, in turn, increase quality of life for dwellers. An ambitious scenario projects an emission reduction by 35% by 2050. The plan mentions 4 scopes of action, namely: *Prepared city; City of proximity; Innovative and low-carbon City; Inclusive City*.

Actions in the energy generation sector (increasing the share of renewable sources) and in the transportation sector, shifting to low-carbon modes, are identified as those with the greatest mitigation potential.

In 2017 the national government launched the first version of the *PANTyCC (National action plan for transportation and climate change)*, with a strong focus on the Buenos Aires metropolitan area, with the vision of generating political measures and actions to improve the mobility of people and goods; reduce time; prioritize safety; improve comfort; prioritize environmental sustainability. And by doing so, to achieve the objective of adapting transport infrastructure and reducing greenhouse gas emissions.

Sustainability concerns still have to achieve more participation and importance in transport planning and freight operations, as both in the past and in the present, decision-making is mostly oriented towards economic calculations and interests, over and above environmental considerations. Increased public awareness (through information and local capacity building) about the negative impacts of freight transport in Buenos Aires is required.

1.1.5. Electric Mobility Uptake in Argentina

At the legislative level, Argentina is lagging behind the rest of the region in initiatives oriented to the production, deployment and uptake of EVs. A bill was presented in 2017 to establish a regulatory framework that promotes the production, commercialization, and use of EVs. Different initiatives have been presented since then to favor the sector through fiscal and tax benefits.

In 2018 Argentina initiated the development of its National Electric Mobility Strategy with the support of UN Environment. That same year, the Traffic Law was amended by Decree, incorporating different categories of EVs and the requirements for their homologation. In 2019, driver's license classifications were modified to include EVs.

The adoption of electric mobility for urban logistics is undoubtedly an element to be considered in the medium term. However, in the short term, Argentina has a series of macroeconomic restrictions, which affect imports of vehicles and spare parts. The precarious economic and financial situation hinders access to funding for the purchase of electric vehicles. Moreover, as long as the TCO of electric vehicles remains higher than traditional ICE vehicles and no significant progress can be achieved regarding domestic production, barriers will be encountered because of higher upfront investments and the resistance of local industrial stakeholders.

The reality is that for the time being there are no announcements for the start of EVs production at scale by international car manufacturers installed in the country. In this sense, it is important to highlight that a transition to electromobility represents a medium-term threat to the production and export of gearboxes in Argentina, since EVSs often do not incorporate these systems.

At present, the costs of incorporating electric vehicles or adapting motors (retrofitting) are very high. In this context, EV launches in the local market are still very limited.

Other shortcomings related to energy generation and distribution, including energy restrictions & availability, the energy production matrix (65% of non-renewable sources) as well as vehicle charging infrastructure must be resolved before moving on with a transition that requires the deployment of a technology that is still unknown for most of the stakeholders of the freight sector.

Furthermore, it is essential for Argentina to adopt a strategy to reconvert its energy production matrix, as the benefits of reducing GHG emissions from electric vehicles depend on the source used for energy production. According to different studies, in the case of electricity production from non-renewable sources, the emissions from EV are similar to those of ICE vehicles running on conventional gasoline or Diesel. Renewable sources of electricity could reduce the total emissions of EV to almost zero.

Regardless of the capacity of the electric network, an important investment in charging stations for EVs and infrastructure for distribution is required. Investments and technological advances related to EV charging infrastructure will be essential to increase the efficiency and performance of electric fleets in the coming years. EV users are increasingly demanding shorter battery recharging phases. ICE technology has a charging performance more than 10 times faster than electric vehicles. For the reconversion of commercial fleets, this represents a great challenge since it generates a direct impact on logistics operation times.

An increase in the EV market would involve a significant demand for lithium batteries, which is the most widely chosen technology. Considering that Argentina, Chile and Bolivia concentrate more than 80% of the world ‘s lithium reserves (in the so-called Lithium Triangle) there is an opportunity for these countries to promote domestic battery production.

However, it will not be an easy task for Argentina to seize this opportunity. The local industrial sector indicates that the complexity for the local production of lithium batteries is very high, requiring strong capital investments in research and development. The local market is small and there is a missing long-term plan supported by the State including quality standards and environmental regulations. For the time

being, there are no certainties about the environmental damage caused by lithium extraction, the battery production process, and its recycling/disposal.

1.2. Current Policy Framework and Market Readiness for deployment of EV for urban logistics

1.2.1. Policy Framework

The regulatory framework governing transportation and logistics operations at national and local levels highlights that traffic regulations are primarily the responsibility of provinces and the Autonomous City of Buenos Aires within their respective jurisdictions. For inter-jurisdictional traffic, a combination of national and local regulations must be adhered to. While national regulations outline definitions and primary requirements for transporters, the organization and regulation of local logistics operations fall under the jurisdiction of local authorities. As such, the regulations of each jurisdiction where transportation activities take place must be followed. Simultaneously, when dealing with the transportation of specific types of cargo, additional regulations do apply. For instance, the transportation of food and pharmaceuticals is explicitly regulated by national agencies such as SENASA and ANMAT. Similarly, the transportation of valuables with armored trucks is primarily regulated by the Central Bank of the Argentine Republic (BCRA).

