



**Brazil\_Belo Horizonte**  
**UEMI\_SOLUTIONS**  
**2018**

**EV**

**READI**

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**ASSESSMENT**



**Wuppertal  
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**UN HABITAT**  
FOR A BETTER URBAN FUTURE



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# SOLUTIONS



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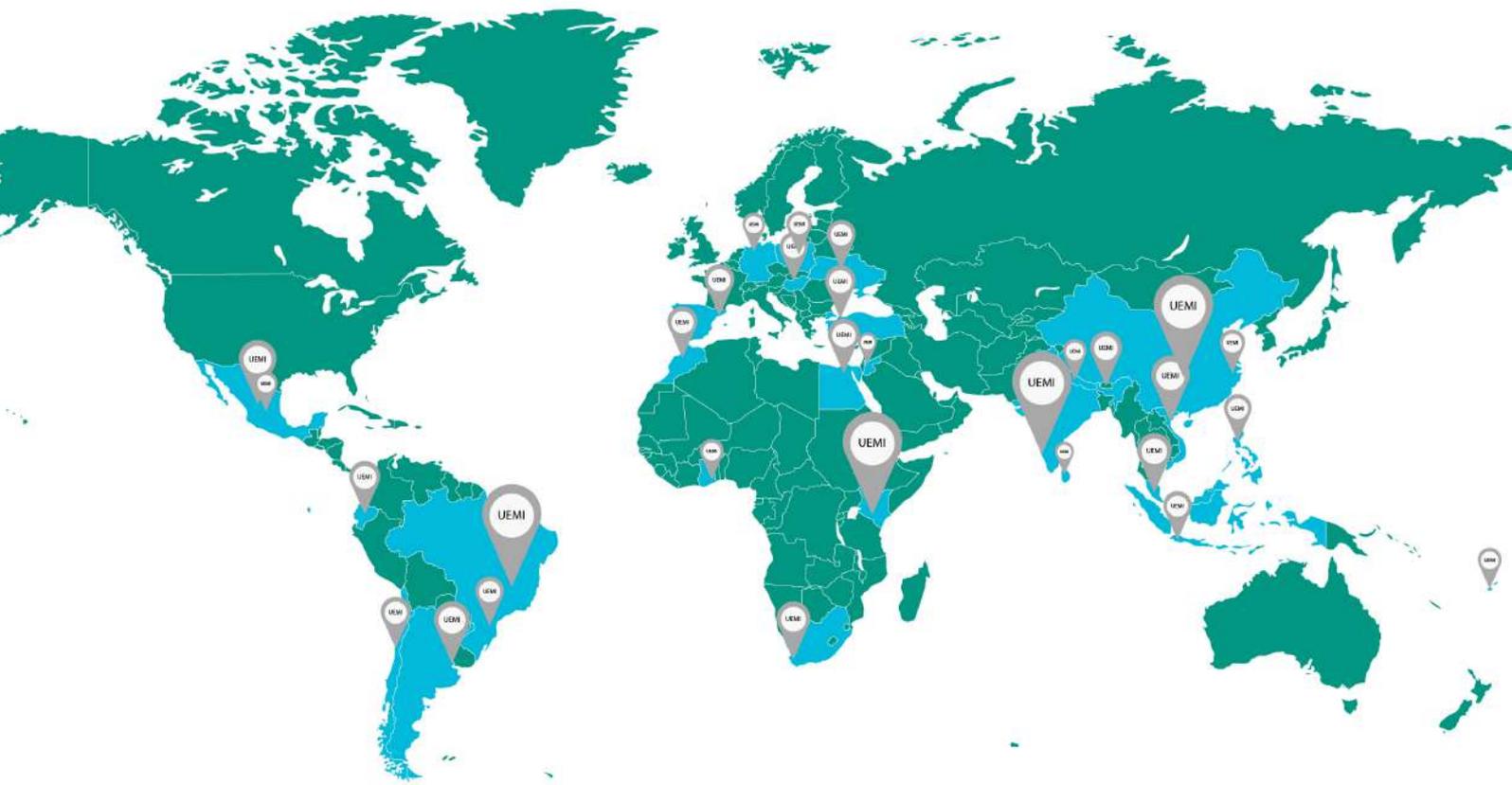
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# UEMI SOLUTIONS COUNTRIES

