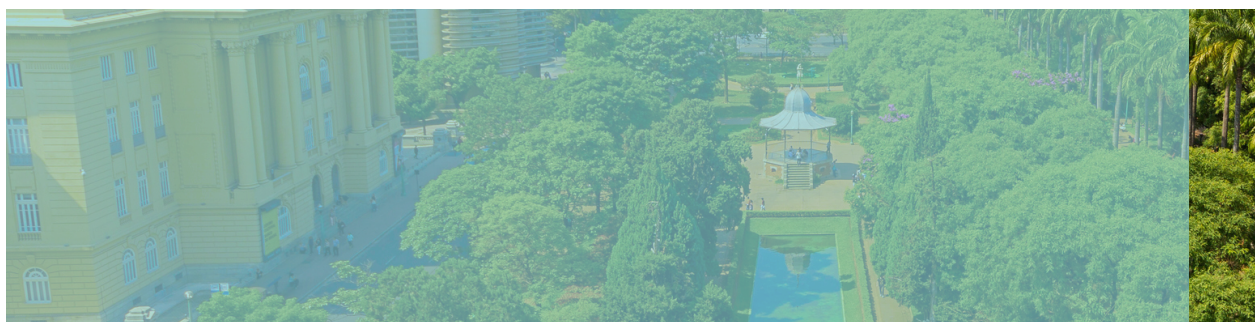


# BELO HORIZONTE, BRAZIL





## CITY FEATURES



Belo Horizonte is a Brazilian municipality and the capital of the state of Minas Gerais. Its population is 2,315,560 (2022) inhabitants, making it the sixth most populous municipality in Brazil. With an area of approximately 331 km<sup>2</sup>, it has a diverse geography, with hills and lowlands. Since the beginning of the 21st century, Belo Horizonte has stood out for the development of the tertiary sector of the economy: commerce, services and high technology sectors (biotechnology and information technology particularly stand out). Some of the recent investments in these sectors include the implementation of the Technological Park of Belo Horizonte, the Google Research and Development Center for Latin America and the Expominas convention center.



Population<sup>1</sup>  
**2,315,560**  
(2022)



Land area<sup>2</sup>  
**331.5**  
km<sup>2</sup>



Average temperature  
**22°C**

## TRANSPORT FEATURES

### Status quo and urban mobility trends

Downtown is the major attraction area for trips because it has a high concentration of commercial activities. Besides, there is a tendency to reduce the use of public transport and to increase the use of private transport (especially motorcycles). The main challenge is meeting people's travel needs while reducing emissions. Thus, key strategy is to reduce motorized trips and make public transport more efficient. To this end, the city studies the inclusion of non-polluting vehicles in the transport system, the tax incentive/exoneration of low-emission vehicles and the restriction of the circulation of private vehicles.

