



Project_Scoping
URBAN PATHWAYS
2018

COLOMBIA



IBAGUÉ

Electric Bike Sharing



Wuppertal
Institut

UN HABITAT
FOR A BETTER URBAN FUTURE

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URBAN PATHWAYS

PROJECT CONCEPT

The Urban Pathways project helps delivering on the Paris Agreement and the NDCs in the context of the New Urban Agenda and the Sustainable Development Goals. It has established a facility in close cooperation with other organisations and networks active in this area to support national and local governments to develop action plans and concrete implementation measures to boost low-carbon urban development. This builds on UN-Habitat's role as "a focal point on sustainable urbanisation and human settlements including in the implementation and follow-up and review of the New Urban Agenda". The project develops national action plans and local implementation concepts in key emerging economies with a high mitigation potential. The local implementation concepts are being developed into bankable projects, focusing on the access to urban basic services to create a direct link between climate change mitigation and sustainable development goals.

The project follows a structured approach to boost Low Carbon Plans for urban mobility, energy and waste management services that deliver on the Paris Agreement and the New Urban Agenda. The project works on concrete steps towards a maximum impact with regards to the contribution of urban basic services (mobility, energy and waste management) in cities to global climate change mitigation efforts and sustainable and inclusive urban development. This project makes an active contribution to achieve global climate change targets to a 1.5°C stabilisation pathway by unlocking the global emission reduction potential of urban energy, transport and resource sectors. The project will contribute to a direct emission reduction in the pilot and outreach countries, which will trigger a longer term emission reduction with the aim to replicate this regionally and globally to make a substantial contribution to the overall emission reduction potential.



PROJECT AIMS

This project implements integrated urban services solutions as proposed in the New Urban Agenda providing access to jobs and public services in urban areas, contributing to equality and social coherence and deliver on the Paris Agreement and the Sustainable Development Goals. This is the first dedicated implementation action oriented project, led by UN-Habitat to deliver on inclusive, low-carbon urban services. Securing sustainability and multiplier effect, the project aims to leverage domestic and international funding for the implementation projects that will follow from this initiative.

SCOPING STUDY SUMMARY

IBAGUÉ

City: Ibagué
Population: 542,939 (2013)
GDP per capita: US\$ 5,868 (2012) Proxy Estimate for Tolima Department
CO2 emissions (total and per capita):
Total: 368 Gg CO2e/ year (Fuel Sale Method used)
Per Capita: 718 kg CO2e/ person / year.

COUNTRY OVERVIEW

Ibagué city is the capital of Tolima (one of the 32 departments that constitute the Republic of Colombia) and has a surface area of 1,439 km². The city is the 7th most populous city in Colombia (Procolombia, 2018).

Urban transport and mobility have over the years become an essential concern for city authorities and planners whose challenges have grown, especially towards improving sustainable transportation systems. With the advancement of electric mobility in transport, electric bicycles have also seen significant increase in usage many cities globally. A fact-finding mission by the Dutch Cycling Embassy on cycling in Colombia reported that there is a steady growth in biking in major Colombian cities with the popularity of e-bikes also increasing over time (Berenschot and Urbanos, 2015).

Efforts to expand cycling activities and promote the use of bicycles as an alternative transport mode in cities can potentially contribute to reducing the impacts of fossil-fuel dependent public transportation not only in Colombian cities, but also in urban areas around the world. This paper proceeds to review the potentials that exist in promoting e-bikes sharing systems in the Colombian city of Ibagué.





Electric Bike Sharing

E-BIKE SHARING

in Ibagué

As an alternative public transport mode, bike-sharing according to Qiu and He (2018), has in recent times seen rapid growth in most cities of the world. Electric Bike sharing systems allow users to rent a bike at a self-service station and return the bike at any other station near the destination. The systems facilitate quick and convenient movement of users usually on short distances. Stratta, Panozzo, et al. (2017) noted that the implementation of a successful bike-sharing system is dependent on a strategic policy and regulatory framework through a well-planned, coordinated process that involves all necessary stakeholders.

Bike sharing, especially e-bike sharing is rapidly becoming a sustainable transport option with potential benefits of reducing traffic congestion, minimizing energy consumption and consequently reducing environmental pollution and improving the health of city dwellers (Qiu and He, 2018). Another benefit of bike sharing systems is that they are less expensive and quick to roll out (City of Wilmington, 2016).

According to Cherry, Worley, et al. (2010), an e-bike sharing system characteristically comprises of electric bicycles, vending and charging station, and support systems.