The National Traffic Law governs a wide range of aspects related to transportation, including licensing for inter-jurisdictional passenger and cargo transport services. In the city, driver's licenses comply with this national regulation. The law also imposes rules for hazardous or odorous loads and provides safety requirements for special cargo, such as hazardous waste.

At a national level, the Ministry of Production has worked on a working document on the transition to electric mobility: overview and perspectives for the Argentinian industry (Baruj et al., 2021). The document is an assessment of the possibilities of Argentina to incorporating itself as a valuable player within the global Electric Vehicle ecosystem. The analysis covers the production of vehicles powered by electric motors (EV), as well as hybrid vehicles, spare parts and components. It also includes other means of micromobility (LEV, motorcycles, 3- and 4-wheelers, bicycles, scooters, and others).

The National Action Plan for Transport and Climate Change (PlanTyCC) calls upon the signatory parties to submit their Nationally Determined Contributions (NDCs) to the United Nations Framework Convention on Climate Change (UNFCCC) as part of the global response to climate change. Argentina adopted the Paris Agreement under the UNFCCC through Law 27,270 and deposited the instrument of ratification with the United Nations Secretary-General on September 21, 2016. During the twenty-second Conference of the Parties (COP22) held in Morocco in November 2016, Argentina presented its Nationally Determined Contribution (NDC) in its revised version, replacing the Intended Nationally Determined Contribution (INDC) from 2015 (Ministerio de Ambiente y Desarrollo Sustentable & Ministerio de Transporte, 2017).

Argentina goal is "not to exceed a net emission of 483 million tons of carbon dioxide equivalent (MtCO2eq) in 2030." Additionally, measures subject to technology availability and cost conditions were included not

to exceed 369 MtCO2eq by 2030. Regarding adaptation to the impacts of climate change, the country committed to developing a National Adaptation Plan (PNA) by 2019. To strengthen its leadership position and commitment to climate change, in 2017, the country began developing sectoral climate action plans to organize the implementation of the National Contribution. These sectoral climate action plans aim to align various sectors with Argentina's climate goals (Ministerio de Ambiente y Desarrollo Sustentable & Ministerio de Transporte, 2017).

A national sustainable mobility bill is currently under discussion in the parliament, encompassing both transportation of people and goods. The bill aims to establish a legal, economic, and public dissemination framework to progressively promote a widespread use of sustainable mobility alternatives. This includes encouraging their availability and commercialization, supporting the national industry, and developing related infrastructure to create a sustainable impact on the environment and quality of life, following the constitutional rights and international commitments on climate change. This bill also includes the development of a National Strategic Sustainable Mobility Plan, in line with Argentina's commitments under the Paris Agreement.

Some of the action lines that this document highlights are the renewal and modernization of the conventional vehicle fleet for both passengers and cargo transportation, the adoption of a labeling system providing information on the energy efficiency of vehicles sold in the country, and the consideration of transitional fuels such as biofuels, compressed natural gas, and liquefied natural gas to reduce polluting emissions in the short term. The specific regulatory framework for the national cargo sector demonstrates a clear trend towards regulating conditions and rules for contracting, circulation, operational requirements, determining the transporter's status, transport contracts, and rules for vehicle operation and other aspects of its functioning (ICLEI et al., 2021).

In November 2020, the Multimodal Logistics Federal Advisory Council (COFED) was established with a focus on “nationally significant” cargo. Its objective is to collaborate with the Ministry of Transport in designing national strategic policies to promote a multimodal logistics ecosystem, facilitating increased national production, cargo and related services, job opportunities, and efficiency in all logistics nodes related to domestic trade and national exports (ICLEI et al., 2021).

At a local level, the Traffic and Transport Code of the Autonomous City of Buenos Aires primarily regulates the logistic operations within Buenos Aires. This code covers various aspects of transportation and logistics operations within the city, including traffic rules, loading and unloading activities, vehicle requirements, safety measures, and special regulations for transporting specific goods, such as hazardous waste and food products.

A recent study by the IDB on freight operations in Buenos Aires provides a good characterization of the actors involved in the urban distribution of goods in the city, ranging from small-scale merchants and logistics operators to medium and large-scale logistic players (Abad et al., 2022).