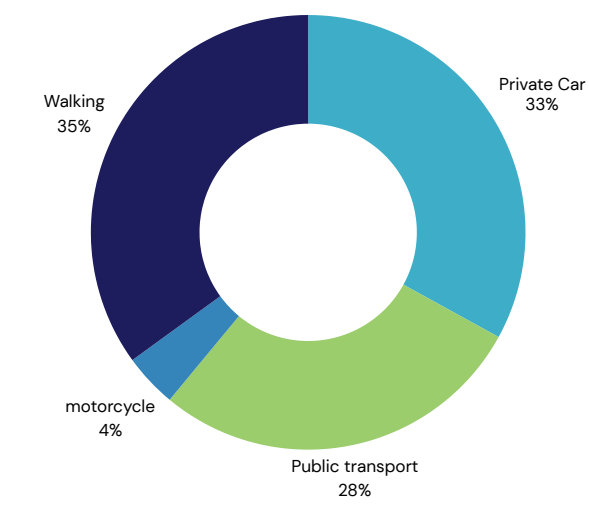


1 IBGE (Brazilian Institute of Geography and Statistics), 2022

2 IBGE (Brazilian Institute of Geography and Statistics), 2023

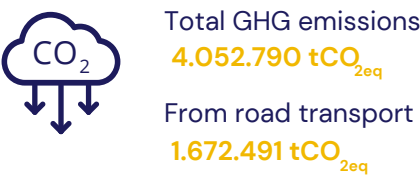
TRANSPORT FEATURES

Modal Split <sup>3</sup>

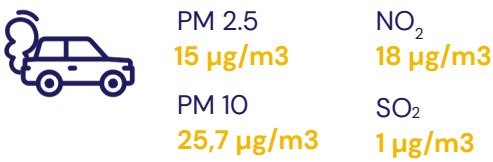


In Belo Horizonte, the modal split reflects a significant reliance on non-motorized and private transport, with walking accounting for 35% of trips, followed closely by private cars at 33%. Public transport use remains substantial at 28%, though trends indicate a decline in favor of private vehicles, particularly motorcycles, which represent 4% of trips. This shift poses challenges for urban mobility and sustainability, as it contributes to increased congestion and emissions. Addressing this, the city is prioritizing strategies to enhance public transport efficiency, reduce motorized trips, and integrate non-polluting vehicles into the transport system to promote sustainable mobility.

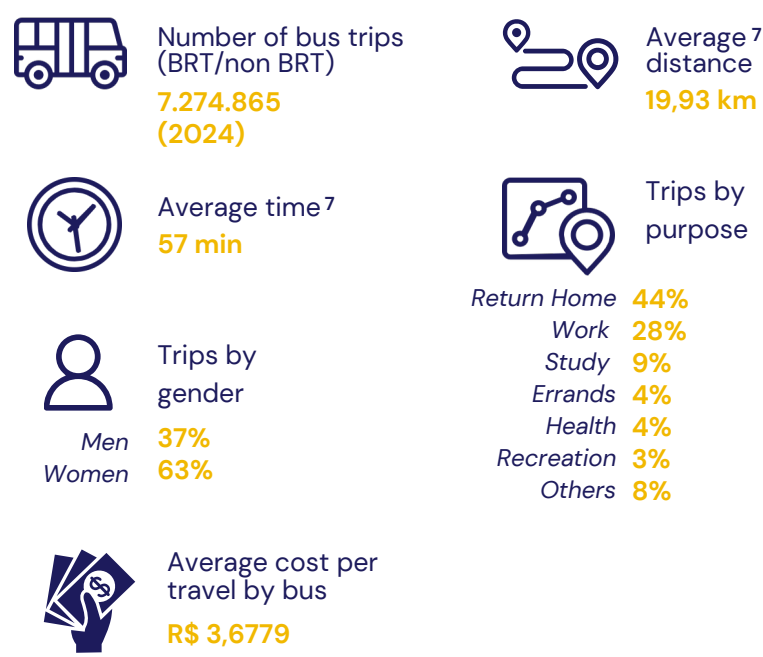
GHG Emission Levels <sup>4</sup>



Air Pollutant Levels<sup>5,6</sup>



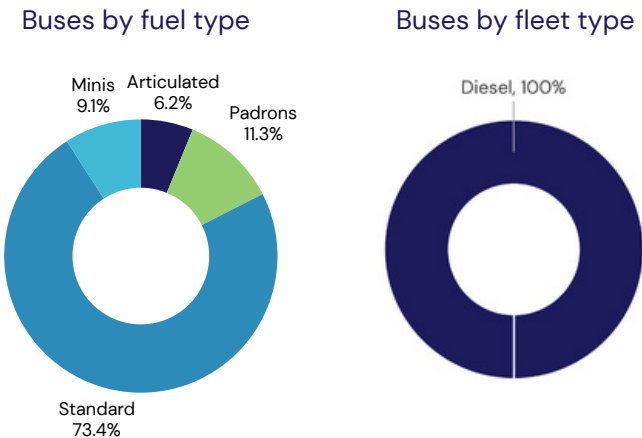
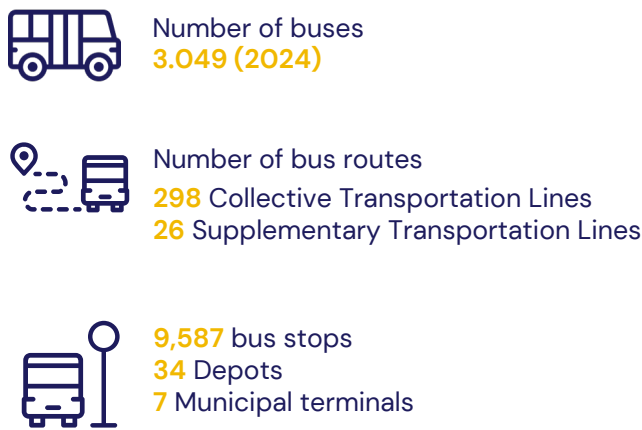
Bus Trips Features



