

# **CLEAN AIR ACCELERATOR:**

## **How cities are cleaning the air we breathe**

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2022 Report

**C4O  
CITIES**

## ACKNOWLEDGEMENTS

This report was created in collaboration with each of the signatory cities of the C40 Clean Air Accelerator. Each city section was self-reported. The city summaries showcase past, present, and future actions the city is implementing to achieve the goals of the accelerator, with a focus on their advances since the last reporting period (September 2021). The delivery of the Clean Air Accelerator and this report has been possible thanks to the support of the Clean Air Fund. For further information on the C40 Clean Air Accelerator, please check out the [accelerator webpage](#).

### Contributing C40 Staff

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# INTRODUCTION

Breathing clean air is a human right, but according to the [latest](#) World Health Organization (WHO) Air Quality Guidelines, 99% of the world's population live in areas that exceed WHO air pollution limits.

Exposure to air pollution is one of the greatest environmental risks to human health; the WHO estimates that exposure to dirty air caused 4.2 million premature deaths worldwide in 2016, and 91% of those premature deaths occurred in low and middle-income countries.<sup>1</sup> Furthermore, it is the poorest and most vulnerable communities that are most at risk. The harmful health impacts of air pollution affect the ability of those living in cities to live safely and to thrive, which is damaging to city economies and their development.

The Clean Air Accelerator includes signatories from all around the globe, with 48 cities currently committed to deliver action. Approximately 227 million people across the signatory cities will benefit from cleaner air and improved health due to the commitments made through C40's Clean Air Accelerator. These commitments are:

- **Within two years, establish baseline levels and set ambitious reduction targets for air pollutants that meet or exceed national commitments. These targets will put cities on a path towards meeting World Health Organization Air Quality Guidelines for particulate matter, nitrogen dioxide, ozone, and sulphur dioxide.**
- **Before 2025 or within 5 years of joining this commitment, implement new substantive policies and programmes to address the top causes of air pollution emissions within cities and under their control.**

In this report you will find updates from the 37 cities (in bold below) that signed this commitment at least one year before this reporting period (i.e. cities that joined before September 2021). In addition, we look forward to sharing in next year's report the work that new signatory cities (not in bold below) are delivering to tackle air pollution.

<sup>1</sup> World Health Organization. (2021, September 22) Ambient (outdoor) air pollution. [www.who.int/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health)

## C40 CITY SIGNATORIES

Abidjan	Dakar	Lima	Quezon City
Accra	<b>Delhi</b>	<b>Lisbon</b>	<b>Quito</b>
Addis Ababa	<b>Dubai</b>	<b>London</b>	<b>Rio de Janeiro</b>
<b>Amman</b>	<b>Durban (eThekweni)</b>	<b>Los Angeles</b>	<b>Rotterdam</b>
<b>Austin</b>	Ekurhuleni	<b>Madrid</b>	<b>Seoul</b>
<b>Barcelona</b>	Freetown	<b>Medellín</b>	<b>Stockholm</b>
<b>Bengaluru</b>	<b>Guadalajara</b>	<b>Milan</b>	<b>Sydney</b>
<b>Berlin</b>	<b>Heidelberg</b>	Nairobi	<b>Tel Aviv - Yafo</b>
<b>Bogotá</b>	<b>Houston</b>	<b>Oslo</b>	<b>Tokyo</b>
<b>Buenos Aires</b>	<b>Jakarta</b>	<b>Paris</b>	Tshwane
<b>Ciudad de México</b>	Johannesburg	Phoenix	<b>Warsaw</b>
<b>Copenhagen</b>	Lagos	<b>Portland</b>	<b>Washington DC</b>

# EXECUTIVE SUMMARY

With more than half of the global population living in urban areas, cities play a key role in the fight against air pollution and the climate crisis. And with shared emission sources, air pollution and the climate crisis go hand-in-hand. Both need swift, unprecedented and collective action to remove the pollution that is harming our health and warming our planet. As such, protecting residents from the devastating consequences of air pollution is top of the agenda for C40's Chair, Mayor Sadiq Khan.

The actions being taken by C40 cities to tackle the twin issues of the climate crisis and air pollution should also deliver better quality of life for residents and more resilient and liveable cities. Cities can achieve the most health benefits by prioritising actions that tackle the exposure of systematically marginalised and clinically vulnerable communities, which are the most impacted by air pollution.

C40 Cities takes the approach that planning and implementation of air quality actions should be data driven to ensure the impact of these efforts are targeted and effective. Collecting data is not only important to planning and implementation but also to measure air pollution changes achieved by actions and help make the case for future efforts.



The latest update of the [WHO Global Air Quality Guidelines](#) in 2021 provides clear evidence of the damage air pollution inflicts on human health, at even lower concentrations than previously understood. The guidelines recommend new air quality levels, to protect the health of populations by reducing levels of key air pollutants, some of which also contribute to climate change.<sup>2</sup> These guidelines are not legally binding standards, but they provide an evidence-informed guide that can inform legislation and policy to tackle emissions within cities, and help cities liaise with other levels of government to fight sources of emissions beyond their jurisdiction.

Air pollution not only affects our health but also our economies. A World Bank report estimated that the cost of the health damage caused by air pollution amounts to USD 8.1 trillion a year, equivalent to 6.1% of global GDP.<sup>3</sup> More investment is necessary to better understand the current and future impacts of air pollution in cities, which will help make the case for further actions that tackle air pollution.

The efforts to tackle air pollution and the climate crisis are an opportunity to drive innovation and invest in a greener economy. In October 2022, during the C40 World Mayors Summit, C40 mayors committed to unite to drive the creation of 50 million good, green jobs by 2030.<sup>4</sup> This commitment by C40 mayors could reduce air pollution by up to 30% and deliver USD 280 billion health-related economic benefits in C40 cities,<sup>4</sup> driven by a reduction in fossil fuel use. In delivering their C40 Clean Air Accelerator commitments, cities are working to deliver on these benefits for their residents and the planet.

<sup>2</sup> World Health Organisation.(2021, September 21) New WHO Global Air Quality Guidelines aim to save millions of lives from air pollution [News Release]. <https://www.who.int/news/item/22-09-2021-new-who-global-air-quality-guidelines-aim-to-save-millions-of-lives-from-air-pollution>

<sup>3</sup> World Bank. 2022. The Global Health Cost of PM<sub>2.5</sub> Air Pollution : A Case for Action Beyond 2021. International Development in Focus; Washington, DC: World Bank. © World Bank. <https://openknowledge.worldbank.org/handle/10986/36501> License: CC BY 3.0 IGO.

<sup>4</sup> C40 Cities. (2022, October 20). C40 cities to drive the creation of 50 million good, green jobs by 2030 [Press release]. <https://www.c40.org/news/50-million-green-jobs-by-2030/>



# CITIES ACTIONS TO MEET COMMITMENTS

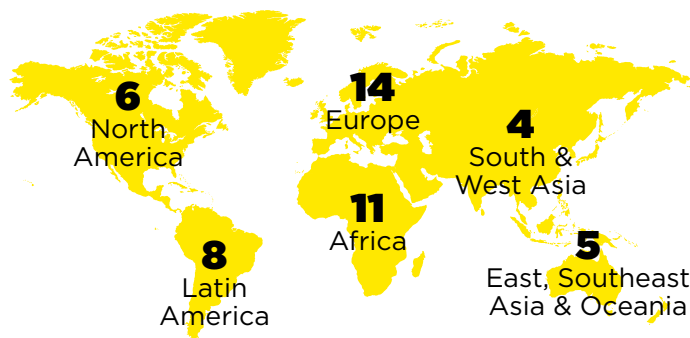
## Total number of signatory cities



**48**

Signatories Cities have committed to the Clean Air Accelerator

## Number of signatory cities by region



Signatory cities are taking action to tackle the main sources of air pollution. These sources vary between cities depending on their context (e.g. transport, energy and waste systems, city infrastructure, industrial and commercial activities, topography, natural and background sources of air pollution, etc.). As such, cities need data in order to understand their air quality levels and the main sources of air pollution and, in turn, to design effective policies.

Through the Clean Air Accelerator we are gathering evidence of how signatory cities are leading the way to clean the air we breathe through a diverse range of high-impact actions – from the expansion of air pollution monitoring networks, to implementing low emission zones, electrifying bus fleets, or shifting away from polluting fuels for heating.

As part of this accelerator cities have committed to set air pollution baseline levels and expand their knowledge of air pollution. To do so, cities are expanding their monitoring networks, conducting source apportionment studies and compiling emission inventories. Nineteen cities (including Bengaluru, Quezon City, London and

Los Angeles) reported efforts to expand air pollution monitoring in this reporting period (September 2021–September 2022)

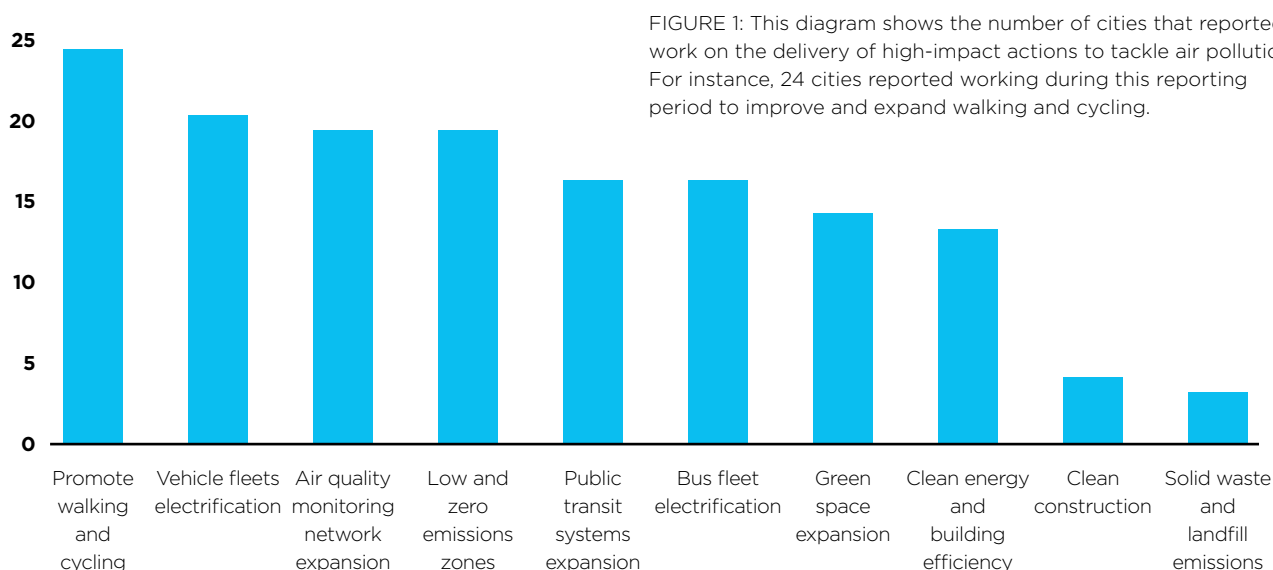
Signatory cities during the last year have also been working to tackle traffic-related emissions. An example of this is the work to develop, implement and expand low and zero emissions zones. Nineteen cities (including Barcelona, Lima, London and Rio de Janeiro) report carrying out these types of vehicle restrictions that have delivered large benefits in cities and proven to be a very effective approach to tackle air pollution sources.

In order to further achieve traffic emissions reductions, cities are also driving a modal shift from private vehicles to public and active transportation. This brings health benefits not just by reducing air pollution, but also by promoting a more active way of moving across our cities. Twenty-four cities (including Berlin, Milan, Paris and Quito) are working to improve and expand cycle lanes and pedestrian areas, driving the transition of public space currently dedicated to private car use. These actions will deliver big rewards for city economies, health and communities,<sup>5</sup> and allow for a more efficient way to move people down the street.<sup>6</sup>

<sup>5</sup> C40 Cities Climate Leadership Group, C40 Knowledge Hub. (2021, August). Why green and healthy transport modes deliver vast rewards for cities. [www.c40knowledgehub.org/s/article/Why-shifting-to-green-and-healthy-transport-modes-delivers-vast-rewards-for-cities?language=en\\_US](https://www.c40knowledgehub.org/s/article/Why-shifting-to-green-and-healthy-transport-modes-delivers-vast-rewards-for-cities?language=en_US)

<sup>6</sup> C40 Cities Climate Leadership Group, C40 Knowledge Hub. (2021, August). How to drive a modal shift from private vehicles to public transport, walking and cycling. [www.c40knowledgehub.org/s/article/How-to-drive-a-modal-shift-from-private-vehicle-use-to-public-transport-walking-and-cycling?language=en\\_US](https://www.c40knowledgehub.org/s/article/How-to-drive-a-modal-shift-from-private-vehicle-use-to-public-transport-walking-and-cycling?language=en_US)

## Number of cities delivering actions



In addition, many cities are working to expand public transportation and transition to cleaner transport options. Sixteen cities have been working to expand public transit systems (including Austin, México City, Oslo and Tel Aviv) and 16 cities are working to electrify their bus fleets (including, Bengaluru, Bogotá, Jakarta and Medellín).