1.3. Barriers for the introduction of EVs for logistics in Buenos Aires

Despite all current initiatives and the ongoing adaptation of policy frameworks, the deployment of low-carbon and electric vehicles for urban logistics in Buenos Aires is still underdeveloped and its potential remains untapped. Some identified barriers for the uptake of low-carbon fleets for urban logistics are the following:

- Fragmented institutions lacking resources and capacities for coordination & planning
- Unclear distribution of competences
- Insufficient capacities in the private sector to facilitate the transition to electric mobility
- Lack of social acceptance & change resistance
- Lack of visibility of available e-mobility solutions and environmental benefits
- Limited funding and financing options (including fiscal benefits)
- Lacking regulatory framework for EVs (favoring traditional ICE)
- Lack of adequate Business Models and legal framework for the adoption of e-mobility
- Insufficient development of end-of-life vehicle management (and regulation)
- Shortcomings in energy generation and distribution (including EV charging infrastructure)

A transition toward electric vehicles would require an important financial inflow, as well as investments in research and development, mainly from the traditional automotive companies based in the country, small and medium national companies that are a part of the automotive supply chain and emerging start-ups. Despite having the necessary infrastructure, the most traditional local manufacturers and OEMs are still hesitant to reconvert their business models towards electric technology.

The charging infrastructure for EVs, the energy production matrix as well as the incremental energy required for these vehicles, are other important issues to be resolved that are not yet being fully addressed.

1.4. Demonstration project

The SOLUTIONSplus project aims to enable a transformative shift towards sustainable urban mobility through innovative and integrated electric mobility solutions, which are implemented as pilots in 10 cities globally. It was funded by the European Union's Horizon 2020 research and innovation program and ran from January 2020 to June 2024. The project encompassed city-wide demonstrations to test different types of innovative and integrated e-mobility solutions, complemented by a comprehensive toolbox, capacity building, business model development and policy, scale-up and replication activities. In addition, the project provided technical and financial support to the local actors, relying on the knowledge and expertise of a consortium of 46 partners that bring together some of the main research and industry players in electric mobility. The project was implemented in 10 demonstration cities, i.e.: Kigali (Rwanda), Dar Es Salaam (Tanzania), Hanoi (Vietnam), Pasig (Philippines), Kathmandu (Nepal), Najing (China), Quito

(Ecuador), Montevideo (Uruguay), Hamburg (Germany) and Madrid (Spain), and in more than 15 replication cities around the globe.

In Latin America, the SOLUTIONSplus carried out demonstration activities in Ecuador and Uruguay and replication in Colombia and Argentina focusing on the five main action lines depicted in Figure 1.

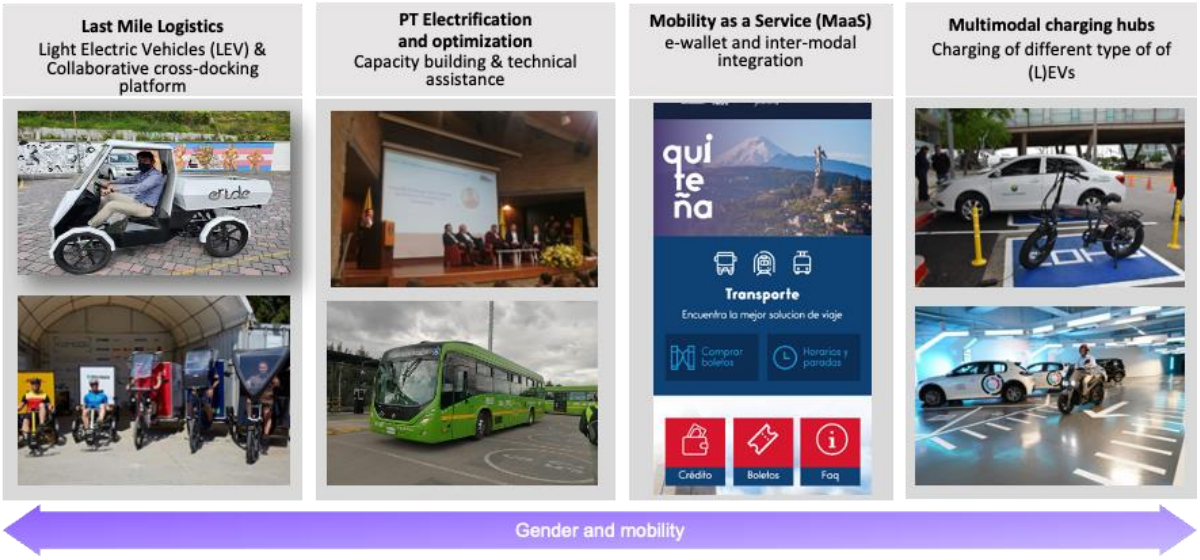

Figure 1. SOLUTIONSplus action lines in Latin America

In this context, SOLUTIONSplus provided seed funding for the manufacturing of 15 different types of LEVs (Figure 2) by a total of 11 local SMEs. These vehicles were tested in 12 different use cases, mainly in logistics operations, but also in passenger transport. The results of the pilots carried out in 2 demonstration cities (Quito, Ecuador and Montevideo, Uruguay) and in 10 replication cities (Escobar and Buenos Aires in Argentina, Cuenca in Ecuador, Bogotá, Medellín, Barranquilla, Bucaramanga, Baranoa and Sabanalarga in Colombia) show high scale-up potential of this solutions in Latin America. However, one of the main barriers identified in most of the cases was the lack on national and local regulations to enable the widespread use of LEV in logistics and passenger transport. In Argentina the replication cases were related to the use