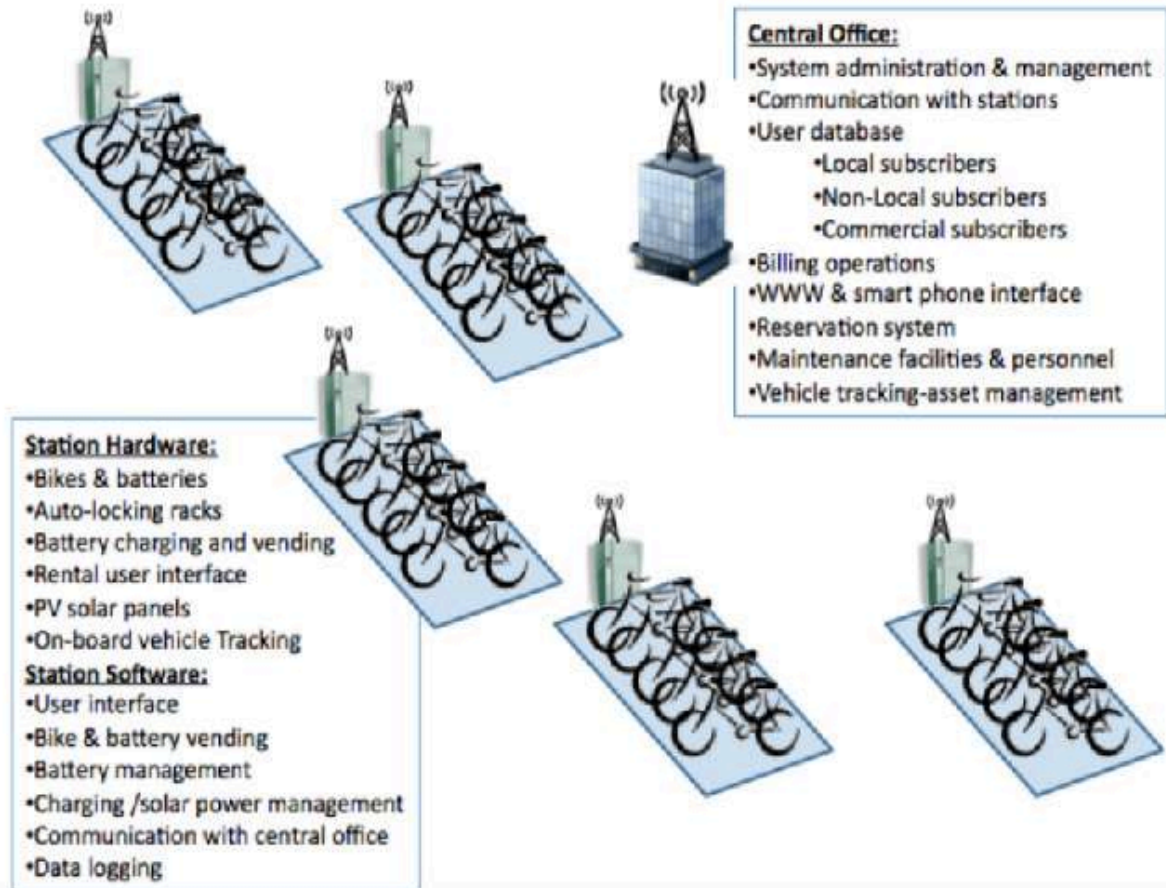
Cherry, Worley, et al. (2010) also noted that apart from battery charging management which is peculiar to e-bike sharing systems, other conventional bike-sharing systems have common operational features as those of e-bike sharing. Installing and maintaining charging infrastructure is therefore an important aspect when considering e-bike sharing projects.

Some key elements in the implementation of a bike-sharing system include equipment, installation, maintenance and operation; where equipment comprises of bicycles, kiosks, docking pads and card readers; installation consists of a Radio Frequency Identification (RFID) system, card-wipe systems. Operation costs is made up of repair, redistribution and customer services (Heda, 2012).



E-bike sharing is quick to roll-out

IBAGUÉ - COLOMBIA



POLICY PROCESS

A report by C40 in 2017 indicated that there has been an increase in stakeholder engagements in cycling initiatives in the city of Ibagué; such as critical mass riding events which are periodically organized to promote biking. These engagements have also manifested in the attention given to the development of non-motorised transport options such as bike-sharing in other Colombian cities, like Bogota and Medellin. (Cities Finance Facility, 2017).

