

Pipeline of Electric Bus Projects in Latin America

An overview of 32 cities

October, 2023



Photo by Alcaldía de Bogotá, 2022-Colombia

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Initiatives



Supporters and Collaborators



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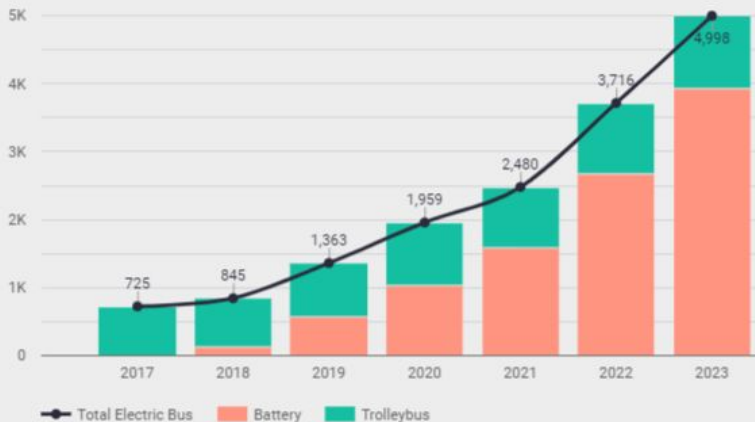
Context

Globally, the Latin American region has distinguished itself for the implementation of electric buses in public transport systems. This has been possible thanks to promising developments in the region, including the adoption of policy frameworks to promote sustainable urban mobility and the expansion of public transport systems.

Main contextual information :

- **The number of electric public buses in the region grew by more than 100% between 2020 and April 2023. (E-Bus Radar, 2023)**
- **Currently, electric buses represent 4.5% of the total bus fleet of the cities interviewed.**
- **Countries and cities in the region have set targets to electrify vehicle fleets.**
- **Similar risks were identified in the different countries of the region; however, it is a growing market with opportunities to be explored.**

Total of e-buses in Latin America



SOURCE: E-bus radar, Oct 2023



PURPOSE OF THE STUDY

To understand how electric bus projects are developing in the Latin American region and the plans that cities have for the electrification of public transportation fleets. This will provide a better overview to investors and financiers and help bridge the link between the needs of the cities with available financing supply.

Latin America



Latin America

Cities included in the study:

México

- México City
- Guadalajara Metropolitan Area
- Monterrey Metropolitan Area
- Mérida Metropolitan Area
- Cuernavaca Metropolitan Area
- León

Guatemala

- Guatemala City

Salvador

- San Salvador

Panamá

- Panamá City

Costa Rica

- San José

Brazil

- Curitiba
- Rio de Janeiro
- Niterói
- Salvador
- São José dos Campos
- São Paulo
- Campinas
- Goiânia

Colombia

- Bogotá
- Valledupar
- Manizales
- Bucaramanga
- Barranquilla

Ecuador

- Cuenca
- Quito

Uruguay

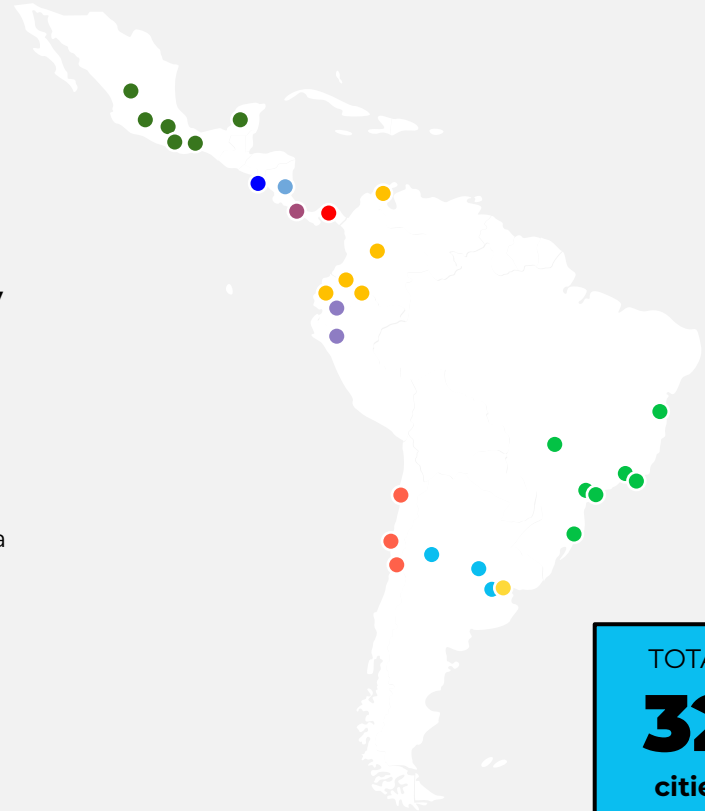
- Montevideo

Chile

- Santiago
- Valparaíso
- Antofagasta

Argentina

- Buenos Aires
- San Juan
- Rosario



TOTAL
32
cities

Why invest in E- buses in Latin America?



High urbanization rate in the region.

Latin America and the Caribbean is the second most urbanized region in the world after North America, with 84% of the population living in cities in 2022.

Source: SLOCAT, 2023 & World Economic Forum, 2019

High use of public transport by the population

Latin America is a mass-public transport powerhouse. The existing public transport and shared system comprises 68% of all passenger travel, one of the highest in the world. This favors the public bus system and therefore, an opportunity to position the electric bus market.

Across the region, 43% of the urban population had convenient access to public transport. Public transport was heavily impacted by the pandemic, however, after economic and political delays and despite ridership losses, the system expanded in 2022 and 2023.



Public policy focused on emissions reduction and sustainable urban mobility

The transport sector is among the biggest source of emission on cities. For this reason, in some of them, air quality issues are driving the introduction of stricter vehicle emission standards and adoption of E-Buses. Also, national governments have increasingly recognised the need to support city and local governments in planning and implementing strategies in this matter (plans, policies and guidelines).

Source: SLOCAT, 2023 & World Economic Forum, 2019



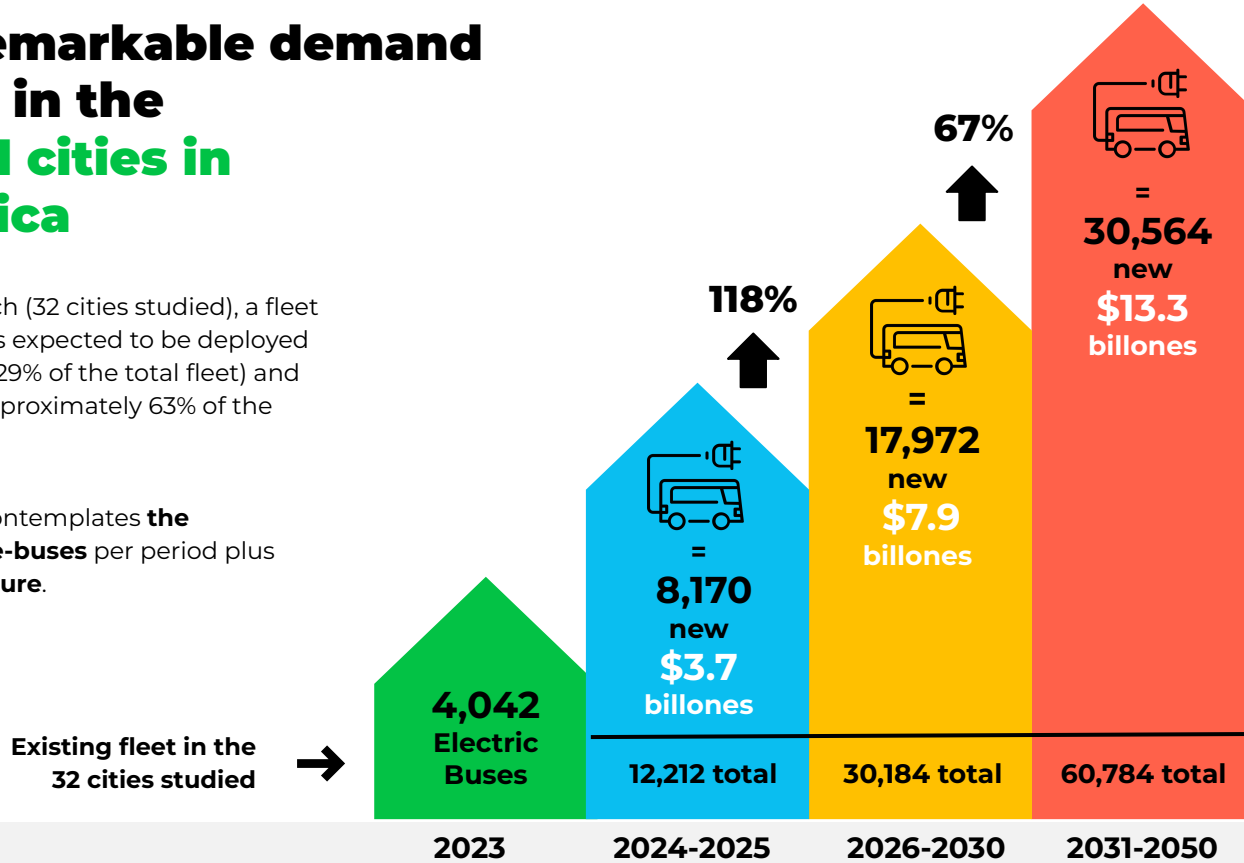
Electric grid with high penetration in renewable energies

Countries in the region show the strongest linkages to renewable energy in transport globally, with nearly 12% of their NDC actions associated with alternative fuels. This allows more environmental benefits from e-buses, as they are powered by clean energy sources.

There's a remarkable demand for e-buses in the 32 analysed cities in Latin America

According to this research (32 cities studied), a fleet of over **25,000 e-buses** is expected to be deployed by **2030** (approximately 29% of the total fleet) and **over 55,000 by 2050** (approximately 63% of the total fleet).

The **investment costs** contemplates the **acquisition of the new e-buses** per period plus the **charging infrastructure**.



The growth percentages represent the growth in investment between periods.

Source: City interviews (2023), relevant public policies and E-Bus Radar

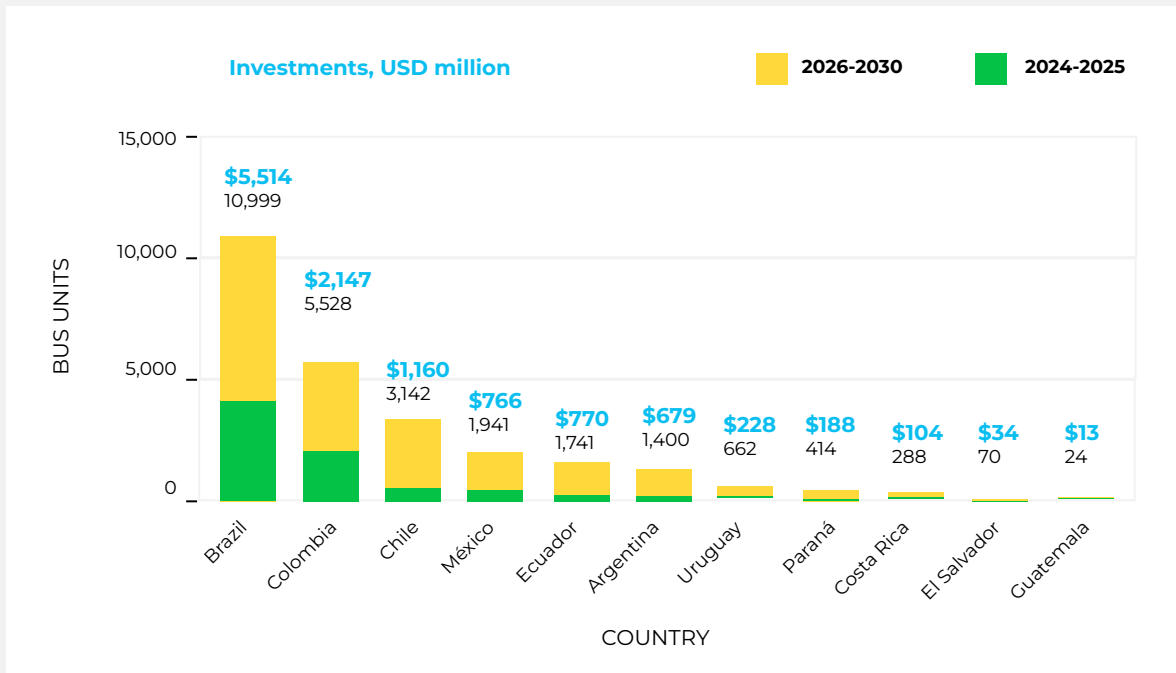
Forecast demand by type of bus



	Minibus (<9m)	Midi-Bus (9-11.5m)	Padron (11.5-15m)	Articulated	Biarticulate d	Double deck	Total of buses
2024-2025	705	1,593	4,465	1,110	271	19	8,163*
2026-2030	983	3,042	11,219	2,028	649	44	17,965*
2031-2050	1,463	6,777	18,324	3,052	933	7	30,556*

***Note:** Total number of buses slightly vary when compared to the numbers in the previous page due to round up considerations on the projections for each of the analyzed cities.

Brazil, Colombia, Chile and Mexico are expected to be the most important markets by 2030



Strong goals in these markets, as well as more developed business models, are driving the adoption of electric buses in these countries.

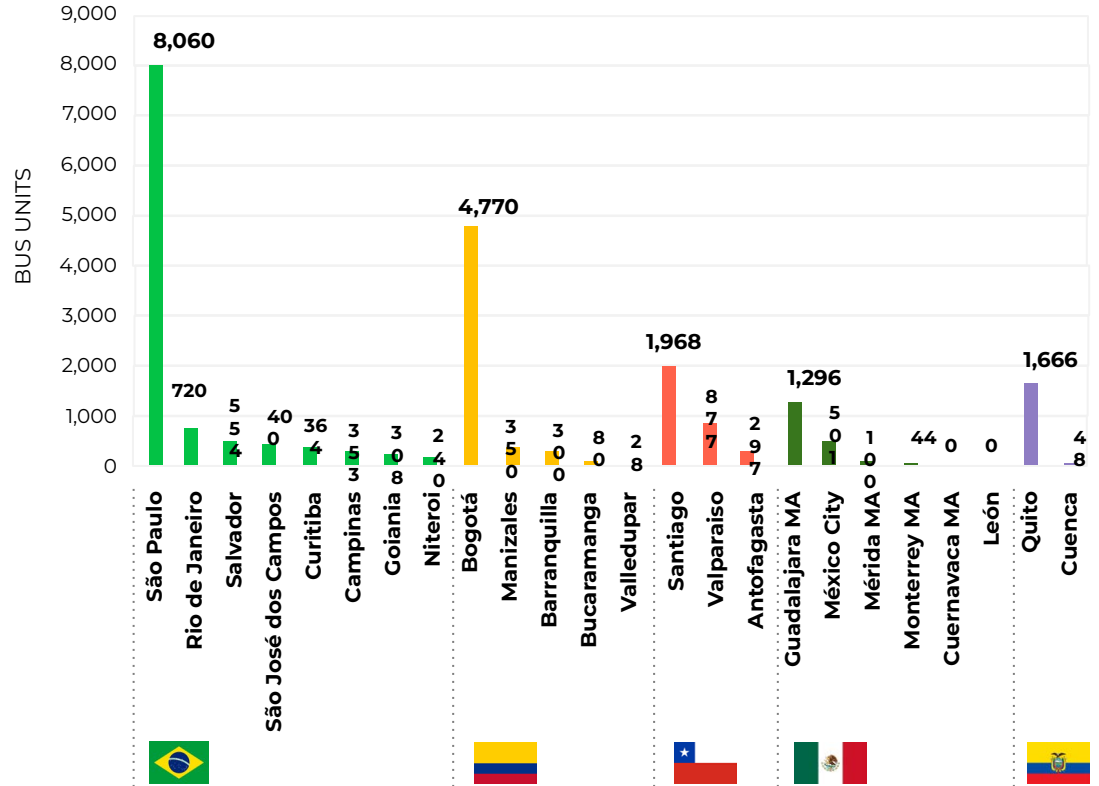
These 4 countries account for 83% of the market until 2030.

Nonetheless, other countries demonstrate important signals and present interesting opportunities going forward.

The graph shows the countries e-bus projection and its Investment size including charging infrastructure

The megacities are in the lead, although...

Other cities show great promise. By 2030, cities such as **Quito** and **Guadalajara MA** show ambition in deploying e-buses as part of their public transport fleets. They follow the regional leaders, **São Paulo**, **Bogotá** and **Santiago**.



*MA: Área Metropolitana

What are the current business models for fossil - fuelled buses?

<i>Business model</i>	<i>Description</i>	<i>City examples</i>																					
<p>A Integral agent (private or public) that concentrates ownership and operation</p>	<p>A.1 Private investment and operation. Operators are owners of the fleet (responsible for the acquisition, the maintenance, operation and replacement). There are concession companies that buy their own buses, and also affiliate companies, where the affiliate (individual person) buys and owns the vehicle.</p> <p>A.2 Public investment and operation. Buses are purchased by the city. The operation comes from a public entity.</p>	<p>Cities from:</p> <table border="0"> <tr> <td>Brazil</td> <td>Manizales</td> <td>Montevideo</td> </tr> <tr> <td>Chile</td> <td>Bucaramanga</td> <td>Ciudad de México</td> </tr> <tr> <td>Argentina</td> <td>Barranquilla</td> <td>Cuernavaca</td> </tr> <tr> <td></td> <td>Salvador</td> <td>Monterrey</td> </tr> <tr> <td></td> <td>Quito</td> <td>León</td> </tr> <tr> <td></td> <td>San José</td> <td>Bogotá</td> </tr> <tr> <td></td> <td></td> <td>Valledupar</td> </tr> </table>	Brazil	Manizales	Montevideo	Chile	Bucaramanga	Ciudad de México	Argentina	Barranquilla	Cuernavaca		Salvador	Monterrey		Quito	León		San José	Bogotá			Valledupar
Brazil	Manizales	Montevideo																					
Chile	Bucaramanga	Ciudad de México																					
Argentina	Barranquilla	Cuernavaca																					
	Salvador	Monterrey																					
	Quito	León																					
	San José	Bogotá																					
		Valledupar																					
<p>B Separating asset ownership from operation</p>	<p>Buses are purchased with public financing (local or national entities). Private companies provide the operation through concessions.</p>	<p>Valledupar Monterrey</p>																					
<p>C Combination of public + private investment</p>	<p>The financing is a combination of public and private investment. The operation comes from private operators.</p>	<p>Guadalajara (A percentage -case by case- of the acquisition is covered by the city). Antofagasta (50% public financing with a national program for fleet renewal) Merida (10% city financing)</p>																					

Source: City interviews (2023)

We identified 2 types of E-bus business models in this study*

Business model	Description	City examples
<p>A Integral agent (private or public) that concentrates ownership and operation</p>	<p>A.1 Private investment and operation. Operators are owners of the fleet (responsible for the acquisition, the maintenance, operation and replacement).</p>	<p>Montevideo Campinas Salvador</p> <p>México City Monterrey</p>
	<p>A.2 Public investment and operation. Buses are acquired by the city. The operation comes from a public entity.</p>	<p>Panamá Goiânia Rosario</p>
<p>B Separating asset ownership from operation</p>	<p>B.1 Buses are acquired with public financing (local or national entities). The e-buses are leased (in certain cases with a buying option) or provided to private operators with operation payments.</p>	<p>Guatemala San José Valledupar Bucaramanga</p> <p>Barranquilla São José dos Campos Antofagasta</p> <p>Santiago Bogotá</p>
	<p>B.2 Operators are responsible for leasing the buses from a private entity that has purchased the units.</p>	<p>Monterrey Bogotá Santiago</p> <p>Campinas Salvador Antofagasta</p> <p>Santiago</p>
		<p>*São Paulo, Curitiba and San Juan.</p>

**This list is not exhaustive; other (sub) models are also being explored or have already been adopted.*

Source: City interviews (2023)

Average costs for E-buses and infrastructure (per country)

Country	Mini bus (<9m)	Midi-Bus (9-11.5m)	Padron (11.5-12.5m)	Articulated	Bi-articulated	Charging infrastructure
Brazil	ND	ND	\$526,500	\$670,000	ND	\$45,000
Ecuador	ND	\$220,00	\$350,000	\$650,000	\$800,000	\$30,000
Colombia	\$194,000	ND	\$285,000	ND	ND	\$20,000
México	\$218,000	\$180,000	\$454,000	\$470,600	ND	ND
Panamá	ND	\$261,000	\$390,000	ND	ND	\$60,000
Argentina	ND	ND	\$521,700	ND	ND	\$27,500
Chile*	ND	\$180,000	\$433,931	ND	ND	ND
Uruguay	ND	ND	\$330,000	ND	ND	\$37,000
Guatemala	ND	ND	\$527,000	ND	ND	ND
El Salvador	ND	ND	\$450,000	ND	ND	ND
Costa Rica	ND	ND	\$330,000	ND	ND	ND

The charging infrastructure varies between 6-23 % over the E-bus price.