# KEY FACTS & FIGURES

GDP: USD 9,257.92 (2015)

## BELO HORIZONTE

### CITY

**Belo Horizonte**, located in the south-eastern region of Brazil, is the capital of the state of Minas Gerais and the 3<sup>rd</sup> largest metropolitan area in the country.

Brazil, one of the five emerging economies that constitute the BRICS, has a population of 208 million inhabitants extended over an area of 8.5 million km<sup>2</sup> in South America (IBGE, 2017). Belo Horizonte has a population of over 2.5 million, with 5.7 million in the metropolitan area (IBGE, 2017)-

### CO<sub>2</sub> EMISSIONS

Brazil is the 7th largest greenhouse gas (GHG) emitter in the world. Belo Horizonte's total CO<sub>2</sub> emissions (2013) were 4,417,834 tCO<sub>2</sub>-eq and per capita (2013) was 1.78 tCO<sub>2</sub>-eq (SisMob-BH, 2014).

In its NDC, Brazil commits to reduce GHG emissions by 37% below 2005 levels by 2025 and 43% by 2030, which translates into a 6% and 16% compared to 1990 levels, respectively. These targets turned Brazil into the first major developing country to commit to an absolute GHG reduction below 1990 levels (Federative Republic of Brazil, 2015). Likewise, in the process of institutionalizing climate change policies, Belo Horizonte set the goal of reducing 20% of GHG emissions by 2030 in comparison to 2007.

Mode share:

Public transport: 28%; Private car: 33%; Walking: 35%; Motorcycle: 4%; Bicycle: 0.4%

35% walking  
0.4% cycling

# UEMI



# SOLUTIONS

# DESCRIPTION & MEASURES

The Low-carbon mobility system was launched in 2016 by the governor of the State of Minas Gerais. The municipality of Belo Horizonte, on the other hand, has already tested and is starting to promote e-taxis and e-buses.

