C40 CITIES
CLIMATE LEADERSHIP GROUP

BENEFITS OF URBAN CLIMATE ACTION

C40 Cities Technical Assistance Report

MEXICO CITY

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 CO_2 emissions and play a leading role in limiting global increases in temperature 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.

MEXICO CITY

Mexico City is the capital and biggest city of Mexico. Extending for 1,495 km^2, it has a population of almost 9 million people. The metropolitan area of Greater Mexico City is the largest of the Western Hemisphere, with a population of approximately 21 million.

Mexico City's industry sector corresponds to 8% of the total Scope 1 and 2 greenhouse gas (GHG) emissions in the city[1]. Although road transport accounts for a greater portion of the city's emissions, industry has also been identified as a key issue for both climate and air quality.

8% OF THE CITY'S GHG EMISSIONS COME FROM THE INDUSTRY SECTOR

THE NEED TO TACKLE AIR QUALITY

Mexico City, once known as one of the most polluted cities in the world, has been considerably improving its air quality over the last two decades. Particulate Matter (PM) and ozone levels, however, remain high. In recent years, alerts have been raised due to extreme levels of air pollution, urging new measures to control pollutant emissions.

According to the World Health Organization (WHO), the annual average concentration of $PM_{2.5}$ should not exceed 10 $\mu g/m^3$. In Mexico City, the annual mean average is around 23 $\mu g/m^3$, showing that people in the city are exposed to very harmful levels of air pollution.

$PM_{2.5}$ CONCENTRATION IS 2.3 TIMES ABOVE THE WHO RECOMMENDED VALUE

THE HEALTH BURDEN

Pollutants such as $PM_{2.5}$ and NO_2 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. Long-term exposure to NO_2 also causes inflammation of the airways and respiratory diseases.

In Mexico City, about 6,700 premature deaths every year are attributable to the current $PM_{2.5}$ levels.

6,700 PREMATURE DEATHS EACH YEAR IN MEXICO CITY ARE DUE TO $PM_{2.5}$ LEVELS

Understanding the problem

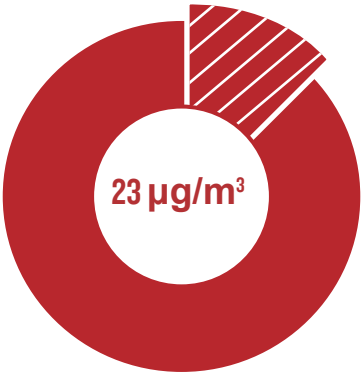
The manufacturing industry is one of the biggest sectors in Mexico City's economy, but it is also an important source of pollutants such as particles, Volatile Organic Compounds (VOC) and toxics. The industry sector in Mexico City is responsible for 13% of the total $PM_{2.5}$ concentration and 4% of the NOx concentration in the city.

Mexico City sits in a high mountain valley that traps pollutants and prevents them from dispersing. This worsens the concentration of pollutants in the area.

Although Mexico City's air quality has improved over the last 25 years, the intensive use of fossil fuels and goods of the City generates emissions and pollutants that significantly affect the composition of the atmosphere.

The combination of highly polluting activities such as industry and transport, geography, and an ever-growing population has created a serious air quality issue in the city.

13% OF PM2.5 CONCENTRATION COMES FROM THE INDUSTRY SECTOR



MEXICO CITY INDUSTRY SECTOR

- **700** INDUSTRIES REGULATED BY THE LOCAL GOVERNMENT
- **1,043 t** PM2.5 EMISSIONS PER YEAR
- **VALLEY** TRAPPING POLLUTANTS
- **GROWING** POPULATION

The action

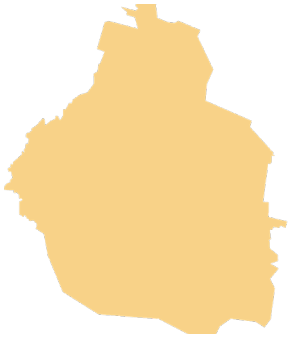
Mexico City has launched a voluntary environmental compliance programme within the industrial sector. This is aimed at improving the efficiency of productive processes and introducing more environmentally sustainable technologies. It also seeks to reduce water, waste and energy consumption along with carbon and pollutant emissions.

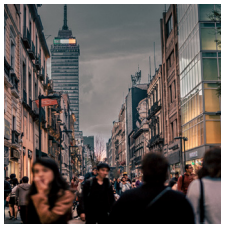
The voluntary compliance process assesses the current environmental performance of an industry. This provides opportunities to identify areas for improvement, recommend good environmental measures, and install control emissions technologies as well as setting viable targets to comply with legal requirements. Industries that participate in the programme are also offered fiscal incentives.

