

# CASE STUDY

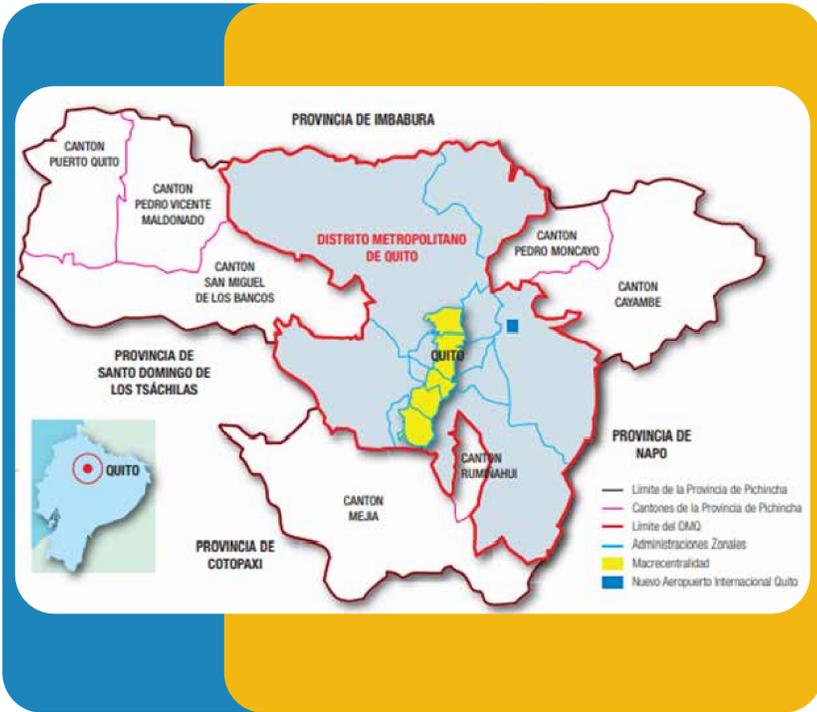
## QUITO, ECUADOR

### Urban Mobility and the Transition to E-Buses



# City Profile

As of April 2023



## Local Government Name

Quito

## Official Name

San Francisco de Quito

## Population

2.781.641 million (2018)

## Total Area

4.230 km<sup>2</sup> (2018), Urban and rural area

## Municipal Budget

\$734.'684.028,28 Usd.

## Web address

<https://www.quito.gob.ec/>

## Project profile

### Local Government Name

TUMI E-Bus Mission City Network

### Project start / end date

2021/2023

### Scale

Global

### Key Partners

- German Ministry for Economic Cooperation and Development (BMZ)
- German Society for International Cooperation (GIZ)
- C40 Cities
- The International Council on Clean Transportation (ICCT)
- The Institute for Transportation and Development Policy (ITDP)
- ICLEI – Local Governments for Sustainability
- The International Association of Public Transport (UITP)
- World Resources Institute (WRI)



## Summary

The city of Quito, capital of Ecuador, recognizes the importance of transportation as an important sector within its urban planning. In response to this, the district has developed actions such as structural changes in the roads, promotion of active mobility and has opened spaces for dialogue to involve different actors. However, the geographical conditions, the concentration of economic centers in some places, highlight the urgency of reinforcing and continuing to work for more sustainable mobility. Currently, 51,3% of the population uses public transport, 33,2% private vehicles and 15,4% active mobility (walking plus bicycle) (Origin-destinationsurvey 2022).

One of the great challenges is to respond to the logic of integration with the different modes of transport and achieve the implementation of at least 10% of the fleet with electric buses by 2023. To advance this transition, in 2022 the city joined the E-Bus Mission City Network, which is the learning network of cities committed to accelerating the transition to electric bus fleets within public transportation systems.

This case study describes the actors involved and the first steps that the city has taken so far in its journey towards the adoption of electric buses, the challenges, the lessons learned and the next steps in the process.

## Introduction

The importance of achieving an integrated transport system SITM-Q between the Metro, the BRT Metrobus-Q system and the electric buses in the conventional transport system and the cable system is to contribute to the establishment of an urban territory with sustainable transport means. The mobility system of District Metropolitan Quito is planned according to the needs of people as a structural element for the progress of the city. Under these aims, policies and programs are elaborated that encourage the development of sustainable transport and the rational use of private vehicles. Metropolitan Ordinance N°. 017-2020<sup>1</sup> and its optimization through the Metropolitan ordinance 046-2022,<sup>2</sup> aim to improve the the quality of the transport service, which consist of the following:

The efficiency of transportation systems will improve the productivity and competitiveness of the District. For this, it is essential to promote an inclusive, sustainable, integrated, safe and clean transport system.