Figure 2. LEVs funded by SOLUTIONSplus in Latin America

In Argentina, SOLUTIONSplus aimed to provide technical and financial support and demonstrative experience to reduce knowledge gap on the deployment of urban electric mobility solutions. The pilot implemented by Correo Argentino and Sero Electric aimed to test the performance and capabilities of LEV (light electric vehicles) for small and medium parcel distribution around different Hubs / Distribution Centers located in the metropolitan region of Buenos Aires. The second pilot developed by Asociación Sustentar aimed to test 2 locally produced LEV (light electric vehicles) to support the harvesting, distribution and logistics needs of two agro-ecological gardens located in the city of Escobar. The details of the two pilots are presented below.

1.4.1. LEV for parcel distribution – Correo Argentino / Sero Electric (Buenos Aires, Argentina)

The main objective of this Pilot is to test the performance and capabilities of LEV (light electric vehicles) for small and medium parcel distribution around different Hubs / Distribution Centers located in the metropolitan region of Buenos Aires. The LEV tested were two electric mini vans. The locally produced Sero Electric model, which is specially designed for last-mile logistics, replaced ICE vehicles in defined circuits during this Pilot test. The vehicles were equipped with GPS to monitor the operational performance. Specific KPIs (Key Performance Indicators) were established to evaluate the operational, environmental and financial performance of the LEV.

The results of the pilot showed that the vehicles tested were not optimal for the initially selected routes, which turned out ot be too long for the autonomy of the vehicles. However, when moved to closer routes and switched from distribution to collection mode, their performance improved significantly. Moreover, the perception of users and the public was very positive, with only few minor inconveniences reported.

Figure 3. Sero Electric LEV used in the Correo Argentino operations

The vehicles were two months in use and were driven by two female drivers. The average operating time was 6,52 hours, with an average vehicle speed of 13,15 km/hr. Around 85.63 km were covered per day (with a total of 5.350 km distance travelled), delivering almost 79 packages in a day (13,2 deliveries/hr). In terms of emissions 1,53 tCO2 emissions were avoided. Overall, the use of the e-mini vans had positive feedback and Correo Argentino envisions the potential of scaling up and replicating similar operations in other regions.

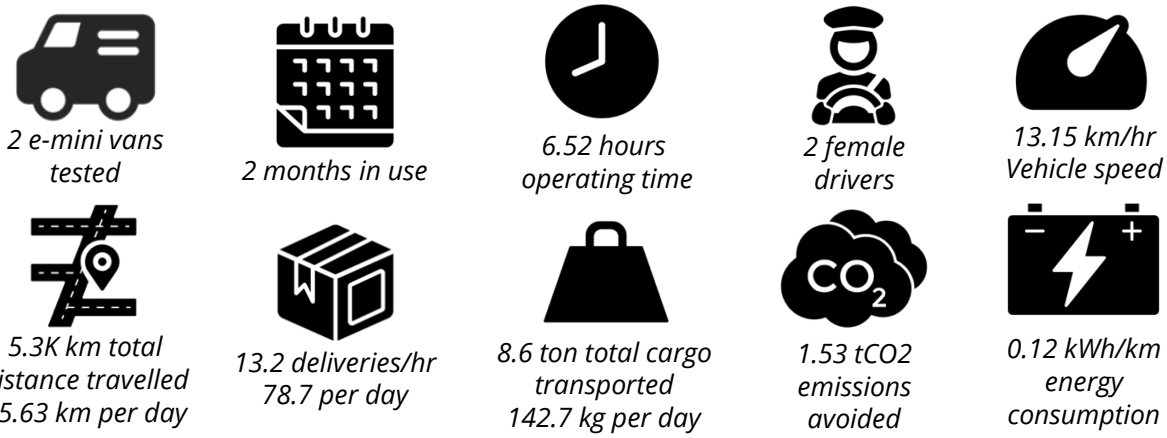

Figure 4.Main results pilot Buenos Aires

In terms of scaling up, Correo Argentino considers future replications of this pilot nationwide, focusing on central urban areas in large Argentinian cities such Buenos Aires, Gran Córdoba, Gran Rosario, Gran Mendoza, among others, which are the places where according to the results the impact of the use of LEFVs could be maximized. Expected benefits include a significant reduction in CO2 emissions in the last mile and a decrease in the financial expenditures by replacing traditional vans.