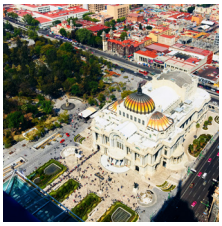
Currently, 27 industries are participating in this programme. This has been estimated to produce a city wide 1% reduction in $PM_{2.5}$ concentrations and 0.02% reduction in NOx concentrations.

THE ENVIRONMENTAL COMPLIANCE PROGRAMME

- **27** INDUSTRIES PARTICIPATING SO FAR
- **1%** REDUCTION IN PM2.5 CONCENTRATION
- **0.02%** REDUCTION IN NOx CONCENTRATION
- AIMING TO EXTEND TO MORE INDUSTRIES







The benefits

With support from C40, the city analysed the social and economic impacts of expanding the programme to all 700 industries in Mexico City. 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 improvements, in terms of reduced concentrations of $PM_{2.5}$ and NOx, are observed 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 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.

AIR QUALITY

6% $PM_{2.5}$ REDUCTION IN THE WHOLE CITY AREA

0.6% NOx REDUCTION IN THE WHOLE CITY AREA

69 PREMATURE DEATHS AVERTED PER YEAR

+855 LIFE YEARS GAINED FOR THE WHOLE POPULATION

+3 DAYS IN LIFE EXPECTANCY PER CITIZEN

HEALTH

579 AVERTED HOSPITAL ADMISSIONS PER YEAR

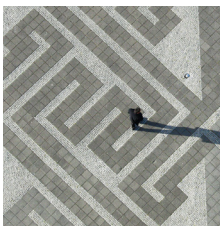
579 averted hospital admissions per year in the whole city including 576 for respiratory diseases and 3 for cardiovascular diseases.

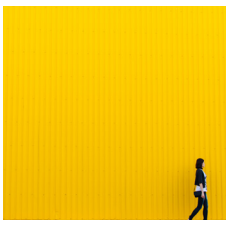
The value of averted hospital admissions is Mex$2.9 million for respiratory and Mex$17,000 for cardiovascular diseases.

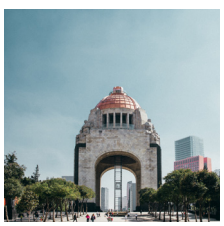
MEX$217M TOTAL VALUE OF AVERTED DEATHS

MEX$2.9M AVOIDED HEALTHCARE COSTS

ECONOMICS







DRIVING ACTION

MAINTAIN AIR QUALITY IN THE AGENDA

Mexico City is currently going through a change in national and local government. While driving action has slowed down during this transition period, meetings will be organized with the new government to promote the programme and place it on their agenda.

BOOST COLLABORATION

Meetings will be organized to share the results of the analysis with the health and transport departments of the new administration. This will involve further stakeholders and gaining support on data collection and analysis.

INFORM THE PUBLIC

A key barrier to overcome in order to scale up the programme is engagement with industries. The analysis has shown that the programme will have massive air quality and health benefits if a large number of industries are involved. It is crucial that these results are communicated to industries and to the public in order to raise awareness and promote participation.

NEXT STEPS

Involve and gain support from the new local and national government through meetings and workshops, where the results of the analysis are communicated and explained.

Promote participation by simplifying the administrative procedures to joining the programme. Discussions will take place between the Environmental and Economic Department to achieve this goal.

Organise workshops with industries to communicate air quality, health and economic benefits.

Provide further technical support to industries, potentially producing a manual showing best practice, to achieve better efficiency and environmental performance.

METHOD AND ASSUMPTIONS

Methodology available here.

Key assumptions:

- *Background concentration from monitoring station with lowest concentration data, located in a residential area.*
- *Data on concentration source apportionment from the industry sector was not available, so the emissions source apportionment was used as a proxy.*
- *Proxy from Quito used for CVD hospital admission rates.*
- *VOLY derived from VSL using the methodology defined in the World Bank's "The Cost of Air Pollution A Case Study for the city of Cuenca, Ecuador" report.*
- *VHA derived from national report on health costs (INECC "Estimacion de impactos en la salud por contaminacion atmosferica en la region centro del pais y alternativas de gestion").*
- *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 µg/m³), and to the mortality rate in the local population. This is assuming impacts only in adults (ages 30+).*
- *$PM_{2.5}$ and NO_2 overall health impacts have been summed together and reduced by a third to account for overlaps between $PM_{2.5}$ - and NO_2-related impacts, The correlation between NO_2 and $PM_{2.5}$ is widely addresses in the HRAPIE and COMEAP guidance, for further information.*

The analysis has been carried out following the methodology outlined in the BUCA Guidance Manual.

Next steps:

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

- *Improve estimate for $PM_{2.5}$ and NOx concentrations source apportionment;*
- *Improve data collection for local respiratory hospital admissions.*

Notes: *[1] C40 Cities, Global Protocol for Community-scale GHG Emission Inventories (GPC), 2016.*

Cover Page Picture: Rafel Guajardo.

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