For those trips that need to be made in private vehicles, including freight, cities are working to expand charging station availability, enabling and incentivising electric vehicle uptake as well as electrifying municipal fleets. Twenty cities (including Buenos Aires, Copenhagen, Heidelberg and Stockholm) worked to deliver these efforts through this reporting period.

On top of that, thirteen cities (including Durban, Madrid, Warsaw and Washington, D.C) are also working to shift away from polluting fuels for heating that directly impact both outdoor and indoor air pollution. Their actions aim to promote clean energy sources and improve residential efficiency, to reduce residents' exposure to air pollutants, among other benefits. Four other cities (including Delhi, Portland and Seoul) also

reported working to reduce air pollution from construction sites by electrifying non-road mobile machinery and preventing particulate matter emissions from construction sites.

By tackling waste production and illegal dumping and by recovering biogas from landfills, three cities (Amman, Delhi and Lima) have also advanced actions to reduce the impact of the waste sector on air pollution.

Cities are also adapting to the impacts of pollution and the climate crisis by expanding green cover in cities, with more trees and green areas. Fourteen cities (including Houston, Quezon City, Lisbon and Sydney) have expanded their green coverage, bringing many benefits for communities and building more resilient cities that better respond to climate change impacts like flooding and urban heat islands.

All these actions put cities in the C40 Clean Air Accelerator on a path to reduce their pollution levels, increase the health of residents and achieve their climate and air quality goals. Cities specific progress summaries can be found in the next section.



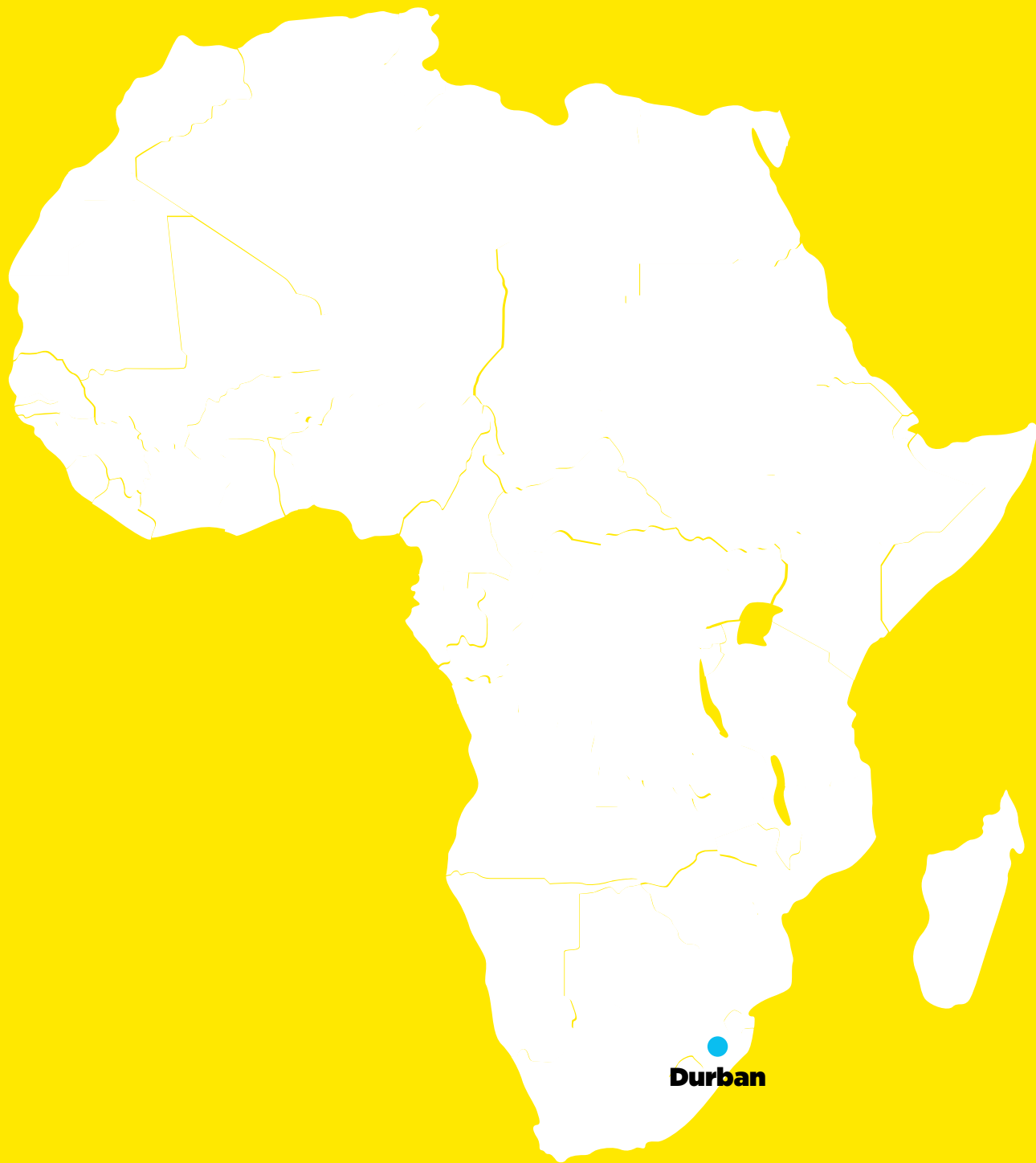


# CITY PROGRESS SUMMARIES

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**The following section of this report contains progress and action summaries that were self-reported by each of the C40 Clean Air Accelerator signatory cities. The city summaries showcase past, present, and future actions the city is undertaking to achieve the implementation milestones of the Accelerator.**





**Durban**

**AFRICA**





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The city has been working to move its existing air quality monitoring stations. The aim is to improve their spatial spread and ensure that air quality data is representative of the city through its length and breadth and across various socio-economic communities. In order to improve calibrations and quality of data the city has also secured the needed gas contracts used in reference stations.

The city's planned next steps are to establish maintenance contracts to minimise instrument downtime and improve data collection as well as quality in monitoring stations. Procurement has been identified as a key constraint in improving data recovery and data quality. In addition NO<sub>x</sub> data is still not currently being collected due to obsolete instruments. The city's budget is constrained by the impact of floods on infrastructure, especially water infrastructure, among other reasons. Other means are being sourced for purchasing NO<sub>x</sub> instruments. In addition, SO<sub>2</sub> instruments are being amended to include H<sub>2</sub>S monitoring to improve the monitoring of odour issues in the city.

The city has just completed a vehicle emission inventory in order to identify hotspots of vehicle emissions. The inventory will help inform the locations of planned low emission zones in the city.

Finally, the city has been awarded funding by C40 Cities and the Clean Air Fund for conducting a cost and benefits analysis on doing away with dirty fuels such as coal and heavy fuel oil in the city. In addition to the benefits analysis the project, which is still in its inception stage, will involve a policy to ban the use of coal in commercial and industrial activities in the city. As part of this work city officials will receive training on how to conduct benefits analyses and use this new knowledge to conduct an analysis on developing a low emission zone and setting stricter emission limits.



# **EAST, SOUTHEAST ASIA AND OCEANIA**





Since September 2021, Jakarta Capital Special Region (DKI Jakarta) has been performing the first stage of developing a roadmap towards establishing air pollution baseline levels and composing reduction targets consistent with achieving WHO Air Quality Guidelines along with targets corresponding to the DKI Jakarta Air Pollution Control Grand Design. Initial levels of  $PM_{2.5}$  (taken from the base year of 2018) were  $31.66\text{--}44.18\ \mu\text{g}/\text{m}^3$  and a 2030 target of  $25\ \mu\text{g}/\text{m}^3$  has been adopted.

The city is working on the preparation of a Draft regulations concerning air pollution control strategies, and the city has entered into cooperation agreements with the surrounding regional governments, namely Bekasi City and South Tangerang City, regarding air pollution control. The policy builds on the 2022 Air Pollution Emission Reduction Scenario Calculation Study carried out by the city.



DKI Jakarta Province has formed a working team to coordinate across the Regional Apparatus Work Unit (Satuan Kerja Perangkat Daerah, SKPD) and UPD to identify actions and establish a timetable for passing regulations, as well as implementing coordinated action to reduce emissions from major sources of air pollution.

Since September 2021, DKI Jakarta Province has been starting to implement measurable and substantial transportation emission control efforts. These projects will reduce emissions from the transportation sector, accounting for concentrations of  $PM_{2.5}$ , and improve air quality in the city.

Key successes include:

- Introduction of motor vehicle emission tests.
- Restoration of public transport and development of environmentally friendly public transportation.
- Development of motor-vehicle-free zones.
- Development of traffic engineering management.
- Improvement of infrastructure/connection to public transportation facilities.
- Control of emissions through reduced mobility, within the framework of government-private sector-civil society cooperation.

Important activities planned for the forthcoming year:

- Implementation of emission tests as a basis for imposing motorised vehicle tax.
- Development of transit-oriented development.
- Implementation of parking disincentives.



## QUEZON CITY

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Since 2019, the city has implemented various initiatives to achieve the goals of the C40 Clean Air Accelerator as well as the Breathe Life Campaign of the World Health Organization, the United Nations Environment Programme and the Climate and Clean Air Coalition.

With the conclusion of the Air Quality Technical Assistance Programme received by the city from the C40 Cities Climate Leadership Group in 2021, eight non-reference sensors and one automated weather station were installed in strategic locations across the city and an air pollution baseline study has also been completed. An air quality management roadmap was also provided, which is being used as basis in formulating the Quezon City Air Quality Management Plan. The said plan will contain, among others, appropriate interventions to attain identified reduction targets aligned with national standards and WHO Air Quality Guidelines.

To complement the eight sensors previously installed and in order to better understand the city's air quality status, Quezon City expanded its air quality monitoring network with the deployment of 12 additional non-reference sensors and five automated weather stations. This was completed in September 2022. Further, reference equipment capable of measuring  $PM_{2.5}$ ,  $PM_{10}$ ,  $NO_2$ ,  $SO_2$  and meteorological parameters is scheduled for installation in December 2022.

In 2023, 10 more non-reference sensors and one automated weather station will be procured to build the most expansive air quality monitoring network in the Philippines. This will acquire the necessary data and information for a science-based approach to policy formulation and programme implementation.

With the creation of the Climate Change and Environmental Sustainability Department (CCESD), various policies, programmes and projects on climate action and sustainability, which also include air quality management, will be implemented in the coming years.

Currently, the Quezon City Government, in collaboration with Clean Air Asia, is in the process of developing an Air Quality Management Plan, which is expected to be completed by June 2023. For the plan development, an emissions inventory and health impact assessment will be conducted to estimate and map pollutant sources and identify sector-targeted interventions. A communication strategy will also be developed to effectively communicate air quality risks and impacts and build public momentum and buy-in for a clean air campaign.



An Executive Order signed by the Honourable Mayor will also be issued, designating and updating the members of the Quezon City Air Quality Technical Working Group (AQ TWG) on a collaborative and cross-sectoral approach to air quality management. Capacity building activities will be conducted to equip the AQ TWG and other city personnel with the necessary knowledge and skills to perform duties and tasks relative to air quality management.

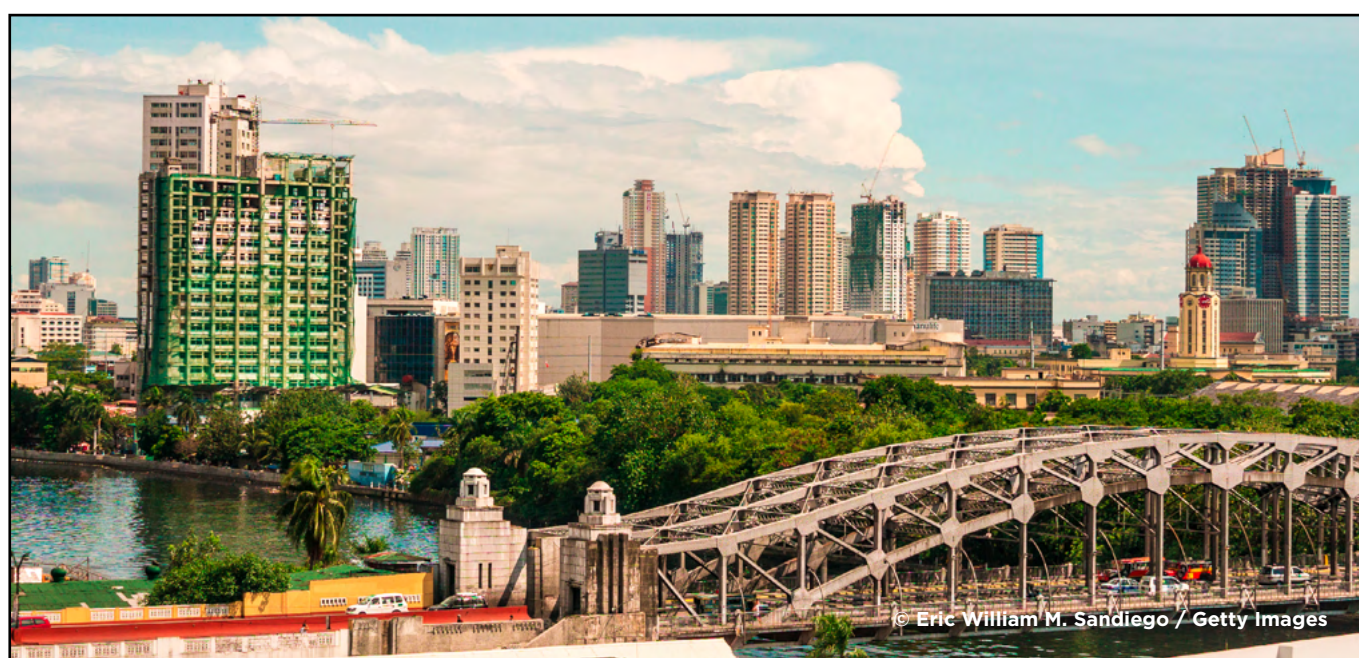
Building on the efforts accomplished under the C40 Air Quality Technical Assistance Programme last 2020–2021, the city is once again a recipient of the C40 Technical Assistance for 2022–2024. This will focus on the conduct of a transport sector analysis and an air quality and health benefit analysis. Said technical assistance will provide support in the implementation of the City's Air Quality Management Plan and the Enhanced Local Climate Change Action Plan for 2021–2050.