The users of Belo Horizonte’s buses are, in majority, young and middle-aged women (18–29 years) who commute to work or to school in the central or commercial districts, leaving home in the morning (8am) and returning at peak hours – early to late afternoon (12pm–5pm). The duration of a bus trip varies depending on traffic and the number of transfers that some users need. On average, a trip covers 6.5 km, with commutes that last about 1 hour. The users of bus-lines are, mostly, medium to low-income citizens (76%). It is observed that the higher the income, the higher the use of individual motorized vehicles. The trips are well distributed in the territory, having less origins or destinations in east and north districts.

3 Belo Horizonte City Hall. "Home Origin and Destination Survey: Modal Division – Trips." 2012  
4 Belo Horizonte City Hall. "Final Inventory of Greenhouse Gas Emissions." Belo Horizonte City Hall, 2021.  
5 Belo Horizonte Energy and Environment Institute. "Air Quality, 2022  
6 Belo Horizonte City Hall. "Mobility Balance 2023: Base Year 2022"  
7 Belo Horizonte City Hall. "Operational Control Map (MCO), Consolidated from April 2022."

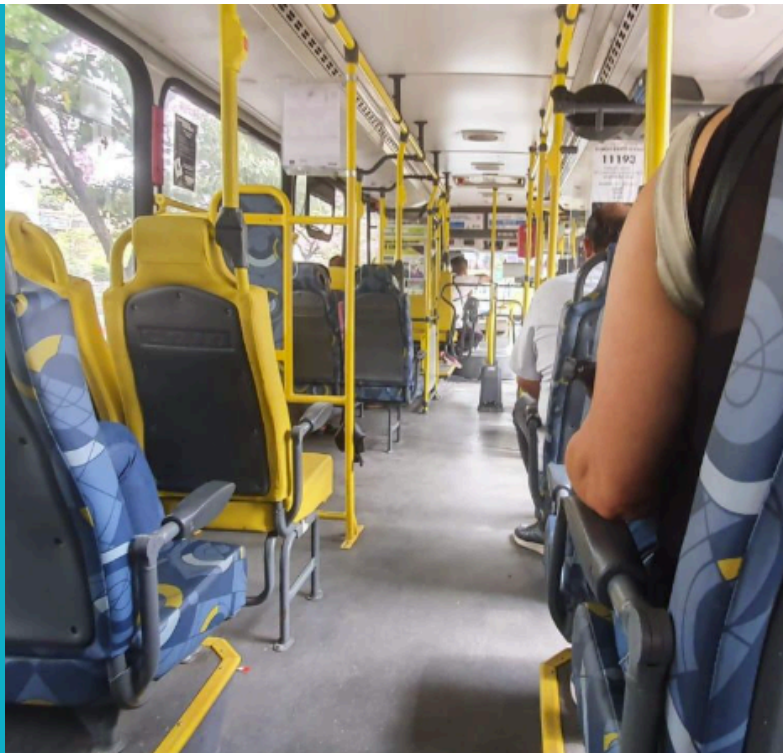
Fleet and Infrastructure



Belo Horizonte's public transportation system is primarily composed of standard buses, which make up almost 74% of the fleet. The average age of the fleet is 4.7 years, and all buses are accessible, with over 80% equipped with air conditioning or climate control. Additionally, 903 vehicles are Euro 6 models, adhering to stricter environmental standards. The fleet includes various vehicle types. Standard buses, with an average gross vehicle weight rating (GVWR) of 17 tons, have three doors and are being gradually replaced by models with air conditioning and air suspension. Articulated buses operate within the MOVE BRT system, offering air conditioning and air suspension, with either four left-side doors or a combination of four left-side and three right-side doors. Minibuses, used on supplementary routes and in informal communities, also feature air conditioning and air suspension. Padron and Mixed BRT vehicles are specifically designed for the MOVE system, equipped with air conditioning, air suspension, and five doors (two on the left and three on the right).

