

C40
CITIES
CLIMATE LEADERSHIP GROUP

BENEFITS OF URBAN CLIMATE ACTION

C40 Cities Technical Assistance Report



QUITO

CLIMATE, AIR QUALITY AND HEALTH

C40 and Johnson & Johnson are working in partnership to connect the dots between climate action, improved air quality in cities and better health amongst citizens.

C40 has undertaken cutting-edge research, working with 26 cities to date to measure the air quality and health benefits of climate action, and use this to make a stronger case for action.

The time for urgent climate action

Cities are responsible for about 70% of global CO₂ emissions and play a leading role in limiting temperature increase to 1.5°C, in line with the Paris Agreement. Simultaneously, cities need to take adaptation measures to protect themselves against current and future extreme weather events,

such as extreme cold and hot weather, floods and droughts. Finally, cities need to attend local issues of air pollution, including pollutants and toxic compounds.

In order to tackle both air quality and climate change, cities need clean and efficient transport, buildings and industry solutions.

QUITO

Quito is the capital of Ecuador. With an elevation of 2,850 meters above sea level, it is not only one of the highest capital cities in the world but also the closest to the equator. The city extends for 4,240 km² and has a population of almost 2.2 million people.

Quito's transport sector corresponds to 52% of the total Scope 2 greenhouse gas (GHG) emissions in the city¹.

52% OF THE CITY'S GHG EMISSIONS COME FROM THE TRANSPORT SECTOR

THE NEED TO TACKLE AIR QUALITY

Air quality in the Metropolitan District of Quito has remained under acceptable conditions. Improvements following the implementation of policies have been monitored in recent years. However, the reduction of fine Particle Matter (PM) emissions has not been sufficient, as it exceeds the annual national standard on a recurrent basis. The city's geographical location and natural sources (i.e volcanic activity) also aggravate the situation. According to the World Health Organization (WHO), the annual average PM_{2.5} concentration should not exceed 10 µg/m³. In Quito, the annual mean average is around 15 µg/m³, showing that people in the city are exposed to harmful levels of air pollution.

Citizens are asking for bolder and bigger actions to reduce the level of contaminants. The government is committed to reducing air pollution, to guarantee a healthier city and better living standards.

PM_{2.5} CONCENTRATION IS 1.5 TIMES GREATER THAN THE WHO RECOMMENDED VALUE

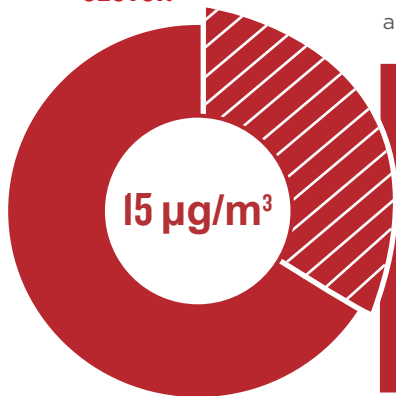
THE HEALTH BURDEN

Pollutants such as PM_{2.5} and NO₂ represent a major risk to people's health, particularly affecting children and older people. Often used as an indicator of air pollution, PM_{2.5} can penetrate deep into lungs and is linked to respiratory and cardiovascular morbidity and mortality, even at low concentrations.

In Quito, about 380 premature deaths every year are attributable to the current PM_{2.5} levels.

380 PREMATURE DEATHS EACH YEAR IN QUITO ARE DUE TO PM_{2.5} LEVELS

MOST OF THE PM_{2.5} CONCENTRATION COMES FROM THE ROAD TRANSPORT SECTOR



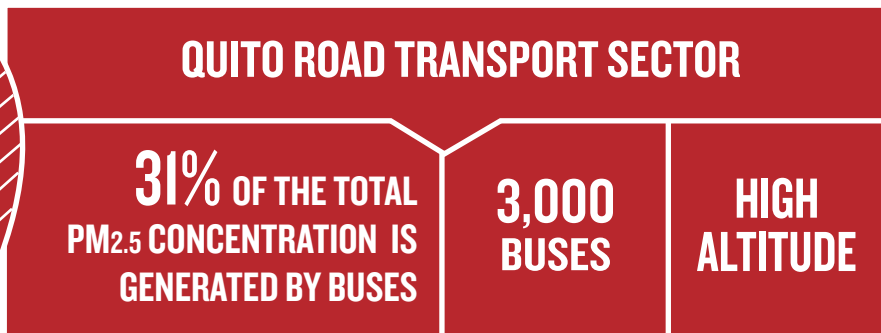
Understanding the problem

The road transport sector in Quito is responsible for most of the total PM_{2.5} concentrations in the city. Overall, 31% of the total PM_{2.5} contribution is generated by buses.

Currently, the city has a bus fleet of about 3,000 buses, most of which are privately owned. The majority of these buses operate on low-quality fossil fuels, contributing significantly to poor air quality in the hyper-centre of the

urban area in the city.