1.4.2. Electric pick-ups for agro-ecological gardens – Asociación Sustentar (Escobar, Argentina)

This pilot project, led by Asociación Sustentar with the support of the Escobar Municipality, consisted of testing 2 L7-category LEVs produced by the Argentinian Company Coradir to support the harvesting, distribution and logistics needs of two agro-ecological gardens located in the city of Escobar. Transitioning to LEV will enable achieving a zero local emissions supply chain with scale-up potential to other municipal programs. The project aimed to test the technical, operational and environmental performance of the LEVs; to build capacities among the municipal staff to operate the LEVs; to collect and systematize data to monitor and evaluate the pilot results and replication potential.

Figure 5. L7-category LEV from Codadir used in the agro-ecological gardens of Escobar

The two electric pick-ups were 3 months in use, with an average operating time of 1.78 hours and 9,52 km/hr of vehicle speed. In total, a travelled distance of 3.517 km was reached and around 57 km were covered per day. By integrating the e-pick-ups, the programme “Sustainable Escobar” increased their operations while avoiding 0.53 tCO2 emissions. Overall, the users highlighted their satisfaction with the vehicle’s autonomy, power, together with the air quality improvement and noise reduction.

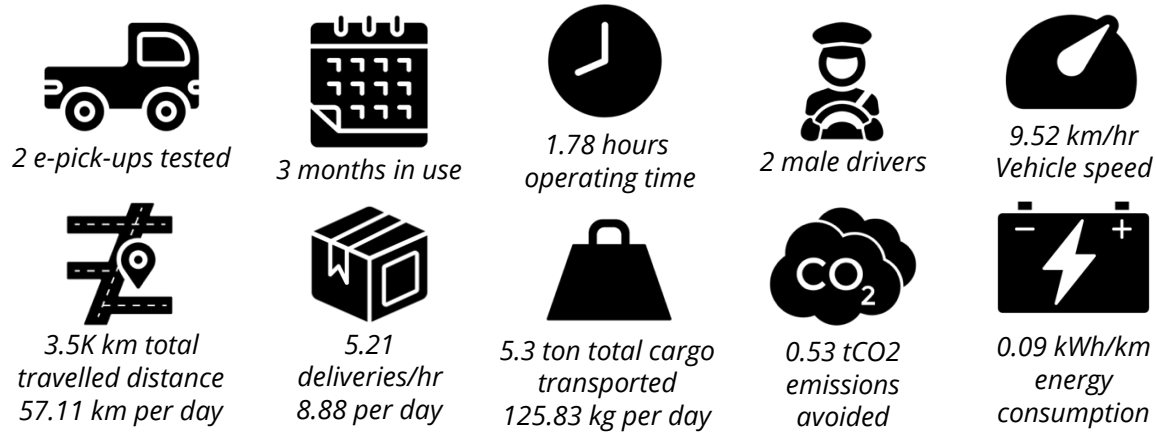

Figure 6. Main results pilot Escobar

The project partners have identified scale-up potential in the agro-ecological program, as well as in other municipal programs. However, its implementation will depend on the financial resources available for the purchase of new LEVs.

1.5. Other low-carbon logistics initiatives in Buenos Aires

The Government of the City of Buenos Aires has already been monitoring the performance and results of new urban logistics operational models (specifically Microhubs + Electric Vehicles) together with private logistic operators. The "microhub" model includes reduced inventory cross-docking operations, sustainable last mile (EV, forklifts, bicycles or on foot) and are often located in historic or traffic-restricted areas.

In the specific case of beverage distribution, the company Express Logística initially operated 2 SERO Electric vehicles (locally manufactured) in 2 Microhubs located in high-density residential and commercial neighborhoods (Palermo and Recoleta). After recording good results during the pilot phase, the company is looking to upscale the model to other locations within the city of Buenos Aires.

Some of the positive results identified by Express Logística include:

- Reduced environmental pollution (CO2 emissions, particulate matter, noise pollution)
- Road Safety (speed limited to 45km/h, vehicle dimensions at pedestrian and cyclist scale)
- Coexistence on streets (size of the vehicle allows for agile movement and facilitates parking reduces traffic congestion)
- Better service (hours of operation are adapted to the reception hours in commercial premises)
- Better ergonomics (height of the cargo box facilitates the driver's work)

Figure 7. Express Logística EV operations on Microhub (left) and commercial street (right) in Buenos Aires

Other institutions are also advancing in the same direction. Correo Argentino is the official courier service of the Argentine Republic, with operations throughout the country. The sustainability area of Correo Argentino is working on a Plan to modernize the parcel distribution Hubs in the Buenos Aires metropolitan area, incorporating digitalization into the process and replacing polluting vehicles with low CO2 emission alternatives. This includes the implementation of a Pilot Hub and then continuing with the modernization of the 7 Hubs in the metropolitan area.