Quality of Service

The efficiency of bus operations in Belo Horizonte is reasonable, with over 98% of scheduled trips completed, 96% of which are punctual. However, the average operational speed during the afternoon peak is 14.7 km/h, making buses slower than cars due to traffic and boarding operations, except for BRT trips. The system integrates feeder and trunk lines with a 5% fare complement and metro lines with a 69% complement compared to metro fares. Belo Horizonte has invested in modernizing its fleet, adding air conditioning and air suspension for passenger comfort. All buses are accessible via elevators, with BRT vehicles offering level boarding. Safety measures include private security at terminals and stations and a panic button system since 2018, alerting bus companies and the city's operations center in cases of harassment or emergencies





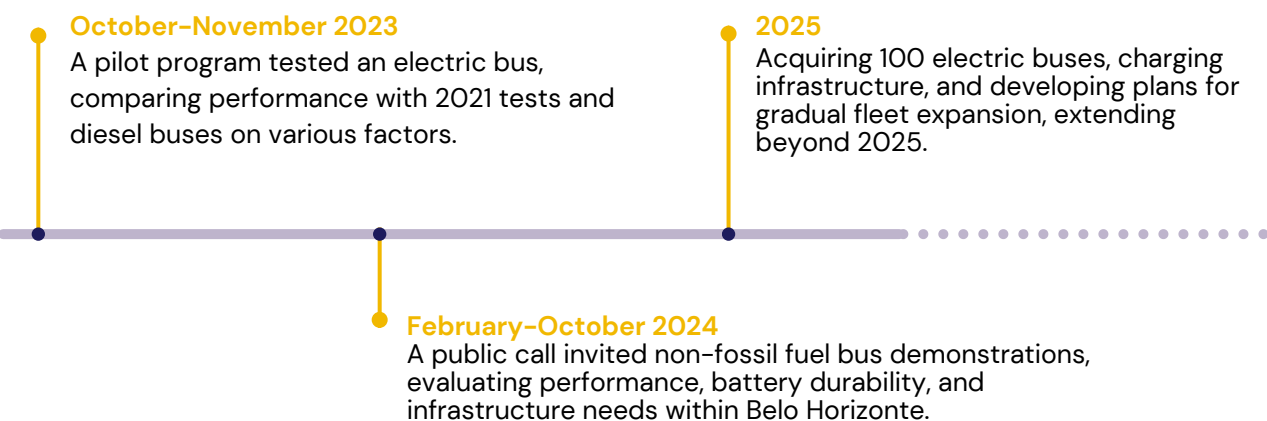
## Existing Business Model<sup>8</sup>

A	B	C	D	E
<b>Model A:</b> Vertically integrated, private operator in BRT/integrated system	<b>Model B:</b> Divided responsibilities in BRT/integrated system	<b>Model C:</b> Large, more formal, private operator in traditional service	<b>Model D:</b> Small, informal, private operator in traditional service	<b>Model E:</b> Government-run system

<b>A</b>	Model A was implemented in 2014 to operate the BRT – MOVE system lines through concessions. The network of lines has physical and fare integration, with regularity, speed, comfort, and safety as the operational result. Payment is made before boarding, with the option of the BHBUS card. Information about the lines' operation is offered to the user in real time. The fleet is made up by padron-type and articulated vehicles, both types with air conditioning and automatic exchange. The vehicles with greater transport and operation capacity are monitored by intelligent systems through the Operational Control Center.
<b>C</b>	Model C operates the feeder, circular, diametric, radial, semi-express and trunk lines of the feeder trunk systems that are not part of the MOVE system. This entire model also operates through a 20-year concession contract (2008 to 2028). The line network has fare integration.
<b>D</b>	The Model D system, implemented in 2003, is operated by minibuses that connect neighborhoods in Belo Horizonte. These minibuses are not permitted to operate in the city's central area. The system consists of autonomous operators who adhere to schedules, fares, and routes set by BHTRANS. While it is not integrated with other transportation systems in the capital, passengers can pay the fare using the BHBUS card.