In addition, Clean Air Asia is implementing the Integrated Programme for Better Air Quality in Asia. This will provide a cost-benefit analysis and financial planning for transitioning the Quezon City government fleet to electric vehicles.

In line with the city's development agenda and the Enhanced Local Climate Change Action Plan,

priority actions currently being implemented in relation to air quality management include:

- Promotion of active mobility by expanding the city's bicycle lane network wherein it targets the completion of a cumulative total of 350 km of bicycle lanes by 2025.
- Promotion of electric vehicles and preparing for the establishment of necessary infrastructure such as solar charging stations.
- Feasibility studies for the formulation of a transition plan towards a clean and fuel-efficient vehicle fleet.
- Expansion of green corridors or pedestrian corridors that link major roads, transport hubs, and commercial districts. These allow interconnectivity, promote active mobility, and encourage people to walk and enjoy adjacent pocket parks developed from idle lots. Currently, the city has a 5.39 km pedestrian corridor through the Green Open Reclaimed Access Lane project.
- Creation of a Green Lung Network technical working group to ensure connectivity and functionality of all green and open spaces. Starting by linking the city's two major parks, the Quezon Memorial Circle and the Ninoy Aquino Parks and Wildlife Center, the city will further develop its parks to become the core and unifying element of the city's green and open space network system.







The city has developed the [Seoul Air Quality Control Action Plan \(2020–2024\)](#), which includes the city’s reduction goals for air pollutants. The progress of the plan can be followed at <https://cleanair.seoul.go.kr/>.

The city is implementing 64 projects across four areas: emissions reduction, public health protection, domestic and overseas cooperation, and public engagement. These projects are all included in the Seoul Air Quality Control Action Plan (2020–2024).

Seoul has worked to reduce emissions in the city and saw the results reaching record low  $PM_{2.5}$  levels of  $20 \mu g/m^3$  in 2021. This follows a reducing trend from  $25 \mu g/m^3$  in 2019 to  $21 \mu g/m^3$  in 2020 to  $20 \mu g/m^3$  in 2021.

The city has worked to reduce emissions from heating with the deployment of 61,000 domestic eco-friendly boilers. It has also placed a cap on emissions at 28 large-scale commercial sites, and supported the replacement of 487 old boilers for commercial purposes.

Transport emissions have been also addressed, with actions including the deployment of 21,000 battery electric vehicles, early scrappage of 7,141 dirty old vehicles, retrofit of 2,801 dirty vehicles, and the implementation of the Green Transport Zone, within which grade-5 vehicles are banned.

Tighter inspection of construction sites, enhanced road cleaning, and tighter standards to regulate fugitive dust at large construction sites are in place. Meanwhile, the retrofit of 167 old construction machines and a ban on usage of dirty old construction machines at municipal construction sites will help reduce emissions from the construction sector in the city.

In 2023, the city will work to electrify compressed natural gas (CNG) buses and diesel mini shuttle buses operating between villages that are inaccessible to subway or bus stations. It will also replace diesel cleaning vehicles with either electric or CNG vehicles. The city is electrifying delivery vehicles and motorcycles, and is going to develop a legal basis for the early scrappage of grade-4 diesel vehicles. It plans to expand the driving ban to include grade-4 vehicles within the Green Transport Zone and eventually the entire city.

The city will also continue to improve monitoring of air pollution, by utilising the ‘Internet of Things’ to monitor construction sites for emissions. Finally, it is going to pilot remote sensing to further the widespread monitoring of particulate matter emissions.





Since the last report, a new regulatory-grade ambient air quality monitoring station has been installed by the NSW Government onto a city-owned site at Alexandria. This means there are now two monitoring stations in the 26 km<sup>2</sup> local government area.

The City has also completed the installation of lower-cost environmental monitors (13 that measure air quality) as part of a trial with the University of Technology Sydney (UTS) who have also developed a draft report assessing the local sensors' data. The UTS also developed a table that compares National Environmental Protection Measure for Ambient Air Quality (NEPM AAQ) with WHO Air Quality Guidelines.

The data collected at both the regulatory stations and the local sensors indicates that particulate matter mostly only exceeds guideline levels when there are bushfires, and particulates and other air quality parameters are not a significant problem in the city under normal conditions.

The City will report 'exceedances' against NEMP AAQ for a range of air quality parameters for Cook and Phillip, and Alexandria, and other NSW Government air quality monitoring stations in the local government area as they come online. The city will also advocate for the NSW Government to develop exceedance reports against WHO Air Quality Guidelines in addition to the NEPM AAQ.

The City of Sydney continues to encourage active transport as the first mobility option, via the provision of physical infrastructure like cycle ways, footpath widening, pedestrianisation of roadways, and the delivery of behaviour change programmes.

The [Greening Sydney Strategy](#), which was developed in July 2021, will help improve health and wellbeing, reduce urban heat impacts, and make a more resilient city. The plan also includes an objective to filter and improve the air we breathe and is now in the implementation stage.

Work is also well advanced to develop a city wide electric vehicle strategy, which will contribute to improving local air quality. The NSW Government has its own [electric vehicle strategy](#), which aims for more than 50% of new car sales to be electric and for the whole NSW Government passenger fleet to transition by 2030. In addition, The Australian Government is currently [consulting on a national electric vehicle strategy](#). The City of Sydney has made a combined submission along with other state capital cities.

The City's main transport advocacy priorities include asking the NSW Government to prioritise the electrification of buses on high-density routes through the metropolitan area, and for the Australian Government to introduce stringent vehicle fuel efficiency standards for new vehicles.





Since signing the Clean Air Accelerator in 2019, the Tokyo Metropolitan Government has been actively working to achieve the commitments of the accelerator.

The Tokyo Metropolitan Government achieved the national environmental standard for PM<sub>2.5</sub> in 2019, and, with a view to further improvement, set a target of reducing the annual average value of all monitoring stations to 10 µg/m<sup>3</sup> or less by 2030.

In order to reduce PM<sub>2.5</sub> concentration levels to achieve the newly set air quality target, and to meet ozone national environmental standards, the Tokyo Metropolitan Government is working to reduce volatile organic compounds and nitrogen oxides, which are common causative substances, through the following initiatives:

- Expanding the use of zero emission vehicles.
- Promoting voluntary efforts by business operators and individuals, and raising public awareness to improve the air quality through the "Clear Sky Supporter Programme".
- Promoting the conversion of air quality data into open data in order to lead to air pollution countermeasures using the latest technologies such as 5G.
- Cooperating with neighbouring prefectures and cities to promote widespread air pollution countermeasures.
- Identifying the sources of volatile organic compounds that contribute greatly to ozone generation.



# EUROPE





# BARCELONA

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The city of Barcelona has already established air pollution baseline levels and is drafting ambitious reduction targets consistent with achieving European Union Directive limit values, especially for NO<sub>2</sub>. However, the city is also committed to fulfilling the new WHO Air Quality Guidelines as soon as possible, and has set ambitious reduction targets using the guidelines' interim targets.

The City Council is working on expanding the monitoring network by adding portable devices.

To achieve the accelerator objectives, ambitious measures must be put in place to reduce road traffic and renew the city's vehicle fleet. Barcelona's Low Emission Zone (LEZ), implemented in January 2020, pursues these objectives. Unfortunately, the COVID-19 Pandemic impacted the implementation of this action and made it more difficult to single out and properly measure the impact of the LEZ.

Nevertheless, the measured results are very positive: the LEZ prompted widespread renewal of the most polluted vehicles (improving from 20% of vehicles without an environmental label in 2017 to just 2% in 2022).

There is currently a legal case against the LEZ in Barcelona, which puts all the achieved and future benefits at risk. In spite of this, the Spanish national government enacted the 'Climate Change and Energy Transition Law' in May 2021, requiring all municipalities with more than 50,000 inhabitants to implement a LEZ before 2023.

The Barcelona City Council must guarantee the permanence of a LEZ. The city is therefore working on a new LEZ that will fulfil the new climate change legal requirements in terms of air quality.





## BERLIN

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The city of Berlin now operates 18 fixed measuring stations that continuously measure the air quality in different areas of the city – this is one more than last year. In addition, three lower-cost monitors from different manufacturers are currently being tested. Given their flexibility, these can be easily applied to address new questions that evolve during the development of the air quality strategy, such as the assessment of temporally and spatially varying sources (e.g. construction, road traffic), or the exposure of the population in new housing areas being built or planned in the future. This comprehensive measurement network enables the city to design future scenarios, underpinning the development of the air quality strategy that will put Berlin on track to ultimately meet the WHO Air Quality Guidelines values.

In addition, continuous measurements and modelling are currently being carried out for the entire city to design new air pollution baseline levels and scenarios. Using this information as an input, the city will start a broader participatory process in 2023, involving relevant stakeholders and interested parts of civil society in the development of additional measures to reduce exposure to pollutants. Modelling of air quality values for the entire city area was commissioned

based on current traffic data and on the situation before the COVID-19 Pandemic, in order to assess the impact of the changes in traffic patterns on air quality now and in the future.

The new state government of Berlin, which has been in power since the end of 2021, has stipulated that Berlin will develop an air quality strategy during the current legislative period that sets new targets for the year 2030 based on WHO Air Quality Guidelines. As a result, Berlin is striving to set itself more ambitious targets than the current national and EU air quality standards.

In December 2021, the Berlin state government also agreed to establish a Zero Emission Zone (ZEZ) in the medium term as part of Berlin's climate action programme. More work is necessary as an amendment of national laws is needed to introduce a ZEZ on a safe legal basis. The city will set up an inter-departmental task force to steer the development of the ZEZ scheme. This will help to overcome the technical and organisational barriers in order to present an implementation solution within the next two years, hoping that in the meanwhile the national government will provide the requisite legal instruments.



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Berlin is also working to convert its bus fleet towards zero emissions: since September 2021, the city has phased out 130 older diesel buses of the Euro IV and EEV emission category. By the end of 2022, the fleet of electric buses will grow by 90 to reach 228 electric vehicles out of around 1,400 buses in total.

In 2021, 35.6 km of new bicycle routes were built, with approximately 40 km more to be finished in 2022. In addition, a pedestrian traffic plan and a new cycling network are planned for the near future. By 2027, Berlin will have a network of main cycling routes of approximately 850 km. In combination with other transport policies, such as parking management, the city aims to reduce the share of car use in the modal split from its current 26% to 18% by 2030. This will result in significant improvements for air quality and help meet Berlin's climate goals.

Since September 2021, parking management has been introduced in Berlin on a total of 8.5 km<sup>2</sup> across six new zones. In addition, the city government decided to increase fees for resident parking permits and parking fees, which is expected to take effect in 2023. Expanding parking management is a key measure in Berlin's air quality plan to reduce motorised road traffic in favour of public transport and cycling.

The Berlin Senate presented the last of five sections on 'new forms of mobility and commercial traffic' of the Berlin Mobility Act for adoption. The law will change transport planning – the so called Verkehrswende – putting in practice the goals for enhancing public transport and pedestrian and bicycle traffic. With the new section on commercial transport and new mobility services, the law will regulate emission-relevant modes of transport and will create among other things a uniform framework for car sharing.





## COPENHAGEN

Since signing the C40 Clean Air Accelerator in 2019, Copenhagen has established baseline levels in order to measure progress in achieving WHO Air Quality Guidelines.

In its Municipal Plan 2019, the city of Copenhagen adopted the WHO Air Quality Guidelines as goals. The city also added an appendix to the CPH2025 Copenhagen Climate Plan with the roadmap for the period 2021–2025, which was adopted in August 2021.