Sources: City interviews (2023) & ZEBRA, (2022)

*In addition, in the case of Santiago it was possible to obtain the Double Decker e-bus price (\$560,000).

Source: City interviews (October 2023)

Los costos promedio de e-buses e infraestructura (por país)

Country	Mini bus (<9m)	Midi-Bus (9-11.5m)	Padron (11.5-12.5m)	Articulado	Bi-articulado	Charging infrastructure
Brazil	ND	ND	\$526,500	\$670,000	ND	\$45,000
Ecuador	ND	\$220,000	\$350,000	\$650,000	\$800,000	\$30,000
Colombia	\$194,000	ND	\$285,000	ND	ND	\$20,000
México	\$218,000	\$180,000	\$454,000	\$470,600	ND	ND
Panamá	ND	\$261,000	\$390,000	ND	ND	\$60,000
Argentina	ND	ND	\$521,700	ND	ND	\$27,500

Source: Entrevistas a ciudades, (2023)

Los costos promedio de e-buses e infraestructura (por país)

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El Salvador	ND	ND	\$450,000	ND	ND	ND
Costa Rica	ND	ND	\$330,000	ND	ND	ND

La Charging infrastructure varía entre el 6% y el 23% del precio de los e-buses.

Source: Entrevistas a ciudades, (2023) y ZEBRA, (2022)

*Adicionalmente, en el caso de Santiago fue posible obtener el precio del autobús eléctrico de dos pisos (\$560,000).

How ready are these 32 cities for electrification?

To understand which cities are better prepared to scale up e-buses, a series of parameters were defined to classify cities' readiness for their deployment.

Cities are classified according to their e-bus maturity, in three levels:

Leaders	6 pts
Immediate potential	4-5 pts
Future potential	0-3 pts

Parameter	Reasoning
Pilot testing	Has the city run a pilot with e-buses?
Charging infrastructure	Has the city developed or is it in the process of having the necessary adaptations for depots or on-street opportunity charging?
Existing fleet	Is the city operating any e-buses currently?
Business model defined	Has the city defined, identified or favored a business model for their e-bus operations?
Political framework	Does the city have a national/local policy, plan or legislation that promotes the conversion of the city's fleet to zero-emission?
Targets for fleet electrification	Has the city defined targets for fleet electrification?

Score: Yes = 1 pt, No = 0 pts

Ranking chart (Leaders)

Cities	Score	Pilot test	Charging infrastructure	Existing fleet	Business model	Local policies/plans/legislation	Electrification targets
São Paulo	6	✓	✓	✓	✓	✓	✓
São José dos Campos	6	✓	✓	✓	✓	✓	✓
México City (Metrobus)	6	✓	✓	✓	✓	✓	✓
Monterrey Metropolitan Area	6	✓	✓	✓	✓	✓	✓
Bogotá	6	✓	✓	✓	✓	✓	✓
Santiago	6	✓	✓	✓	✓	✓	✓
Guatemala City	6	✓	✓	✓	✓	✓	✓
Panamá City	6	✓	✓	✓	✓	✓	✓
Antofagasta	6	✓	✓	✓	✓	✓	✓

Ranking chart (Immediate potential)

Cities	Score	Pilot test	Charging Infrastructure	Existing fleet	Business model	Local policies/plans/legislation	Electrification targets
Campinas	5	✓	●	✓	✓	✓	✓
Salvador	5	✓	●	✓	✓	✓	✓
Merida Met. Area	5	✓	✓	✓	●	✓	✓
Montevideo	5	✓	●	✓	✓	✓	✓
Curitiba	4	✓	●	●	✓	✓	✓
Niterói	4	✓	●	●	✓	✓	✓
Guadalajara Met. Area	4	✓	●	✓	●	✓	✓
Valledupar	4	✓	●	●	✓	✓	✓
Manizales	4	✓	●	●	✓	✓	✓
Bucaramanga	4	✓	●	●	✓	✓	✓
San José	4	✓	●	●	✓	✓	✓
San Juan	4	✓	●	●	✓	✓	✓

Ranking chart (Immediate potential)

Cities	Score	Pilot test	Charging infrastructure	Existing fleet	Business model	Local policies/plans/legislation	Electrification targets
Río de Janeiro	3	✓	●	●	●	✓	✓
Barranquilla	3	●	●	●	✓	✓	✓
Quito	3	✓	●	●	●	✓	✓
Cuenca	3	✓	●	●	●	✓	✓
Buenos Aires	3	✓	●	●	●	✓	✓
Rosario	3	●	●	●	✓	✓	✓
Goiânia	3	✓	●	●	✓	✓	●
Valparaiso	2	●	●	●	●	✓	✓
San Salvador	2	●	●	●	●	✓	✓
León	2	✓	●	●	●	✓	●
Cuernavaca Metropolitan Area	1	●	●	●	●	✓	●

Identified risks and possible mitigation mechanisms



Political and regulatory risk



Change of government or transport authorities

This may put on hold projects and programs in electrification because of a lack of political will or gaps on technical knowledge.



Lack of regulations to promote electric buses

A solid regulatory framework is required in the system to attract foreign investment. Also, updated legislation to promote incentives for the public transport sector



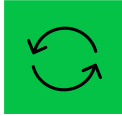
Proliferation of informal transport services

Due to deficiencies in the public transport services, proliferation of informal transportation is capturing demand from current services. Inclusion of these services as part of public transport systems and increasing demand is necessary to create the enabling conditions to attract investment.

Mitigation mechanisms

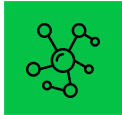
- Agreements, materialized through binding regulations, between stakeholders to implement plans and provide security for investments. For example, Bogota's Acuerdo Distrital 790 (2020) and several Brazilian cities' laws.
- Capacity building and technical advice for new administrations
- Approve ambitious policies and targets, with intermediate goals, to provide clear signals for investors. Santiago has one of the most ambitious ones in the region.
- Engage all stakeholders to create comprehensive public policies that benefit everyone. An example is the Strategic Plan Niterói que queremos, from the Brazilian city.
- Establishment of fair, inclusive and sustainable transport policies for public transport.
- Inclusion of informal transport services within formal public transport operators.
- Create financial, management and operational structures in the public transport system that are sustainable and provide trust and bankability to investors by reducing risks. Mérida MA and San Salvador are implementing measures to create formalized structures to support the transition to e-buses.

Operational risk



Changing the fleet to e-buses will require operational changes

This can cause resistance from the operators and uncertainty in the unit domain. As they are more dispersed forms of organization, there might be less convincing capacity.



Systems where each operating concession has an owner

This makes organization and massive investment more difficult. Many of the cities are already in transition to more integrated operation schemes.



Environmental conditions vary significantly around the region

Climate and topography conditions may cause difficulties for the vehicle performance.

Mitigation mechanisms

- Robust planning of operations to ensure that e-buses can operate as well as combustion engine buses.
- Capacity building sessions to relevant authorities and operating companies to guarantee adequate operation of e-buses.
- Communication strategies with the public transport ecosystem to create a suitable transition towards e-buses. During its pilot project, San Jose created a communications and engagement strategy for the public, operators and transport authorities to prepare them for the new operating conditions with e-buses.
- Create financial, management and operational structures in the public transport system that are sustainable and provide trust and bankability to investors by reducing risks.
- Design of Credit Guarantee Schemes focusing on public transport systems that catalyze the formalization of the sector, reducing lending risks. Cuenca's Chamber of Private Operators has centralized fare collection systems to support reduce lending risks.
- Pilot projects to test e-buses in real operating conditions.
- Networking with cities with similar conditions to exchange experiences and opportunities for e-bus deployment. Latin American cities have utilized e-buses under coastal and mountainous conditions, which provide interesting results for the whole region.

Source : C40, ICCT, ZEBRA, Hincio, 2023.

Financial risk



Importing e-buses is quite expensive, especially due to tariffs

For this reason, there is a need for cost-competitive national manufacturing. Some cities already have it, but it is very expensive in comparison to imported buses.



There is still the challenge to accommodate electrification of buses into current contracts

Some diesel fleets are fairly new and companies are still far from needing a replacement.



Higher upfront investment

Costs of units, charging infrastructure and electric power supply are higher than for internal combustion engine buses. This could be aggravated due to exchange rate risks.



The cost of the system falling completely on fares

This may cause that new efforts to improve the service will impact the user, by having them covered through ticket prices.

Mitigation mechanisms

- Create long-term investment strategies in manufacturing countries that promote the revamping of current facilities and ensuring cooperation, capacity building and exchanging regional experience of current manufacturers to supply e-buses to local and regional markets. Colombia's National Electric Mobility Strategy is an example.
- Negotiation with operating companies to include e-bus targets with incentives and KPIs in ongoing contracts.
- Create fair buyout mechanisms to substitute internal combustion engine buses, ensuring their decommissioning. The case of Mexican states with NAFIN to replace buses through bonds is an interesting experience.
- Diversification of business models to ensure all types of operators can transition towards e-buses.
- Bulk purchase through federal government
- Management or through city alliances to reduce CAPEX for cities. This has not been the case yet for the region, but the Indian experience could be helpful.
- Restructure public transport to consider cash flow mechanisms related to service level KPIs, for transport operators and bus providers. Barranquilla has a fare stabilization fund to finance the system, as well as payments per km traveled to operators.

Source : C40, ICCT, ZEBRA, Hincio, 2023.

Technology risk



The market of e-buses is yet to be ripe in the region

There is still uncertainty in the technology due to a lack of data and comparative success stories of long-term performance and cost savings. Also, more training is required to build technical capacities.



Lack of knowledge around charging infrastructure costs, equipment and conditions

Uncertainty in the capacity of bus depots and available land location to build charging infrastructure. In addition, for longer distances it might be necessary on-street opportunity charging, which could imply higher costs.

Mitigation mechanisms

- Support from e-mobility platforms (ZEBRA, GEF, MDBs, UNEP, etc.) to exchange experiences from operators, authorities and suppliers to accelerate the deployment of e-buses.
 - Dissemination of case studies on regional operations and networking among decision makers to commit to deployment of e-buses. Reports such as the ones in Buenos Aires and San Jose could be helpful for other cities.
-
- Support from e-mobility platforms (ZEBRA, GEF, MDBs, UNEP, etc.) to build capacities in operators, authorities, utilities and suppliers to accelerate the deployment of e-bus charging infrastructure. Experiences in Chile, Colombia, Panama, Mexico, Chile and Uruguay can support regional knowledge.

An aerial photograph of a city street, likely in Buenos Aires, showing a wide multi-lane road with a central green median and a tall, white, triangular tower in the foreground. The word "Cities" is written in a white box with a black border in the center of the image. The background is filled with dense urban buildings and a clear blue sky.

Cities

Summary chart

#	Country	City	Existing e-buses (2023)	New e-bus by target year	Target year	% new e-buses in total fleet
1	México	México City (Metrobus)	115	501	2030	65%
		Guadalajara Metropolitan Area	38	1,296	2030	25%
		Cuernavaca Metropolitan Area	0	No goals have been set yet	-	No goals have been set yet
		Monterrey Metropolitan Area	66	44	2027	17%
		Mérida Metropolitan Area	136	100	2024	10%
		León	0	No goals have been set yet	-	No goals have been set yet

Summary chart

#	Country	City	Existing e-buses (2023)	New e-bus by target year	Target year	% new e-buses in total fleet
2	Guatemala	Ciudad de Guatemala	24	24	2030	8%
3	El Salvador	San Salvador	0	70	2025	1%
4	Costa Rica	San José	0	288	2030	17%
5	Panamá	Panamá City	5	414	2030	29%
6	Colombia	Bogotá	1,485	4,770	2030	50%
		Valledupar	0	28	2030	15%
		Manizales	0	350	2030	36%
		Bucaramanga	0	80	2025	13%

Summary chart

#	Country	City	Existing e-buses (2023)	New e-bus by target year	Target year	% new e-buses in total fleet
6	Colombia	Barranquilla	0	300	2030	100%
7	Ecuador	Quito	0	1,667	2030	50%
		Cuenca	0	48	2030	10%
8	Brazil	Curitiba	0	364	2030	32%
		Río de Janeiro	0	720	2030	20%
		Niterói	0	240	2030	40%
		Salvador	8	554	2030	31%

Summary chart

#	Country	City	Existing e-buses (2023)	New e-bus by target year	Target year	% new e-buses in total fleet
8	Brazil	São José dos Campos	12	400	2030	100%
		São Paulo	68	8,060	2030	60%
		Campinas	15	353	2030	35%
		Goiânia	0	308	2030	32%
9	Chile	Santiago	2,000	1,968	2030	38%
		Valparaíso	0	877	2030	41%
		Antofagasta	40	297	2030	41%

Summary chart

#	Country	City	Existing e-buses (2023)	New e-bus by target year	Target year	% new e-buses in total fleet
10	Argentina	Buenos Aires	0	900	2030	50%
		San Juan	0	480	2030	80%
		Rosario	0	20	2030	3%
11	Uruguay	Montevideo	30	622	2030	41%



Cities

This section presents a summary of the progress on bus electrification for 32 Latin American cities. For its correct interpretation, take into account the following:

The investment calculations were made according to the prices of buses and charging infrastructure indicated by the cities. In cases where this information was not indicated, a given value for a similar city within the country or in another country was taken. These costs are described in each slide.



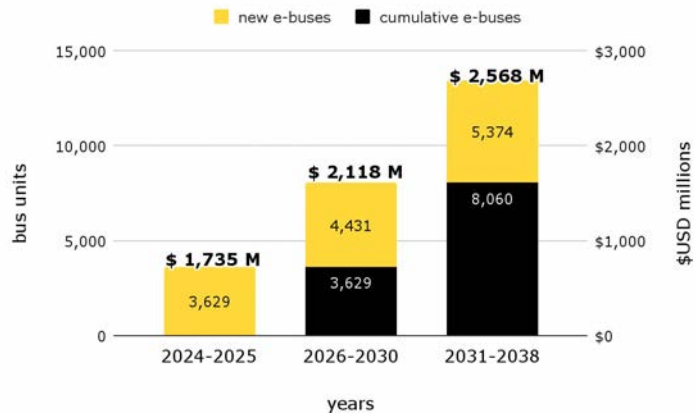
E-bus pipeline: 8,060 buses by 2030

The estimate was made according to the city's prime goal of **2,600 e-buses by 2024**, **50% electric fleet by 2028** and **100% by 2038**.

Brazilian e-bus price for a Padron bus: \$526,500 and \$670,000 for an Articulated bus. Prices of other types of e-buses were taken as a reference from other Latin American cities.*

Brazilian average cost of charging infrastructure: \$45,000 per bus.

*220k = Midi-Bus (9-11.5m)
194k = Minibus (<9m)



City policies

- Lei 7,220 (2006)
- Lei 576 (2016)
- Decreto 19,028 (2022)
- Lei Municipal n.º 9.684/2018

Identified risks

- Making the energy transition in urban transport without passing on the costs to the user (public transport funded by public fares) (Machado, 2023).
- Political complexity and the lack of a national guideline (MLG, 2022).

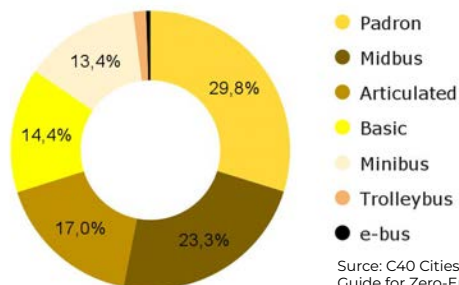
Possible mitigation mechanisms

- Restructuring cash flows based on KPIs.
- New business models, sources of revenue, and incentives for e-buses and charging infrastructure (Machado, 2023).
- Guarantee mechanisms to lower risks (such as fare stabilization funds or others).
- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).

Public Transportation Stats - 2023

Fleet: 13,434 diesel buses, 201 trolleybuses + **68 e-buses**
of operators: 24
of bus routes: 1,300
Average pax per day: 7.1 million
Ticket price (USD): \$0.85 (July 2022)
Average fleet age: 5.1 years

Fleet composition



Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, (2022).

Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, 2022.

Funding & Financing

- **Funding:** most funding in the city comes from the passengers' fares. Operators are then paid with fare revenues and city subsidies.
- **Financing:** operators are the players buying the buses. They do it with their resources or by requesting bank loans.

Charging infrastructure

- Enel X is a subsidiary of the electricity provider company in São Paulo, leading the infrastructure negotiations.
- Enel X is part of the electricity provider company in São Paulo, but other players are also interested and could be potential partners.
- The company is mapping the energy provision quality/amount in depots and the necessary adaptations.

Projects

The city of São Paulo aims to reach 2,600 electric buses in its fleet by the end of 2024. The city recently welcomed 50 new e-buses, the first since the 18-vehicle pilot launched in 2019.

In October 2022, SPTrans banned the procurement of new diesel buses. The decision was taken to comply with the Climate Change Law and the 2024 target since ZE-buses are the technology that primarily meets the reduction of the pollutants at present.

Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, 2022.

São José dos Campos



E-buses Pipeline: 400 buses by 2030*

City's goal: **400 electric buses by 2030**, with a single tender and phased delivery by suppliers.

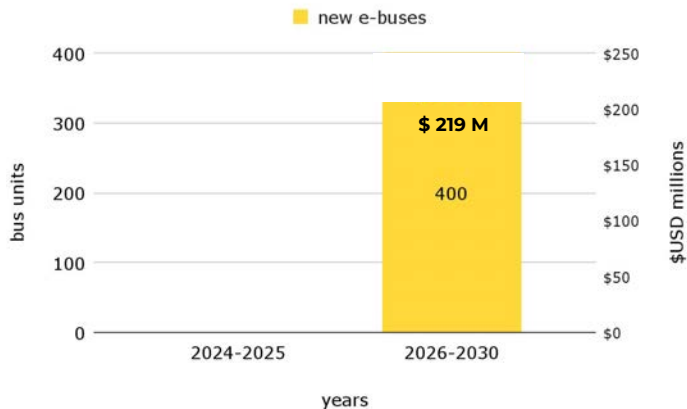
*The buses are expected to be delivered between 2024-2030.

The new contract is for 400 electric buses, replacing the 335 combustion buses that exist today, and the 12 current e-buses will be maintained.

Brazilian e-bus price for a Padron bus: \$526,500 and \$670,000 for an Articulated bus. Prices of other types of e-buses were taken as a reference from other Latin American cities.**

Brazilian average cost of charging infrastructure: \$45,000 per bus.

**220k = Midi-Bus (9-11.5m)



Public Transportation Stats - 2023

Fleet: 335 buses + **12 e-buses**

of operators: 3 (Expresso Maringá, Joseense and Saens Peña)

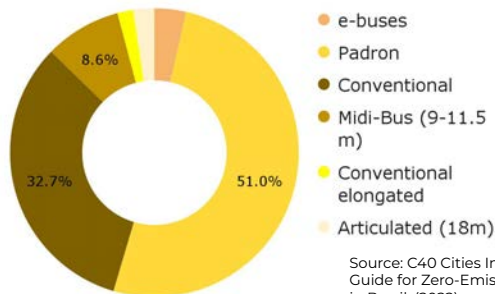
of bus routes: 104

Average pax per day: 214,000

Ticket price (USD): \$0.96 (June 2023)

Average fleet age: 7.2 years

Fleet composition



Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, (2022).

Cities policies

-Lei 7,220 (2006)

-Lei 576 (2016)

-Decreto 19,028 (2022)

-Lei Municipal n.º 9.684/2018

Identified risks

- Need for knowledge about the driving practices and operations of e-buses on the road. For example, there have been crashes with e-buses because people do not listen to them.
- Need for energy supply (electric capacity installed).
- Geographical and temperature difficulties.
- Lack of qualified drivers for electric vehicles.
- Charging times for electric buses are higher compared to diesel ones, requiring adjustments in planning and operations.

Possible mitigation mechanisms

- Knowledge exchange networks.
- Investment in energy provision.
- Testing new technologies that adapt well to local conditions.
- Capacity building and training in operating companies for adequate planning and operations.
- Comprehensive transport policies that prioritize public transport.
- General education is needed for the city to adapt to this new fleet.

Source: Secretaria de Mobilidade Urbana, 2023.

Funding y Financing (e-buses)

- **Funding:** Funding in the city comes from passengers' fares..
- **Financing:** The city bought the current E-buses with its own resources and allocated them to the operators. In São José dos Campos, the city hall will be the financier of the E-buses through URBAM a mixed capital company, responsible for procuring the vehicles, and then will provide them to the private operators

Charging infrastructure

- The municipality will be in charge of the infrastructure construction through a contracting process.
- For the pilot project of the 12 electric buses, the municipality owns the city's bus depots and is planning to directly procure all adaptations to implement the charging infrastructure.
- For energy demand, a connection to the conventional grid is made through a contract with any public property to the charging stations.
- Studies are being carried out and the possibility of a specific contract with the energy supplier is being considered.
- The municipality has started investing in renewable energy sources with the construction of an electricity generating unit powered by biogas captured at the landfill and the implementation of a solar photovoltaic plant which, among other things, will be responsible for charging the Green Line's VLPs.

Projects

Green Line: Specific route for electric buses. The project is a broader concept not only as public transport, but also as an integration of urban planning. The municipality assumed the infrastructure costs (built the lanes and purchased the chargers).

- First phase: exclusive electric bus corridor, sidewalks and bike lanes.
- Second phase - corridor for electric buses and other vehicles (East Ring Road), with sidewalks and bike lanes along the entire stretch.

Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, 2022 & Secretaria de Mobilidade Urbana, 2023.

Campinas



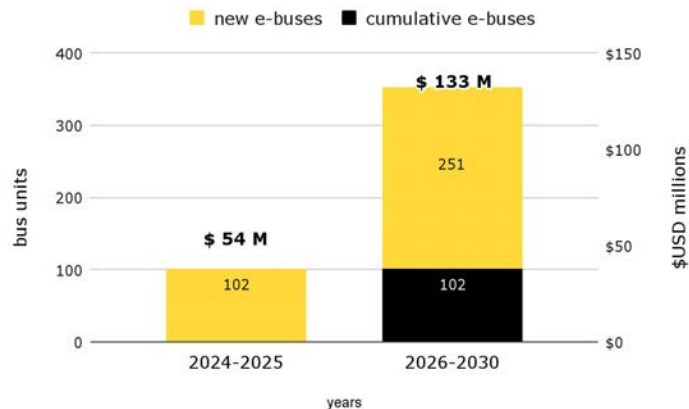
E-bus Pipeline: 353 buses by 2030

The estimate was based on the next concession bidding target **25% of the fleet electrified in the next 5 years and 35% of fleet by 2030.**

Brazilian e-bus price for a Padron bus: \$526,500 and \$670,000 for an Articulated bus. Prices of other types of e-buses were taken as a reference from other Latin American cities.*

Brazilian average cost of charging infrastructure: \$45,000 per bus.

*220k = Midi-Bus (9-11.5m)
194k = Minibus (<9m)
800k = Biarticulado



City policies

- Law 16,022
- Plano de Mobilidade Urbana de Campinas (PMUC) (2019)

Identified risks

- Making the energy transition in urban transport without passing on the costs to the user (public transport funded by public fares) (Machado, 2023).
- Political complexity and the lack of a national guideline (MLG, 2022).

Possible mitigation mechanisms

- Restructuring cash flows based on KPIs.
- Guarantee mechanisms to lower risks (such as fare stabilization funds or others).
- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).

Public Transportation Stats - 2023

Fleet: 1,008 buses + 15 e-buses

of operators: 26

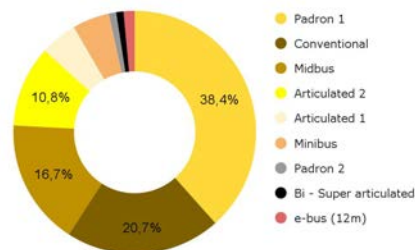
of bus routes: 226

Average pax per day: 450,000

Ticket price (USD): \$1.08 (July 2022)

Average fleet age: 8.3 years

Fleet composition



Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, (2022).

Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, 2022.

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes from passengers' fares. Under the new concession, the city will subsidize 25% of the operation. A new ticketing system and centralized fare collection will be implemented for the new concession. The fare revenues from the centralized fare collection will be transferred to the system account to fund 75% of the operation. The remaining 25% will be paid per the contracted tariff versus the number of passengers using city subsidies.
- **Financing:** the new operators will be responsible for the procurement of the E-buses. In case of payment default by operators, the city will cover the payments to asset owners.

Charging infrastructure

The city is currently procuring the charging infrastructure and the energy is paid for by the concessionaires.

Projects

Campinas launched a public consultation for the public bid and has a planned goal to electrify its fleet over the next two decades.

Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, 2022.

Salvador



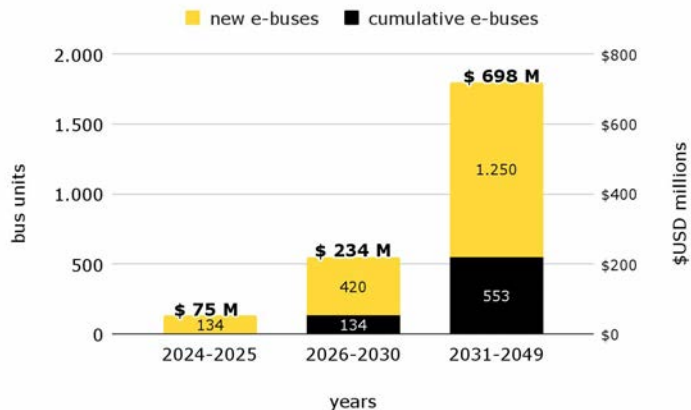
E-bus pipeline: 554 buses by 2030

The estimate was made according to the city's goal of **30% of its new BRT system fully electrified by 2024, 40% of the city's total public fleet will be electrified by 2032 and 100% by 2049.**

Brazilian e-bus price for a Padron bus: \$526,500. Prices of other types of e-buses were taken as a reference from other Latin American cities.*

Charging infrastructure cost indicated by the city: \$40,000 per bus

*194k = Minibus (<9m)



Public Transportation Stats - 2023

Fleet: 1,803 + **8 e-buses**

of operators: 3 (PLT+OTT+BRT)

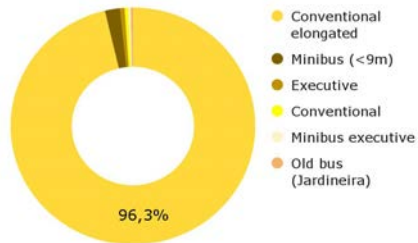
of bus routes: on average 300

Average pax per day: 1,200,00. Around 1,500,00 for metropolitan area.

Ticket price (USD): \$1 (July 2023)

Average fleet age: 7 years

Fleet composition



Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, (2022).

City policies

-Plano de Mitigação e Adaptação às Mudanças Climáticas

- Lei 9,374/2018, establishes the city policy on sustainable urban mobility and the PlanMob Salvador

-Planejamento estratégico

Identified risks

- To fit the electrification into current contracts. Today the entire cost of the system falls on fares.
- The municipality cannot invest in the fleets due to contract limitations. The infrastructure investment was the exception.
- Institutional and financial risk. In the current model, the fare would be very high. Today it does not have a guarantee model.

Possible mitigation mechanisms

- Restructuring cash flows based on KPIs.
- New business models for e-buses and charging infrastructure.
- Guarantee mechanisms to lower risks (such as fare stabilization funds or others).

Source: SEMOB, Secretaria Municipal de Mobilidade, 2023.

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes from passengers' fares. The city is assessing alternatives and feasibility to deploy electric buses in the public transport system.
- **Financing:**
 - The operators procured the initial eight ZE-buses using a financial recovery subsidy due to the pandemic. Salvador moves toward asset ownership separation model.
 - Salvador has not decided if it will separate CAPEX from OPEX. The city plans to maintain the concessional model, but remains open to another possibilities. The city is yet to define which guarantees will be provided for investors.

Charging infrastructure

- The city delivered in September 2023 the first charging infrastructure and the energy is paid for by the concessionaires.
- Salvador's first charging station that has a capacity for, at least, 40 ZE-buses. A second station is already being planned in a cooperation with GIZ.

Projects

- Study with the World Bank on how to finance charging infrastructure.
- They took part in a call from the BNDES (National Bank for Economic and Social Development), KfW and other partners and won cooperation to receive consultancy support in order to assess e-buses models within the city's context.
- BRT Infrastructure to be expanded +7km by 2024 with new BRT/BRS lines to be deployed.

Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, 2022 & SEMOB, Secretaria Municipal de Mobilidade, 2023.



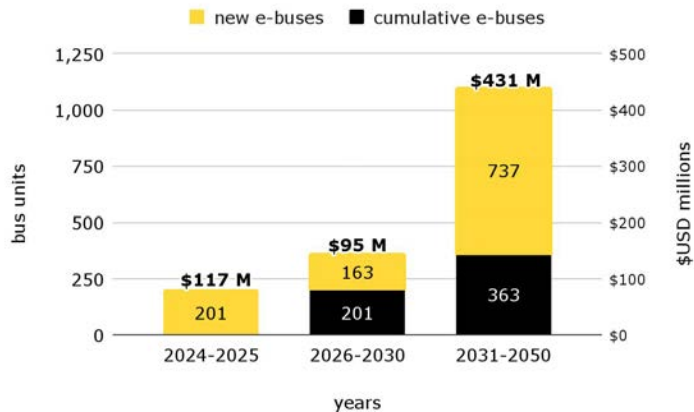
E-bus pipeline: 364 buses by 2030

The estimate was made according to the city's goal of acquiring **168 new e-buses by 2024, 33 electric fleet by 2030 and 100% by 2050.**

Brazilian e-bus price for a Padron bus: \$526,500 and \$670,000 for an Articulated bus. Prices of other types of e-buses were taken as a referenc from other Latin American cities.*

Brazilian average cost of charging infrastrucri \$45,000 per bus

*800k = Biarticulado
194k = Minibus (<9m)



City policies

- Lei 14,187 (2012)
- Decreto 1528 (2019)
- Plano de mobilidade urbana e transporte integrado (em construção)
- Plano de eletromobilidade para transporte coletivo (2023)

Identified risks

- Resistance from the operators: since the new concession would grant the municipality the entire domain.
- Buses prices are not being offered as competitive at a national level.
- Political and management complexity depending on the model chosen.

Possible mitigation mechanisms

- Communications and capacity building with the operating companies and municipal operators.
- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- Networking with cities to create larger markets for e-buses.

Source: Instituto de Pesquisa e Planejamento Urbano de Curitiba, 2023.

Public Transportation Stats - 2023

Fleet: 1,130 buses

of operators: 9 operators divided into 3 consortiums

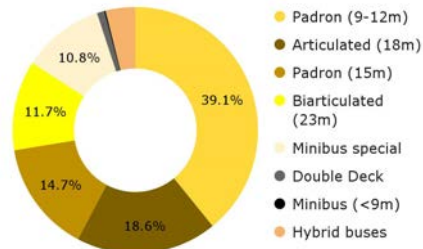
of bus routes: 250

Average pax per day: 800,000-900,000

Ticket price (USD): \$1.2 - 1.3 (June, 2023)

Average fleet age: 7.4 years

Fleet composition



Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, (2022).

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes mainly from passengers' fares and also receives subsidies from the municipality and state government (seasonal).
- **Financing:** The City Climate Finance Gap Fund, implemented by the European Investment Bank (EIB) and GIZ, supports the city with technical assistance to reframe the urban mobility services system in Curitiba and metropolitan region. The project considers fleet electrification as an assumption.

Stakeholder financing:

- **Public:** The city signed contracts with IDB, NDB, AFD and KfW for technical assistance projects, including support for the definition of a suitable electrification business model.
- **Private:** The city has ongoing negotiations with the IDB, AFD, NDB, KfW and BNDES on its electric mobility projects. The municipality has also held discussions with several private investors to develop its projects and gather information for its improvement.

Charging infrastructure

- The city is currently procuring the charging infrastructure and the energy is paid for by the concessionaires.
- There will be charging in depots and the possibility of investing in charging centers at strategic points in the city.

Projects

- Electrification pilot project: In 2022 a call for a demonstration of electric bus technology was issued. Nine proposals were received from 6 industries. Vehicle testing is already underway on 9 models - 3 articulated and 6 padrons (12 to 15 meters).
- Sustainable mobility technology park: The Urban planning secretariat (IPPUC) is supporting the project in partnership with the State of Paraná. It will promote electromobility solutions such as: building capacities such as battery management, bringing companies to cooperate in partnership, improve technology, train local supplies, train maintenance personnel from motor vehicles to electric vehicles, etc.

Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, 2022 & Instituto de Pesquisa e Planejamento Urbano de Curitiba, 2023.

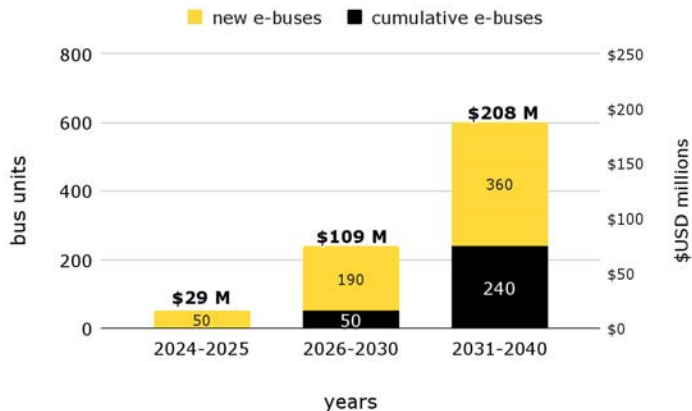


E-bus pipeline: 240 buses by 2030

The estimate was made according to the **new bidding process of 12 vehicles for 2024** and the city's plan of **100% electric fleet by 2040**.

Brazilian e-bus price for a Padron bus: \$526,500.

Charging infrastructure cost indicated by the city: \$50,000 per bus.



City policies

- Lei 2,913 (2012)
- Niterói que queremos: Plano estratégico 2013-2023
- Plano de Mobilidade Urbana Sustentável (2022)

Identified risks

- The market is yet to be ripe. More work with other cities is needed to show clear signals.
- Manufacturers are also waiting for the market to have more favorable conditions.
- Upcoming elections in 2024.

Possible mitigation mechanisms

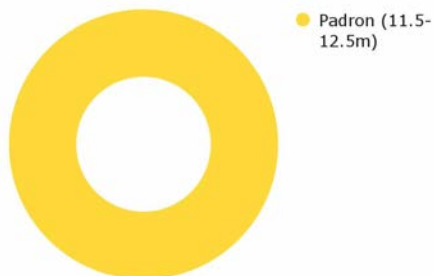
- Existing political commitment through laws and strategic plans to support electrification plans.
- Networking with cities to accelerate larger markets for e-buses.

Source: Secretaria Municipal de Urbanismo e Mobilidade, 2023

Public Transportation Stats - 2023

Fleet: 600 buses
of operators: 2 (Transoceânica 64% and Transnit 36%)
of bus routes: 54
Average pax per day: 302,116
Ticket price (USD): \$0.85 (July 2022)
Average fleet age: 4.6 years

Fleet composition



Funding & Financing (E-buses)

- **Funding:** Funding in the city comes from passengers' fares. The city uses the pay per person system.
- **Financing:** The city hall is still studying ways to finance the new system.

Charging infrastructure

Reference studies on where to place the charging stations are already available. The idea is to place the infrastructure at the bus terminals.

Progress is being made with the acquisition of the free energy market for the electrification of the bus fleet. An agreement was made with the city of Rio de Janeiro, where the municipality can purchase energy directly from the company that is generating energy, without an intermediary.