At high altitude, local air pressure and oxygen levels are lower than at sea level. This has an impact on engine performance, which reduces efficiency and worsens pollutant emissions. Therefore, due to Quito's high altitude, pollution from road transport is exacerbated, which makes it a key sector to improve the city's air quality.



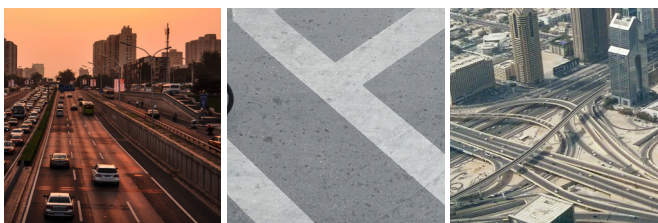
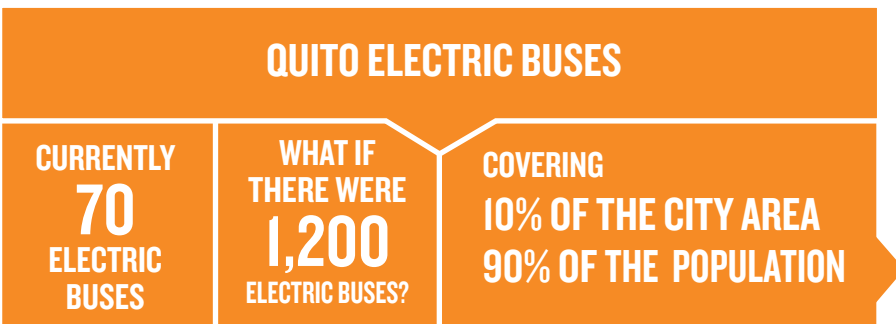
The action

Quito has a long-term strategy to achieve mobility, air quality and emissions reduction among other goals. The current action responds to objectives and targets set out in the city's Development and Land Use Plan (PMDOT 2015-2025) and in the Environmental District Plan, which includes the Climate Action Plan and the Natural Resources Plan.

Specifically, Quito is in the process of procuring a total of 70 electric buses

to replace their current old and poorly performing Euro II (94% of the total circulating fleet) and Euro III (6%) buses. Results presented in this analysis provide an overview of the potential impacts associated with a bolder and more ambitious action of replacing 1,200 buses.

The action will be implemented in Quito's urban area, which accounts for about 10% of the city and almost 90% of the total population.



The benefits

With support from C40, the city analysed the social and economic impacts of upgrading Quito’s circulating fleet with electric buses. The results showed that this would have a massive improvement on air quality, which would in turn improve the population’s health and produce considerable economic benefits.