Under this plan, the city will continue to work to reduce the use of fossil fuels, representing an important step towards achieving WHO Air Quality Guidelines and becoming a city with cleaner air, less noise, energy-friendly housing and greener mobility by 2025.

Key successes include:

- 94% of municipal-owned passenger cars are now electric or hydrogen vehicles.
- 43% of city buses now run on electricity.
- Widespread charging infrastructure for electric vehicles is being implemented.
- The city is lowering the speed limits on all roads in the municipality except on some regional roads, which is expected to limit car use.

Since the last reporting period, an agreement to ensure a legal basis for zero emission areas (ZEAs) has been reached on a national level. The legislation has not been adopted yet, but a legislative proposal has been consulted. The legislation is expected to be adopted by the end of 2022. Financing has been secured in the city's 2023 budget to prepare an application to the national government including an implementation plan for ZEAs in Copenhagen.

In addition, there is now stricter legislation in place on environmental zones. The new legislation allows municipalities to restrict older diesel passenger cars within the existing environmental zones. The City Council of Copenhagen will make a public announcement about the new requirements in the environmental zones and is expected to make a final decision by the end of 2022. Implementation is expected in 2023 if the City Council adopts the new requirements.

Finally, since the last reporting period, national legislation has been adopted allowing municipalities to restrict older wood stoves. It is expected that the City Council will make a decision on an approach to tackle air pollution from wood stoves in 2023.





# HEIDELBERG

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For four years now, the European NO<sub>2</sub> limit of 40 µg/m<sup>3</sup> has been complied with at the monitoring station in the Heidelberg environmental zone. The measured value is continuously decreasing and is now below the legal limit at this location by more than 30%, and at the Heidelberg state monitoring station by more than 50%. This proves the success of the measures implemented so far, and the Ministry of Transport of the state of Baden-Württemberg has therefore decided to abolish the Heidelberg environmental zone.

The city has initiated various measures to achieve the goals of the C40 Clean Air Accelerator and further reduce traffic emissions. The city continues to electrify the municipal vehicle fleet, with a current share of 13% battery electric vehicles and fuel cell electric vehicles. The electrification of the bus fleet is planned to be implemented as part of a city's hydrogen model project. The depot for buses is now planned to be procured from 2023 onwards.

The Heidelberg 'Environmentally Friendly Mobile' funding programme continues to be very successful. In 2021, the city funded 73 more annual passes for people who gave up their car. In addition, the city funded additional 99 e-cargo bikes, 26 company pedelecs and 158 private charging stations. In 2022, the city started to promote and subsidise e-taxi vehicles as well as bicycles, e-scooters and e-motorcycles in connection with the deregistration of a car.

In addition the city continues to further develop and concretise the new 'Climate Mobility Plan' (formerly the 'Heidelberg Transport Development Plan 2035') and the Green City Plans.

Finally, the online data platform [Klimakompass](#) provides real time environmental information on air quality and the urban climate and raises awareness of the use of environmentally friendly means of transport. The service is continuously being improved and expanded.





# LISBON

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The Regional Air Quality Improvement Plan currently in force (published in February 2019), advocates measures necessary for the city of Lisbon to achieve significant reductions in concentrations by 2023 (baseline 2011-2014):  $PM_{10} \approx 14\%$  in annual and daily indicators and  $NO_2 \approx 21\%$  on the annual indicator and  $\approx 16\%$  on the hourly indicator. The initial target date was 2020, but the COVID-19 Pandemic delayed the implementation.

During 2021, Lisbon invested in a global strategy aligned with the climate change scenarios to prevent, mitigate, monitor, and undertake immediate action, both in normal situations and in moments of disruptive events – such as the COVID-19 Pandemic – to fight against global pollution.

The transition policies carried out in the context of this strategy to improve air quality include:

- An increase in green areas and trees (nature-based solutions) with more than 100 hectares of green canopy cover and a 15% increase in green areas (300 acres).
- Improvement of the public transport offer with the creation of a single monthly ticket for the metropolitan area, as well as, the improvement in the energy performance of the municipal and public transport fleets.
- Expansion of the cycling network and improvement of public space with the reduction in space for cars.
- Implementation of a complex sensor network at local level to monitor environmental quality indicators such as air quality ( $NO_2$ ,  $NO$ ,  $PM_{10}$ ,  $PM_{2.5}$ ,  $PM_{1p}$ ,  $SO_2$ ,  $O_3$ ,  $CO$ ), noise, traffic, and meteorology, with 650 sensors across 80 monitoring stations. This network was designed to receive, process and provide useful information to decision makers, operational and strategic services, the parish councils, stakeholders, researchers and citizens.

Given that car traffic is one of the main contributors to air pollution in Lisbon, policies that encourage sustainable mobility will have a direct impact on the reduction of air pollution. Examples of these are the new parking regulation, which aims to raise parking prices in areas well served by mobility alternatives, while also ensuring parking for residents. The goal is to reduce the need for parking spaces due to a reduction in car ownership. Other measures taken to further this goal include the improvement of public transport services with more vehicles and drivers, and more efficient vehicles; reformulation of the public transport ticketing system in the Lisbon Metropolitan Area, making it much simpler and more competitive for those who live in the outskirts; and awareness campaigns like the European Mobility Week, or the 'A Rua é Sua' (every month, on the last Sunday, one of the major avenues in the city centre is closed to traffic and designated pedestrian only).

The municipality welcomes and facilitates new car-sharing systems that will cover the last mile of public transport, making it more attractive and competitive. The Lisbon Intelligent Traffic Control monitors the traffic in the central area of the city, aiming to improve traffic management and safety. Several subsystems have been implemented, namely centralised traffic light systems, TV cameras, radar gauges, traffic lights triggered by speed controllers, and variable message boards. Other objectives of these measures are to improve traffic conditions, speed up the maintenance of traffic lights with the activation of alarms in case of failure of equipment, improve environmental conditions, and reduce energy consumption. A final example is the initiation of a public participation process to define the circulation model on Av. Almirante Reis, one of the main roads in the city of Lisbon within the Low Emission Zone, based on environmental (air quality and noise) and social criteria.



# LONDON

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London has been monitoring nitrogen dioxide and particulate matter for many years. There are 131 nitrogen dioxide monitors, 109 PM<sub>10</sub> monitors and 59 PM<sub>2.5</sub> monitors that form part of the London air quality network. These sites are operated and funded by London boroughs. The London Air website of Imperial College London records real time and historical monitoring data.

By August 2022, the Breathe London sensor network had grown to over 300 sensors across the city. This includes 136 funded by the mayor at priority locations including schools and hospitals. The data is publicly available on the Breathe London website and an Application Programming Interface has been provided to enable developers to access the data directly.

The Breathe London Communities programme has begun, with the first 10 fully funded community sensors now deployed following an applications process. The Breathe London website has been updated with community stories sharing information about the first 10 community groups receiving the funded sensors to inspire and engage community projects.

London has committed to meeting the WHO Air Quality Guidelines 3rd interim target for PM<sub>2.5</sub> by 2030 and is working to develop proposals to achieve the WHO Air Quality Guidelines for particulate matter and NO<sub>2</sub> in the shortest time possible.

The expanded Ultra-Low Emissions Zone (ULEZ) was launched on 25 October 2021. It operates up to, but not including, the North

Circular Road and South Circular Road to create a single, larger zone. Nearly four million people live within the expanded ULEZ zone. Here, six in ten households do not own a car yet suffer poor air quality in part caused by polluting vehicles. The compliance rate (percentage of vehicles detected in the zone that meet the strict emissions standards) during the first month was 92%. This is a 53% increase on the 2017 compliance levels of 39%. On an average weekday, there were 47,000 fewer non-compliant vehicles in the expanded zone than the two weeks before the scheme was introduced. This is a 37% reduction in non-compliant vehicles. There were also 11,000 fewer vehicles driving at all. The ULEZ expansion will result in a 30% reduction of road transport emissions of NO<sub>x</sub>. This means that 92% of roads in London were expected to comply with legal limits for NO<sub>2</sub> by the end of 2021. Combined with other measures, this puts the city on track for legal compliance by 2025 at the latest.

In March 2021, the city launched the 2030 Future Neighbourhoods fund, which will deliver transformative area-based projects that act as trailblazers for improving the environment in London's most vulnerable communities. The city has since funded two Future Neighbourhoods in Somers Town, Camden, and Nottingdale, Royal Borough of Kensington and Chelsea.

The London Plan was adopted in 2021 and includes significant new air quality policies, such as air quality neutral and air quality positive. The city has completed public consultations on these new policies and will soon start implementation.





# MADRID

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Since September 2021, the city of Madrid has continued to implement policies for improving air quality, as well as for mitigating and adapting to climate change. Regarding improvements to air quality, Plan A of the Air Quality and Climate Change 2017 established more ambitious targets for particulate matter, in addition to the targets defined in the legislation.

The Madrid 360 Sustainability Strategy, proposed in 2019, puts great focus on the road transport sector, establishing some mobility targets: promote micromobility, optimise the public transport service, reduce the impact of the urban distribution of goods, taxis and vehicles for hire, and renew the vehicle fleet using cleaner technologies and promoting shared modes.

The strategy develops a set of measures that prioritise active modes of mobility (walking and cycling), a bid for public transport, shared mobility, and the renewal of vehicle fleets with less polluting fuels and technologies. In addition, the Madrid City Council works with other administrations on the implementation of structural measures (low emission zones, park and rides, HOV bus lanes, etc.) as well as on improving parking policies that help minimise unnecessary travel.

In March 2021, the 'Roadmap towards the city of Madrid's climate neutrality 2050' was proposed, which establishes the neutrality objectives with a first milestone of reducing 65% of greenhouse gases by 2030 in relation to 1990. In April 2022, this document was updated, without changes to the objectives but with an adaptation to the levers, actions and measures. In addition, a series of indicators associated with the levers have been developed for monitoring and tracking.

Other more notable measures developed in the past year are the approval of the new Sustainable Mobility Ordinance, the renewal of the Municipal Transport Company bus fleet and the aid scheme Change 360.

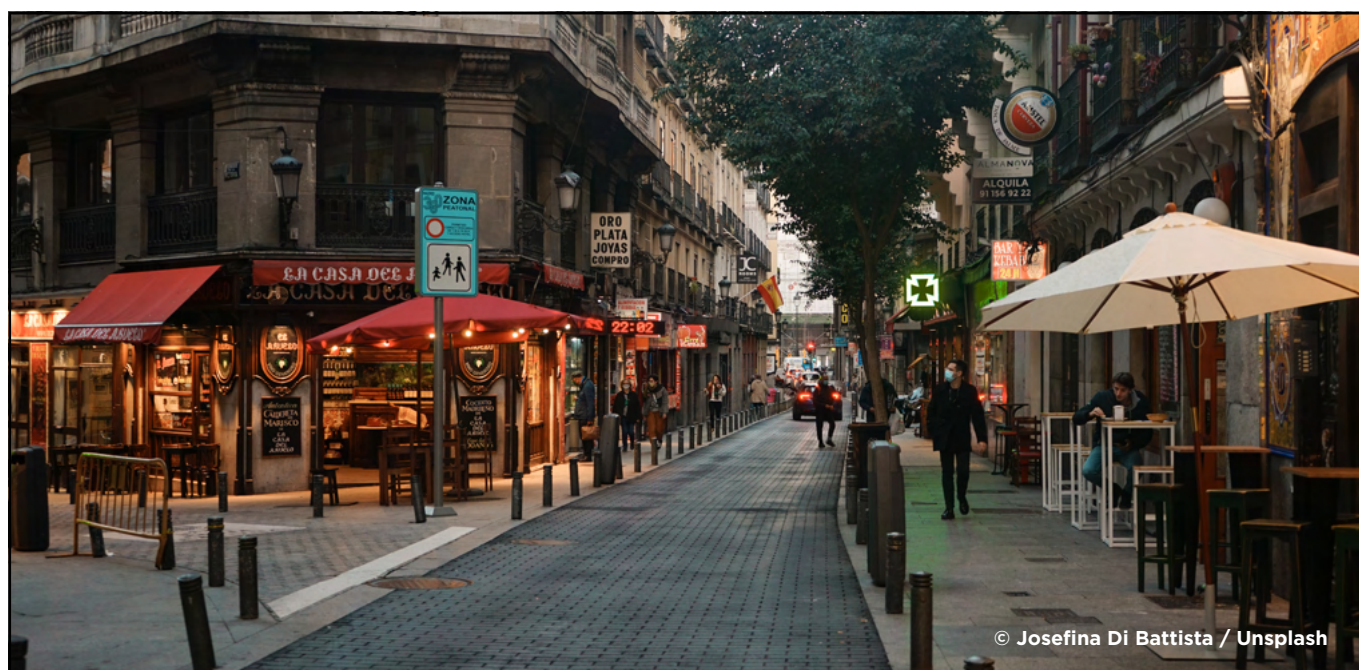
With the approval of the new Sustainable Mobility Ordinance in September 2021, the entire Madrid Municipality was defined as a Low Emissions Zone. This gradually limits the access of vehicles that cause more pollution (without an environmental label), prohibiting the movement of such vehicles from outside of Madrid within the whole municipality by 1 January 2024, and such vehicles of residents by 2025. In addition, special protection low emission zones are in place in the Central District and Plaza Elíptica. The Municipal Transport Company has continued with the plan of renewing their fleet, acquiring a total of 50 electric buses, six plug-in minibuses

and 190 CNG buses in 2021, and allocating the purchase of 150 standard electric buses through bidding in 2022, which will be in operation in Madrid by between 2022 and 2023.