In an attempt to promote urban mobility, the Colombian Ministry of Transport in 2016, initiated a pilot project to encourage bike-sharing in 23 cities in the country, among which was the city of Ibagué (World Resources Institute, 2017). The pilot project was intended to deliver bikes to the cities and offer technical assistance in the construction and monitoring of the bike-sharing systems. As a way of ensuring ownership, city administrations were expected to bear the operation and maintenance costs of the system (Colombia Ministry of Transport, 2016). Again, Berenschot and Urbanos (2015) reported that e-bikes are increasingly becoming popular in some Colombian cities, and that city dwellers are showing interest in cycling for recreational purposes as well as transporting people, goods and services. Evidently, the political support for the implementation of electric bike-sharing systems in Colombian cities is shown in the formulation and adoption of government policy actions and strategies which are further discussed in the section below.





The Colombian government's resolve to promote sustainable transport initiatives is enshrined in the country's National Development Plan (2014 – 2018) which clearly identifies non-motorised transport (such as bicycles and tricycles) as key to the improvement of transport systems in cities. The plan makes provision for the integration of non-motorised modes into the overall transportation systems in urban areas and at the national level. Also, the plan supports the development and use of electricity as alternative fuel source for vehicles (Republic of Colombia, 2015b).

The support of the national government for the development of sustainable transport modes is also explicitly stated in measures such as; the establishment of tax and tariff systems by city authorities to minimize vehicular congestion and pollution. Funds accrued through the tax systems are expected to be channeled into financing road infrastructure and public transport projects that have environmental mitigation benefits. The plan aims to "implement clean technologies (hybrid vehicles run on gas or electricity) in public and private transportation vehicles and incorporate variables related to climate change within the structuring of projects" (Republic of Colombia, 2015b). Moreover, the plan encourages co-financing through public-private partnership as a means to deliver urban public transport services and projects (Republic of Colombia, 2015b).

The existence of the Colombian National Urban Transport Policy is favorable for the deployment of e-bike sharing systems in the city of Ibagué. This policy was formulated to guide the development of urban transport in the country; promote the construction of bicycle infrastructure including well-connected bike lanes and bicycle parking areas in transport stations; encourage the implementation of public bike systems; and ensure the regulation and formalization of bike-taxi (Colombia Ministry of Transport, 2013).

Additionally, there exist other national policies and guidelines which encourage electric biking in Colombian cities.

These include the following:

- Policy guideline titled "Guide for Cycle-Infrastructure for Colombian Cities" issued by Ministry of Transport in 2016 to guide policy makers and implementers in the design and execution of bicycle infrastructure projects in Colombian cities. The guideline was prepared through in-depth research and comprehensive consultation with bicycle users, civil society, experts and public stakeholder institutions and authorities in Colombia (World Bank, 2016).
- Colombia's INDCs communicated to the UNFCCC in 2015, identified the transport sector as one of its six priority sectors which are expected to integrate climate change mitigation and adaptation innovation in planning and implementation (Republic of Colombia, 2015a).
- The Colombian Ministry of Transport in its Sectorial Mitigation Action Plan (2014) for the transport sector, outlined several actions and programs to help promote sustainable transport. Notable among these are; the imposition of congestion and pollution charges in cities with population of more than 300,000; the promotion of quality vehicle fuel; and replacement of public and private transport fleets with electric technology (Colombia Ministry of Transport, 2013)

POTENTIAL CO₂ REDUCTION

The implementation of bike-sharing systems in Colombian cities among other sustainable transport projects initiated by the Colombian government, is expected to contribute to the country's efforts to reduce greenhouse gas emissions by 20% compared to the business-as-usual scenario by 2030 (Cities Finance Facility, 2017). Also, in the Transport Sector Mitigation Action Plan (2014) the Ministry of Transport has projected that the implementation of public bicycle systems, especially in large cities in Colombia, as well as the increased use in private bikes would contribute to a reduction of 13MtCO₂ emissions by 2040 (Colombia Ministry of Transport, 2013).

A Low-Carbon Development Strategy developed for Colombia in 2014 to assess Colombia's climate change and mitigation actions, estimates that investments into the expansion of non-motorised transport infrastructure in Colombian cities would reduce car use and congestion, increase bicycle trips and consequently lessen fossil fuel consumption thereby minimizing greenhouse gas emissions (Johnson and Fernandes, 2014). From the foregoing, it can be said that the execution of e-bike sharing systems as a more sustainable public transport option in Colombian cities including Ibagué would boost efforts in reducing adverse environmental impacts on city dwellers.