Projects

The city tested a BYD bus in 2022 for 4 months in several lines of the city (09/2021-01/2022). By July (2023), both Eletra and Marcopolo provided the city with 1 bus from each company for testing.

Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, 2022 & Secretaria Municipal de Urbanismo e Mobilidade, 2023

Rio de Janeiro

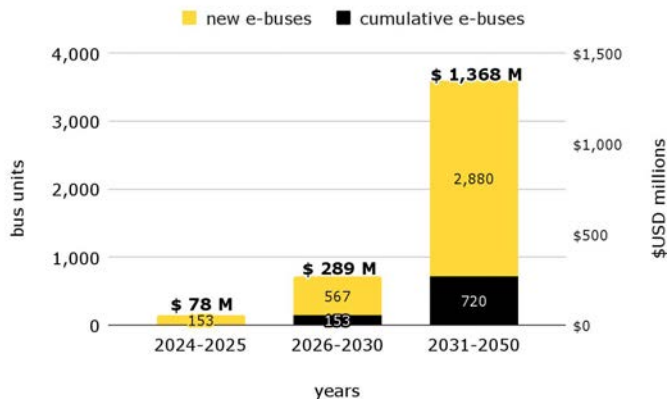


E-bus pipeline: 720 buses by 2030

The estimate was made according to the city's commitment to have **40 e-buses by 2024, 20% electric fleet by 2030 and 100% by 2050.**

Brazilian e-bus price for a Padron bus: \$526,500 and \$670,000 for an Articulated bus. Prices of other types of e-buses were taken as a reference from other Latin American cities.*
Brazilian average cost of charging infrastructure: \$45,000 per bus.

*220k = Midi-Bus (9-11.5m)
194k = Minibus (<9m)



City policies

- Decreto 46.081 (2019)
- Lei 7.315 (2022)

Identified risks

- City buses are operated by private companies. The change of the bus fleet to electric buses will require operational changes for the operators (C40,2019).
- Financing costs on the units and their recharging infrastructure (epe,2020).
- Political complexity.

Possible mitigation mechanisms

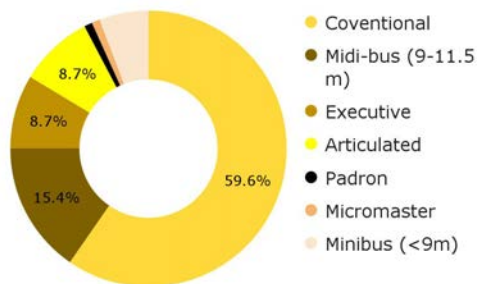
- Negotiations with the operating companies, incentives and KPIs.
- New business models for e-buses and charging infrastructure.
- Political agreements with all stakeholders.

Source: Secretaria Municipal de Transportes (SMTR), 2023 & C40 Cities Investment Guide for Zero-Emission Buses in Brazil, 2022.

Public Transportation Stats - 2023 (only conventional bus system)

Fleet: 3,600 buses
of operators: 29
of bus routes: 358 (October 2023)
Average pax per day: 2.2 million (October 2023)
Ticket price (USD): \$0.85 (October 2023)
Average fleet age: 7.6 years (May 2023)

Fleet composition



Funding & Financing (E-buses)

- **Funding:** most funding in the city comes from the passengers' fares. Operators are then paid with fare revenues and city subsidies. The public subsidy currently accounts for ~30% of the system's total revenue, the other ~70% being covered by the fare paid by users.
- **Financing:** the city hall is studying business models for future public bidding processes

Charging infrastructure

Rio's energy provider is Light. The company supported studies for the adaptation of one depot, but the company is still evaluating how to invest in electric mobility .

Projects

The city started the C40/CFF "Eco-Garage for Electric Buses in Rio de Janeiro" project. It aims to develop a business model and a functional project for the local transport network, for the provision of 50 electric buses in a depot, max of 80-100 buses; adopting concepts of resilience and the circular economy.

Source: Secretaria Municipal de Transportes (SMTR), 2023 & C40 Cities Investment Guide for Zero-Emission Buses in Brazil, 2022.



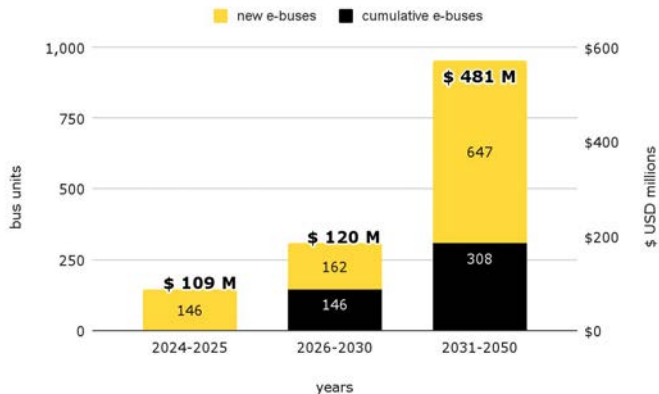
E-bus pipeline: 308 buses by 2030

The estimate was based on the next bidding for the rental of **114 e-buses by 2024**, and an average distribution per year, assuming that in **2050 all the fleet will be electrified**.

Brazilian e-bus price for an Articulated bus: \$670,000. Price of the other type of e-bus was taken as a reference from other Latin American city.*

Brazilian average cost of charging infrastructure: \$45,000 per bus.

*800k = Biarticulado



City policies

- Law 9,929
- Plano de Mobilidade de Goiânia (em construção)

Identified risks

- Making the energy transition in urban transport without passing on the costs to the user (public transport funded by public fares) (Machado, 2023).
- Political complexity and the lack of a national guideline (MLG, 2022).

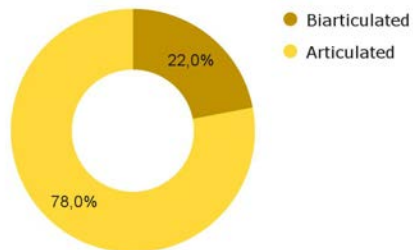
Possible mitigation mechanisms

- Restructuring cash flows based on KPIs.
- Guarantee mechanisms to lower risks (such as fare stabilization funds or others).
- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).

Public Transportation Stats - 2023

Fleet: 955 buses
 # of operators: 5
 # of bus routes: 283
 Average pax per day: 211,000
 Ticket price (USD): \$0.83 (July 2022)
 Average fleet age: 3.6 years

Fleet composition



Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, 2022.

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes from passengers' fares. The city uses the pay per person system.
- **Financiación:** The city is planning to rent E-buses and operate them through a public company called Metrobus.

Charging infrastructure

Not identified

Projects

Not identified

Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, 2022.

Bogotá



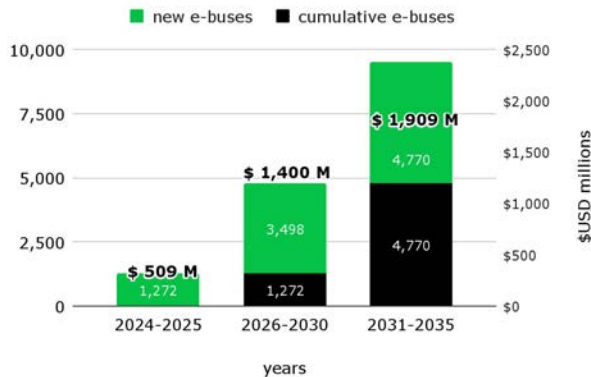
E-bus pipeline: 4,770 buses by 2030*

The estimate was made according to the Law 1964 which establishes that **40% of buses acquired by 2029** and **100% of buses acquired by 2035 must be electric**. Also, Agreement 790 establishes that new bidding processes must be done with zero-emission buses.

Colombian e-bus prices: \$194,000 for a Minibus (<9m) and \$285,000 for a Padron bus (12m). Prices of other types of e-buses were taken as a reference from other Latin American cities.**

Colombian average cost of charging infrastructure: \$20,000 per bus.

**650k = Bus articulado / 800k = Bus biarticulado



Public Transportation Stats - 2023

Fleet: 9,540 + **1,485 e-buses**

of operators: 17

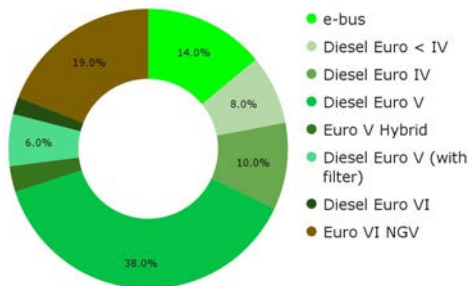
of bus routes: 575

Average pax per day: 133,333 (April 2023)

Ticket price (USD): \$0.72 trunk routes, 0.67 area services.

Average fleet age: 52% less than 3 years (trunk routes), 54% less than 3 years (feeder routes), 49% between 5 and 10 years (zonal routes)

Fleet composition



Source: Transmilenio, (2023); E-bus radar, (2023)

City policies

- Acuerdo Distrital 790 de 2020 (mandato 4)
- Plan Maestro de Movilidad de Bogotá
- Plan de Ascenso Tecnológico del SITP

Identified risks

- The financial models with which the contracts were developed, were not well established. Government investment is required, as the fleets designed cannot be fully incorporated by the private sector.
- The changes in government.
- Unsustainable systems due to lack of demand (Portal de Movilidad, 2023).

Possible mitigation mechanisms

- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- Comprehensive public transport policies that increase demand and use.

Source: Secretaria de Movilidad Urbana, 2023.

Funding y Financing (e-buses)

- **Funding:** Not identified.
- **Financing:** La ciudad ha incorporado un mecanismo que permite reducir el riesgo financiero para el inversor y el riesgo tecnológico para el operador mediante una doble licitación que separa la provisión de la Fleet de e-buses de la operación.

Charging infrastructure

- There are 9 depots and 1 additional depot that is not exclusively electric.
- There are 209 solar panels installed in the electrical depots, which contribute to energy efficiency.

Projects

In 2022 Bogota inaugurated La Rolita, the first and only public transport operator in the history of the city, composed of 100% electric buses, with gender equity, where 50% of its employees are women who work in driving, technical and administrative tasks. The city opted for 1,485 100% electric buses that are currently operating. This electric fleet includes 195 buses that are part of La Rolita.

Source: C40 Cities Investment Guide for Zero-Emission Buses in Brazil, 2022 & Secretaria de Mobilidade Urbana, 2023.



National policies

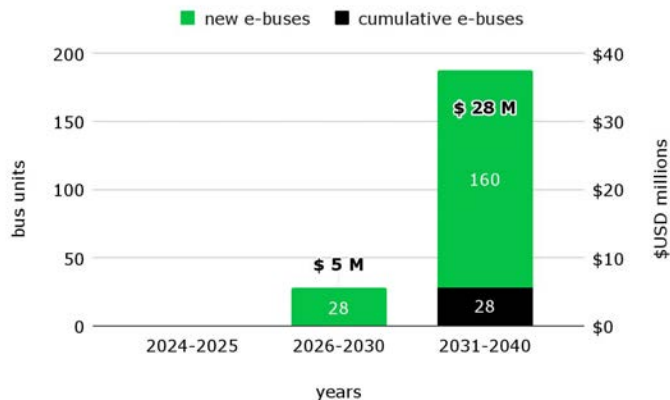
- Plan Nacional de Desarrollo de Colombia 2022-2026
- Estrategia Nacional de Movilidad Eléctrica
- Ley 1964 (2019)

E-bus pipeline: 28 buses by 2030

The estimate was made considering the last fleet renewal, the useful life of the units (15 years), and the next replacement date (2037 CNG and 2029 diesel).

E-bus price indicated by the city: \$157,000 for a Minibus (<9m.)

Charging infrastructure cost indicated by the city: \$20,000 per bus.



Identified risks

- Electoral year: new authorities and political difficulties.
- Electric power supply: the service is expensive.
- Unplanned urban growth as a determining factor in required autonomies.
- For Strategic Transportation Systems there is a restriction that a minimum of 75% of the vehicles must be domestically bodied.

Public Transportation Stats - 2023

Fleet: 188 buses

of operators: 1

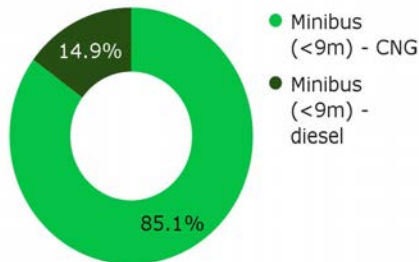
of bus routes: 12

Average pax per day: 18,000 (with 9 routes; 30,000 are expected with the 12 routes)

Ticket price (USD): \$0.4-0.5 (June 2023)

Average fleet age: CNG buses entered in dec 2022, diesel buses are 9 years old

Fleet composition



Possible mitigation mechanisms

- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- Investments in energy provision.
- Pilot projects in routes that require expansion.

Funding & Financing (E-buses)

- **Funding:** Not identified.
- **Financing:** Investment with a distribution of 70% coming from the national government and 30% from the local government. Private companies provide supply through concessions.

Charging infrastructure

Depot charging has been the main option reviewed. Other options are not excluded, however the main focus has been depot charging.

Projects

- Progress thanks to the project with TUMI and WRI: Pre-feasibility analysis for road electrification (technical and financial aspects).
- In addition, two pilot projects are proposed in terms of transition to an electric fleet:
 1. To be able to expand into a more rural area (on the slopes of the Sierra Nevada, with tourism potential).
 2. In the municipality of La Paz where the National University is located (16 km from Valledupar).

Source: Sistema Integrado de Transporte de Valledupar, 2023.

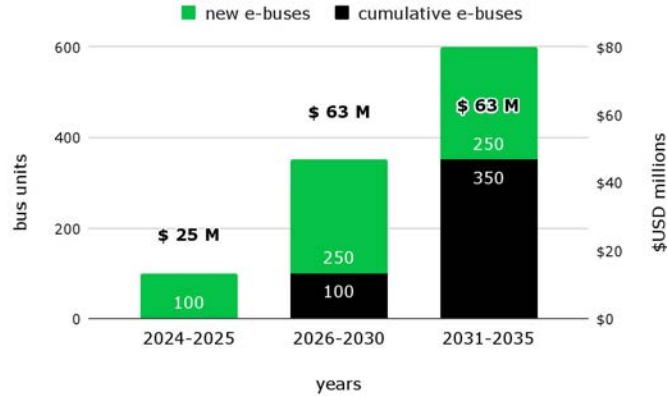
Manizales



E-bus pipeline: 350 buses by 2030

The estimate was made according to the city's goal of reaching **600 electric buses by 2035**.

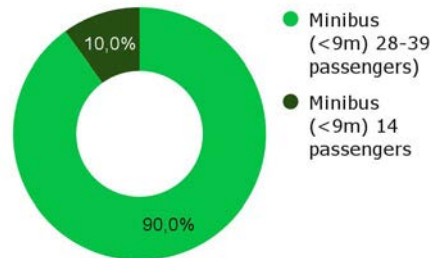
E-bus price indicated by the city: \$231,000.
It is expected to maintain Minibuses (<9m)
Colombian average cost of charging infrastructure: \$20,000 per bus.



Public Transportation Stats - 2023

Fleet: 971 buses
of operators: 6
of bus routes: 73
Average pax per day: No validation of the number of passengers
Ticket price (USD): (August 2023) Basic service (allows standing room, \$0.60), and executive service (no standing room, \$0.65).
Average fleet age: Not identified

Fleet composition



National policies

- Plan Nacional de Desarrollo de Colombia 2022-2026
- Estrategia Nacional de Movilidad Eléctrica
- Ley 1964 (2019)

Identified risks

- Prevent the number of buses in the city from becoming larger than it can financially and demand-wise sustain.
- Automotive industry: by 2040, it is expected to be in deficit levels of lithium in the world. It would open up possibilities for new technologies.
- There is a risk of power shortages and blackouts in the country, so contingency plans for this situation must be in place.

Possible mitigation mechanisms

- Capacity building in city authorities to design optimal e-bus routes and charging infrastructure.
- Investment in energy provision.
- Creation of contingency plans for energy supply.

Funding & Financing (E-buses)

- **Funding:** Not identified.
- **Financing:** Assumptions have been made but have not yet been defined. Some scenarios are being evaluated such as external owners/mixed capital for the fleet, buses under the ownership of Manizales and another in which one part is owned by a third party and the battery in another property. Financial support from the public sector and increased supply from suppliers will be needed.

Charging infrastructure

- The city is in the process of testing the technology to define the feasibility of operating.
- Charging for the pilot project is expected to be in depots.

Projects

- Pilot test of electric buses on different routes: 10-year project, with different phases.
- Phase 1: proposal to operate 2-6 buses, in addition to the creation of an exclusive lane for the operation. The bus stop would be located in public space in integration with active mobility and with the aerial cable.
- Manizales is in the process of testing the technology to define the feasibility of operating.

Source: Secretaría de Movilidad de Manizales, 2023.

Bucaramanga

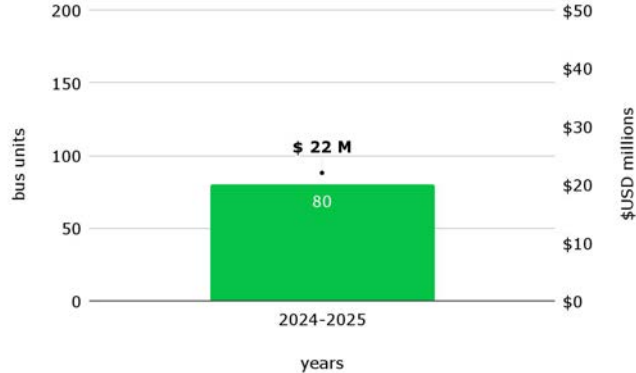


E-bus pipeline: 80 buses by 2025

City's goal: between **50-80 zero and low emission buses by 2025.**

E-bus price indicated by the city:
\$250,000 for a Padron bus
(11.5-12.5m).

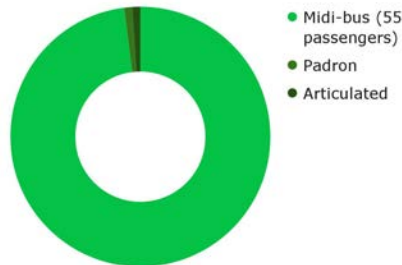
Colombian average cost of charging
infrastructure: \$20,000 per bus.



Public Transportation Stats - 2023

Fleet: 600 buses (expected to grow to 1000 buses)
of operators: 1 (BRT) & 11 (Collective Public Transport)
of bus routes: 54
Average pax per day: 72,000
Ticket price (USD): \$0.60 (August 2023)
Average fleet age: older than 25 years (Collective Public Transport), and 15 years old (BRT)

Fleet composition



Cities policies

-Política Pública Ambiental de Cambio Climático y Transición Energética
-Plan Maestro de Movilidad

National policies

-Plan Nacional de Desarrollo de Colombia 2022-2026
-Ley 1964/2019
-Estrategia Nacional de Movilidad Eléctrica

Identified risks

- High proliferation of informal transportation that is capturing the current users of public transport. If they cannot guarantee the number of users necessary for the system to be sustainable, it will be difficult for the service to be attractive and to be financed for this transition.
- For the investment to be reliable, the quality of the service must be improved through the integration of the mass and collective system, expansion and improvement of routes (more coverage).