- Service quality improvement
- Travel time savings
- Lower operating costs
- Environmental improvements, by reducing kilometers traveled and incorporating the provision of electric transport
- Eliminate itinerary redundancy
- Recovery of public space and promotion of multiple uses
- Guarantee coverage and continuity in the provision of the service
- Plan for the progressive integration of the Public Transport System
- Route restructuring plan
- Implementation of control and collection systems

<sup>1</sup> ORD-017-2020-MET-INTEGRATION OF TRANSPORTATION SUBSYSTEMS

<sup>2</sup> ORD-046-2022 OPTIMIZATION ORD-017-2020



## The City of Quito

Quito is the nucleus and most populated city of the Metropolitan District of Quito (DMQ) located in the Province of Pichincha. The DMQ is the capital of the Republic of Ecuador and has a population of 2,123,495 inhabitants, of which 1,534,017 inhabit the city of Quito and 589,478 inhabitants in the rest of the metropolitan territory (See Figure 1). The city is divided into 32 urban and 33 rural zones.

Quito is almost 3,000 meters above sea level, which has led to enormous challenges in the geometric development of its road and transportation infrastructure. The east-west topography has prevented the city from spreading in this direction and over the years, urbanization processes with little planning have accelerated in a north-south direction.

Because it is the most important city in Ecuador, Quito has a high concentration of administration and equipment, public,

commercial, financial, and educational services, which leads to forces occurring between the different urban centers and their centrality that generate a large number of trips, which creates congestion and a saturation of the road network.



**Figure 1.** Quito's trolleybus corridor.  
Source: Alcaldía Metropolitana de Quito.

## How Quito is advancing in the integration of electric buses into the transport system

### Getting to know Quito's transportation system

Public transportation in the city of Quito is managed by the Integrated Metropolitan Transportation System, better known by its acronym SITM-Q, which operates all of the city's mass transportation subsystems, both public and private. Currently the number of urban buses add up to 3,220 units, integrated into the conventional service with buses and mini-buses, and in the integrated system, formed by part of the north central corridor, ecovía system, feeder

buses, central trolleybus corridor with articulated and bi-articulated units.



## Interdisciplinary work team and stakeholder mapping

The city has made progress in carrying out formal discussions for the adoption of electric buses with National Government, the transport sector, Citizen Oversight, the Mobility Observatory and the Mobility Commission of the Assembly of Quito who have positively observed the transparency of the bidding processes issued, where it is recommended better times for the presentation of offers, feedback of the causes when there is a deserted tender.

The Quito tender was led by the passenger company. One of the biggest challenges for those who apply for this type of tender is the gap between the social rate (determined by the municipalities) and the technical rate. In the case of Quito, there is a new strategy to cover that difference. The city proposes a higher tariff for the electric buses (10 US cents more per ticket), but improving mobility, safety, and quality conditions. It is a particular bet for the region that will begin to be evaluated.

The structure available to the Municipality to monitor the implementation of the projects is based mainly through the following entities: Secretariat of Mobility of Quito, Single Transportation Authority, Metro Quito Metropolitan Public Company (EPMMQ), Metropolitan Public Company of Quito Passenger Transport (EPMTPQ), Public Metropolitan Mobility and Public Works Company (EPMMOP) and Metropolitan Transit Agency (AMT). The progressive incorporation of electric

buses in Quito will require preparation and planning so that the city can prepare itself in terms of its electrical infrastructure, regulatory aspects, its operators, suppliers, and human capital that supports this new ecosystem.



**Figure 2.** caption: Quito's metro.  
Source: José Jácome / EFE



**Figure 3.** Quito's Trolley bus in San Blas region  
Source: Alcaldia Metropolitana de Quito

## Goals towards the transition to electric buses

The goals that the city of Quito has set for itself correspond to:

Goals	Year	Term
Implementation of at least 10% of the fleet per route with electric buses	2023	Short
The vehicles that are incorporated into the urban and interparroquial public transport service must only be electric	2025	Medium
Have 100% zero emissions public transport	2040	Long

### Operational Design Fit

The Municipality through ordinance O17 of 2020 carried out a restructuring plan with its respective schedule that contemplates the socialization, budget allocation, route allocation process, formation of the trust for integration, institutional strengthening, sustainability mechanism and continuity of the transportation integration. The renewal of the fleet and the contemplated operational improvement maintain the same passenger demand. The autonomy required for the correct operation of electric buses according to the operational design is 300 km in real range (not nominal range).

The starting point of the routes will be considered based on the location of the yard infrastructure where the nighttime vehicle charging process takes place. It is planned that the provision of charging infrastructure will be in charge of the Quito Energy Company (EEQ), which should support the necessary and sufficient electrical network in terms of capacity to meet the proposed goals in the short (2023), medium (2025) and long (2040) term.

### Pilot tests

On July 19, 2018, tests began in the city of Quito with three 100% electric buses of the Chinese brand BYD, for a period of two months. One of the vehicles was articulated with a capacity for 160 passengers, while the other 2 buses of 12-meter long had a capacity of 80 people. The tests were carried out by the private transport company UnitransQ.<sup>3</sup>

Currently, a BYD bus is being tested based on a protocol established by the Secretariat of Mobility, on the Pueblo Blanco - Asamblea route, operated by the Transport Company of Guadalajara.