Through the Change 360 Plan, which plans to invest 110 million € between 2021 and 2023, grants were awarded as of 30 September 2022 for the renewal of diesel and carbon boilers (14 million €); renewal to less polluting vehicles in the goods distribution sector (4 million €), taxis (4.24 million €), private vehicles (20 million €) and buses; for the installation of electric charging points (3 million €); and for the acquisition of scooters, bikes and motorbikes (1 million €).

The next course of action will continue the route marked by the M360 Strategy. Among other measures, the following should be noted:

- There has been an increase in the fleet of electric and CNG buses, with the objective of eliminating all diesel vehicles from the fleet and using 200 electric buses by 2023.
- The taxi fleet and the municipal fleet have been renewed with electric vehicles.
- A new bicycle lane is planned on el Paseo de la Castellana, with the first phase (4.4 km) due to be finalised in March 2023.
- The public bicycle rental system has been expanded. Direct management of this service will be transferred to the Municipal Transport Company, which will enable its expansion from 258 to 620 stations and from 2,964 to 7,500 new bicycles.
- The fast-charge public access network has been boosted, and there has been an increase in charging points for the city council vehicle fleet.
- A new lane has been reserved for buses and high-occupancy vehicles on A-2 national motorway. The end of 2021 and 2022 saw the last phase of the bid, with its implementation to begin in 2023.







In February 2022, the City Council approved the Air Quality and Climate Plan, which includes actions specifically dedicated to air quality improvement (1- A healthy and inclusive Milan: a clean, equitable, open and supportive city) and other related domains with a remarkable impact on air quality, such as mobility (2 - A well-connected and accessible Milan) and energy (3 - Positive Energy Milan).

At the end of 2021, the guidelines for the development of a long-term strategy to comply with WHO Air Quality Guidelines for air pollutants (including  $PM_{10}$ ,  $PM_{2.5}$  and  $O_3$ ) were finalised. They include an outline of the city's commitments to and tools for the improvement of air quality, an analysis of the current air pollutant concentrations, and an overview of planned and implemented measures for the improvement of air quality.

In 2021, a network was designed and deployed based on innovative technologies for providing near real-time data at lower costs. This supports an increase knowledge on air quality at a hyperlocal scale to support the efficacy of air quality policies.

Currently, Milan operates five multi-parameter, near-reference air quality monitoring stations, periodically calibrated with reference stations. A location campaign took place in the first months of 2022 and, after careful planning of the sites for deployment, measuring campaigns are now starting at schools and other vulnerable sites.

Since the beginning of 2022, a dedicated air quality digital platform has been in development in order to manage sensor network data and help with citizen awareness promotion through the validation of citizen science data.

A project financed by Bloomberg Philanthropies to measure air quality by means of 30 relocatable lower-cost monitor in 50 schools and 10 vulnerable sites during 2023–2024 will be deployed starting from the beginning of 2023. This initiative is integrated with student and family awareness-raising initiatives that will be delivered in 50 schools during 2023.



Using the framework of the EU-funded project 'CARES – City Air Remote Emission Sensing', in September–October 2021, a campaign was carried out to measure emissions from vehicular traffic in three different points of the city within the two Restricted Traffic Zones (Area B and Area C). It tested the performance of innovative remote sensing systems, in order to collect data on driving conditions and at the same time assess their direct impact on air quality. Based on the analysis of the collected data, an accurate data set of vehicle emission factors will be developed for the improvement of local emission inventories.

The city has also implemented a number of actions focusing on sharing mobility. In March 2022, a new electric car sharing service, E-Vai, was opened. The network includes 112 private and public stations located in strategic locations of the city (railway stations, universities, hospitals, subway stops, etc.), with widespread coverage of all neighbourhoods. Since November 2021, the company DOTT has made 1,500 e-bikes available, and since May 2022, a different company, TIER, has provided a further 1,000. In September 2022, the company BOLT launched an e-scooter service with 750 vehicles. Since November 2021, the car sharing station UBEEQO has used only private parking spaces for their service. Meanwhile ZITY, a new car sharing operator, launched its service in June 2022, with 450 'Dacia Spring' electric cars.

The city continues working to improve walking, with its 'Open Squares' project (started in 2018, in collaboration with Bloomberg Associates and the Global Designing Cities Initiative). The project goal is creating new pedestrian spaces, and since September 2021, two public spaces have already been transformed.

The city is also expanding green areas. September 2021 saw the transformation of Angilberto Square, and a further 1,100 m<sup>2</sup> of grey areas have been transformed into green areas. The transformation of 2,000 m<sup>2</sup> at Piazza Castello is currently in progress, and an additional intervention of about 1,500 m<sup>2</sup> in other areas is planned.

Meanwhile, the city is also strengthening the existing Low Emission Zone, known as 'Area B', starting from 1 October 2022 to reduce traffic-related emissions.

Beyond traffic, the city is tackling other highly polluting activities, in March 2022, the municipality issued a tender to assign [non-repayable grants](#), for a total of 600,000 euros, to support the maintenance costs of the boilers and autonomous heating systems of private houses. Since Quarter 2 2021, 10 out of the 15 diesel boilers owned by the municipality have been substituted with less polluting models. The remaining five will be replaced by December.







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The city of Oslo has ambitions to reach national health authorities standards for air quality, particularly for particulate matter. The city has expanded its air quality monitoring network by establishing more monitoring stations, and air quality in Oslo has improved for the NO<sub>2</sub>-component due to effective measures to reduce exhaust from road transport in recent years. But the city is still working to reduce particulate matter pollution and emissions from cars and heavy vehicles. To do so, the city is limiting access to public parking, implementing traffic tolls, repurposing public space, and promoting public transportation as well as walking and cycling.

In September 2022, the city increased traffic tolls for cars and heavy vehicles, in an effort to decrease traffic throughout the city. During the summer, two city streets were closed for traffic, and the area was repurposed for urban recreation. Since 2015, the city has removed over 6,000 parking spaces and repurposed them to promote green transport. During the

period 2019–2022, the city has continued to build and upgrade more than 50 km of cycling infrastructure, resulting in a measured increase in bicycle traffic. In the first eight months of 2022, cycle traffic increased by more than 7% compared to 2021.

In addition to the actions already implemented, in 2023 the city will continue work towards establishing a zero-emission zone in the city centre. The city will further improve and expand the its public transport network with new trams, zero-emission buses and boats, and expansions to the metro network. The city is continuing and possibly expanding the summer closure and repurposing of city streets and parking spaces to promote greener transport. The city will continue to promote walking and biking, by committing NOK 600 million (USD 59.1 million) to new infrastructure for pedestrians and cyclists in 2023. The city will also keep promoting electric vehicles through toll rebates, discounted public parking and public charging infrastructure.





## PARIS

The [2021 Air Quality Report by Airparif](#) shows the effectiveness of traffic reduction measures year after year. This downward trend continues, especially for NO<sub>2</sub> concentrations, especially near traffic, thanks to the renewal of the road fleet and the reduction of overall traffic.

Nevertheless, despite the evolution of engines, an important contributor to the fine particles emissions in Paris remains the abrasion of tires, brakes and pavement, but still behind emissions from wood fires. The Airparif study '[WHO trajectory and scenario' – Emission reduction targets required to meet regulatory thresholds](#), shows that despite the decrease in air pollutant concentrations observed in recent years, these remain above the regulatory limit values for NO<sub>2</sub> and the intermediate thresholds recommended by the WHO Air Quality Guidelines for fine particles. The modelling carried out by Airparif shows that to comply with the regulatory value and the 2005 WHO Air Quality Guidelines of 40 µg/m<sup>3</sup> for NO<sub>2</sub>, it is necessary to reduce road traffic emissions by 60%. To respect the intermediate threshold of 10 µg/m<sup>3</sup> on PM<sub>2.5</sub>, the effort must be made at the same time on car traffic (- 60%) and on residential heating, mainly open wood fireplaces (- 60%). A new study, planned for the end of 2022, will evaluate the extent of the reductions necessary to respect the new WHO Air Quality Guideline published in September 2021.

Airparif has assisted the city of Paris in drawing up and assessing its 'Air Action Plan'. Among the many actions identified to improve air quality, those that offer direct gains in quantifiable air pollutant emissions were assessed. These include the mobility (the low emissions zone, deployment of electric charging stations, development of cycling and public transport networks, and carpooling) and building (renovation and reduction of energy consumption) sectors. With the implementation of these actions, Paris will meet the national objectives of reducing emissions and reaching regulatory values by 2025.

Paris is also working to improve the city's understanding of the territory's exposure to ultrafine particle (UFP) pollution, carrying out a study in collaboration with Airparif and Bloomberg Philanthropies. A measurement campaign was undertaken from February to June 2022, on five representative Parisian sites (two close to traffic, three in background situations) and a second campaign will be carried out in the summer of 2023. The results should make it possible to define the spatial and temporal variability of UFP pollution in Paris categorised by streets, neighbourhoods, season, and type of emissions (wood burning, traffic, etc.). It will also help identify areas of Paris that require increased monitoring, will provide knowledge to epidemiologists to aid in regulating UFP in the future, and allow for data cross-referencing and knowledge sharing with other European cities.



The city of Paris and the Greater Paris Metropolis are winners of the call for expressions of interest for the ADEME air quality roadmap. They have launched a study to better identify emissions from wood fires through a large survey and to raise awareness among users. Wood burning is the leading source of fine particles in the Paris region. The results of this study are expected by the end of 2023. After a survey has been conducted, an action plan will be defined.

The city is also working to raise awareness through 'Paris Takes the Air', a large-scale air pollution awareness project carried out in Parisian schools and among residents. It responds to the wish of Parisians, expressed during the 2019 edition of the participatory budget, to strengthen municipal actions concerning air quality. The initiative will be deployed from the last quarter of 2022, for a period of 18 months, and will include street animations alongside citizen and school workshops, in partnership with Bloomberg Philanthropies, Airparif and Les Petits Débrouillards.

To tackle emissions from traffic, in third quarter of 2021, in-situ measurements of emissions were taken from eight boats representative of the traffic on the Seine. The city of Paris also generalised the 30 km/h speed limit throughout Paris (excluding the Boulevard périphérique and pedestrian priority roads) as part of a traffic calming programme and to encourage walking

or cycling. In addition the city is working to deploy the 'Rues aux écoles', or 'School Streets' programme, which consists of pedestrianising streets in the vicinity of Parisian schools to make the route between home and school safer for children. This will combat noise pollution (and air pollution to a lesser extent) by eliminating or limiting the passage of cars or by lowering their speed to 20 km/h in calmed zones. Among the 168 school streets in the capital, 114 have been incorporated into the project since third quarter of 2020. A total of 204 schools are involved, and the objective for the 2022/2023 school year is to create 30 calmed school streets and 24 new green school streets. Some neighbourhoods, as part of the program called "Embellish your neighbourhood" are also calmed and vegetated. Finally, a large calmed zone that drastically limits transit traffic is being studied for 2024 in the centre of Paris.

The city is implementing its new bicycle plan for a 100% bikeable city by 2026. In 2021, Paris had more than 1,000 km of bicycle facilities, including more than 300 km of lanes and 52 km of temporary lanes created after the first lockdown. These will be made permanent in their entirety. Development will continue with new infrastructure, the massive development of secure parking solutions, the strengthening of the bicycle ecosystem, and more.

The city also made a decision on a new phase of the Low Emission Zone in 2024 that will restrict traffic for Crit'Air 3 vehicles.

In order to support residents and to encourage more environmentally friendly mobility for everyone, the city of Paris will continue to work on making the use of active modes of transport accessible to all on a daily basis. It will provide assistance with the purchase of bicycles, electric bicycles, bicycle trailers, accessories, and so on, and help citizens with learning to ride bicycles. It will also work to increase the autonomy of disabled persons. Finally, the city has developed the Mobilib car-sharing service and supported the ecological transition of mobility with the installation of equipment for a recharging station in professional premises.







# ROTTERDAM

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Rotterdam continues to meet the legal standards for air quality. This can be seen in the 2021 monitoring report - [Voortgangsrapportage luchtkwaliteit 2021](#). Air quality has continued to improve and the city aims to achieve the 2005 WHO Air Quality Guidelines by 2025.