Possible mitigation mechanisms

- Inclusion of informal transport into formal public transport, along with organizational and operational improvements.
- Comprehensive transport policies that prioritize public transport.

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes from the passengers' fares. Operators are then paid per kilometer traveled.
- **Financing:** There is a very high disposition on the initial investment to be made, with a distribution of 70% coming from the national government and 30% from the local government.

Charging infrastructure

- With the electrification company (ESA) it has been established which would be the depots for charging. From the technical point of view, the city already has an idea of the types of chargers, batteries and what would be needed initially to cover the exclusive BRT lane (route that crosses the entire metropolitan area).
- Two sites have already been evaluated for the installation of the charging infrastructure.

Projects

- In 2022 Bucaramanga had a contract with the World Bank. They did a pre-feasibility study (not yet publicly available), conducting a pilot with a BYD electric bus.
- With this pilot the city already has an idea of the performance or positive indicators for the change of technology.
- The electrification company (ESA) has generated 1 pilot recharging point and has made progress in all the research and technical structuring of the recharging infrastructure to meet the future demand of electric buses.

Source: Alcaldía de Bucaramanga 2023.

Barranquilla



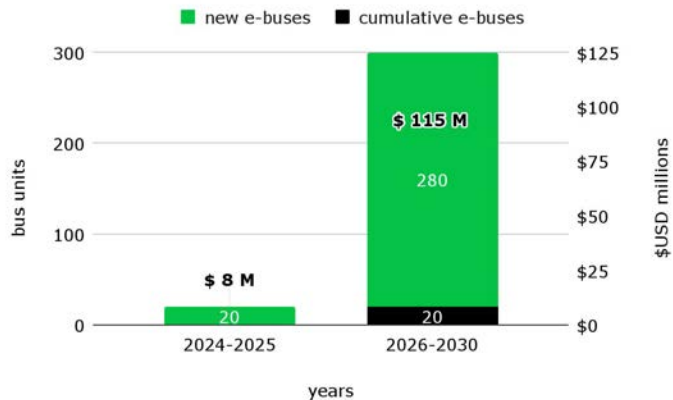
E-bus pipeline: 300 buses by 2030

The estimate was made according to the future electric bus pilot project with 20 e-buses, and the projected fleet replacement for 2029.

E-bus price indicated by the city: \$320,000 for a Padron bus. Prices of other types of e-buses were taken as a reference from other Latin American city.*

Charging infrastructure cost indicated by the city: \$20,000 per bus.

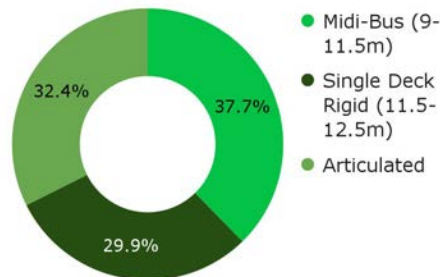
*220k = Autobús Midi (9-11.5m)
650k = Autobús articulado



Public Transportation Stats - 2023

Fleet: 300 buses
of operators: 2 (MetroCaribe and Unión Temporal SISTUR)
of bus routes: 5 trunk routes and 25 feeders
Average pax per day: 80,000
Ticket price (USD): \$0.6 (July 2023)
Average fleet age: 13 years

Fleet composition



National policies

- Plan Nacional de Desarrollo de Colombia 2022-2026
- Estrategia Nacional de Movilidad Eléctrica
- Ley 1964 (2019)

Identified risks

- Time to update the Sustainable Mobility Master Plan.
- Opportunity cost of passing up financing from the State, due to the time required for policy updates.
- Reliance on technology in the transport sector:
- Lack of access to information of the technology benefits.

Possible mitigation mechanisms

- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- Comprehensive transport policies that prioritize public transport.
- Communications and capacity building with all stakeholders.

Source: SITM
Transmetro SAS, 2023.

Funding & Financing (E-buses)

- **Funding:** Payment is made per km traveled and takes into account the revenues/operating costs of the system. About 85-90% is usually paid through tariffs and 10-15% through the tariff stabilization fund.
- **Financing:** Investment with a distribution of 70% coming from the national government and 30% from the local government. Buses are leased to concessionary companies.

Charging infrastructure

- Barranquilla is considering mainly depot charging.
- The pilot test is designed with eight depot chargers

Projects

- The city has worked with WRI for the elaboration of a pilot project: review of operating costs, technical aspects, maintenance costs, etc.
- For the pilot test of 20 buses everything is designed, however they are waiting for funding from the city to be able to carry it out. Due to the elections, the city is waiting for the future administration to implement it.

Source: SITM Transmetro SAS, 2023.

México City (Metrobús)



City policies

- Programa ambiental y de cambio climático para la ciudad de México 2019-2024
- C40 Declaration for Fossil-Fuel Free Streets
- Estrategia Local de Acción Climática 2021 - 2050 y el Programa de Acción Climática de la Ciudad de México 2021 - 2030
- Ley de mitigación y adaptación al cambio climático y desarrollo sustentable para la ciudad de México

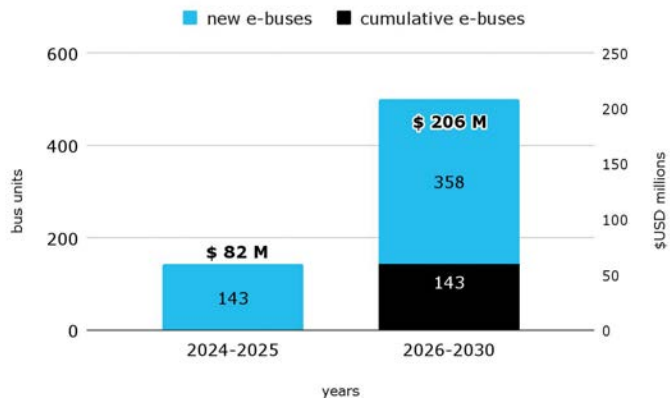
E-bus pipeline: 501 buses by 2030

The estimate was made according to the renewal target of the Metrobus system **(65% of its total fleet by 2030)**.

Mexican e-bus price for a Padron bus: \$454,000 and \$470,000 for an Articulated bus. Prices of other e-buses were taken as a reference from other Latin American cities. *

Reference cost of another Latin American city for charging infrastructure: \$30,000

*800k = Bus biarticulado
560k = Autobús doble piso



Identified risks

- Some diesel fleets are fairly new and companies are still far from needing a replacement.
- Possible changes in the city government with 2024, federal and local elections.
- Some routes have special requirements that the industry can't offer right away.
- New technology that needs time for adaptation and learning (evaluations for economic parameters, and adjustments such as an extension in concession periods).

Public Transportation Stats - 2023

Fleet: 770 buses + **115 e-buses** (60 buses of 18m in operation and 55 buses (15m) will arrived in 2023).

of operators: 17

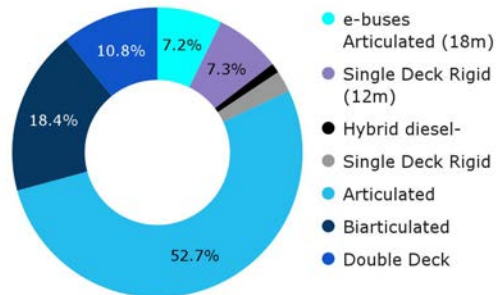
of bus routes: 7 permanent and 1 temporary

Average pax per day: 1,800,000

Ticket price (USD): \$0.35 (september, 2023)

Average fleet age: 80% less than 10 years

Fleet composition



Possible mitigation mechanisms

- Negotiations with the operating companies, incentives and KPIs.
- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- Communications and capacity building with all stakeholders.
- Pilot projects in routes that require expansion or replacement of buses.

Funding & Financing (E-buses)

- **Funding:** The city is responsible to pay the companies the corresponding amount of their monthly operation revenue, which is calculated based on the compliance of the companies with the established KPI's, monthly ridership and subsidy provided by the city. There is a fund that collects money to dedicate it to the substitution of fleets (through payments per km).
- **Financing:** The operators are responsible for the procurement, operation, maintenance and replacement of the E-buses.

Charging infrastructure

- Metrobús is only considering electric buses with depot charging systems. Additionally, the buses in operation and those to be acquired have regenerative braking systems but the charging does not depend solely on this charging method.
- The Federal Electricity Commission (CFE) is responsible for the generation and distribution of the electricity in Mexico. The Mexico City division of CFE works together with Metrobus to define the technical requirements and financial schemes for the contract of the service for the charging stations. Each charging station has different requirements based on the number and capacity of chargers, as well as the location of the nearest power lines that are suitable to supply the energy required in the depot.
- The main recharging strategy is depot recharging, which is generally done at night when the bus is out of service.

Projects

Metrobús Línea 4: The project consists of the electrification of metrobus Line 4 that runs through Mexico City Downtown and is a crucial connection with the Airport and the eastern bus terminal of the city. The project includes the construction of the charging infrastructure needed to operate the fleet.

Source: Metrobus, 2023 & SEMOVI, 2023



Fleet electrification

RTP-Red de Transporte de Pasajeros (Passenger Transportation Network)

The RTP includes peripheral routes, operated by a government company, which provide service for general public, and function as feeders or trunks. They are talking with Metrobús to understand how to electrify their operations. **This service is identified as a great potential for electrification.**

Public Transportation Stats - 2023

Fleet: 15000 Approx. (2500 concessionary companies+10800 individual concessions + 500 trolleybuses +Metrobus). 1000 buses in RTP fleet.
of operators: 24 concessionary companies (another 5 in process)
of bus routes: 96 routes and 1100 branch lines (concessioned transportation) and 90 routes (RTP)
Average pax per day: 7,000,000 (concessioned transportation) 420,000 (RTP)
Ticket price (USD): \$0.35 and \$0.24 for RTP (september, 2023)
Average fleet age: 25 years (midibuses) and 15 years (others).

Fleet composition

RTP:
Midi-Bus (9.9 m)
Single Deck Rigid bus (12 m).

Concessioned buses (10-12m)
Midi-Bus
Single Deck Rigid

*The proportion of the fleet composition was not identified.

Cities policies

- Programa ambiental y de cambio climático para la ciudad de México 2019-2024
- C40 Declaration for Fossil-Fuel Free Streets Estrategia Local de Acción Climática 2021 - 2050 y el Programa de Acción Climática de la Ciudad de México 2021 - 2030
- Ley de mitigación y adaptación al cambio climático y desarrollo sustentable para la ciudad de México

Identified risks

- No budget has been available for the electrification of the RTPs, but planning can be started.

Possible mitigation mechanisms

- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- Communications and capacity building with all stakeholders.

Monterrey Metropolitan Area

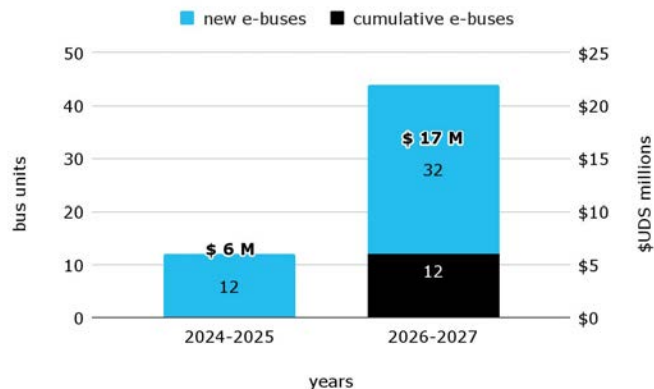


E-bus pipeline: 44 buses by 2027

City's goal: **12 e-buses by 2024** and **32 e-buses by 2027**.

Average e-bus price indicated by the city: \$500,000 for a Padron E-bus (11.5-12.5m)

Reference cost of another Latin American city for charging infrastructure: \$30,000.



Cities policies

-Plan Nuevo León

National policies

-Estrategia Nacional de Movilidad Eléctrica (ENME)

Identified risks

- Uncertainty in the operation of the technology by the operators.
- Origin of the buses: historically they were produced/assembled in Mexico. Now there is only one manufacturer supplier, but it is very expensive.
- Climatic conditions for vehicle performance

Possible mitigation mechanisms

- Communications and capacity building with all stakeholders.
- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- Pilot projects for information based on real operations in routes that require expansion or replacement of buses.

Public Transportation Stats - 2023

Fleet: 262 buses + 66 e-buses (Padron bus 11.5-12.5m)

of operators: 8

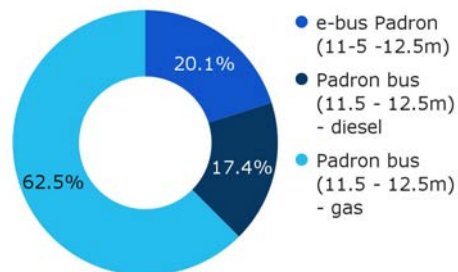
of bus routes: 23 (expected to be 28)

Average pax per day: 380,000 (subway + transmetro buses)

Ticket price (USD): \$0.89 (July 2023)

Average fleet age: 168 buses (2023 model), 94 buses (5 years old, to be replaced in 2023).

Fleet composition



Source: Sistema de Transporte Colectivo Metrorrey, 2023.

Funding & Financing (E-buses)

- **Funding:** The city does not grant concessions that are self-financing with fare revenue, but now replaces those concessions with pay-per-kilometer contracts with some incentives per passenger transported.
- **Financing:** The operator is in charge of acquiring or leasing the fleet.

Charging infrastructure

The provision of energy and space for the recharging infrastructure (but not the infrastructure as such) is provided by Metrorrey. Any overage in energy consumption is paid by the operator).

Projects

- Deployment of electric buses under the Transmetro model.
- GGGI provided support in reviewing the e-bus bidding process documents and technical specifications.

Source: Sistema de Transporte Colectivo Metrorrey, 2023.

Mérida Metropolitan Area

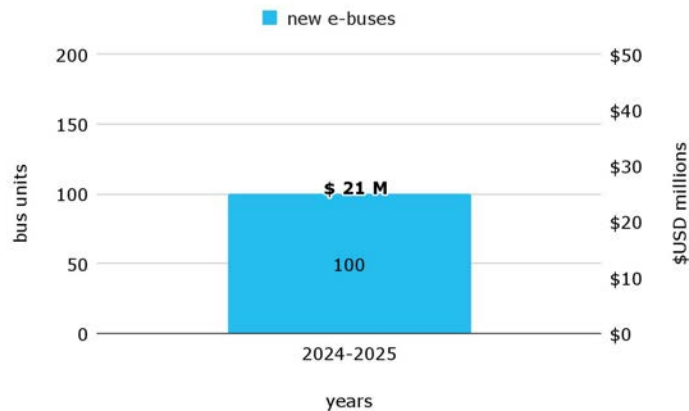


E-bus pipeline: 100 buses by 2024

City's goal: **100 more e-buses** (40 Midi-buses 10.5m and 60 Mini-buses 6m) **by 2024.**

E-bus price indicated by the city for a Mini bus (6m): \$195,000. The cost of the Midi-bus (10.5m) was taken as a reference from another Mexican city that aspires to have e-buses of the same type.* Reference cost of another Latin American city for charging infrastructure: \$20,000 per bus.

*Midi bus (10.5m) = \$180,000



Public Transportation Stats - 2023

Fleet: 956 + 32 e-buses (IE-Tram) + 60 e-bus for night routes + **40 e-bus for conventional routes + 4 articulated e-bus for the peripheral route**

of operators: 7

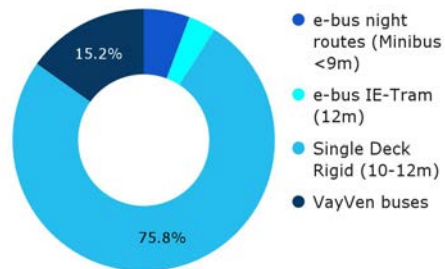
of bus routes: 172 (13 in the VayVen integrated system)

Average pax per day: 428,119

Ticket price (USD): \$0.42 for non-integrated system and \$0.63 for integrated system (VayVen)

Average fleet age: 8 years

Fleet composition



Cities policies

- Ley de Movilidad y Seguridad Vial del Estado de Yucatán
- Ley General de Cambio Climático: Art 34
- Plan Estatal de Desarrollo de Yucatán

Políticas Nacionales

- Estrategia Nacional de Movilidad Eléctrica (ENME)

Identified risks

- Deficient electrical infrastructure: blackouts during heat waves.
- Human resources at the level of the transport authority and operating companies: more training is required to build technical capacities to operate charging stations.
- Professionalization process of the concessionary companies: special attention to after-sales and maintenance issues.

Possible mitigation mechanisms

- Investments in energy provision.
- Communications and capacity building with all stakeholders.
- Knowledge exchange networks and capacity building.

Source: Instituto de Movilidad y Desarrollo Urbano Territorial, 2023

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes from passengers' fares. The city uses the pay per kilometer.
- **Financing:** The fleet is financed depending on the project, but in the future is expected to work broadly with the cooperation of BANOBRAS, CAF, state government financing, and the fleet renewal program of KfW-Nafin.

Charging infrastructure

- Opportunity charging and charging at electro-liners are being considered. To this purpose, the city is thinking of more recharging points throughout the city.
- Currently there is one yard with 16 chargers and 3 pantographs. New yards of less than 1 MW are being considered to facilitate construction and charging on the grid.
- The buses are expected to be charged at night with lower power to avoid overloading the power grid.

Projects

- The city will work with a European fund to elaborate a decarbonization plan. Mérida wants to develop a plan for charging points in order to define how many are needed for the transition. It is planned not to purchase diesel buses in the future.
- They also have some projects in other areas of the state, where they want to include the integrated VayVen system. They expect to have new routes in other parts of the state by 2024.

Source: Instituto de Movilidad y Desarrollo Urbano Territorial, 2023

Guadalajara Metropolitan Area



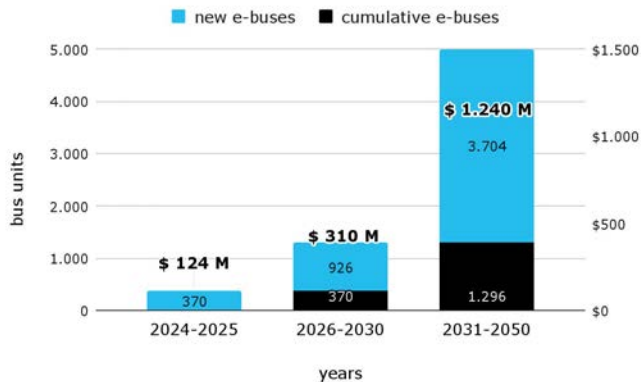
E-bus pipeline: 1,296 buses by 2030

The estimate was made according to the city's goal of 100% electric fleet by 2050 (Tumi E-bus mission, 2022).