IMPLEMENTATION PARTNERSHIPS

Counterpart at the city level

- The Municipality of Ibagué
- The Colombia Ministry of Transport
- The Colombian Ministry of Mines and Energy

Potential finance partners

- National and Local Government Subsidies
- International institutions with low carbon focus such as C40's Cities Finance Facility (CFF)
- Multilateral Funds
- Bilateral Agreements
- Private Capital Markets
- International Carbon markets



FINANCIAL REQUIREMENTS

Pilot project level (10.000 – 100.000 EUR)

The major cost components in executing a bike sharing system according to Heda (2012) include the cost of equipment, installation and maintenance. The author estimated that the implementation of a typical bike sharing system costs about 30,000 EUR per station (20,000 EUR for equipment including 6 bikes and installation; 10,000 EUR for annual maintenance). With these cost elements in mind and considering that a pilot deployment of e-bike sharing system in the city of Ibagué will involve the procurement of e-bikes which are usually more expensive than the regular bicycle, the project can start with:

- The procurement of equipment including 20 e-bikes and installation of solar-powered charging infrastructure at 3 transport stations,
- Establishment of user information systems, and
- Technical capacity building for key stakeholders and operators of charging infrastructure.

Implementation project (3 – 300 million EUR)

The expansion of the system after a successful piloting phase can potentially include the following:

- Procurement of more e-bikes and setting up of more stations,
- Extension of solar-powered charging infrastructure for city-wide coverage, and
- Upgrading of user information systems to support the expanded city coverage.



Technical barriers to the project

The deployment of e-bike sharing systems in the city of Ibagué can be hampered by some challenges. Some of these impediments are highlighted by Berenschot and Urbanos (2015) who presented an overview of biking situation in Colombia; these include the following:

- Inadequate bicycle parking facilities including public charging infrastructure for e-bikes,
- Multiple institutions and organisations involved in promoting cycling activities in Colombian cities; as such the level of coordination and collaboration is usually low, and
- Inadequate expertise in the management and operation of e-bike sharing systems especially at the city level.

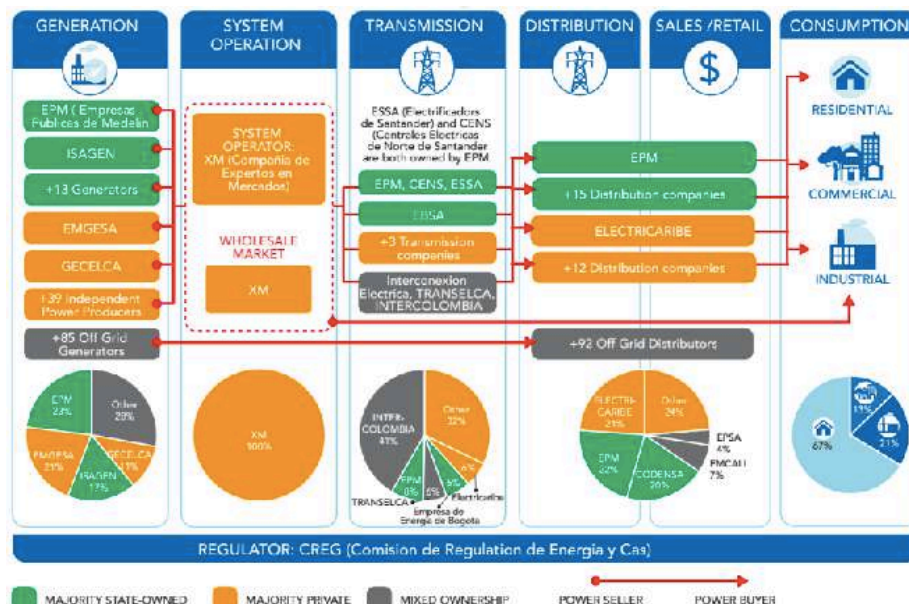
Electricity mix and reliability of the grid

According to Martinez-Villegas (2018), the electricity mix in Colombia is composed of 66% hydro sources, 28% thermal and 6% self-generating plants. It is estimated that electricity generated from hydro sources during years of heavy rains constitutes about 80% of total generation; whilst a reverse situation occurs in drought years where 55% of total generation comes from thermal sources. In order to ensure stability in its electricity generation, the government of Colombia, through its Ministry of Mines and Energy, plans to increase the share of non-conventional renewable sources in its electricity mix (such as wind and solar) to 6.5% by 2020; and in the long- term achieve equal generation between hydro, thermal and non-conventional renewable sources (Roy, 2017, Martinez-Villegas, 2018).