According to their analysis, the electrification together with dynamic routing of circuits would significantly reduce greenhouse gas emissions (over 20% of savings from dynamic routing and up to 75% of savings from electric vehicles –local emissions, not considering energy production-). While digital tools allow dynamic routing to Hubs thus avoiding inefficient fixed circuits and scheduling, in order to minimize the carbon footprint of delivery, it is necessary to replace the fleet with electric vehicles.

SERO Electric is the Argentine company that in 2010 started a project to develop “Microcars”, inspired by vehicles that circulate in Europe. The objective of the company is to locally manufacture this kind of vehicles in Argentina (also developing local suppliers) and scale up to different markets. Today the company offers 5 different models approved for passenger and cargo transportation.

Figure 8. Pilot vehicle of Correo Argentino (left) and SERO electric vehicle for urban logistics (right).

2. Approach – Methodology

The methodology used for the elaboration of the Roadmap includes the review and analysis of studies and technical reports that have been carried out with a focus on urban logistics in Buenos Aires. In a separate phase, interviews and consultations were performed with stakeholders related to the subject as well as urban logistic and e-mobility experts in Buenos Aires.

Technical reports and studies conducted by local institutions involved in the subject are relevant to understanding the actual context and outlook of electric mobility and the urban logistics sector. Input documents for this paper are:

- Plan de Acción Climática 2050 - City of Buenos Aires, 2020
- Plan de Acción Nacional de Transporte y Cambio Climático v.1 – Ministerio de Ambiente y Desarrollo Sustentable, 2017
- Distribución urbana de mercancías en la Ciudad Autónoma de Buenos Aires - IDB, 2022
- La transición hacia la electromovilidad – Ministerio de Desarrollo Productivo, 2021

It is important to emphasize that this document seeks to build based on the diagnosis made by experts on urban logistics and the lines of action and objectives proposed by the government of the city of Buenos Aires, with a special focus on electrification and the adoption of electric vehicles. In this way, this work is intended to be a useful input for the interested stakeholders and not a marginal element detached from the local context and ongoing initiatives.

After identifying the actors involved in different initiatives around urban logistics, interviews and consultations have been coordinated and conducted with academics, professionals and public officials actively involved in the subject:

- Government of the City of Buenos Aires: Gerencia Operativa de Logística Urbana & Coordinación de Bajas Emisiones
- Instituto del Transporte – Universidad Nacional de San Martín
- Express Logística
- SERO Electric

The Urban Logistic department of the City of Buenos Aires also contributed to the development of this roadmap by providing comments throughout the process of drafting the document. In addition to the Buenos Aires City Government, review and feedback of the document was carried out by consortium members of the SOLUTIONSplus project.

Furthermore, this document contains information and contents arising from the different activities related to the SOLUTIONSplus Regional Training for Latin America carried out during 2021 and 2022, in which organizations from Europe and Latin America and the Caribbean presented on LEV for urban logistics, regulatory frameworks for e-vehicles and charging infrastructure for e-mobility. Some concepts learnt in the webinar were included in this roadmap.

The content and outcomes of other courses and capacity building activities in the framework of the SOLUTIONSplus project were also taken as sources for this work. The roadmap for the uptake of LEVs in urban areas of Uruguay as well as the Scale up concept note for Buenos Aires (SOLUTIONSplus deliverables related to electric mobility and urban logistics) are relevant resources for this paper.

With all this, the following work aims to analyze the actual scenario and conditions in Buenos Aires for the uptake and deployment of electric vehicles for urban logistics (where are we now?), define and structure a Roadmap (where are we going?), as well as an implementation plan (how do we get there?). Finally, this work finishes with some conclusions and next steps (what do we need?).

For the implementation plan: The individual actions proposed by for Buenos Aires were grouped under 3 Focus Areas:

- FA1: Urban Design
- FA2: Regulatory Measures
- FA3: Partnerships and Public Awareness

3. The roadmap – Where are we going?

The roadmap provides a pathway with specific actions, budgets, timeframes, and outputs to achieve the set goals. Prioritizing these actions is crucial based on Buenos Aires context, needs, and insights from previous experiences. Ranking criteria can guide this prioritization process, including potential GHG emissions reduction, costs, project implementation time, availability of external resources, and social and economic benefits.

The primary criteria help identify potential obstacles to project progress, while secondary criteria ensure alignment with project objectives, local programs, and stakeholder acceptance. This forward-looking and systematic approach aims to facilitate efficient, resilient, and sustainable urban freight movement. The Roadmap for urban freight focuses on influencing policymakers by defining a vision and specific goals and implementing measures and policies in various areas, such as:

1. Infrastructure management
2. Parking – Loading / Unloading spaces management
3. Vehicle-related strategies,
4. Traffic management,
5. Pricing, incentives, and taxation,
6. Logistic management,
7. Freight demand/Land use management
8. Stakeholder engagement and capacity building

3.1. Vision

The government of the City of Buenos Aires and specifically the Secretariat of Transportation and Public Works have committed to carry out actions and measures aimed at prioritizing and improving the development and efficiency of the City's transportation system, moving towards a more sustainable system.