<sup>3</sup> <https://bydelectrico.com/ec/2018/07/>

## Financial structuring and business model

The current operation business model in Quito is carried out through private companies with an operation contract that defines the characteristics of the operation and provides the buses. The rate is defined by the Metropolitan Council. The demand risk is transferred to the operator, because it is paid only per passenger.

During the city's bidding processes, complications related to financing arose.. So the city gave up on the bidding because there were financial weaknesses to cover the gap between the social bus fare, which is determined by the Municipality, and the technical fare, which has increased given the low user's demand.

It must also be foreseen that more than 95% of public transport operators are private and require financing according to the number of years of contract they have in operation on each of the routes, in order to have adequate profitability. taking into account the initial investment costs and operational costs, the first costs being higher in electric buses vs. combustion buses, but when comparing operational costs, the proportions are considerably reversed.

This becomes an opportunity to define a tariff fund that draws on resources from obtaining green bonds and alternative sources of financing between the public and private sectors that cover the tariff gap and the clear definition of the risks that the transport sector must assume as well as the municipality.

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Figure 4. Quito trolleybus station.  
Source: svenschermer.

<sup>3</sup> <https://bydelectrico.com/ec/2018/07/>

## National and local normative frameworks towards the transition to electric buses

Standard and year	Context
Council Resolution No. C-105 02-07-2019 (decarbonisation transport):	Proposed Decarbonization Ordinance, which establishes incentive schemes to recognize Operators with electric or zero-emission vehicle fleets, in recognition of the socio-environmental benefits derived from the reduction of emissions and noise reduction.
Productive Promotion Law, 2018	Exempts from tariffs "electric vehicles for private use, public transport and cargo"
Tax Simplification Law: 2019	It raises the exoneration of the Tax on Special Consumption (ICE) and Value Added Tax (VAT) for the recharging service for electric vehicles at the stations
Ecuadorian Energy Efficiency Law (ENEE), 2019	The buses that enter the public transport system of the country, from 2025 must be electric.
Ordinance 017 of 2020:	Restructuring plan for transport services in order to improve the quality of service provision and incorporate electric transport supply.
Energy Tariff Sheet 2020	Agency for the Regulation and Control of Electricity, provides for the collection of a preferential rate for charging electric vehicles.
National Electromobility Strategy for Ecuador (ENEE), 2021	Guide and apply electric mobility and the use of renewable energy.
Municipal Code for the Metropolitan District of Quito, 2023,	Socio-environmental benefits derived from the reduction of emissions and noise (art. 2692) and tariff scheme for electric or low-emission buses (art. 2918). The electric bus fare is \$0.45 USD
Mobility Master Plan with a 2023-2043 vision	Update of the Plan with strategic guidelines, programs and projects that make up a city in accordance with the Territorial Planning Plan in force until 2025

## Results

Some results are presented that have been key in the first steps of the city of Quito in the transition to electric buses:

- 2018: the city began a pilot test with three 100% electric buses
- 2020: The city integrates the electric bus transition into its public policy. In this sense, the Quito Climate Change Action Plan - PACQ 2020,
- 2020: Study of purchase and feasibility of implementation of electric buses
- 2022: The Quito Public Passenger Transport Company carried out a market study for the purchase of 26 100% electric trolleybuses (overhead contact line plus battery)
- 2023: The definition of a higher rate in the Municipal Code of January 2023 (article 2918) for the use of electric public transport is a financial incentive.

# Lessons Learned

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## Political will and stakeholder involvement:

For the project to continue, it is essential to maintain the political will where the different public and private stakeholders can discuss technical, legal and financial issues necessary in the comprehensive planning of electric buses. This is one of the key factors for the city of Quito and other cities that are beginning this transition.

## Normative framework

The city has been adjusting its regulatory framework, aligning its goals in the short, medium and long term focused on the transition to electric buses, however, there are still great challenges in the regulatory framework that expands opportunities for access to financing for initial investment, the possibility of obtaining green bonds and finding mechanisms to relocate subsidies.

## Pilot tests- Tender

Although the city of Quito has already implemented electric bus pilot projects and has carried out bidding processes where a vehicle typology was contemplated, it is imperative through the definition of the pilot test protocol to carry out experiments with vehicle typologies given the operational adjustment made and the topographic and geometric conditions of some

areas of the city. These conditions, for example, prevent the provision of the service with a low-floor vehicle.

## ITS systems

In terms of ITS equipment,<sup>4</sup> It is important to consider technological equipment aimed at improving road safety with automatic speed restrictions and door control, weight sensors, on-board entertainment, WIFI, USB ports, as well as cameras for user safety.



<sup>4</sup> Intelligent Transport Systems

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