

Curitiba Ecoelétrico: moving towards intelligent electric urban mobility

Curitiba has been an international reference point for progressive urban planning and bus rapid transit (BRT) since the 1970s. Now, almost 50 years later, and confronted with climate change and a burgeoning urban mobility crisis, Curitiba is seeking to reaffirm its international reputation: the *Curitiba Ecoelétrico* project seeks to integrate fossil fuel alternatives and technological advancements into Curitiba's urban mobility strategy.

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Summary

Curitiba Ecoelétrico is a pioneering project in Brazil which can potentially inspire other Latin American cities with access to renewable energy sources to invest in electric mobility infrastructure. With the completion of the first phase of the project in 2015, Curitiba will have a municipal fleet of vehicles using low-carbon energy from the Itaipu hydroelectric plant. The municipality hopes that by demonstrating the benefits of their initiative they can promote its uptake elsewhere, thereby further reducing the greenhouse gases, pollutants and particulate matter emitted by motorized vehicles. This project, the first of its kind by any municipality in Brazil, will be integrated into Curitiba's existing transport infrastructure (which includes BRT, bike paths, and a soon-to-be operational subway system), and is motivated by Curitiba's desire to effectively manage traffic and avoid long journeys.

Why an electric mobility fleet?

Cities throughout Latin America are confronted by considerable challenges in the 21st century; in the face of climate change and increasing urbanization, urban infrastructure must be able to meet the needs of a growing population. To facilitate this, it is imperative to develop regionally applicable models of sustainable cities, along with land-use patterns which are compatible with the principles of sustainable mobility and low-carbon urban development.

A 2012 study of 15 metropolitan regions, conducted by Observatório das Metrôpoles, revealed that Curitiba, with a ratio of 49.8 cars per 100 inhabitants, was the most motorized among those observed. The Curitiba Ecoelétrico builds on the City's current mobility strategy. It looks to reduce GHG emissions related to transportation, while demonstrating the feasibility of transitioning away from fossil fuels and transitioning towards a low-carbon economy.



Facts & Figures

Population / Land area
3,395,400 / 435.036 km² (2014)

Municipal budget
\$ 3,060 million USD (2014)

GDP per capita
\$ 16,980 (2014)

Local economy
Services, Commerce, Industry



Curitiba has been a member of ICLEI since 1992, and is one of the eight Brazilian cities participating in the Urban-LEDS project.

Integrating electric mobility

The context in Curitiba: Urban Planning

The formal beginnings of urban planning in Curitiba occurred in 1943 with the creation of the ambitious Agache Plan. Heavily influenced by European and North American modernization, the Agache Plan proposed a radial urban growth pattern and identified areas suitable for housing, commerce and industry, road restructuring, and reorganization measures. Ultimately, the Agache Plan was too expensive to complete, as Curitiba had grown considerably since its inception. Thus, in 1964, by way of a national urban design competition, the City's Preliminary Plan for Urban Planning was developed, proposing a linear model of urban expansion with an emphasis on improving the quality of urban life.



Curitiba's renowned BRT system

The Institute for Research and Planning of Curitiba (IPPUC - Instituto de Pesquisa e Planejamento de Curitiba), formerly the Advisory of Urban Research and Planning of Curitiba, was created in 1965 to detail and monitor the winning plan proposed by Sociedade Serete and Jorge Wilhelm Architects. The incubation period for this plan was considerable: it was discussed at-length with the population in a series of public debates, and only in 1971, did the Plan's visions of sustainable transportation services evolve from theory to practice. When it did emerge, it aspired to three fundamental transformations in the city: physical, economic, and cultural.

The plan sought to integrate the demands of living, moving, working, and recreation into urban services to form an integrated tripod between mobility, the road system, and land-use. Serete's project focused on the two main roads in the city, as Curitiba is intersected by two large north-south and east-west structural roads. The IPPUC team perfected the idea with a tri-lane system: an exclusive central lane for public transport and two parallel lanes in each direction - one for fast-traffic and one for slow-traffic. This ternary system enabled the creation of the first BRT system in the country in 1974.

Beyond functioning as an exclusive corridor for buses, the mobility plan has integrated high capacity transport with land-use planning. This is a fundamental principle of Transit Oriented Development (TOD), which aligns dense, mixed-use urban developments with public transportation corridors.

In the Ecoelétrico project, IPPUC's role is to coordinate the planning and monitoring process, ensuring that issues and perspectives relating to mobility and land use are taken into account. The benefit of this is considerable, as it allows for the project to be effectively integrated into the existing transport infrastructure network. The municipality hopes that effective integration into a multi-faceted system will satisfy the travel requirements for the entire population.

Project Curitiba Ecoelétrico

The City of Curitiba, in partnership with Itaipu Binacional, Renault-Nissan do Brasil, and the Center for Excellence and Innovation in the Automobile Industry (CEIIA) of Portugal, launched the Curitiba Ecoelétrico project on 5 June 2014.

The project began to take shape following a visit of the Deputy Mayor of Curitiba, Mirian Gonçalves, to the Electric Mobility Department of Itaipu Binacional. This was followed by the signing of a lending agreement between the parties and new partners. This agreement provided a two-year contract for the sale of electric vehicles and stations to Curitiba City Hall, with potential for renewal following the contracts completion.