Since 2016, the Autonomous City of Buenos Aires has been on track to achieve the ambitious goal of being a carbon neutral city by 2050. This means that greenhouse gas emissions generated by activities in the city must be offset by mitigation and adaptation actions by that date. The effects of climate change are already being felt in Buenos Aires, for example, through increased and more intense rainfall or a sustained increase in the frequency and duration of heat waves. According to different studies, these effects will continue and increase over time.

The transition towards electromobility and the reconversion of freight transport systems requires strengthening the links between the different key players, vehicle manufacturers and users involved in urban logistics activity. The city government believes that the shift towards electric mobility should occur in the first instance in public transport and urban logistics, focusing on micromobility / last mile solutions, as these solutions require less investment in infrastructure associated with battery charging. Additionally,

it is considered that the incremental fixed costs could be absorbed by the vehicle fleets that both public transport operators and logistics operators run on a daily basis.

Climate Action Plan 2050

To achieve these ambitious objectives, the Government of the Autonomous City of Buenos Aires has developed the Climate Action Plan 2050 (PAC 2050). This CAP includes actions to mitigate Greenhouse Gas (GHG) emissions generated by the transportation, energy and waste sectors in the city. The PAC 50 commitments seek to contain the increase in global temperature, adapting the city and mitigating the effects of Climate Change, through different global actions.

SDG

The Secretariat of Transportation and Public Works of the Government of the Autonomous City of Buenos Aires is committed to the execution of actions in line with initiatives of other metropolises around the globe. The main actions in the transportation sector are aimed at: encouraging active mobility as pedestrians and cyclists; making public transportation more efficient and cleaner; and promoting more efficient and sustainable Urban Logistics.

Actions that promote efficient urban logistics take into consideration the following SDGs:

SDG #9 Industry, Innovation and Infrastructure: Develop reliable, sustainable, resilient and quality infrastructure, including regional and cross-border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all.

SDG #11 Sustainable Cities and Communities: By 2030, ensure access for all people to adequate, safe and affordable housing and basic services and improve slums.

SDG #13 Climate Action: Strengthen resilience and adaptive capacity to climate-related risks and natural disasters in all countries. Integrate climate change measures into national policies, strategies and plans.

SDG #17 Partnerships for the goals: Strengthen domestic resource mobilization, including through the provision of international support to developing countries, to enhance domestic capacity to raise tax and other revenues. Increase international support for effective and targeted capacity-building activities in developing countries to support national implementation plans for all the Sustainable Development Goals, including through North-South, South-South and triangular cooperation.

3.2. Objective

In this context the Buenos Aires City Roadmap aims to support the advancement to low-carbon urban logistics in which the City Government has already been working through the introduction of the adequate urban planning and regulatory measures, as well as the generation of private-public partnerships and awareness on the importance of the topic.

4. Implementation plan – How do we get there?

The Climate Action Plan 2050, Point 11 - “Efficient Urban Logistics” includes a series of actions to increase the efficiency of urban logistics. All initiatives have a short and/or medium-term time horizon.

The individual actions proposed for the future of the City of Buenos Aires are listed in the Table 3 and grouped into 3 different Focus Areas, which are explained in detail later:

- FA1: Urban Design
- FA2: Regulatory Measures
- FA3: Partnerships and Public Awareness

The following is a detailed analysis of the actions proposed for the city of Buenos Aires, analyzing how electrification could contribute to achieving the proposed objectives for each Focus Area.

Table 3. Proposed actions by Focus Area

Actions	FA 1	FA 2	FA 3
Regulation on loading and unloading in commercial areas	■	■	
Establishment of micro-hubs and cross-docking platforms in public and private parking buildings	■	■	■
Improvement of "cargo blue boxes" strategy to indicate loading and unloading areas	■		
Waiting spaces for food delivery drivers	■		
Implementation of nighttime loading and unloading (incl. noise impact assessment)		■	
Promotion of last mile deliveries with LEVs	■		■
Promotion of sustainable/green logistics plans in the private sector.			■
Calculation of urban logistics carbon footprint (incl. e-commerce shipments)			■
Capacity building and peer-to-peer exchange on urban logistics			■
Provision of road infrastructure for the safe circulation of LEVs	■		
Adoption of alternatives like packet stations, or parcel locker stations	■		
Establishment of Zero – Low – Ultra low – emission zones	■	■	

4.1. Focus area 1: Urban Planning

Urban design plays a crucial role in transport as it can promote compact cities, mixed land use and public spaces that encourage sustainable transport, reduce congestion and improve road safety.