E-bus price indicated by the city: \$412,000 for a Padron bus and \$470,600 for an Articulated bus. Price of the other type of e-bus was taken as a reference from other Mexican city.*

Reference cost of another Latin American city for charging infrastructure: \$30,000.

*180k = Autobús Midi (9-11.5m)



Public Transportation Stats - 2023

Fleet: 5000 buses with 38 e-buses

of operators: 132

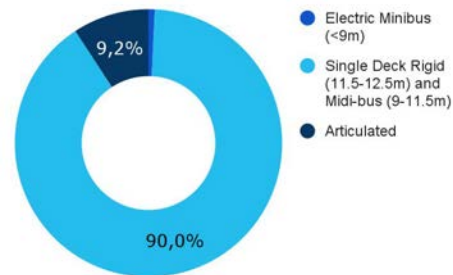
of bus routes: 200

Average pax per day: 3.1 millions (includes BRT, train and buses)

Ticket price (USD): \$0.56

Average fleet age: 6 years

Fleet composition



Cities policies

- Plan de 6 years para la renovación de Fleet
- Plan Integral de Movilidad y Transporte Sustentable del Área Metropolitana de Guadalajara (PIMUS)
- Plan de Acción Climática del Área Metropolitana de Guadalajara

Política Nacional

- Estrategia Nacional de Movilidad Eléctrica (ENME)

Identified risks

- Need to understand first the location of depot charging, as it is critical for optimal operation.
- Change of government may put electrification plans on hold due to lack of political will and may create a gap on technical knowledge (impact on creating feasible plans).
- No continuity of projects and programs to electrify fleets (the fact that programs exist does not necessarily mean that they will be fulfilled).
- Fear about the cost over electric units due to lack of data and comparative success stories of long-term performance and cost savings.

Possible mitigation mechanisms

- Detailed analysis of energy provision to design adequate charging infrastructure.
- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- Knowledge exchange networks.

Source: Secretaría de transporte de Jalisco, 2023.

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes from passengers' fares (covered by 95%). This year (2023) a support to passengers was implemented, so that the fare would not be raised and the state could compensate the difference to the carrier.
- **Financing:** It has not yet been defined, as they are undergoing a change of administration. State financing is provided for four years for the acquisition of units and charging infrastructure (ending in 2024).

Charging infrastructure

One of the reasons why the electric route is in charge of the state, is because of the optimization of resources (implementing and integrating the charging depots/bus stations with the train line).

Projects

They have an electric route that is operated by the State of Jalisco. There are 38 electric units on this route and they are already evaluating the expansion of it due to demand. The route is perpetually in the hands of the state.

Source: Secretaría de Transporte de Jalisco, 2023.



Cities policies

- Plan Integral de Movilidad Urbana Sustentable (PIMUS) del Municipio de León
- Plan de Movilidad Municipal

City's goal:

Not identified

The city has pending to establish local goals. By 2025 León would like to start with a pilot route.

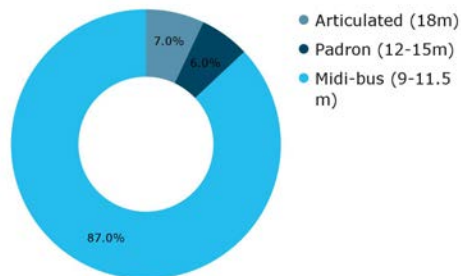
Identified risks

- CAPEX is still a problem and business models have not yet given up for the city.
- Due to the temporary nature of the administration (3 years), it is difficult to achieve continuity in these projects.
- Charging infrastructure remains a barrier and it has yet to be determined where it should be installed in a way that is useful and convenient for system operation.
- More support is needed at the government and federal level. The municipality does not currently have sufficient capital.

Public Transportation Stats - 2023

Fleet: 1500
of operators: 19
of bus routes: 139
Average pax per day: 600,000
Ticket price (USD): \$1.05
Average fleet age: 5-6 years

Fleet composition



Possible mitigation mechanisms

- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- New business models, sources of revenue, and incentives for e-buses and charging infrastructure.

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes entirely from passengers' fares.
- **Financing:** There is still a choice to determine which will be the best option.

Charging infrastructure

- To be defined by pre-feasibility studies.
- The main challenge identified is the charging infrastructure and the electric grid. There is no charging infrastructure for buses yet. There has been a pilot project, but with the difficulty of charging.
- The city want charging depots to be established in government centers.

Projects

- The Municipal Mobility Plan is being implemented (mentioning the electrification of public transportation), decarbonization projects (pre-feasibility studies) to provide the basis for action in the short and medium term. Also, the best technology for the context of the city is beginning to be studied.
- Collaborations with C40, UNEP and GIZ (for the transition to a smart mobility system, including energy transition).

Source: Dirección de Desarrollo de la Movilidad (Ayuntamiento de León)

Cuernavaca Metropolitan Area



City's goal: Not identified

No goals have been set yet, only the contact with NAFIN to participate in the fleet replacement program.

E-bus price indicated by the city: \$180,000 (Midi-Bus 9-11.5m)

Cost of charging infrastructure not mentioned

Public Transportation Stats - 2023

Fleet: 5,500 buses

of operators: 114

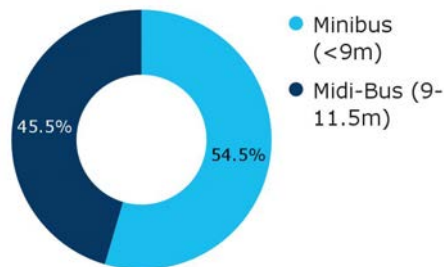
of bus routes: 16 south, 34 east and 26 metropolitan

Average pax per day: Not identified

Ticket price (USD): Minimum fare \$0.55-0.60 (depends on the route)

Average fleet age: more than 10 years

Fleet composition



Cities policies

-Acuerdo para crear un fondo que proporcione Funding para nuevas tecnologías (GNC o eléctricas). Basado en el Artículo 155 de la Ley de Transporte del Estado.

National policies

-Estrategia Nacional de Movilidad Eléctrica (ENME)

Identified risks

- Resistance to change: the approach to transport operators must be attractive in order to reduce opposition to the technology. As they are more dispersed forms of organization, there might be less convincing capacity.
- Lack of charging infrastructure.
- Complex topography.
- 2024 elections.

Possible mitigation mechanisms

- Communications and capacity building with all stakeholders.
- Investments in energy provision.
- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- Pilot projects for information based on real operations in routes that require expansion or replacement of buses.

Source: Secretaría de Movilidad y Transporte del Estado de Morelos, 2023.

Funding & Financing (E-buses)

- **Funding:** Not identified.
- **Financing:** Through a development banking institution (NAFIN), the financing is expected to be created.

Charging infrastructure

In Morelos there is not yet developed infrastructure for bus charging. However, terminals are being considered.

Projects

- The city has made contact with NAFIN to participate in the fleet replacement program. They are in the phase of defining how much the state is going to be able to participate.
- Morelos developed a study to identify how many units have already exceeded their authorized useful life (almost 30%).

Source: Secretaría de Movilidad y Transporte del Estado de Morelos, 2023.

San Juan

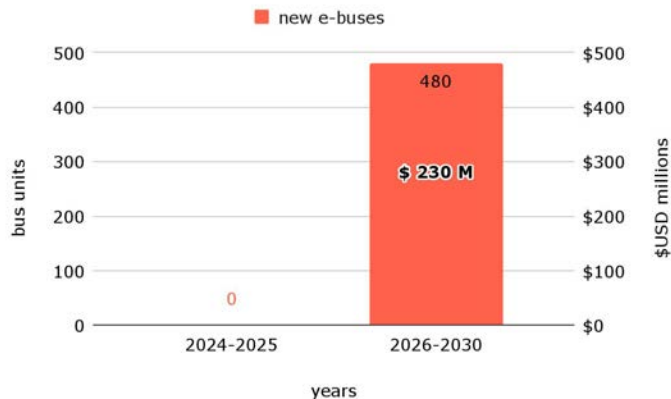


E-bus pipeline: 480 buses by 2030

The estimate was made according to the date of the last tender (2020) and the next one that it's going to be until 2030 (city's goal: 80% electric fleet)

Average e-bus price indicated by the city: \$450,000. The cost of the bus was calculated from the total cost of the pilot project minus \$30,000 of the charging infrastructure.

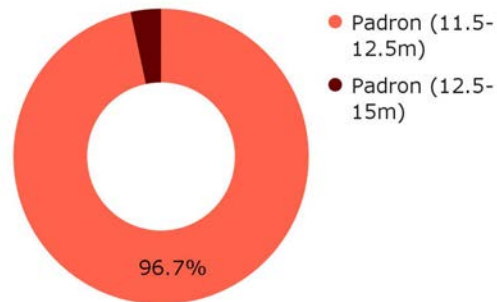
Charging infrastructure cost indicated by the city: \$30,000 per bus.



Public Transportation Stats - 2023

Fleet: 600 buses
of operators: 7
of bus routes: 130
Average pax per day: 266,666
Ticket price (USD): 0.10-0.20 (June 2023)
(differentiated by zones)
Average fleet age: less than 5 years

Fleet composition



Cities policies

-Plan de Movilidad Sostenible (borrador)

National policies

-Plan Nacional de Transporte Sostenible
-Plan Nacional de Mitigación y Adaptación al Cambio Climático

Identified risks

- Long-term profitability.
- Importation of equipment in the country is quite expensive, if there were national manufacturing it could be less expensive.
- Alignment of priorities and a comprehensive strategy for the public transport sector is needed.
- Argentina's macroeconomic conditions.

Possible mitigation mechanisms

- New business models for e-buses and charging infrastructure.
- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- Comprehensive transport strategies that prioritize public transport.

Source: Secretaría de Tránsito y Transporte del Ministerio de Gobierno, 2023.

Funding & Financing (E-buses)

- **Funding:** There is a 70% subsidy to the tariff between the national and provincial levels.
- **Financing:** It is expected to be provided by a third party (private or public). More regulations should be created in this regard. The operating companies will be operating and not acquiring fleets.

Charging infrastructure

- The charge has been analyzed at terminal points (both within the city and in its peripheral areas).
- An effort has been made to identify locations for charging stations for the system.
- Aspects of the charging infrastructure are being included in the Sustainable Mobility Plan.
- They installed a charging station at the terminal in the city center (capacity for 6 buses) and are waiting for others to increase the capacity to 12 (but 6 simultaneously).
- The infrastructure is being considered to be placed under government control and on public land.

Projects

- The city has begun to explore renewable energies for electric transportation due to the privileged position of photovoltaic energy use in the region.
- In San Juan, pilots have been launched with two electric buses and the pilot is expected to be expanded to 4 buses.
- “Plan de Movilidad Sostenible” is under development.
- MOVE/UNEP: the city has been seeking funding from green funds and would like to contact C40 for support.
- They currently have 1,200 people trained in driving for electromobility, through a training module of 6 work sessions.

Source: Secretaría de Tránsito y Transporte del Ministerio de Gobierno, 2023.

Buenos Aires



E-bus pipeline: 900 buses by 2030

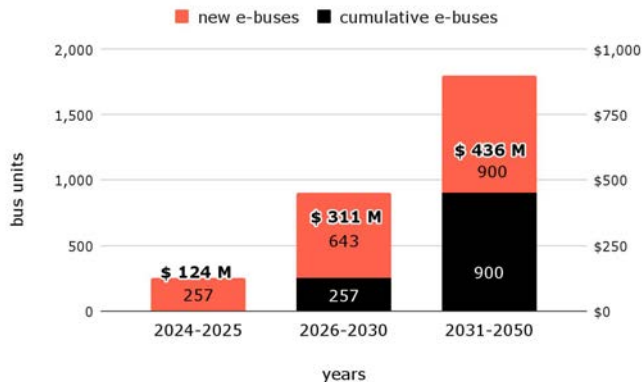
The estimate was made according to the city's goal of **50% low emissions* fleet by 2030 and 100% by 2050**.

E-bus price indicated by the city: \$455,000 (pilot). Prices of other e-buses were taken as a reference from other Latin American cities. **

Charging infrastructure cost: \$25,000 per bus.

*Bajas emisiones: buses a gas natural, biodiesel o eléctricos.

** 650k = Autobús articulado.



Source: Plan de Acción Climática 2050

Public Transportation Stats - 2023

Fleet: 1,800 buses

of operators: 24

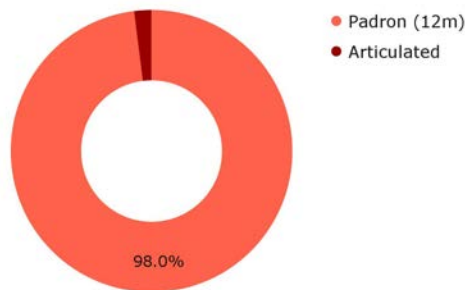
of bus routes: 32 (in the Federal District), 135 (indoor urban services)

Average pax per day: 1,000,000 (for the 32 routes) & 3,000,000 (for the 135 routes)

Ticket price (USD): \$0.23 average (varies according to km) (July 2023)

Average fleet age: 5 years (it changes per line/operator)

Fleet composition



Cities policies

-Plan de Acción Climática 2050
-Plan de Movilidad Sustentable 2030

National policies

-Plan Nacional de Transporte Sostenible
-Plan Nacional de Mitigación y Adaptación al Cambio Climático

Identified risks

- Complex governance around public transport management at the city level, currently under national legislation.
- Upfront investments.
- Elections in 2023.
- Electricity consumption varies a lot in the city: there are outages or instability in certain areas.
- Regulatory barriers to operate.

Possible mitigation mechanisms

- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- New business models for e-buses and charging infrastructure.
- Investments in energy provision.
- Communications and capacity building with all stakeholders.

Source: Secretaría de Transporte y Obras Públicas del Gobierno de la Ciudad de Buenos Aires, 2023.

Funding & Financing (E-buses)

- **Funding:** Compensation scheme is quite high (around 80%).The aim is to reach 40% from tariffs and 60% from public investment.
- **Financing:** It has not been defined yet.

Charging infrastructure

- The analysis has been done with on-site charging. But it is always taken into consideration according to the kilometers traveled by the lines to make charges on route.
- Prioritize night charging, most evaluated scheme.

Projects

- The national government has jurisdiction over the operation of the buses. Currently, work is being done to transfer the lines to the city's mandate and thus have plans for electrification. There is still no specific project in detail, but there is an intention to work on it.
- A consultancy is being initiated with the International Finance Corporation (IFC) for electric buses. This is a continuation of previous consultancies.
- These past consultancies have been of pre-feasibility to know how to make the transition.
- They have the Driver Leaders program to train on sustainable mobility issues. They are looking to regain confidence in public transportation post pandemic.

Source: Secretaría de Transporte y Obras Públicas del Gobierno de la Ciudad de Buenos Aires, 2023.

Rosario

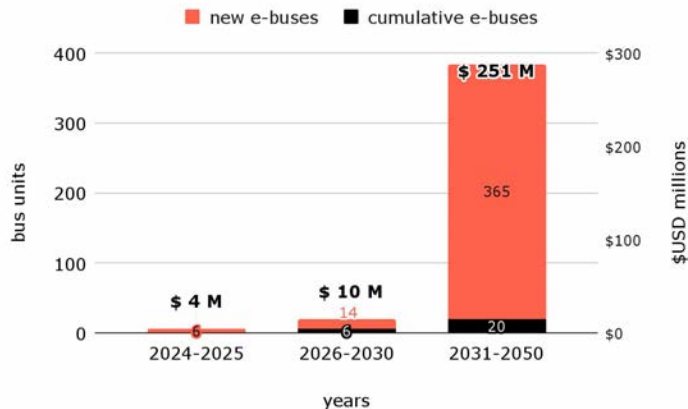


E-bus pipeline: 20 buses by 2030

The estimate was made according to the city's goal of **20 units by 2030 and 50% electric fleet by 2050.**

E-bus price indicated by the city:
\$660,000 for a Padron bus (11.5-12.5).

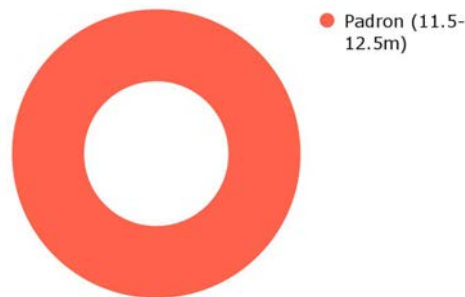
Argentine average charging infrastructure cost: \$27,500 per bus.



Public Transportation Stats - 2023

Fleet: 770 buses
of operators: 2
of bus routes: 53
Average pax per day: 420,000 (post-pandemic), 450,000 (pre-pandemic)
Ticket price (USD): \$0.53 (October, 2023)
Average fleet age: 7 years

Fleet composition



Cities policies

-Plan Local de Acción Climática Rosario 2030
-Plan Integral de Movilidad de Rosario

Políticas Nacionales

-Plan Nacional de Transporte Sostenible
-Plan Nacional de Mitigación y Adaptación al Cambio Climático

Identified risks

- The main barriers for the city have to do with financing the units and infrastructure due to the current country's economic situation.

Possible mitigation mechanisms

- New business models for e-buses and charging infrastructure.
- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).

Source: Ente de la Movilidad de Rosario (EMR), 2023.

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes from passengers' fares with public subsidy.
- **Financing:** The electric lines will be transferred to public operation and financed by the city.

Charging infrastructure

They do not yet have the specific design of the infrastructure, but they do have personnel with expertise in this area.

Projects

- Have had training with TfL (Transport for London) for investment, knowledge and other aspects of electric buses.
- Movi Rosario is developing a project for the conversion of diesel units (in disuse) to electric. Everything is being done with local input (local companies and academy). There are 3 units, one soon to be released and two others in the future.

Source: Ente de la Movilidad de Rosario (EMR), 2023.

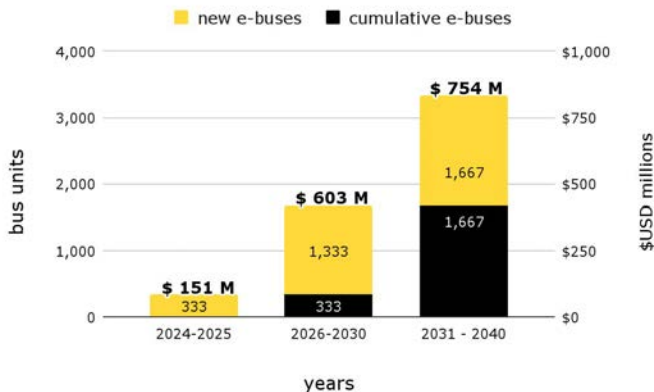


E-bus pipeline: 1,667 buses by 2030

The estimate was based on national targets (10% electric fleet by 2025, 50% by 2030 and 100% by 2040) and the city's local fleet.

E-bus price indicated by the city: \$400,000 for a Padron bus (11.5-12.5m), \$220,000 for a Midi-Bus (9-11.5m), \$650,000 for an Articulated bus and \$800,000 for a Biarticulated bus (25-26 m).