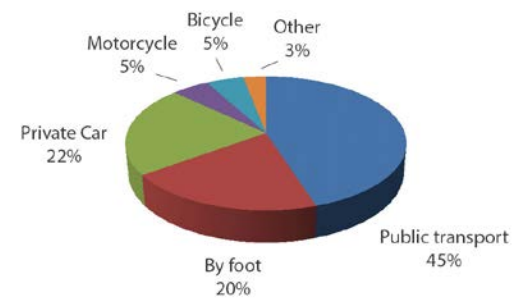
According to the Brazilian Association of Electric Vehicles (ABVE), there are about 1000 electric vehicles in use across the country roughly. Curitiba's initiative guarantees the use of electric cars and minibuses in the municipal fleet, and corresponds to the guidelines of the City's sustainable urban mobility program by fulfilling the initiative for modal transportation with low environmental impact. A key sustainable characteristic of the electrically powered vehicles is their zero emission of both noise and pollutants. In total, 13 electric vehicles were assigned to public service, making this the largest public administration pilot project in support of electric mobility in Brazil.

Mirian Gonçalves has been charged with coordinating the project, and vehicles have been allocated to the following municipal bodies: Municipal Guard, Municipal Transit Department (Setran), and Curitiba Tourism Institute. Studies are planned for the second phase of the project which will implement sharing solutions for rental cars and bikes, and will be focused on servicing the corporate and public interest markets.

The distance afforded by a full charge varies according to the type of vehicle. Thus far, four models have been tested: Zoe can travel up to 210 km; Kangoo ZE to 125 km; Twizy to 100 km, and minibus to 100 km. The electric station required for charging consists of a totem and a cable, and the cable is connected to the vehicle to be charged.

In May 2014, the ten electric stations (totems) were implemented, the operating system was calibrated, and the required testing phases were completed. Training sessions were held with all the potential vehicle operators, as well as others involved in the project.

The project has a strategic focus on 2020, which is when it hopes to accomplish the total integration of the city's mobility services into an intelligent network that will integrate the city's mobility services with smart systems, providing utility and mobility benefits for residents. This intelligent network will integrate the Master Plan for the City's Urban Mobility with the expansion of the BRT system, the bicycle network, and the subway.



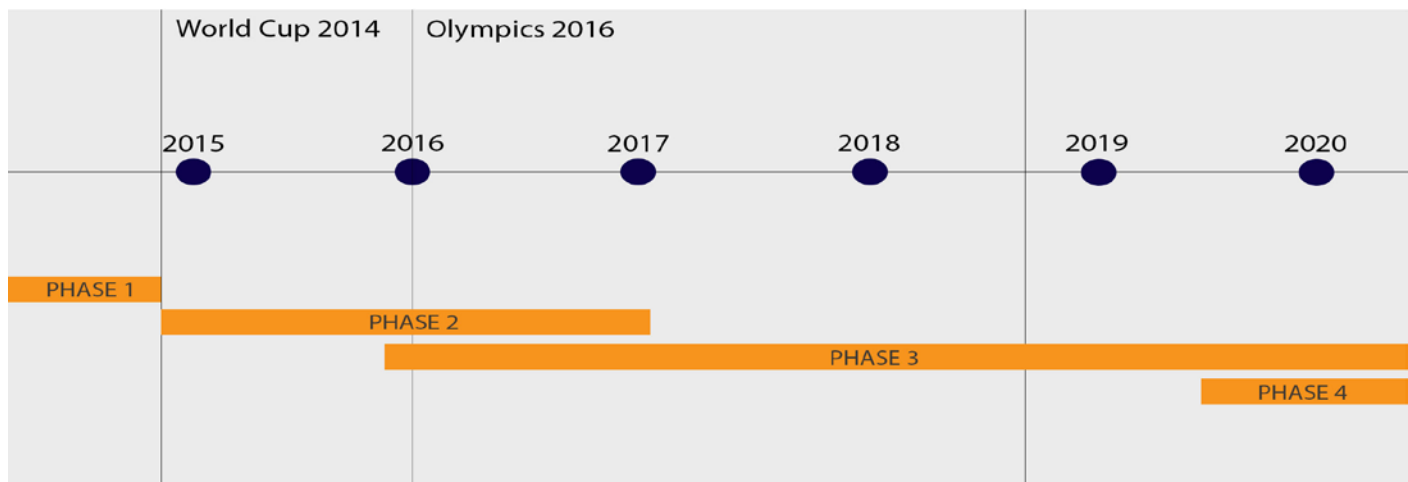
Modes of transportation in Curitiba (by %)