The European Union recently published stringent limit values for air quality. Therefore the city must continue to focus on further improving air quality. The city is doing so by working to reduce emissions from road traffic, by changing car mobility and stimulating alternatives such as walking and cycling. The city is working on the development of a new programme to further improve air quality over the next few years.

Rotterdam is currently implementing the Zero Emission City Logistics Plan, which will be completed by 2025, with the aim of reducing emissions from the transport and freight sector and reaching emission-free city logistics by 2030. The city also joined C40's Green Ports Forum, which connects port cities and ports around the world to implement policies and programmes that mitigate air pollution and greenhouse gas emissions from ports, shipping and supply chains. The city is investing in the development of shore power for seagoing vessels.





# STOCKHOLM

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The COVID-19 Pandemic had a major impact on the city's traffic over the last two years, and lower pollution levels associated with traffic, such as  $PM_{10}$  and  $NO_2$  were recorded as a result. The yearly average concentrations for 2020 and 2021 were the lowest on record.

In 2022, traffic returned to pre-pandemic conditions and  $PM_{10}$  concentrations also showed a consequent increase. That said, concentrations of  $PM_{10}$  and  $NO_2$  are, on a larger time scale, still on a decreasing trend. Carbon monoxide (CO) at a motor event, held each year in downtown Stockholm, did not exceed the EU 8h limit value for the second year in a row, since the action plan for CO was approved.

Since 1 July 2022, Euro 5 diesel cars are no longer allowed to drive on Hornsgatan (a major

city street in Stockholm). The full effects of the ban are being studied in fourth quarter of 2022. Older vehicles are still allowed to take other routes through the city, but as with the studded tyre ban (introduced on Hornsgatan in 2010) the emission zone seems to propagate its positive impact to a larger area than just the street with the ban.

Vehicle electrification is rapid in the Stockholm region, both with the installation of charging stations and the numbers of people changing to electric vehicles. The city is also changing its buses to fully electric, instead of the current hybrids, bio-CNG or bio-diesels. The municipality's vehicle fleet has also transitioned to being almost completely fossil free over recent years, with vehicles already fully electric.





The main source of air pollutants in Tel Aviv-Yafo is transportation emissions. Ayalon Highway, which is a major intercity freeway, runs along the eastern border of central Tel Aviv from north to south and connects all of the major highways leading to the city. Tel Aviv municipality placed seven monitoring stations along Ayalon Highway to measure  $PM_{2.5}$  and  $NO_2$  along the highways from November 2021 to March 2022. The purpose of the monitoring project was to measure air quality along the highway where people live and work, run an air quality model, and establish solutions to reduce emissions and improve air quality along the highway. To better understand the rest of the city's air quality status, 50 lower-cost monitors will be installed in the first quarter of 2023.

The city is still in the process of increasing forms of mobility while promoting solutions for walkability. Measures taken so far include:

- Evacuating parked vehicles from sidewalks.
- Reducing hazards and infrastructure located on sidewalks.
- Adding trees and shading along the main walkways.

- Widening sidewalks and crossings.
- Arranging sidewalks around the city.
- Improving traffic light times to benefit pedestrians and create continuous crossings.
- Designating zero emission streets.

The city is also increasing the possibilities for cycling by paving more bicycle paths (164 km in 2022 to 300 km by 2025) and promoting bicycle hire for a subsidised price. In November 2022, the first 'light train' route connecting four different cities to Tel Aviv will begin operations.

In its efforts to promote clean transportation, Tel Aviv-Yafo has installed charging stations for electric cars in public car parks and limits the number of parking spaces in new buildings. The city encourages the most polluting heavy diesel vehicles to become cleaner, utilising digital enforcement methods.

Tel Aviv municipality is also working on new programmes to address the top causes of air quality emissions and become a low emission city. A memorandum of understanding on the project is currently being established with the national government.





The city of Warsaw has achieved its goals to reduce particulate matter concentration. The mean annual  $PM_{2.5}$  goal was to reduce from 22 to 19  $\mu g/m^3$  and for  $PM_{10}$  the goal was to go from 34 to 30  $\mu g/m^3$ . In 2021, the annual mean level of  $PM_{2.5}$  was 18.2  $\mu g/m^3$ , and the annual mean of  $PM_{10}$  was 27.3  $\mu g/m^3$ . The city is now approaching the next ambitious targets in the reduction of particulate matter concentration, with a target completion date of 2025.

In September 2022 the city of Warsaw launched a monitoring network expansion of 165 air quality monitors. All of the monitors measure  $PM_{10}$ ,  $PM_{2.5}$ ,  $PM_{10}$ ,  $NO_2$  and 13 of them measure  $O_3$ . The expansion of the air quality monitoring

system in Warsaw is now complete, consisting of eight reference monitoring stations and 165 lower-cost air quality monitors. Data from all devices is available online in real time on the Warsaw platform.

The city also continues to tackle emissions from the main sources of air pollution. The authorities of Mazovia Province, in cooperation with the city of Warsaw, have established a ban on burning coal in Warsaw to take effect from fourth quarter of 2023 and in surrounding municipalities from 2028. The city has eliminated 1,225 classless and low-class stoves in 2021.



# LATIN AMERICA





# BOGOTÁ

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In the District Development Plan 2020-2024, the city established the goal of 'Reducing the concentration of  $PM_{10}$  and  $PM_{2.5}$  by 10% as a weighted city average, through the implementation of the Integrated Air Quality Management Plan for Bogotá 2030, which will include Air Governance as one of its pillars'. Annual targets were generated to reach compliance with the goal by 2024.

$PM_{10}$  levels show a reduction of  $0.6 \mu g/m^3$  in 2022, compared to the baseline  $38.30 \mu g/m^3$ , while  $PM_{2.5}$  levels show a reduction of  $0.3 \mu g/m^3$  in 2022, compared to the baseline  $19.70 \mu g/m^3$ . These concentrations show progress towards the 2030 reduction target of  $30 \mu g/m^3$  for  $PM_{10}$  and  $15 \mu g/m^3$  for  $PM_{2.5}$ , in accordance with Resolution 2254 of 2017 of the National Ministry of Environment and Sustainable Development.

The Bogotá Air Quality Monitoring Network is the main tool for monitoring atmospheric pollutants in the district, and its information is the basis for the design and implementation of measures and policies aimed at improving air quality, as well as the evaluation of their effectiveness and regulatory compliance.

Bogotá has advanced the implementation of the Strategic Plan for the Integral Management of Air Quality - Plan Aire 2030, adopted by Decree 332 of 2021. The plan aims to reduce emissions of key criteria pollutants into the city's air. The implementation process has made progress in its execution of 42.8%, compared to the 44.10% planned to date (July 2022), corresponding to the 2022 target.

The city continues the implementation of the Air 2030 Plan, which consists of 45 projects.

It is divided into two scopes (sectoral and transversal) and into six sectors (transport, infrastructure, industry, commercial and institutional, territory, and transversal strengthening of control). This plan is aimed at achieving five main objectives:

- **Objective 1.** Structuring and developing actions related to the reduction of emissions by increasing energy efficiency, technological upgrading, good operational and environmental practices in the value chain of the economic and productive sectors. Progress: 45.5% as of August 2022, compared to the 47.2% planned.
- **Objective 2.** Strengthen the mechanisms and procedures for the evaluation, monitoring and control of pollutant emission sources. Progress: 34% as of August 2022, compared to the 38.5% planned.
- **Objective 3.** Develop, apply and transfer knowledge of information related to air pollution and meteorological variables by strengthening the representativeness, spatial coverage, quantification and qualification of data. Progress: 55.7% as of August 2022, compared to the 53.6% planned.
- **Objective 4.** Promote actions aimed at air pollution risk management and urban planning around air quality. Progress: 54% as of August 2022, compared to the 54% planned.
- **Objective 5.** Positioning air governance in the city region through complementary mechanisms to integrated air quality management. Progress: 28.60% as of August 2022, compared to the 28.60% planned.



In 2021, the city of Buenos Aires began the first road map stages to establish air pollution reference levels. This begins with renovation and improvements to equipment in the three currently existing stations and strategic alliances to allow the city to measure criteria pollutants that are as yet not measurable. This will allow the network to be amplified in the future and ultimately means the city can gather data that is robust, precise and reliable.

Additionally, new Air Quality Standards (Resolution N° 68-APRA/2021) are in use to establish reduction objectives in line with the 2005 WHO Air Quality Guidelines, and these will be implemented in five consecutive stages. The city is currently in the second stage and will enter the third in May 2023.

To address the top causes of air pollution, the city is focussing its programmes on reducing emissions from mobile sources and reducing the impact of these by planting more trees in streets and green spaces.

These programmes include specific actions to reduce the impact of the transport sector on the climate crisis, through projects prioritising pedestrians, shared streets, the use of bicycles, and improvements to public transport and freight, among others.

The city is working on the creation of new pedestrian areas in specific neighbourhoods to favour sustainable mobility, recreation and health. Streets are selected for inclusion through a detailed survey of the amount of public green

space available per inhabitant, population density and areas associated with children, among other parameters.

The city has sought to improve bicycle mobility by expanding the bicycle lane network, which now totals 267km. In addition, the city has extended the Ecobici public bicycle system to all neighbourhoods. Meanwhile, the Metrobus network is due to be expanded to improve traffic congestion, reduce journey times and improve road safety. The city plans to complement these proposals with exclusive lanes and better bus stop locations, in order to improve public bus routes.

With regards to low emission public transport, the city is doing more pilot tests to establish the feasibility and scalability of the results obtained. These tests are a great source of information when it comes to breaking through technical and financial barriers and accelerating the move to clean fuel in the transport sector.

With regards to urban logistics systems, the city is working together with the private online and logistics sectors to drive the implementation of efficient dispatch plans. At the same time, the city is moving forward with the regulation of scheduling and inspecting loading and unloading spaces. The city has already carried out pilot tests on lightweight commercial vehicles in real operating conditions and data analysis has provided vital information. With this information, the city will start to bring electric fleets into the sector.





## CIUDAD DE MÉXICO

Mexico City took part in the revision of four environmental air quality standards: ozone ( $O_3$ ) – NOM-020-SSA1- 2021; carbon monoxide (CO) – NOM-021-SSA1-2021; nitrogen dioxide ( $NO_2$ ) – NOM-023-SSA1-2021; suspended particles  $PM_{10}$  and  $PM_{2.5}$  – NOM-025-SSA1-2021, for which new compliance standards have been established. The city has also launched various measures focussed on reducing pollution in the city.

To follow up actions previously committed to, developments are described below:

- In December 2021, Mexico City, together with bodies making up the Metropolitan Zone (Mexico City and Hidalgo), published the [Management Programme for the Improvement of the Air Quality of the Metropolitan Zone of the Valley of Mexico \(ProAire ZMVM\) 2021-2030](#).
- To implement ProAire, the city set targets to reduce criteria pollutants - in order to improve air quality and population health, as well as to enjoy 'good' air quality for at least two-thirds of the year. These reduction methods are in line with other programmes being run by the city, such as the Climate Action Programme and the City Development Plan.

Mexico City is working to address the sources of air pollution from the transport sector in order to achieve the targets set. The city is made up of different public transport systems that together offer citizens an efficient and integrated public transport system. The city has invested in electric units for parts of the Metrobus and Trolleybus elements of Mexico City's transport system, including the EURO V units with particle filters and the EURO VI. In addition, a cable car system has been brought in, called Cablebus (Line 1 in July 2021 and Line 2 in August 2021). Line 2 is the biggest of its kind in Latin America. Further, to encourage the use of bicycles, a system of cycle parking stations has been built near public transport systems and the ECOBICI system has been updated and extended.

With the aim of detecting highly polluting vehicles and reducing traffic, Mexico City, through SEDEMA, the Secretariat of the Environment, carries out daily operations in different parts of the city. Vehicles with visible black smoke and those driving on unscheduled days in line with the 'hoy no circula' programme are fined.

Finally, the city is running working groups to establish standards to regulate emissions from new motorbikes and off-road machines, in addition to the national standard for the updating of the air quality index.





## GUADALAJARA

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Guadalajara developed an integrated air pollution and greenhouse gas emission inventory in 2018. The city also established an [Emergency Response and Atmospheric Contingencies Plan](#), a document that sets procedures and actions to be applied by the corresponding authorities in case of atmospheric emergency.

To tackle one of the main sources of air pollution, the city of Guadalajara is improving sustainable mobility systems, increasing active mobility access, and transitioning to electric vehicles.

The transformation of [Paseo Fray Antonio Alcalde](#), a key part of the Guadalajara Downtown Master Plan promotes active mobility by transforming 2.5 km of previously heavily trafficked roads (an average of 100,000 vehicles per day), to give priority to pedestrians and cyclist with a new design that is accessible and green, with 2,000 new trees.

In 2022, the city also implemented the first BusBici lanes in the metropolis. This strategic project establishes an exclusive lane for cyclists and public transport of the Integral System of the Light Train, whose units are electric and circulate at a controlled speed. The 3.72 km of lanes connect the city from west to east through the city centre, expanding connectivity.

The city is also working to reduce transport emissions by transitioning its vehicle fleet from diesel to electric.