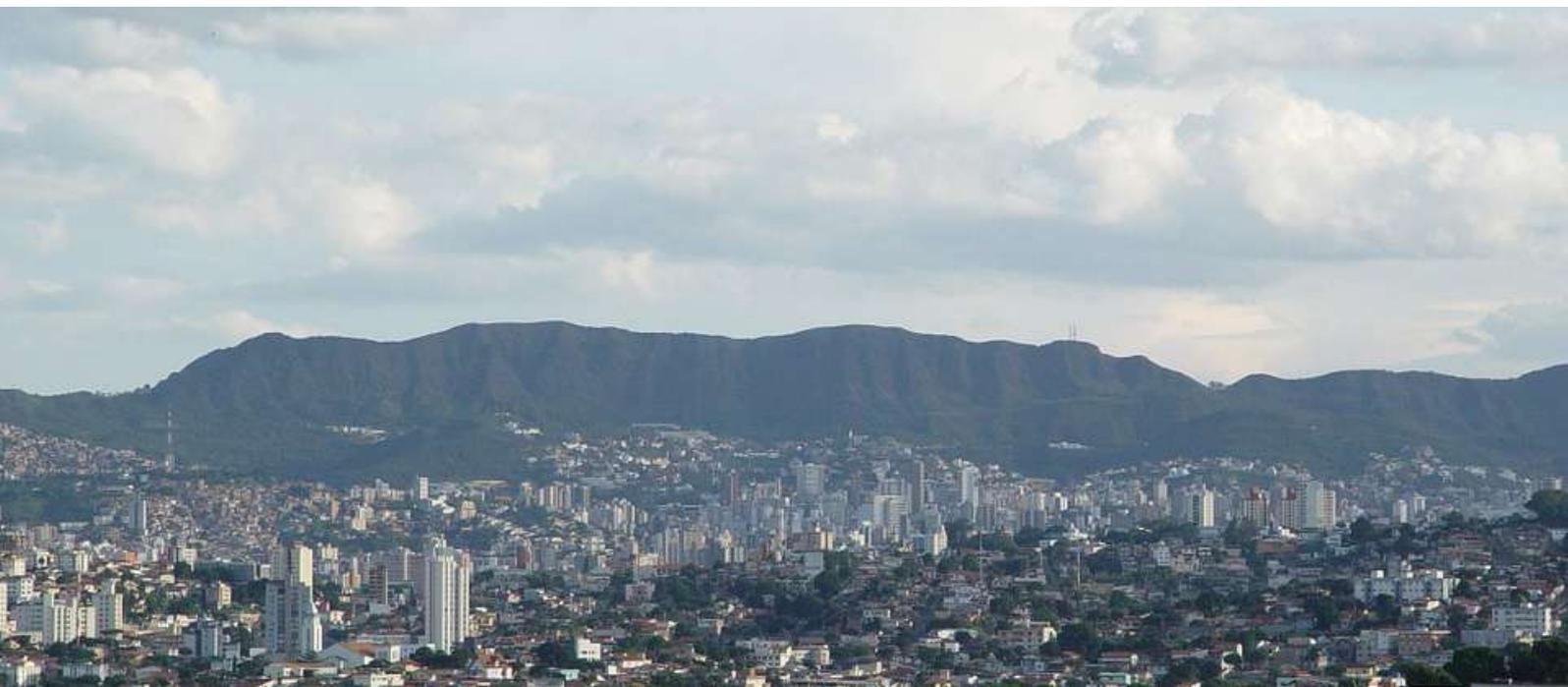
Since 2010 Belo Horizonte has an innovative Sustainable Urban Mobility Plan, called PlanMob-BH, with comprehensive measures related to TOD, BRT and bike solutions, which include the planning and construction of a 23 km BRT system called MOVE BRT, a bike sharing system with 40 stations and 400 bikes, 2 pedestrianized streets, 150 km of bike lanes, Zones 30, Fahrradstraßen, among others.

Moreover, due to Belo Horizonte's high density of IT companies and start-ups, as well as universities and research institutes, the municipality decided to take advantage of these characteristics and promote Belo Horizonte as a smart city. One of the 5 pillars of the "Belo Horizonte Smart City" plan focuses on the improvement of public transport and urban mobility, promotion of traffic safety and integrated management of city problems (Prefeitura BH, 2018).

In terms of e-mobility both the State of Minas Gerais and the city of Belo Horizonte have been active in its promotion.

## **EV Project 1: EVs in the Administrative City**

In September 2016, the governor of Minas Gerais launched a project called "low-carbon mobility system" in partnership with the Portuguese Centre for Excellence and Innovation in the Mobility Industry (CEiiA for its Portuguese acronym). This initiative is part of the Conect-ME project; a project implemented jointly between the government of Minas Gerais and Datora Mobile, a partner of Vodafone in Brazil. The Low Carbon Mobility System started working with a fleet of electric cars and motorcycles for public officers that circulate between the Airport and some public buildings in the so called Administrative City of Belo Horizonte. It also includes charging infrastructure (16 charging stations) and a real-time monitoring system, which collects data from the operation of vehicles and charging stations and generates periodic reports.



The implementation of the system occurred in 2017 in a period of 12 months, with an investment of approx. 750,000 EUR (R \$ 3.3 million), divided equally among the four signatories of the cooperation agreement (DOMG, 2016). At first, 19 touring vehicles and two buses will be available, but the idea is to replace the entire fleet by the end of 2018 (Hoje em dia, 2016).