In terms of urban logistics, well-planned infrastructure and urban design can lead to more efficient urban logistics, by reducing travel time, improving EVs performance, optimizing last-mile delivery and reducing emissions. In addition, thoughtful urban design in logistics can improve pedestrian safety and worker

conditions. It is therefore key to consider all the stages of the logistics chain and integrate cross-docking stations, loading and unloading areas, waiting areas and drop-off points into urban planning and design.

To ensure this, the following actions are proposed:

1. Improvement of the "cargo blue boxes" strategy to indicate loading and unloading areas. This could include the integration of a digital tool to book the loading and unloading spaces
2. Waiting spaces for gig workers, food deliveries or delivery drivers
3. Adoption of alternatives like packet stations, or parcel locker stations
4. Provision of road infrastructure for the safe circulation of LEVs

4.2. Focus area 2: Regulatory measures

One of the main barriers identified in the widespread use of LEVs in logistics transport in Buenos Aires is the lack of national and local regulations. To overcome this challenge, a regulatory framework is required to ensure efficiency and sustainability in the adoption of EVs in urban logistics. This involves defining specific regulatory measures that need to be taken to strengthen and enable operational models in logistics, such as for loading and unloading times and areas, usage of storage infrastructure, or the implementation of low emissions zones.

The following are regulatory measures proposed:

1. Regulation of loading and unloading in commercial areas
2. Promotion of the establishment of micro-hubs and cross-docking platforms in public and private parking buildings among large distribution companies to reduce congestion in central areas
3. Implementation of nighttime loading and unloading (incl. noise impact assessment)
4. Establishment of Zero – Low – Ultra low – emission zones in which logistics operations are conducted by zero-emissions vehicles

4.3. Focus area 3: Partnerships and public awareness

In order to strengthen the implementation of all activities of the two focus areas described above, strong partnerships between different stakeholders are necessary. In Buenos Aires, efforts need to focus on disseminating the benefits of using LEVs in logistics, engaging the private sector to adopt new sustainable operational models, and promoting capacity building activities with participation of all sectors and stakeholder.

To achieve this the following activities are proposed:

1. Promotion of sustainable logistics plans in the private sector
2. Promotion of last mile deliveries with LEVs

3. Calculation of urban logistics carbon footprint (including e-commerce shipments)
4. Capacity building and peer-to-peer exchange on innovative business and operations for urban logistics

5. Conclusion and next steps – what do we need?

Urban logistics is a topic often forgotten by the authorities, as it is conceived as a private matter. However, understanding the impact that logistics have for the in the city ‘s congestion, road safety, air pollution, and GHG emission, in the past years, the GCBA has been working towards improving its efficiency and reducing its emissions. This City Roadmap was developed with the input of the municipal authorities in charge of the topic and has highlighted, therefore, the topics in which the City of Buenos Aires lays the higher priority.

In this line, ACCESS (2024–2029): Accelerating Access to Low-carbon Urban Mobility Solutions through Digitalization, a project funded by the International Climate Initiative of the Federal Ministry of Economy and Climate Protection of Germany, will use this document as guidance to implement its activities in one of its action lines in Argentina, which is precisely digital tools to enhance low-carbon urban logistics in Buenos Aires. The latter ensures the continuation of the activities initiated by SOLUTIONSplus until 2030, horizon in which it is expected that the measures proposed move to the stage of mainstreaming.

6. References

Abad, J., Moleres, C., Dobrusky, F., Pérez Martín, J., Sánchez, J., Fiadone, R., Suyai Mendiberri, L., Fulponi, J. I., Parisi, M., Spadaro, P., & Pipicello, T. (2022). *Distribución urbana de mercancías en la Ciudad Autónoma de Buenos Aires: Propuestas para la innovación en políticas públicas en infraestructura, marco regulatorio y procesos logísticos*. Banco Interamericano de Desarrollo. https://doi.org/10.18235/0004466

Baruj, G., Dulcich, F., Porta, F., & Ubogui, M. (2021). *La transición hacia la electromovilidad: Panorama general y perspectivas para la industria argentina* (No. 5; Documentos de Trabajo Del CCE). Consejo para el Cambio Estructural, Ministerio de Desarrollo Productivo de la Nación.

ICLEI, ZLC, Smart Freight Centre, & despacio. (2021). *Recomendaciones de Política Nacional de Logística Baja en Carbono para Argentina*. Local Governments for Sustainability - ICLEI. https://sustainablemobility.iclei.org/wpdm-package/nelpr_argentina/

Ministerio de Ambiente y Desarrollo Sustentable, & Ministerio de Transporte. (2017). *Plan de Acción Nacional de Transporte y Cambio Climático. Versión 1—2017*. Ministerio de Ambiente y Desarrollo Sustentable.

solutions plus