In addition to tackling the sources of air pollution, Guadalajara is cleaning the city's air

through the expansion of green infrastructure. The municipality of Guadalajara has an estimated 973,483 trees, which provide ecosystem services, such as air purification, noise damping, temperature regulation, water infiltration, runoff mitigation, and carbon sequestration. In addition, these spaces serve as centres for recreation, appropriation of public space, and social cohesion. In 2022, 22,000 endemic trees have been planted.

For three consecutive years (from 2019 to 2021) Guadalajara has been recognized as Tree City of the world by the Food and Agriculture Organization of the United Nations (FAO) and the Arbor Day Foundation. This recognition is in response to Guadalajara's implementation of public policies and regulations aligned with international guidelines, having an authority responsible for the care and well-being of urban tree areas, having regulations in the city for the management of trees, an inventory of city trees and the allocation of resources in the city's Expenditure Budget for said purposes.

Within the tree plantation plan, the city has a strategy to develop green corridors - corridors of vegetation that link green areas of the city that would otherwise remain detached, in order to provide connectivity between urban forests, parks and areas green. Guadalajara currently has 50 green corridors that span more than 240 km. In 2021 and 2022, the city has carried out strategic plantings in each of the green corridors, in order to ensure the maintenance of biodiversity and ecological processes found within the city.





Capacity for monitoring has increased in Lima by 191%, with 44 air quality monitors spread out over strategic points in the city. The monitoring network implemented in 2020 and 2021 continues to operate, and through this network, the “Aires Nuevos para la Infancia” Lima [new air for children Lima] project has been launched. The city has worked with 14 educational, health and shelter institutions to adopt the initiative and install sensors in their facilities. But the most important outcome is that the information produced has begun to generate real change. The city held the first ‘science-based actions’ event in the grounds of Fe y Alegría No. 4 school, where a reduction of 45% in PM<sub>2.5</sub> was achieved by means of strategic, low-cost actions.

Following on from the success of the first project, the city launched the ‘Transformation of public spaces by clean air’ project, which by the end of 2022 will have restored another five spaces to counteract the top causes of pollution in its zones. This has been achieved through restoration of roads and paths, installation of vertical and horizontal signage and projections, improvements to accessibility, elimination of solid waste points, implementation of spaces for children’s games and relaxation with green areas, and muralization of facades with paints that absorbs pollutants from the air, thus creating safe routes to school zones. Joint events directly benefit over 3,000 children and indirectly over 10,000 people in surrounding areas.

The city is also working on the first low emissions zone in The Historic Centre of Lima. This will start implementation in 2023 and will tackle the

main sources of air pollution in the city. Aligned with these efforts Lima will receive technical assistance from C40 to carry out the evaluation of co-benefits from the “[Low Emission Zone](#)” and the “[Respira Limpio](#)” campaign.

The Metropolitan Municipality of Lima has planned, approved and published a series of measures to create specific actions to reduce air pollution in the city. These include:

- For the sustainability of the Aires Nuevos project, the city is driving an ‘Ordinance to Promote Clean Air for Early Childhood’. This aims to establish a regulatory framework at municipal level for the province of Lima to promote, preserve and improve air quality for early childhood by designing and implementing actions related to air pollution. Creating standards to institutionalise and promote actions will ensure the city’s projects are sustainable.
- To establish the framework for the implementation of Reduced Emission Areas, which is the local term for low emission zones, the city is driving an ‘Ordinance for the Promotion, Design, Planning, Implementation and Management of REAs in the province of Lima’.
- Since 2019, the city has run a campaign known as ‘Breathe Clean Air’, designed to raise citizen awareness of actions to reduce the negative environmental impact on air quality created by the transport sector.

The Medellín district administration focuses its air quality management efforts on compliance with the aims and indicators of the Comprehensive Air Quality Plan (the PIGECA) and the Municipal Development Plan (PDM) 2020–2023. All efforts to reduce the concentration of polluting particles in the air in the Aburrá Valley for 2023, 2027 and 2030 are under current national air quality legislation (resolution 2254 of 2017). Bearing in mind the World Health Organization recommended values, the aim is to reduce the concentration of fine particles ( $PM_{2.5}$ ) in Medellín's air to  $22 \mu g/m^3$  by 2023, as set out in the PDM.

Key achievements include advances in compliance with the aims and indicators in the PDM and the PIGECA. The aim is to build sustainable mobility in the territory, reinforce public transport systems and avoid emissions from mobile sources. The city also aims to generate and strengthen spaces such as technical tables and topical committees, where most of the internal and external players responsible for managing air quality actively participate.

Advances have also been made in links with different bodies with voluntary commitments to improve the city and the region's air quality, within the framework of initiatives such as the 'Air Quality Pact'. Strategies have been put in place aimed at developing more and more sustainable institutional activities, such as the training in eco-driving programme.

Air quality management depends on every part of the district administration, in conjunction with the different agencies, all year round, and especially during critical air pollution episodes during two seasons of every year. Key achievements in this context include:

- Working together with the Secretariat of Services and Supplies to strengthen the

sustainable mobility strategy and update vehicle purchasing policies to encourage cleaner technology.

- Reinforcement of work with internal and external players to increase charging infrastructure for electric vehicles, economic benefits for users of said vehicles, changing of public transport vehicles to cleaner technology, etc.
- Discussions with environmental authorities and other municipal authorities in spaces such as the management committee of the PIGECA, the regional sustainable mobility table, inter-institutional topical committees, etc.
- Working with the national government to improve the energy efficiency of buildings and reduce the emission of greenhouse gases.
- Implementation and advances in compliance in the indicators contemplated by the Urban Protected Air Zones, with processes of awareness-raising, appropriation and dialogue with citizens.
- Promotion and incentives for low or zero emissions systems in collective public transport, individual and cargo transport.
- Diagnosis and definition of the reach of the Circular Economy Policy, in which energy matters are involved.
- Update of the Environmental Education Policy, which covers all fields and resources, in order to ensure that citizens' environmental practices are continually improving.
- Promotion, planning and execution of human mobility projects, which focus on gender and universal accessibility, emphasising the importance of continuing to promote walking and cycling as modes of transport, their integration with the Aburrá Valley integrated transport system, and the occupation of public space.
- Structuring of the Renaturation Plan, which includes an air quality target.





# QUITO

In September 2021, the city of Quito began the first stages of establishing reference levels and setting out ambitious reduction objectives that will comply with the WHO Air Quality Guidelines. This is being carried out by means of the Quito Air Quality Index, which follows the Ecuadorian Air Quality Standard, adjusted to the WHO interim targets and targets around effects on health of Quito citizens using hospital statistics.

The city took part in the C40 Air Quality Network workshop, which helped it to share and learn from experiences in establishing and maintaining an air quality monitoring network that gives solid, precise and reliable data. Quito extended the network with the addition of lower-cost monitors to measure  $PM_{2.5}$  in the Ciudad Bicentenario area, a popular urban development sector that is influenced by stone quarries, and in four other public market sectors in the historic centre of Quito. This makes a total of nine automatic stations, five lower-cost monitors and 30 passive monitoring points. These allow the city to establish baselines and targets for reducing air pollution in line with the WHO Air Quality Guidelines.

In addition, the 2021–2033 Metropolitan Territorial Plan includes air quality improving actions and sets out the need to establish new air quality standards.

Analysis of new substantive policies and programmes to address the top causes of air pollution shows that 90% of emissions in the Quito Metropolitan District are from mobile sources. In this context, the city has drawn up a diagnosis of public space and active mobility within the framework of a revision to the 2022–2042 Master Sustainable Mobility Plan. The city has measured the total surface area of parks, squares, plazas and boulevards, obtaining a total of 28,602,128 m<sup>2</sup> of public space. This data has been calculated in the context of the Urban Green Zone proposed in the Metropolitan Development and Territorial Structuring Plan. Consolidation of a Zero Emissions

Historic Centre, as established by the Quito Climate Action Plan 2020–2050. In this sense, Quito currently has 1.5km of pedestrian streets, which are used by around 1,800 people/hour, reaching 2,400 people/hour at peak times. Additionally, by means of the joint work of the Secretariats for Mobility and the Environment, Quito is implementing the pilot electric mobility plan, SOLUTIONSplus, with the planned deployment of 10 electric cargo-bikes for logistic and recycling purposes at the Historic Centre. The pilot will start on 7 November 2022 and will last 6 weeks until 16 December, throughout the pilot data will be collected to assess its results, an important component is the gathering of information about air quality with the use of lower-cost monitors.

Meanwhile, the city is promoting an integrated and efficient public transport system, working on the reorganisation of routes and ticket prices in public transport with an aim to integrate transport and the metro. Quito is building an integrated public transport system that integrates the pedestrian and cycle networks as a strategic element of sustainable mobility for the city. The implementation is being led by the Secretariat for Mobility, the Metropolitan Public Passenger Transport Company and Metro de Quito.

Quito has a 133km cycle network and is working to expand with the construction of the following infrastructure: North–South Cycle Network, 67km long; Quito Historic Centre Cycle Network, on Av. 5 de junio, 6.5km long, connecting the historic centre to the south zone. Other plans include a permanent north–south connection in the city with trolleybuses, cycle network, and extended pedestrian area; the Valles cycle network; functional connection with the city's valleys, Tumbaco, Conocoto, and Calderón and Carapungo; and reinforcement of the public bicycle programme, with more stops and automated public electric bikes.





## RIO DE JANEIRO

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Since November 2021, the Climate Change Management of the Environment and Climate Municipal Secretariat has been integrating the Air Monitoring Network of the Rio de Janeiro City Council with the 'Monitorar' (Monitoring) platform of the Ministry of the Environment. The integration enabled access to air monitoring information in real time through the [portal](#).

Through the C40 Technical Assistance Programme, the city of Rio de Janeiro has received two compact air monitoring stations for the Centre region, where the Low Emissions District project is being implemented. The stations will monitor  $PM_{10}$  and  $PM_{2.5}$  particulate matter.



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# NORTH AMERICA



As part of the City of Austin’s goal to continue improving air quality in the Central Texas Region, the city is working to ensure that it not only meets but exceeds the 2005 World Health Organization Air Quality Guidelines and the Environmental Protection Agency’s National Ambient Air Quality Standards.

In order to achieve this goal, the City of Austin continues to support the implementation of the Regional Air Quality Plan and Climate Equity Plan.

Both plans aim to reduce the use of fossil fuels in transportation and energy generation. Major efforts are underway to help residents bike, walk, and use public transportation as well as

utilise electric vehicles. Over the last year, the city has increased the amount of local air quality monitoring through real-time small-scale air quality sensors and a research project with the University of Texas.

More information about the implementation of the Climate Equity Plan can be found on the [implementation dashboard](#).

The city has also worked to implement more programmes, including progress towards building out a full-scale public transportation system in Austin – Project Connect – and the Austin Energy EV Buyers Guide to support an increase in electric vehicles on the roads.





The city established air pollution baseline levels in 2018 and continues to work towards attaining the WHO Air Quality Guidelines for the pollutants. To that end, the city is expanding its monitoring capability and is pursuing different methods towards reducing pollution.

For example, some neighbourhoods surrounding industrial plants have been suffering the impacts of industrial emissions. This is the case for the areas around the TPC Group plant, which has experienced a significant increase in the levels of 1,3-Butadiene. The city applied for an United States Environmental Protection Agency (US EPA) grant to monitor these levels through installation of monitoring stations in the surrounding neighbourhoods.

The city is installing Sensor Pod monitors. These measure Volatile Organic Compound (VOC) concentrations and automatically carry out more specific analyses when VOCs concentrations reach a prespecified threshold. The city continues to run its benzene email alert monitoring system, mobile monitoring, night-time monitoring, and Asthma Aware alerts, working to have as robust a monitoring system as possible and to reduce the adverse effects of pollution.

The city is also working with local organisations to address the top causes of air pollution. In partnership with Houston Wilderness, the city developed a framework to target tree-planting of species that reduce air pollution and mitigate the effects of climate change in areas where air pollution and climate-related health effects will be exacerbated. Furthermore, the city is partnering with a non-profit to investigate the abuse of permitting rules known as 'Permit By Rule' regulations, meant for small operators. The city is also participating in a joint air monitoring programme with Harris County, the Environmental Defense Fund, and an outside consultant to create a pollution monitoring dashboard.

The city continues to work on policies and ordinances to counteract pollution, such as the approved ordinance banning e-cigarette sales.





## LOS ANGELES

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The city continues to expand efforts to better understand air quality in the city. Under the Watts Rising Air Quality Monitoring project, 13 air quality monitoring stations measuring  $PM_{2.5}$ ,  $O_3$ , and  $NO_2$  were deployed on city streetlights in the community of Watts. The monitoring started in July 2020 and is still in operation as of October 2022. These local monitoring stations provide the community with real-time data on its local air quality. In addition, 10 lower-cost monitors were placed in high pollution burden areas, including South LA, East LA, and Sun Valley, throughout 2022.