According to Conect-ME estimations based on the data collected so far (Rodrigues, 2017):

Assumptions: 100 EVs in 1 year

Avoided CO<sub>2</sub> emissions: 270 tCO<sub>2</sub>

Financial resources saved: R \$ 594.182 (approx. EUR 130,000)

### EV Project 2: Electric taxis

In July 2017, BHTrans presented the first fully electric vehicle manufactured by BYD, a Chinese automobile manufacturer with an assembly plant in Brazil, to the taxi drivers. The BYD e6 model will be homologated and made available for taxi service in Belo Horizonte. This initiative is in line with the objectives of the Belo Horizonte Mobility Plan (PlanMob-BH) to build a city focused on sustainable urban mobility.

The BYD e6 model is an ample and comfortable electric car whose range is 400 km per load. It can be charged in 2 hours in a public charging station or



at home in an average of 6 hours. The battery has a lifespan of 40 years and 60 kWh of capacity.

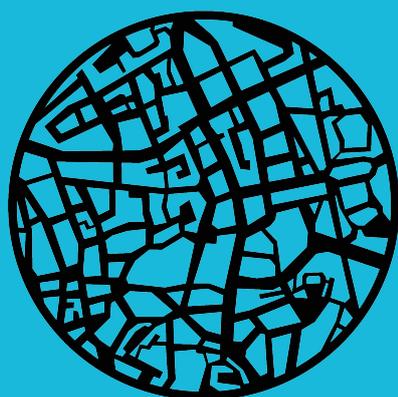
The BYD e6 costs R \$ 270 thousand (approx. EUR 60,000), which includes a free home charger for the car. To motivate taxi drivers to buy EVs, BYD has implemented a financing line for them by which they pay a down payment of R \$ 5 thousand (approx. EUR 1,000) at the beginning and the rest in 72 monthly installments of EUR R \$ 2,347 (approx. EUR 500). Moreover, the commercial manager of BYD Brazil asserts that the taxi drivers who opt for the BYD e6 model will experience a reduction in the operative costs (fuel and maintenance) of up to 85% (BHTrans, 2017).

### EV project 3: Tests of BYD electric bus

In December 2015, BHTrans tested a BYD electric bus on two routes of public transport. During the tests, BHTrans directors and technicians evaluated the safety and comfort aspects for users and drivers. The bus is 100% electric, powered by iron phosphate batteries, and can be charged in only five hours. The electric bus is already being manufactured in Brazil, where it has been tested in public transportation lines in many cities, including São Paulo (SP), Porto Alegre (RS) and Campinas (SP) (BHTrans, 2015).

The goal is to include at least 25 electric buses in the conventional bus service by 2019. WRI is currently supporting the municipality of Belo Horizonte in the development of a viable business model for bus owners. With this purpose, WRI conducted a workshop in August 2017, with representatives of BHTrans, other municipal secretariats, such as planning, environment and public works, possible financing banks, such as Caixa and BNDES, electricity companies and BYD (WRI, 2017).





## POLICY

## ENVIRONMENT

■ In the 1980s Brazil undertook measures to develop bio-fuels, as well as on the production of vehicles that are able to run on ethanol and biodiesel. As a result, Brazil is the second largest producer of biofuels in the world after the USA and 88% of all new light vehicles (LV) sold in Brazil run on a combination of ethanol and gasoline, with the so-called flex-fuel engines. Furthermore, in 2005 Brazil started the production of biodiesel with the goal of reducing the use of fossil fuels in heavy vehicles. Due to its important biofuels market and industry, the expansion of e-mobility in Brazil might not happen as fast as in other countries.

■ Nevertheless, it is worth noting that Brazil is the 10th biggest car producer in the world (2016). Accordingly, Brazil's automotive industry represents 22% of the industrial GDP, 4% of the total GDP, and generates 1.3 million direct and indirect jobs. Thus, in order to keep competing in the automotive market, the Brazilian industry has to adapt to the new trends and technologies of the sector, including the production of EVs.

■ The national government together with representatives from the automotive sector of Brazil are elaborating a 12-year plan for the development of the industry, called Rota 2030. One of the discussions groups is focused on electric mobility.