## E-BUS ADOPTION APPROACH



<sup>8</sup> Based on Accelerating a market transition in Latin America: New business models for electric bus deployment, P4G, Zebra and Dalberg, 2020

## OPPORTUNITIES AND CHALLENGES FOR ADOPTION OF E-BUS FLEETS



### Opportunities

The implementation and expansion of electric bus fleets in our city present several key opportunities. These include lower operational costs (OPEX), a growing number of suppliers, increasing interest in environmental and climate resilience issues, and the prospect of a new concession contract starting in 2028. Additionally, there is the potential for utilizing renewable energy sources, establishing partnerships with state and private institutions, and benefiting from a consolidating market for buses, batteries, and chargers. Other advantages include the positive public perception of clean vehicles and the availability of both national (Federal Government – Novo PAC) and international financing sources.



### Challenges

There are significant challenges to adopting and expanding electric bus fleets. These include the high initial investment costs (CAPEX), the capacity to supply energy at designated charging station locations, and the impact of the city's topography and routes on vehicle performance. Other concerns include exchange rate fluctuations, energy price variations, the need for professional training and qualification, political and electoral cycles, and the long-term battery capacity and disposal process at the end of their lifespan. Additionally, there is resistance from traditional fuel suppliers, which poses an additional barrier to the transition.



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## OVERALL FRAMEWORK

### Policy

Belo Horizonte is advancing its transition to sustainable transportation, with fleet electrification as a key pillar. The city aims to improve air quality, reduce fossil fuel reliance, and become a leader in clean urban mobility.

Key initiatives include:

- Strategic partnerships: Collaboration with CEMIG to install charging infrastructure at strategic locations.
- Testing and pilots: Electric bus trials on various routes to assess efficiency and address challenges.
- Fleet acquisition: Purchasing 100 electric buses to enhance sustainable transport.
- Policies and incentives: Aligning with national policies and leveraging tax incentives and financing.
- Community engagement: Awareness campaigns to gain public support for electrification. These efforts align with the PlanMob-BH, Greenhouse Gas Reduction Plan (PREGEE), and Local Clean Mobility Plan (PLML), which aim for 100% non-fossil fuel vehicles in the city's contracted fleet.

### Financing

To support the electrification of transportation and sustainable mobility initiatives, the city has utilized internal credit operations backed by the federal government, in partnership with the National Bank for Economic and Social Development (BNDES) and Caixa Econômica Federal (CEF). These national banks have played a central role in providing financial support for the transition to sustainable transportation through their credit products and financing schemes.

### Impact

The PlanMob-BH includes measures for sustainable mobility that also address climate change. A key goal is achieving 100% non-fossil fuel-powered vehicles in the city's contracted fleet, along with 40% of the bus fleet being hybrid or non-petroleum-based. The city's Greenhouse Gas Emissions Inventory and targets are outlined in the Greenhouse Gas Reduction Plan (PREGEE). Financial estimates are provided in PlanMob, which also highlights benefits like improved air quality and public health, reducing respiratory diseases. The electrification of buses will make public transport more attractive, encouraging a shift from individual car use. The PlanMob-BH is supported by partnerships with energy suppliers, bus companies, and local authorities. The central area, one of the city's most congested regions, is prioritized for electrification. The gradual decarbonization could directly benefit up to 380,000 residents, with a potential expansion to 2.4 million people. Special focus is placed on marginalized groups affected by air pollution. Additionally, training programs for drivers and garage staff are planned.

# TUMI E-bus Mission City Network – Profile BELO HORIZONTE, BRAZIL



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## About the TUMI E-Bus Mission

Funded by the German Ministry for Economic Cooperation and Development (BMZ), a core group of organizations supports cities in their transition toward electric bus deployment.

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