Ecuadorian average charging infrastructure cost: \$30,000 per bus (depending of the type of charge).



Source: Estrategia Nacional de Electromovilidad para Ecuador, (2021).

Cities policies

-Código Municipal para el Distrito Metropolitano de Quito: Ordenanza 017-2020 y Ordenanza 046-2022

National policies

-Ley Orgánica de Eficiencia Energética (2019)
-Estrategia Nacional de Electromovilidad para Ecuador (ENEE) 2021

Identified risks

- New authorities and political difficulties.
- Type of units due to topography, location of charging sites, and maneuvering yards.
- Lack of regulations on electric buses.
- Upfront investment.

Possible mitigation mechanisms

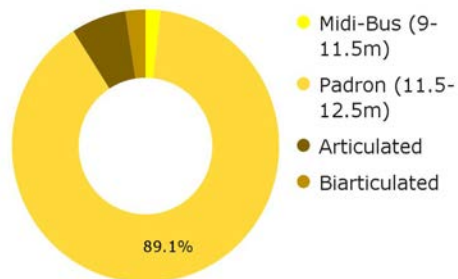
- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- Pilot projects to obtain real operation information for the city.
- Knowledge exchange network.
- New business models for e-buses and charging infrastructure.

Source: Secretaría de Movilidad del Municipio del Distrito Metropolitano de Quito, 2023.

Public Transportation Stats - 2023

Fleet: 3,333 buses
of operators: 66
of bus routes: 265
Average pax per day: 4,000,000
Ticket price (USD): Flat rate for the plateau (\$0.45 for electric, \$0.35 for ICE), different rate for rural areas (based on distance traveled) (June 2023)
Average fleet age: 10 years old

Fleet composition



Funding & Financing (E-buses)

- **Funding:** Not identified.
- **Financing:** Trusts would be created for the replacement of units to support this process. A stabilization fund has been established to keep companies afloat, which would incorporate resources for mobility and energy efficiency.

Charging infrastructure

Not identified

Projects

- The city is taking the first steps to incorporate electric buses in their fleet. For this reason, the company Transportes Guadalajara S.A. is carrying out the first tests with an electric bus on one of its routes.
- A public tender was launched to determine the zero emission operations and so far 9 zones have been assigned, representing about 3,000 buses. Each operator included a schedule for the incorporation of zero emission buses. At the moment it has been defined that the buses of the trunk lines must be zero emissions (electric) as well as those operating in the historic center of Quito.
- The city is seeking funding to generate the Metropolitan Plan for the Electrification of Public Transportation.

Source: Secretaría de Movilidad del Municipio del Distrito Metropolitano de Quito, 2023.

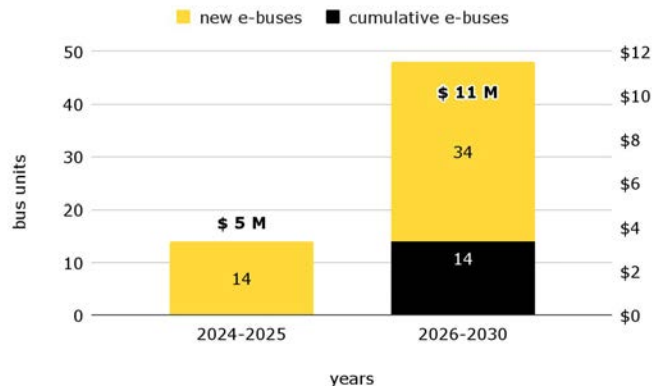


E-bus pipeline: 48 buses by 2030

The estimate was made according to the city's goal (10% of the electric fleet in urban buses by 2030).

E-bus price indicated by the city: \$300,000 for a Padron bus. (Price of the bus calculated from the information provided in the interview minus 10% of the charging infrastructure)

Charging infrastructure cost indicated by the city: \$30,000 per bus.

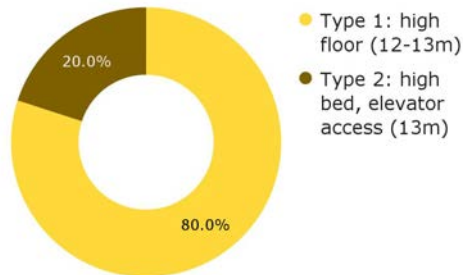


Source: Plan de electromovilidad de Cuenca, (2023).

Public Transportation Stats - 2023

Fleet: 475 buses
 # of operators: 7
 # of bus routes: 38
 Average pax per day: 210,000 (full) and 55,000 (reduced rate)
 Ticket price (USD): \$0.3 (August, 2023)
 Average fleet age: less than 5 years

Fleet composition



Cities policies

-Plan de electromovilidad de Cuenca (2023)

National policies

-Ley Orgánica de Eficiencia Energética (2019)
 -Estrategia Nacional de Electromovilidad para Ecuador (ENEE) 2021

Identified risks

- Recovery of demand to be able to meet investment needs.
- Unit costs and investment.
- Adjustment to operating contracts in case they are already signed.
- Resistance to change on the part of the operating companies due to new technology.

Possible mitigation mechanisms

- Comprehensive transport policies that prioritize public transport.
- New business models for e-buses and charging infrastructure.
- Negotiations with the operating companies, incentives and KPIs.
- Communications and capacity building with all stakeholders.

Source: Municipio de Cuenca, (2023)

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes mainly from passengers' fares. A subsidy was given to cover the drop in demand.
- **Financing:** It is pending to define the financing model in the feasibility study. If the consultancy begins in 2023, it would be expected to be completed in mid-2024.

Charging infrastructure

It will depend on the feasibility study. They have seen technologies in the region (Colombia, Chile) that have helped them to generate the terms of reference for the development of this infrastructure.

Projects

- The city is about to conduct a feasibility study for electric buses in which it plans to define the type of bus, charging infrastructure and other details.
- For this feasibility study Cuenca has a KfW loan to work on the Low Emission Historic Center.

Source: Municipio de Cuenca, (2023)

Santiago



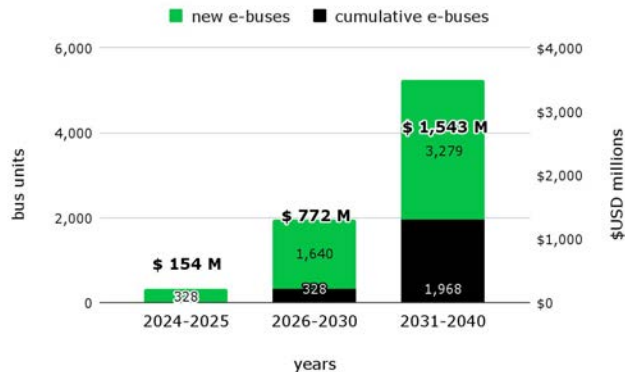
E-bus pipeline: 1,968 buses by 2030

The estimate was based on national targets (**100% electric fleet by 2040**), the city's local fleet. Nationally, it is expected that by 2035, 100% of new additions to urban public transport will be zero-emission.

E-bus price for a Padron bus: \$433,931. Chilean e-bus price: \$180,000 for a Midi-bus (9-11.5m). Price of other types of e-buses were taken as a reference from other Latin American cities.*

Reference cost of another Latin American city for charging infrastructure: \$30,000 per bus-

650k = Bus articulado



Source: Estrategia Nacional de Electromovilidad (2021), E-bus radar (2023) & ZEBRA, (2022).

National policies

- Ley No. 18.696
- Ley No. 20.378
- Estrategia Nacional de Electromovilidad (2021)
- NDC (2020)

Identified risks

- Additional infrastructure and possible adjustments to the electrical distribution networks according to the level of demand (ElectroMov, 2023).

Possible mitigation mechanisms

- Investments in energy provision.

Public Transportation Stats - 2023

Fleet: 5,247 buses + **2,000 e-buses**

of operators: 9

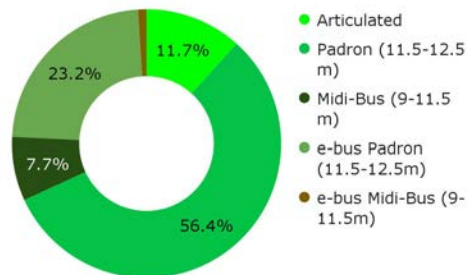
of bus routes: 390

Average pax per day: 1.289.361 (2021)

Ticket price (USD): \$0.82 (August 2023)

Average fleet age: Not identified.

Fleet composition



Source: Informe de Gestión DTP, (2021) y E-bus radar, (2023)

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes from passengers' fares with public investments in the system.
- **Financing:** The financing model separates the provision of the electric bus fleet from the operation. Bus tenders are made through the transport authority and private entities can compete for the provision of e-buses. E-buses are then allocated to operators through agreements between the transport authority, the bus provider and the bus operators.

Charging infrastructure

- Thanks to the latest bidding process, the city has the largest fleet of electric buses in LATAM and the second largest in the world. Reaching 2,000 e-buses in the RED System.
- Also, with the latest bidding process it will require a minimum percentage of female participation in the concession company's workforce.
- There are projects for the exchange of experiences between regions and Santiago to reduce technological risks in the operation and transfer competencies and capacities to the regions. Work carried out by GIZ.

Projects

- In Santiago there are 3 distributors and there is coordination at both levels (central and local). The coordination is through the Comisión Nacional de Energía (CNE).
- There are configurations determined by the Ministry of Transportation and Telecommunications (MTT) and are ruled by the electrical code.

Source: División de Transporte Público Regional, 2023 & Gob.cl, 2023.

Antofagasta

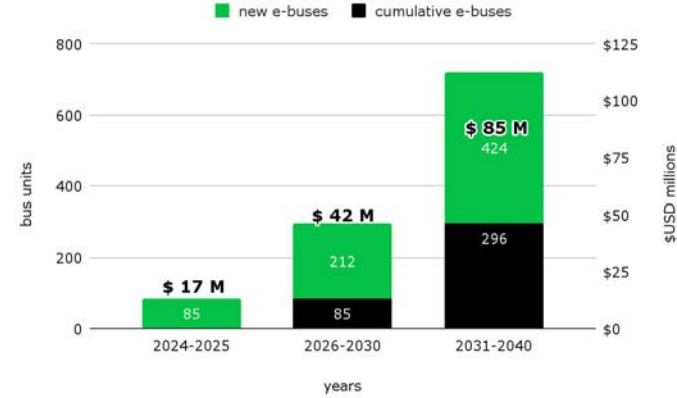


E-bus pipeline: 297 buses by 2030

The estimate was based on national targets (**100% electric fleet by 2040**) and the city's local fleet. Nationally, it is expected that by 2035, 100% of new additions to urban public transport will be zero-emission.

E-bus price indicated by the city: \$180,000 for a Midi-bus (9-11.5m).

Reference cost of another Latin American city for charging infrastructure: \$20,000 per bus.



Source: Estrategia Nacional de Electromovilidad (2021)

National policies

- Ley No. 18.696
- Ley No. 20.378
- Estrategia Nacional de Electromovilidad 2021
- NDC (2020)

Identified risks

- Long-term concession model is necessary.
- None of the current public transport terminals meet land use regulations.
- Dependence on external manufacturers, meaning that the necessary after-sales guarantees may not be provided.
- The cost of public transportation and its relation to the social outburst of 2019 has been manifested through public transportation. There is the possibility of damage to these high-investment.

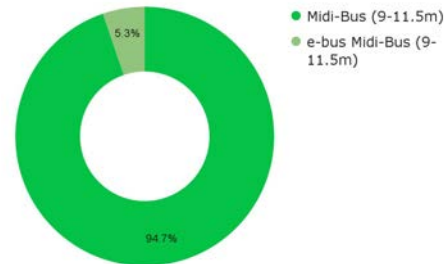
Possible mitigation mechanisms

- The high investment required for electromobility is an opportunity to formalize the sector.
- Adaptation of land use regulations for e-bus depots as negative impacts are lessened.
- Contractual stipulations that guarantee after-sales services and components that are available based on the needs of the city.
- Insurance mechanisms that provide coverage for social risks.

Public Transportation Stats - 2023

Fleet: 720 + 40 e-buses
of operators: 13
bus routes: 13
Average pax per day: 250,000 (2010)
Ticket price (USD): \$0.8 - \$0.9
Average fleet age: 14 years old

Fleet composition



Source: Gobierno Regional de Antofagasta, 2023

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes from passengers' fares with public subsidy.
- **Financing:** Buses are funded through national and subnational investments and then leased to operators. New models are being developed to reduce public investment.

Charging infrastructure

- Charging in terminal has been planned.
- The charging in terminal will be private; in the case of Calama, the legal process is being worked on so that this charging service will be public.

Projects

- The city is in the process of decentralization to pass competencies to regional governments, since public transportation is seen from a central level.
- Antofagasta developed the Sustainable Urban Mobility Plan (SUMP) with the support of Euroclima-GIZ.
- Thanks to the creation of the SUMP, the regional government was empowered and created instances of climate change action to address emission reductions.
- A project of 40 electric buses is being planned in Calama (another city in the Antofagasta region).

Source: Gobierno Regional de Antofagasta, 2023

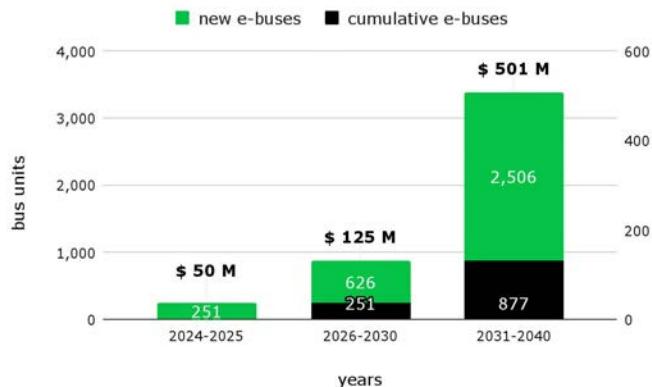


E-bus pipeline: 877 buses by 2030

The estimate was based on national targets (**100% electric fleet by 2040**) and the city's local fleet. Nationally, it is expected that by 2035, 100% of new additions to urban public transport will be zero-emission.

Chilean e-bus price: \$180,000 for a Midi-bus (9-11.5m).

Reference cost of another Latin American city for charging infrastructure: \$20,000 per bus.



Source: Estrategia Nacional de Electromovilidad (2021) y E-bus radar, (2023)

National policies

- Ley No. 18.696
- Ley No. 20.378
- Estrategia Nacional de Electromovilidad (2021)
- NDC (2020)

Identified risks

- Fear of new technology.
- Route design and route assignment.
- Backup plans in case of emergencies or power outages.
- The administrative structure of the companies would not necessarily facilitate this transition. They may not be subject to financing because they do not meet the requirement.

Possible mitigation mechanisms

- Knowledge exchange network.
- Pilot projects for information based on real operations in routes that require expansion or replacement of buses.
- Investment in energy provision.
- New business models for e-buses and charging infrastructure.

Public Transportation Stats - 2023

Fleet: 2,130 buses
of operators: 10
of bus routes: Not identified
Average pax per day: Not identified
Ticket price (USD): \$0.28 - 0.80 (varies according to distance traveled)
Average fleet age: 5.7 años (2017)

Fleet composition

Not identified

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes from passengers' fares with public subsidy.
- **Financing:** Different models are being evaluated in order to adjust them to more local conditions

Charging infrastructure

Charging at end points of the route (terminals). Due to regulatory issues, it is complex to think about opportunity charging because it requires more management with different counterparties. It is not discarded but it is not the priority.

Projects

There are projects for the exchange of experiences between regions and Santiago to reduce technological risks in the operation and transfer competencies and capacities to the regions. Work carried out by GIZ.

Source: División de Transporte Público Regional (DTPR), 2023.

Guatemala City

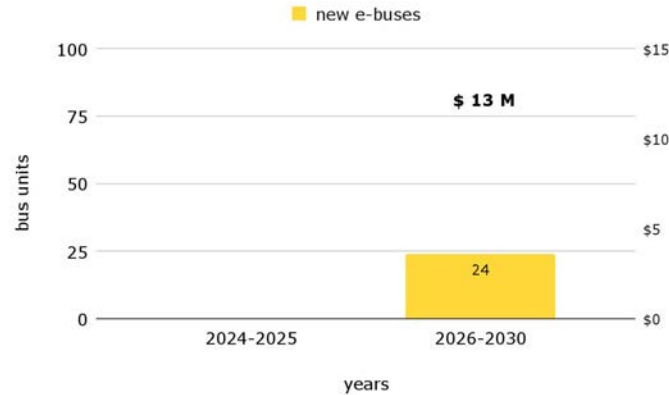


E-bus pipeline: 24 buses by 2030

City's goal: next line to be electrified # 15, with **24 e-buses**.

E-bus price indicated by the city: \$527,000 for a Padron bus (11.5-12.5m).

Reference cost of another Latin American city for charging infrastructure: \$30,000 per bus.



Public Transportation Stats - 2023

Fleet: 289 buses + **24 e-buses** (Already bought, expected to be in the country in November 2023).

of operators: 1

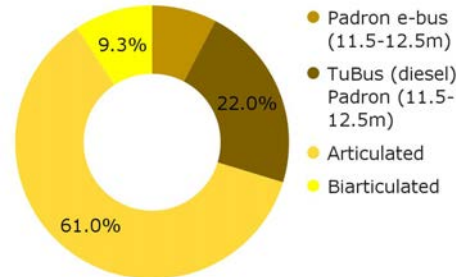
of bus routes: 110

Average pax per day: 315,000

Ticket price (USD): \$0.13 (July 2023)

Average fleet age: 8 years

Fleet composition



National policies

- Ley de Movilidad Eléctrica (2023).
- Estrategia Nacional de Movilidad Eléctrica (lista para finales del 2023)

Identified risks

- Lack of funding from the central government.
- Charging schedules, narrow time slot.
- Land location to be able to create the charging infrastructure.
- Community resistance to change the location of charging stations.
- Conflicts between different types of transport (tuk tuk) and TransMetro.

Posible mecanismos de mitigación

- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- Capacity building and training in operating companies for adequate planning and operations.
- Communications and capacity building with all stakeholders.
- Inclusion of informal transport into formal public transport operations.

Source: Transmetro, 2023.

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes from passengers' fares with public subsidy.
- **Financing:** Public financing and lease to operators with option to purchase (for 96 months) including.

Charging infrastructure

- The city worked with WRI Mexico to pre-design fleet and charging equipment and obtain the first product (with IDB financing).
- In September 2023, the tender for the construction of charging infrastructure for the 24 E-buses was awarded. Also, another tender was opened for the lease with purchase option of charging equipment.

Projects

- The Municipality made the decision to create the 8th line of the BRT to electrify it (24 km round trip). This would function as a pilot to demonstrate the technology and see it in operation in the country.
- **WRI/IDB:** work with WRI Mexico to pre-design fleet, charging equipment and obtain the first product (with IDB financing).
- **CBAEI/RedPlanners:** CBAEI supported them financially for the feasibility for risk and financial issues to be used as input for the contracting bases.
- **Transconsult:** work on risk mitigation and social and environmental negotiation.
- Work is being done with UNEP on the feasibility of converting line 12 to electric (75 articulated buses).