■ A decrease in the tax for EVs from 25% to 7% has been offered by the national government, but it has not been implemented yet

■ In 2013 the National Electricity Agency (ANEEL) launched a 5-year research program called Emotive. Its main purpose is to conduct the necessary research on different aspects of e-mobility to generate inputs for an adequate legislation in Brazil.

■ The Federal Institute of Minas Gerais (IFMG by its Portuguese acronym), seeking to fulfil its mission of developing RD & I projects in partnership with companies, signed a cooperation agreement with the automotive sector in 2014. This agreement allowed the construction of a sophisticated laboratory dedicated to the study of intelligent automotive systems. Thus, Belo Horizonte will turn into a knowledge and innovation hub dedicated to the development of automotive technologies. This could benefit the development and promotion of e-mobility solutions.

## CO<sub>2</sub> EMISSION

Conect-ME project estimates a reduction of 270 tCO<sub>2</sub> in a year with 100 EVs. PlanMobBH aims to reduce the GHG emissions in 36% by 2030 (all measures included, no specific information for the electric taxis/buses project)



## REDUCTION



## ACCESS & MOBILITY

As the e-mobility projects are still on an early stage, they have not improved the access and mobility of a significant part of the population yet. The EVs in the Administrative City, for example, are limited to public officials.

# counterpart at city level

BHTrans

## POTENTIAL FINANCE PARTNERS

Technical and Financial Cooperation between the Development Bank (BDMG)  
The Energy (Cemig)  
The R&D Foundation (Fapemig) and the Company of Economic Development (Codemig) of  
the State of Minas Gerais  
Caixa (national bank)  
Brazilian Development Bank (BNDES)

## TECHNICAL BARRIERS TO THE PROJECT

So far 16 charging stations are operational in the State of Minas Gerais. If the EV fleet increases beyond the pilot projects, further charging infrastructure needs to be provided.



# KEY STAKEHOLDERS

**1** ■ The State Government, the Development Bank of Minas Gerais (BDMG)

**2** ■ The Energy Company (Cemig)

The R&D Foundation (Fapemig) and the Company of Economic Development (Codemig) of the State of Minas Gerais

Municipality of Belo Horizonte, public officials, Caixa (national bank)

**5** ■ Brazilian Development Bank (BNDES)

**6** ■ Private sector: Datora Mobile, Vodafone Brazil and BYD, Start-ups

**3**

**4**



# STEPS TOWARDS IMPLEMENTATION

## FEASIBILITY OF THE IMPLEMENTATION

The pilot project in the administrative city of Belo Horizonte has been launched and financed, and the first tests on electric taxis and buses have been conducted by the municipality. However, as the price difference between an EV and a fossil-fueled vehicle is high, the success of the planned e-mobility measures in Belo Horizonte will be difficult without the adequate incentives and resources.

Research conducted by WRI (2017) shows that many of the barriers that Brazilian and Latin American cities in general face are:

- High initial costs. In general, the costs of electric buses or cars are 2 to 4 times higher than the diesel-fueled ones. Furthermore, the existence of import taxes and the current subsidies to diesel are also factors that weigh in this direction.
- There is fear of shifting to a new technology and lack of technical knowledge and skills among the stakeholders.
- There are only few examples of long-term operation of clean vehicles, especially in the Latin American context. Thus, there is no certainty about the performance of batteries, and lack of information on the reliability and quality of EVs.
- Concession contracts are mostly based on the lowest price, disqualifying and discouraging the adoption of low-carbon solutions, which tend to be more expensive.

The pilot project in the administrative city of Belo Horizonte started in 2016 and is already operative. The electric taxis and buses have already been tested and the city of Belo Horizonte has the plan to implement at least 25 e-buses until 2019.