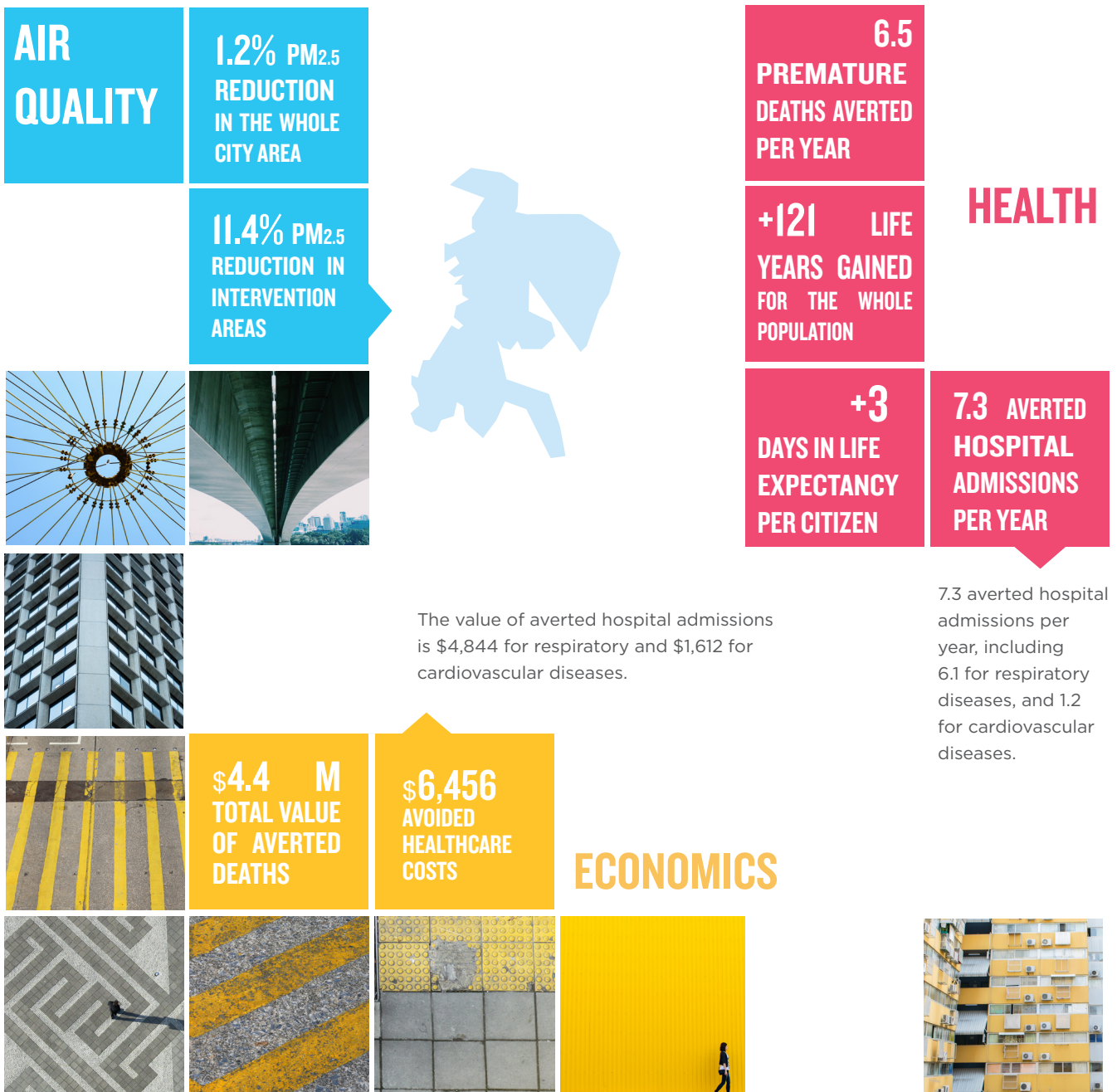
Air quality, expressed here in terms

of PM_{2.5} concentration, is expected to improve both in the intervention area and in the whole city area.

The air quality improvement leads to a reduction in the health burden of cardiovascular- and respiratory-related diseases and deaths. Hospital admissions are used as an indicator for morbidity (diseases), while the change in premature deaths, life expectancy

and life years gained are used to quantify mortality impacts.

The economic impact represents the monetary value of averting a hospital admission and of gaining an extra year of life.



DRIVING ACTION

FINANCE CLIMATE ACTION

The key barrier to scaling up the action is the lack of funding available for upgrading the entire municipal fleet from Euro II and Euro III buses to electric. The city is already going through a procurement process for switching an additional 50 trolleybuses and 20 articulate buses to electric. New infrastructure will also need to be provided.

Quito is also participating in the C40 Cities Finance Facility for bankable project preparation to boost the upgrading of municipal buses to electric technologies.

MAKE THE CASE FOR POLITICS

The current political transition period, with elections to take place in 2019, might pose challenges to the project implementation.

In order to overcome these challenges, the city will discuss the results of the air quality and health benefits analysis with the Secretariat of Mobility, Public Transport Company, Air Quality Monitoring Department and Secretariat of Health. In addition, meetings will be organized to communicate the results within the city.

NEXT STEPS

The Municipality is engaging with the city's sixty public transport companies and guaranteeing that, every year, each company replaces at least one diesel bus with one that's zero-emission between 2020 and 2025. Then, from 2025 onwards, the rate will increase to at least three diesel buses being replaced to ensure that Quito's entire fleet is zero-emission by 2040.

Similarly, the city will look at switching from fossil fueled taxis to electric. Zero-emissions vehicles and the installation of charging infrastructure will be promoted.

The estimated benefits will be presented to the city's decision makers to make the case for bolder actions.

Results from the analysis will also inform the update of the city's Climate Action Plan in 2020.

METHOD AND ASSUMPTIONS

Methodology available [here](#).

Key assumptions:

- Background concentration derived from WHO database.
- Proxy data from Cuenca in Ecuador used for VOLY.
- Proxy data from Salvador used for VHA and converted from Brazilian Real using the relevant PPP exchange rate.
- Burden of air pollution on mortality was calculated by using the relative risk from published studies relating air pollution concentrations to health outcomes. This was applied to the difference between city-wide annual average $PM_{2.5}$ concentration and the GBD's theoretical minimum exposure ($5.8 \mu g/m^3$), and to the mortality rate in the local population. This is assuming impacts only in adults (ages 30+).

The analysis has been carried out following the methodology outlined in

the BUCA Guidance Manual.

Next steps for the analysis:

Future data collection activities based on the data gaps in the analysis include:

- Improving data for background concentration
- Collecting data for NO_x and NO_2
- Collecting data for local VHA.

Notes

¹ C40 Cities, Global Protocol for Community-scale GHG Emission Inventories (GPC).

Cover page picture : Xenika, i-stock