The electricity sector in Colombia is unbundled into generation, transmission, distribution and commercialisation. The country's energy sector is regulated by national laws: - Public Services Law (142) and Electricity Law (143) which were promulgated in 1994. The Energy and Gas Regulatory Commission (CREG) is the national institution mandated to regulate activities within the sector (Colombia Ministry of Mines and Energy, 2018). The figure below illustrates the structure and key players in the electricity sector of Colombia.

As at 2016, electricity coverage in Colombia's urban population is estimated to be 100% whilst 95.7% of the rural population had access to electricity (World Bank, 2018). Despite this wide coverage, Roy (2017) indicated that cities continue to experience frequent power outages, though the period of interruptions has been improving over time due to major government interventions such as: the introduction of reliability charges which encourage electricity generators to produce during times of resource scarcity (for example in drought seasons). Again, the Colombian government has also shown interest in developing smart grids to improve the electricity sector. Its 2030 smart grid vision, among other objectives, aims at establishing advanced metering infrastructure, modernising its automated distribution, and developing well-distributed energy systems for electric vehicles (Roy, 2017).

Source: (Roy, 2017)



STEPS TOWARDS IMPLEMENTATION

FEASIBILITY OF THE IMPLEMENTATION

Colombia's commitment to developing sustainable transportation as indicated in its INDCs to UNFCCC sets a positive tone for the implementation of e-bike sharing systems which are considered as environmentally sound transport innovative with benefits for enhancing mobility in urban areas. Establishing e-bikes sharing systems in Ibagué is therefore a feasible innovation as it fits into government's agenda on promoting climate change mitigation and adaptation measures (Republic of Colombia, 2015a). Since there already exists some level of engagements on biking activities as well as government-initiated projects to promote bike-sharing in the city of Ibagué as mentioned earlier in this paper, taking-off with e-bike sharing will only possibly involve the acquisition of e-bikes stock, installation of charging infrastructure at strategic locations in transport stations, and developing user information for riders. Mobilisation of the necessary resources and engagements with key stakeholders can be done throughout 2019 whilst actual implementation involving the aforementioned actions can start by 2020.



PROJECT SCOPING IBAGUÉ

CONCLUSION

- The availability of specific policy guidelines on the development of bicycle infrastructure such as the “Guide for Cycle-Infrastructure for Colombian Cities” issued by the Colombian Department of National Planning (Departamento Nacional de Planeación – DNP) and the Ministry of Transport, can guide potential investors and policy decision-makers and implementers in establishing the required and appropriate e-bike sharing systems in Ibagué.
- The desire to promote bicycle infrastructure development is also evident in Ibagué Municipality’s 2016-2019 Development Plan which acknowledges the need to develop bicycle infrastructure and promote biking as part of efforts to improve transport mobility and reduce the environmental effects of vehicular emissions (Ibagué Municipality, 2016).
- The deployment of e-bike sharing in the city of Ibagué must consider the establishment of the requisite facilities such as parking stations, public charging infrastructure and user information systems.
- The presence of e-bike selling companies in Colombia can facilitate the acquisition of e-bike stocks for the deployment of e-bike sharing system in the city of Ibagué.

- The Colombian government’s determination to promote renewable energy sources can be contributory to the development of solar powered installations to feed the charging facilities for e-bikes sharing projects. Also, the wide electricity coverage in Colombian cities and the vision for smart grid development present an opportunity for the expansion of charging infrastructure systems for e-bikes in Ibagué.
- The multiplicity of stakeholder institutions already involved in advancing bike riding activities may pose a challenge to the implementation of the e-bike sharing initiatives; hence efforts must be made to harmonise institutional engagements and possibly establish an institutional structure to run e-bike sharing systems.
- The existence of local financial institutions and international donors as well as organisations interested in promoting sustainable transport solutions, constitutes an opportunity for securing the necessary funding and investments to implement e-bike sharing projects in the city of Ibagué.
- The Colombian government’s commitment to reducing the negative impact of the country’s transport sector on the environment as indicated in the NDCs communicated to UNFCCC represents a major favorable policy direction for the development of environmentally sustainable transport means such as e-bikes. The deployment of e-bike sharing systems will therefore conform to the country’s drive to mitigate and adapt to the effects of greenhouse gas emissions and climate change; and ultimately improve the lives of the Colombian population especially the urban populace.



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