# ELECTRICITY MIX



# RELIABILITY OF THE GRID

In 2016 most of the energy produced came from renewable sources, mainly hydropower with 61% of the energy mix (MME, 2017). Furthermore, Brazil's installed capacity in 2002 was 80.3 GW and in 2016 it reached 150.3 GW. It grew 87.2% in the period, an annual average of 5,8%, a variation similar to the one of the electricity consumption growth. By 2025, the installed capacity is expected to reach 195.1 GW (EPE, 2017)

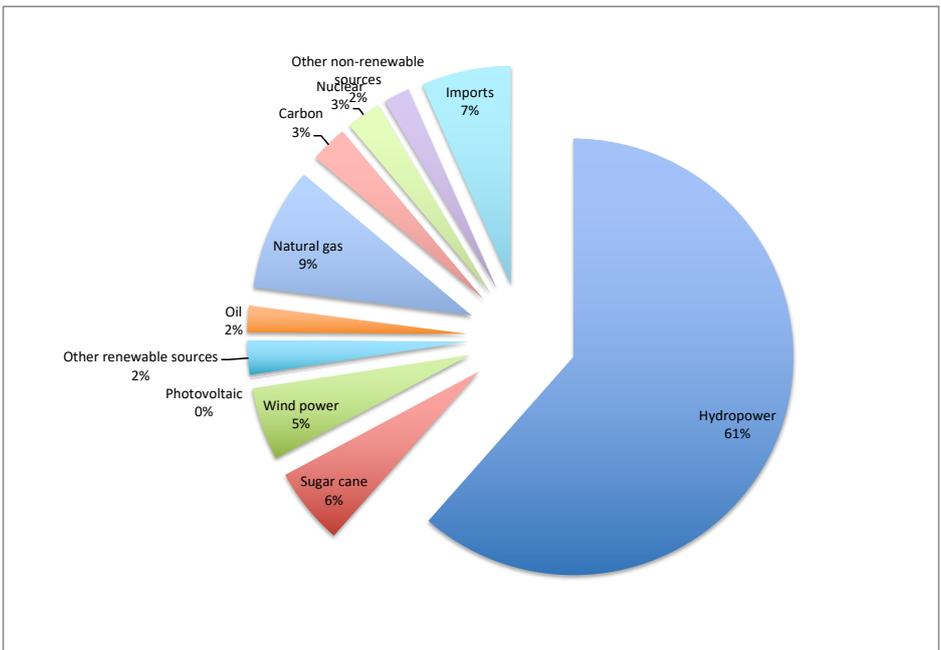


Figure 1: Electricity Mix, Brazil 2016

# READI NESS

## Summary of the key issues of assessment

The launch of the municipal mobility plan –PlanMob-BH- in 2010 and the State Initiative Conect-ME have contributed to the planning and implementation of a series of policies and measures aiming at promoting sustainable urban mobility in Belo Horizonte. In this context, 3 measures related to electric mobility have been / are being implemented in the city: 1) EVs in the Administrative City, a pilot project promoted by the State government, which provides EVs in the administrative area of the city. 2) Electric taxis, a project promoted by the Municipality of Belo Horizonte in partnership with the Chinese Car Producer BYD, which has the goal of encouraging taxi drivers to acquire EVs instead of fossil-fueled ones. An electric bus was tested in two public transport routes with the aim of including at least 25 e-buses to the conventional bus fleet until 2019.



# POLITICAL & INSTITUTIONAL & FINANCIAL READINESS

## Political, institutional and financial readiness

The first actions towards a transition to electric mobility in Belo Horizonte have been taken. There is interest from the State and Municipal Governments to promote sustainable mobility and EVs. However, the incentives to encourage taxi drivers to buy EVs and the resources for the Municipality of Belo Horizonte to acquire the electric buses for its public transport fleet have not yet been provided.



The national government is still working on the policies and the regulatory framework for the sector. Nevertheless, once the necessary policies are in place, electric mobility could expand in Brazil. In particular, in cities where there exist a high interest to integrate e-mobility solutions in their transport system, such as Belo Horizonte.



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