Vehicle from the Ecoelétrico program being charged

Curitiba once again at the forefront of sustainable mobility

<p>Phase 1 Electric mobility pilot project - World Cup 2014</p>	<p>Phase 2 Pilot project for the integration of corporate sharing solutions</p>
<p>The minibuses and zero-emission vehicles are being functionally exhibited in the mobility ecosystem of Curitiba, allocated to specific use of the town hall services: Municipal Guard, Municipal Institute of Tourism, and Municipal Transit Department. During this phase, the network of ten electric supply stations (totems) at eight municipally strategic sites was established.</p>	<p>Scalable sharing solutions (cars and bikes) will be implemented. These solutions will be directed at the corporate market and public interest services, such as Municipal Guard, Municipal Institute of Tourism, Municipal Transit Department, Post Office, taxis, shopping malls, and employees of companies that are integrated in the network. This pilot network of electric mobility will be in the smart mobility management platform, and thus based on the reality of Curitiba.</p>
<p>Phase 3 New mobility services in Curitiba's transport network</p>	<p>Phase 4 Mobility as utility: Curitiba 2020</p>
<p>Next generation mobility services directed to the corporate market and services of public interest will be developed and customized to specific user needs. End-user driven solutions will be developed according to market evolution and the adjustment of the legal and fiscal framework. In parallel, and according to the advancement of the Smart Mobility Network (Rede de Mobilidade Inteligente) other mobility operators and transport of Curitiba will be progressively integrated into the service infrastructure.</p>	<p>Mobility services will be integrated into an intelligent city network. This will allow the generation of single invoice for mobility (similar to those produced for the consumption of electricity and water). This will result in savings to the user, who can adapt it according to their individual profile.</p>



Results to date

Following the launch on June 5th, 2014, the ten electric vehicles in use traveled 16.2 thousand kilometers during the first 84 days of operation. This distance traveled by electric vehicles represented 2,000.00 kgCO₂ emissions prevented, in addition to the environmental quality benefits provided by reduced noise generation and emission of air pollutants from the burning of fossil fuels. Considering the current fleet, it is estimated that by the end of 2014, nine tons of CO₂ will be avoided. In this period, there was an 83 percent savings in regard to fuel cost: the city saved R\$ 4,600.00 on fuel (by not using gasoline) by spending only R\$ 812 for electricity costs. According to City Hall data, if this were to be extrapolated for a municipal fleet consisting of 10 perfect electric vehicles, then over the same 84 day period, the economic savings would have been R\$ 182,477, while 96 tons of CO₂ emissions would have been avoided.

Costs and funding

The electric vehicles required for the project were provided by a partnership between the municipality and Renault-Nissan do Brazil. This partnership provides vehicles and electric stations over a two-year lease agreement.

The municipality has borne the costs of installation of the electric stations within its "civil works and electrical installations" budget, so no extra costs were generated by the project. All services have been provided by internal teams, and the material has been reclaimed and reused from existing supplies found in various municipal departments. The maintenance of the power stations will be conducted by the partners until the end of the lending, while the cost for the electricity consumed is being covered by the municipality.

Lessons learned, potential scale economies and replicability

A demonstration-period is important when introducing a new initiative. One of the project's objectives has been to demystify the use of electric vehicles in urban areas, particularly with respect to the range and reliability of the vehicle. The cost of electric vehicles is a barrier to access for the majority of the community; however, by adopting this mode of transportation, the city demonstrates its commitment to sustainability.

In an ambitious and long-term project, it is helpful to breakdown its implementation into phases. By implementing the project in phases, objectives and results become tangible and those involved are constantly stimulated by the success. It also allows for maintaining some flexibility to review strategies according to partial results, avoiding costly mistakes in larger scale phases.

Partnerships are key. Considering the high cost for the purchase of major equipment, vehicles and electric stations, the project would have been impossible without private partners. The identification of win-win opportunities provides incentives for innovation.

The Urban-LEDS Project

An Urban Low Emissions Development Strategy (Urban LEDES), or Low Emissions Urban Development Strategy, defines a pathway to transition a city to a low emission, green and inclusive urban economy, through its integration into city development plans and processes.

Curitiba is one of the eight Brazilian cities selected to participate in the Urban-LEDS project, which also includes Rio de Janeiro, Belo Horizonte, Recife and Fortaleza.

The Urban-LEDS project (March 2012 - March 2016), funded by the European Union, was jointly implemented by UN-Habitat and ICLEI. It supported local governments in emerging economy countries (Brazil, India, Indonesia, South Africa) and in Europe to transition to urban low emission development using ICLEI's GreenClimateCities methodology, comprehensive process guidance, to integrate low emission strategies into all sectors of urban planning and development.

For more information, please visit: <http://urbanleds.iclei.org/>

Photo: Harada / News Agency Gazeta do Povo



Zero emission electric cars were provided through a partnership between Curitiba and Renault-Nissan do Brazil

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Given the need for coordination of multiple stakeholders, engagement and political leadership were crucial. A project such as this requires coordination among a multitude of bodies, and is not subject to the usual municipal protocol. To avoid the delays and barriers that might occur when introducing new elements into an established framework, the leadership of the deputy mayor's office was essential.

Cities interested in replicating this should not overlook long-term construction requirements. Accordingly, an interested city must maintain an integrated view of various actions that influence this type of project. It is necessary to promote awareness and conduct information campaigns, as well as offer incentives for private investment, and be committed to the provision of adequate infrastructure.

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It represents solely the views of the authors and cannot in any circumstances be regarded as the official position of the European Union.

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