Source: Transmetro, 2023 & Portal Movilidad, 2023

Panamá City

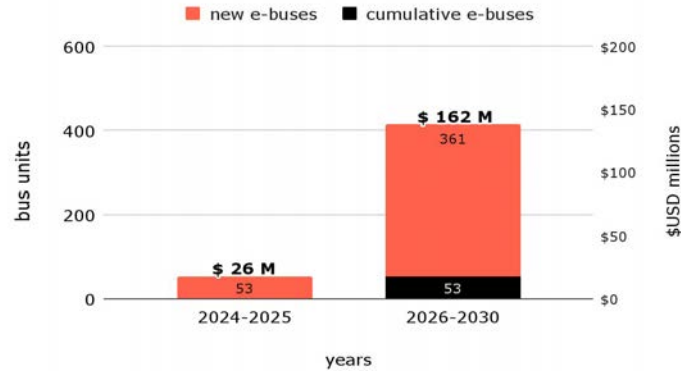


E-bus pipeline: 414 buses by 2030

The estimate was based on the city's goal of **52 e-buses by 2025** and the results of the IDB study of MiBus routes feasible for electrification.

E-bus price indicated by the city: \$390,000 for a Padron bus.

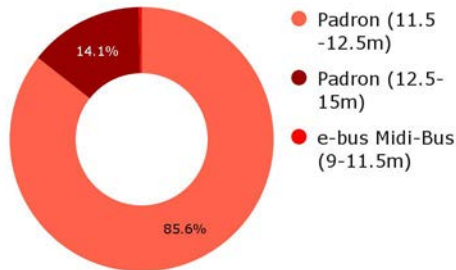
Charging infrastructure cost indicated by the city: \$60,000 per bus



Public Transportation Stats - 2023

Fleet: 1,436 diesel buses + **5 e-buses** (Already bought, expected to be in the country in January/February 2024).
of operators: 1 official - MiBus system (several with permission)
of bus routes: 142 (according to ATTT)
Average pax per day: 465,000
Ticket price (USD): \$0.25 mainline, \$0.75 express (technical tariff: \$0.8 mainline, \$1.74 express, last update 2017)
Average fleet age: 13 years old (14% of the fleet under 6 years)

Fleet composition



National policies

- Estrategia Nacional de Movilidad Eléctrica 2019 (ENME)
- Ley que incentiva la Movilidad Eléctrica 2022 (N°295)
- NDC (2020)

Identified risks

- Outdated monitoring and operation support equipment.
- Institutional complexity adds risk to the planning and operations of public transport.
- Need for prioritization of investments for the electrification of public transport by the national authority.

Possible mitigation mechanisms

- Investment in public transport infrastructure and improvements in operations.
- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- Improved coordination through e-mobility working groups among main institutional stakeholders and other local parties.
- Financing through national budget, MDBs or investors.

Source: MiBus, 2023.

Funding & Financing (E-buses)

- **Funding:** Funding in the MiBus system comes from passengers' fares with public subsidy.
- **Financing:** The government procures the financing and provides the backing to make the investment in fleet replacement or provides the money directly.

Charging infrastructure

- With the recent purchase of the 5 e-buses, 2 chargers were purchased.
- MiBus issued the tender for the construction and adequacy of the bus depot. The buses are expected to be lined up (project in progress).
- Charging in depot is the model considered.
- Electricity is regulated in Panama and special fees are about to be published for electric mobility that can be used by companies to present specific schemes.

Projects

- The country had funds to improve tourism related activities (IDB loan) and these were used to provide service in the Historic Center of Panama. From there, 5 medium-sized electric buses were purchased to operate in that area.
- IDB has been doing an analysis of how to replace the buses in the current public transportation system. The IDB is working with the Green Climate Fund to complement and finance the purchase. They have supported Panama City with other technical assistances.
- Fleet renewal is needed due to the age of the fleet and as a result of this, support has been obtained for fleet electrification analysis (with the World Bank).
- CAF has pre-approved funding to finance up to 150 e-buses.

Source: MiBus, 2023.

Montevideo

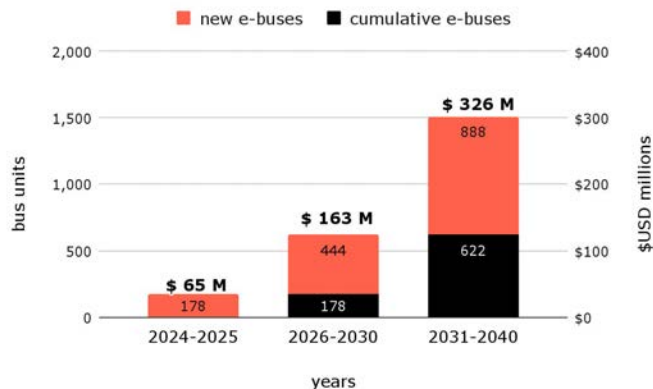


E-bus pipeline: 622 buses by 2030

The estimate was made according to the city's goal of **100% electric fleet by 2040**.

E-bus price indicated by the city: \$330,000 for a Padron bus (11.5-12.5m).

Charging infrastructure cost indicated by the city: \$37,000 per bus.



Public Transportation Stats - 2023

Fleet: 1,500 buses + **30 e-buses** (Padron bus 11.5-12.5m)

of operators: 4

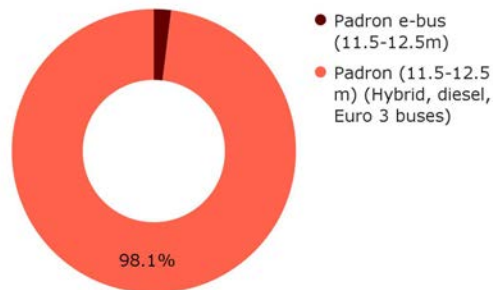
of bus routes: 143

Average pax per day: 680,000

Ticket price (USD): \$1 (July, 2023)

Average fleet age: 8 years

Fleet composition



National policies

- Política Energética Nacional 2005-2030
- Ley para subsidio compra buses eléctricos 2018 (Ley 19.670)
- Estrategia Climática a Largo Plazo de Uruguay
- Decreto N° 165/019
- NDC 2017

Identified risks

- Capacity of the bus depots and costs of charging infrastructure.
- Charging for long distances: it might be necessary to opt for opportunity charging, that implies cost variation according to tariff.
- No analysis has been done on the impact of the weight of electric buses on the roads.
- Uncertainty in the useful life of electric buses, due to the change of technology.

Possible mitigation mechanisms

- New business models for e-buses and charging infrastructure.
- Detailed analysis of energy provision to design adequate charging infrastructure.
- Knowledge exchange network.

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes from passengers' fares with public subsidy.
- **Financing**
 - ❑ Operators are responsible for the purchase of the buses.
 - ❑ There was a specific subsidy for the purchase of the current 30 electric buses.
 - ❑ There may be a possibility of investment in the bus sector and energy transition through Uruguay's Renewable Energy Innovation Fund (REIF), a UN trust fund, to support the energy transition.
 - ❑ The city hall of Montevideo is structuring a trust fund for financing 80-100 electric buses, which would start operating next year (2024).

Charging infrastructure

- UTE is the national energy company, the only energy supplier (distribution and sale). They will provide each operator with the necessary power to charge the buses.
- infrastructure has been seen mainly with terminal charging (off-peak). UTE gives a reduced rate (discounts) for charging electric buses.

Projects

International technical assistance: MOVÉS project with UNDP, World Bank with business models, Ministry of Environment with Euroclima. The municipality is particularly working with the SOLUTIONSplus project with Horizon 2020 funds (EU) for an electric mobility pilot (opportunity charging center).

Source: Depart. Movilidad - Intendencia de Montevideo, 2023.

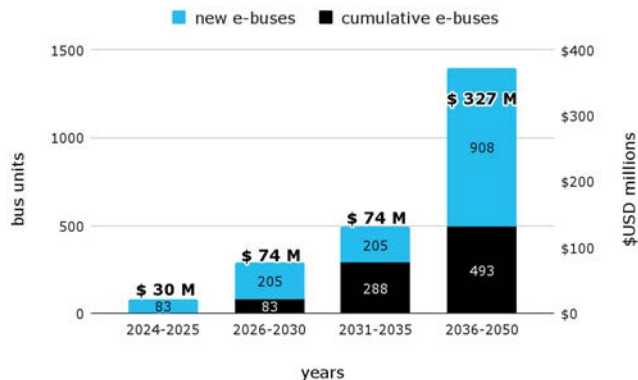


E-bus pipeline: 288 buses by 2030

The estimate was based on national targets (**30% electric fleet by 2035 and 85% by 2050**) and the city's local fleet. Besides there is an aspiration to have between 200-500 buses by 2026.

E-bus price indicated by the city: \$330,000 for a Padron bus.

Reference cost of another Latin American city for charging infrastructure: \$30,000 per bus.



National policies

- Ley N°9518
- Plan Nacional de Descarbonización 2018-2050
- Plan Nacional de Transportes 2011-2035
- Plan Nacional de Energía 2015-2030
- Plan Nacional de Transporte Eléctrico 2018-2030

Identified risks

- 7 year concession period for public transport limits the return of investments.
- Tariffs fall completely on the user (there is no public investment) so all new efforts to improve the service have to be covered through ticket prices.
- Uncertainty around charging infrastructure costs and suitable locations that optimize costs and operations.

Possible mitigation mechanisms

- Alignment between concession periods and bus service life.
- Political agreements with stakeholders at the local and national level (incentives, revenues, funding).
- Restructuring cash flows based on KPIs.
- New business models for e-buses and charging infrastructure.
- Guarantee mechanisms to lower risks (such as fare stabilization funds or others).

Public Transportation Stats - 2023

Fleet: 1,650 buses

of operators: 36

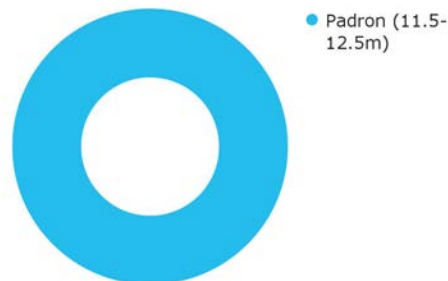
of bus routes: 250

Average pax per day: 480 000 (Nov. 2022)

Ticket price (USD): For most of the San Jose area, prices are between \$0.5 - 1.25 (varies depending on each route)

Average fleet age: 8 years

Fleet composition



Funding & Financing (E-buses)

- **Funding:** Funding in the city comes from passengers' fares. There are exemptions schemes for people over 65.
- **Financing:** The most advanced scheme involves a national bank leasing the buses to the operators. There are other efforts by operators to purchase their fleets directly.

Charging infrastructure

Ongoing studies by utility to understand existing infrastructure, needs and opportunities..

Projects

- IDB: business models for electrification.
- WB: tariff scenarios with bus electrification and business models for electrification and financial models to support electrification of buses (ongoing).
- GIZ: pilot project with 3 e-buses, capacity building, transport electrification impact on the grid and gender studies.
- UNEP: barriers and mitigation actions for bus electrification, suitability for bus route electrification.
- CRUSA Foundation: roadmap for bus electrification.

Source: Consejo de Transporte Público, 2023.

San Salvador

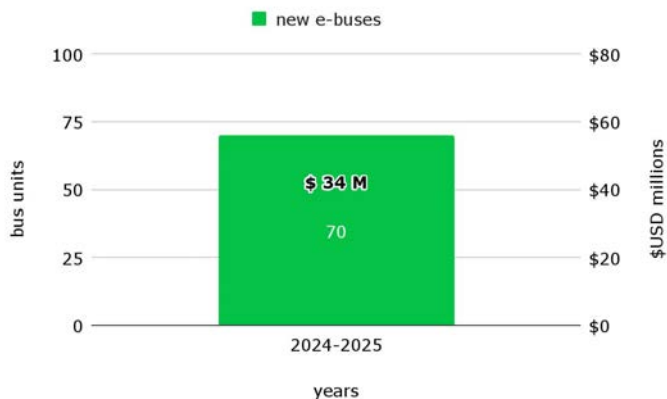


E-bus pipeline: 70 buses by 2030

City's goal: **70 e-buses** for a 5-route pilot project projected to 2025.

E-bus price indicated by the city: \$450,000 for a Padron bus-

Reference cost of another Latin American city for charging infrastructure: \$30,000 per bus.



Public Transportation Stats - 2023

Fleet: 6,000 buses

of operators: 2000-3000

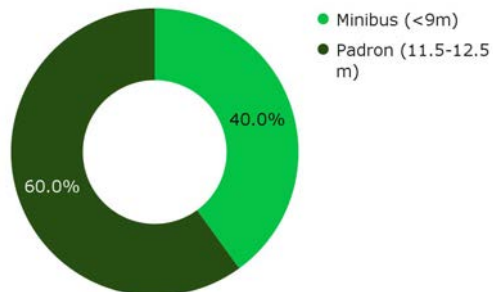
of bus routes: 1,262 (total country, including interdepartmental)

Average pax per day: Not identified

Ticket price (USD): \$0.20 (urban ordinary service), \$0.34 (urban exclusive service) (July 2023)

Average fleet age: more than 10 years

Fleet composition



National policies

-Estrategia de Movilidad Eléctrica (technical validation stage)

-NDC (2021)

Identified risks

- High upfront costs of e-buses.
- Age of the fleet: 85% of the buses are used, making the insertion of new technologies difficult.
- Updating of the legislature: to promote incentives for the public transport sector.
- Lack of knowledge about bus maintenance, chargers.
- Cultural aspects: lack of knowledge on the population's part, resistance to the implementation of electronic payment.

Possible mitigation mechanisms

- New business models for e-buses and charging infrastructure.
- agreements with stakeholders at the local and national level (incentives, revenues, funding).
- Capacity building and training in operating companies for adequate planning and operations.
- Communications and capacity building with all stakeholders.

Source: Ministerio de Obras Públicas y Transportes, 2023.

Funding & Financing (E-buses)

- **Funding:** Funding in the city comes from passengers' fares with public subsidy.
- **Financing:** The city is looking into the possibility of providing loans through the Banco Hipotecario (national bank) to replace units. Also, resources from green climate funds are being sought for the purchase.

Charging infrastructure

There is an available land/yard for the charging infrastructure, which would be provided by the State.

Projects

- A pilot project of 70 units is being structured for 5 routes (San Salvador and interdepartmental). The city is in the process of seeking funding for the project. The results of the pilot project are expected to provide information for scaling up the the electrification of public transportation.
- Electric Mobility Strategy: currently under technical validation. Work carried out together with UNEP
- Thanks to IDB support they have visited Colombia to facilitate exchange with operators.
- The city has developed the Transportation Master Plan and the electrification of transportation is mentioned as part of the recommendations.

Source: Ministerio de Obras Públicas y Transportes, 2023.

An aerial photograph of Rio de Janeiro, Brazil, showing the bay, mountains, and dense urban development. The bay is filled with many sailboats. The mountains are rugged and green. The sky is a mix of pink and blue, suggesting a sunset or sunrise. The city is built on a steep slope, with many high-rise buildings. The water is a deep blue color. The overall scene is a vibrant and scenic view of the city.

UrbanShift Cities

Mendoza



Fleet: **18 buses**

Principal type of buses: Padron (11.5-12.5m)

Parameter	City information
Electrification targets for public transportation (buses)	Not identified
Electrification projects in the early stages of development	Yes, there are e-buses in the city
Financing strategies for replacement of buses by electric models	No identificadas
Project or technical assistance related to bus electrification	Not identified
Main challenges identified for the electrification of bus fleets	Development of charging points

Ushuaia



Fleet: **20 buses**

Principal type of buses: Padron (11.5-12.5m)

Parameter	City information
Electrification targets for public transportation (buses)	Yes, in the formulation stage
Electrification projects in the early stages of development	Yes, there have been projects. Currently, under review by the city
Financing strategies for replacement of buses by electric models	Not identified
Project or technical assistance related to bus electrification	Not identified
Main challenges identified for the electrification of bus fleets	Climate and costs



Fleet: **620 buses**

Principal type of buses: Minibus (<9m) & Articulated

Parameter	City information
Electrification targets for public transportation (buses)	Replacing five units per year, with the goal of replacing all of them over the next 20 years, can improve the average if external partnerships and financing are obtained.
Electrification projects in the early stages of development	Yes, it is included in the city's strategic plan.
Financing strategies for replacement of buses by electric models	Not identified
Project or technical assistance related to bus electrification	Not identified
Main challenges identified for the electrification of bus fleets	Not identified

Florianópolis



Fleet: **289 buses**

Type of buses: Padron (12.5-15m)

Parameter	City information
Electrification targets for public transportation (buses)	The city has no targets, although there are plans to electrify some lines.
Electrification projects in the early stages of development	<p>Yes, there is an initial proposal to electrify the lines that serve low-income communities on the slopes of the center.</p> <p>The region has completed a study of three deployment scenarios: the initial scenario of 8 vehicles, the second scenario of 28 vehicles and the third scenario of 100% of the zero-emission fleet (289 vehicles), and another study in the preliminary stage for public charging infrastructure..</p>
Financing strategies for replacement of buses by electric models	Not identified
Project or technical assistance related to bus electrification	Not identified
Main challenges identified for the electrification of bus fleets	Suitable location and infrastructure for recharging, business model, operational planning and financial structuring.

Teresina



Fleet: **250 buses**

Type of buses: Minibus (<9m), Midi-Bus (9-11.5m), Padron (11.5-12.5m), Padron (12.5-15m)

Parameter	City information
Electrification targets for public transportation (buses)	Yes, by 2027 electrify 30% of the bus fleet and by 2032 electrify 100% of the bus fleet.
Electrification projects in the early stages of development	The city of Teresina is at the initial planning stage and will have to follow the guidelines of the Climate Action Plan.
Financing strategies for replacement of buses by electric models	Not identified
Project or technical assistance related to bus electrification	Not identified
Main challenges identified for the electrification of bus fleets	Costs, infrastructure and logistics

Asunción Metropolitan Area



Fleet: **1,700 buses**

Type of buses: Minibus (<9m), Midi-Bus (9-11.5m), Padron (11.5-12.5m)

Parameter	City information
Electrification targets for public transportation (buses)	Yes, NAMA facility's vision of replacing 1000 units in 10 years.
Electrification projects in the early stages of development	Yes, NAMA Project - Zero Emissions Public Transport in the Asuncion Metropolitan Area (AMA). It consists of mechanisms to operationalize the Zero Emissions Public Transportation project.
Financing strategies for replacement of buses by electric models	Not identified
Project or technical assistance related to bus electrification	Yes, Nama facility and AMA's Public Transportation Bus Renewal Plan
Main challenges identified for the electrification of bus fleets	Costs

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Pipeline of Electric Bus Projects in Latin America

An overview of 32 cities

October, 2023

Photo by Alcaldía de Bogotá, 2022-Colombia