Through the C40 Women4Climate Tech Challenge grant, Los Angeles installed 10 air monitoring stations in five library branches to measure  $PM_{2.5}$  levels both indoors and outdoors. The project ran from March 2021 to March 2022.

Los Angeles Unified School District, the second largest public school district in the United States of America, installed 200 local air monitoring stations across the entire city to provide real time, neighbourhood level air quality data to residents.

In 2020 the city of Los Angeles launched the Predicting What We Breathe project, an air quality measurement study funded through a USD 1.3 million NASA grant to better understand, predict, and address air quality impacts in Los Angeles. In partnership with OpenAQ and California State University Los Angeles, NASA's investment funded research to devise a machine learning platform that integrates data from ground- and spaced-based air quality measurements. The model provides local officials with new information to predict local air quality, issue more effective on-the-ground intervention tactics, and receive detailed feedback on the impact of current efforts to reduce air pollution citywide and improve health outcomes. Learnings were shared internationally, including with fellow C40 cities such as Mexico City, Durban, and London.

Finally, Los Angeles successfully completed its first Criteria Air Pollution Inventory report in 2021.





# PORTLAND

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The city of Portland continues to rely on the Oregon Department of Environmental Quality's (DEQ) ambient monitoring to establish air pollution baseline levels. The city's most recent monitoring report is for the year 2020, during which an extreme wildfire smoke event occurred.

The 98th percentile  $PM_{2.5}$  value for 2020 was over  $120 \mu g/m^3$ , exceeding the daily National Ambient Air Quality Standard (NAAQS). However, when wildfire data is excluded, the 98th percentile is below the daily NAAQS. The United States Environmental Protection Agency (US EPA) allows for wildfires to be treated as exceptional events, defined as unusual or naturally occurring events that can affect air quality but are not reasonably controllable using techniques that tribal, state or local air agencies may implement in order to attain and maintain the NAAQS.

Annual mean  $PM_{2.5}$  levels remained below the annual average NAAQS when including or excluding data during wildfire events.  $PM_{10}$  followed similar trends. For ozone, the 2020 8-hour mean (4th highest values) was 59ppb while 2019 was 58 ppb. However, the DEQ noted that the ozone monitor malfunctioned during the extreme smoke. While the 2017–2019 three-year averages for ozone levels in the city were elevated above the NAAQS, the three-year average with 2020 data trends below the NAAQS. Nitrogen dioxide levels at both reference monitoring locations in Portland are continuing to show decreasing trends and are below the annual and hourly NAAQS.

The city does not have regulatory authority to set reduction targets beyond current regulatory commitments, the US EPA's NAAQS. While there is not an explicit focus on setting additional reduction targets, the city of Portland continues to partner, identify, and invest in various projects and policies that intersect with air pollution reduction. City taxing authority on industrial source

emissions was explored since the last reporting period, however this is no longer being pursued.

The city has continued to advance the [Electric Vehicle \(EV\) Strategy](#) adopted in 2017 and has made policy and environmental changes to support the transition from fossil-fuelled private cars to zero-emission electric vehicles. Since last reported, the EV Code Ready Project has progressed from public outreach to a set of proposed zoning code changes. These will reduce barriers to installing electric charging stations in new developments and increase access to charging to encourage EV adoption. EV expansion will continue to reduce the release of tailpipe emissions.

A primary element of the code is the policy to require EV-ready infrastructure for new developments with five or more units, in order to increase charging access to renters within the city. This will support equitable adoption of EV, since a greater portion of renters are low income or Black, Indigenous, or People of Colour. Other proposed additions include development standards for EV-ready installations, clarification on EV-ready installations in land use code, EV charging requirements for car sharing and carpooling parking spaces, and exclusion of EV improvement costs from site improvement value.

The proposed draft was discussed by the City Planning and Sustainability Commission in September 2022, and is expected to become effective 2023.

Additionally, in third quarter of 2022 the Bureau of Planning and Sustainability released a three-year [Climate Emergency Workplan](#) to reduce emissions, sequester carbon, and build community resilience. The plan includes several actions to reduce the release of carbon and other air pollutants through strategies in the transportation, land use, development, industrial, and utility sectors.



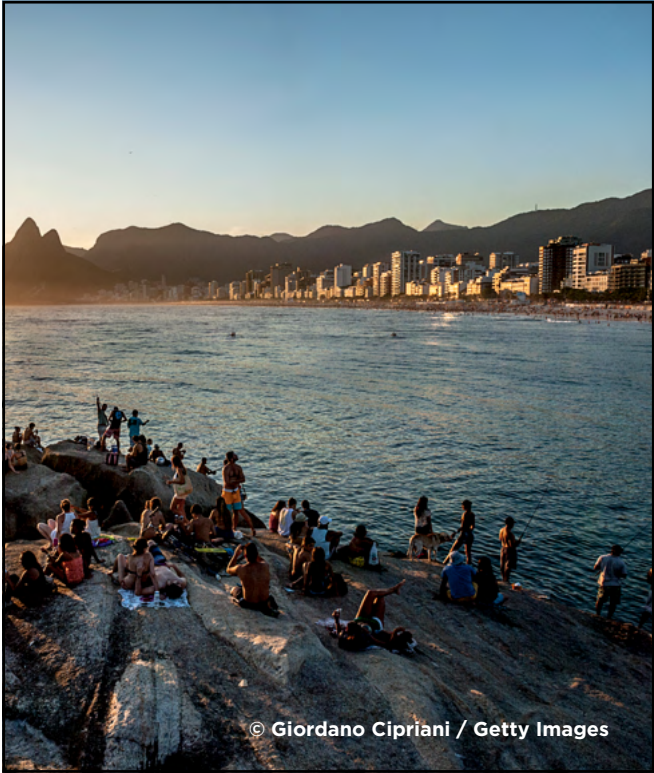


# WASHINGTON, D.C.

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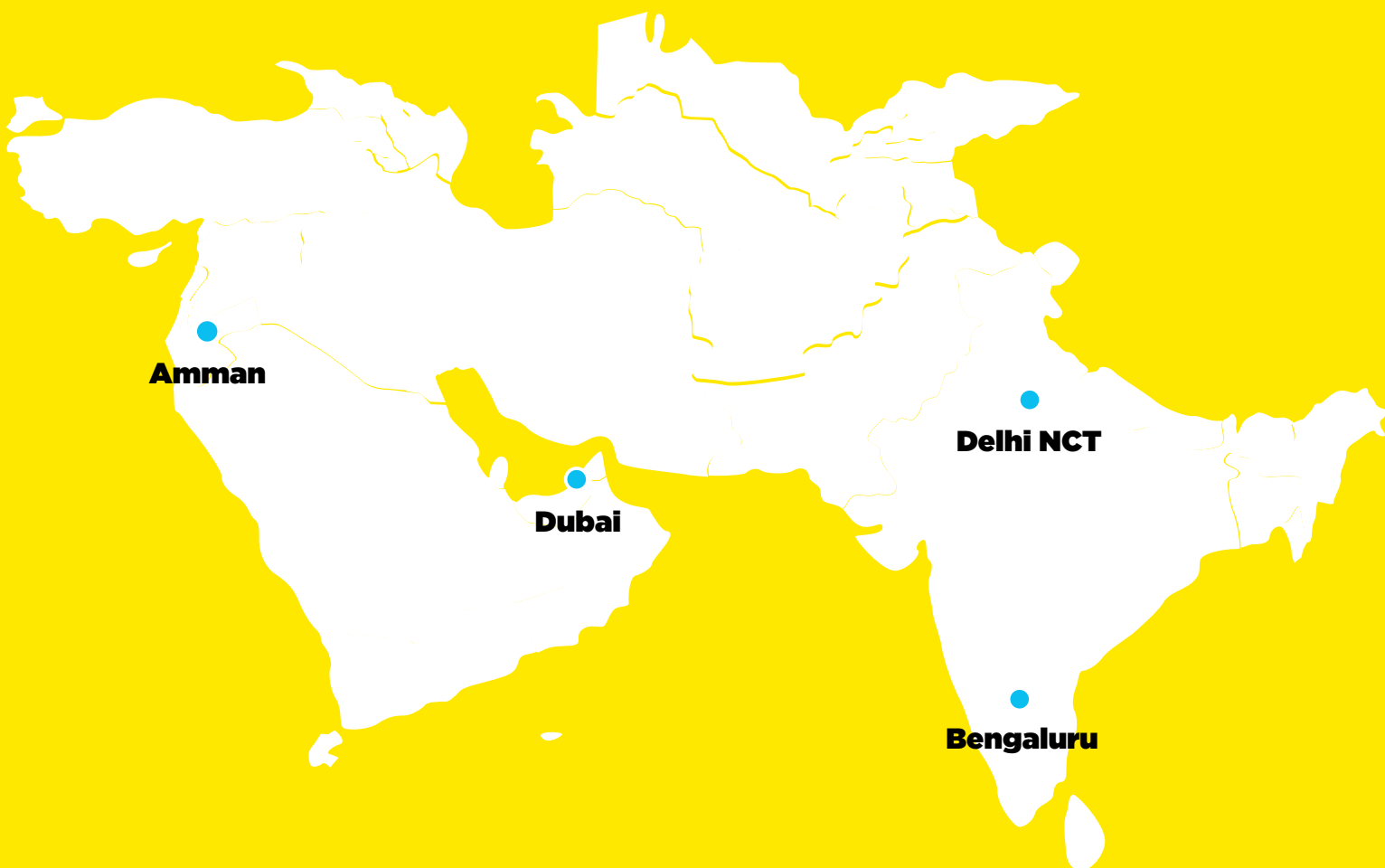
Through the reduction of emissions the District is now monitoring air quality levels below United States Environmental Protection Agency’s (US EPA) National Ambient Air Quality Standards (NAAQS) for ozone. Once the District, in collaboration with Maryland and Virginia, submits a plan demonstrating how it will maintain the current levels of ozone that is approved by US EPA it will be in compliance with all current NAAQS.

Since September 2021, the District has implemented regulations setting stricter NO<sub>x</sub> emissions standards for boilers and non-emergency stationary generators, allowed for removal of incompatible Stage II Vapor Recovery Systems from gas stations, and set VOC limits from large screen-printing operations. These actions will help the District continue to reduce emissions within its borders and further improve both its air quality and residents’ health and welfare.



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# **SOUTH AND WEST ASIA**



## AMMAN

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Since September 2021, the city of Amman has undertaken the first stages of roadmap development to establish air pollution baseline levels and to draft ambitious reduction targets consistent with achieving WHO Air Quality Guidelines. Attending C40's Air Quality Network workshop in November 2021 helped the Greater Amman Municipality (GAM) to progress with setting up an air quality monitoring network that provides robust, accurate, and reliable data sets. A city working team coordinates across departments to set timelines for passing legislation and implementing coordinated actions to reduce emissions from the top sources of air pollution.

The city has been continuing with the implementation of its Bus Rapid Transit and solid waste projects. These will measurably and substantially reduce emissions and improve air quality. The projects will reduce emissions from both the transportation sector and the solid waste sector, which are together responsible for a substantial percentage of the city's  $PM_{2.5}/O_3/NO_2$  and/or  $SO_2$  emissions.

Solid waste management projects updates:

- The Ghabawi Landfill's Biogas Recovery System is tackling waste sector emissions. The system is operational and generates electricity from four cells that are connected to the Jordanian electricity grid. Capping of cell 5 and subsequent connection to the landfill gas recovery system is due in 2023.
- Construction of the 6th cell is ongoing during 2022-2023.
- The Ghabawi Landfill is estimated to have reduced its greenhouse gas emissions by 335,000 tCO<sub>2</sub>e in 2022. This reduction is mostly due to actions taken to directly tackle CH<sub>4</sub> emissions, and indirectly due to increased renewable energy production (4.05 MW H power generation).
- The Al-Shaer waste transfer station will be rehabilitated and upgraded. An invitation for tender was published in November 2022, and the execution of the project is expected to be finished by the end of 2023. The rehabilitation will consist of a closed system that reduces emissions and odours.



- 12 electric sweepers were added to the city services fleet, substantially contributing to better health and air quality.
- Circular economy: sorting-from-the-source pilot projects took place in two neighbourhoods, contributing to the collection of recyclables and a reduction of transfer emissions. Fourteen electric trucks and six electric trolleys are in operation, reducing the number of trips needed to collect waste. Three further pilot projects in other neighbourhoods are planned for 2023 and a fourth in 2024.
- Two recycling banks will be established and operated in partnership with the private sector, under a pilot project to increase the waste volumes diverted from the landfill. The city aims to increase the commercial sector's utilisation of recycling services in Amman,



by expanding private-led recycling services and integrating the informal sector within municipal solid waste management. The locations for the facilities were determined in 2022 and the construction and operation by a private operator are planned for 2023. The facilities are expected to operate at volumes of ~ 30 tons/day.

To tackle transport emissions, the city is expanding public transit with the launch of a Bus Rapid Transit Network. Other key successes resulting from transportation projects are:

- A smart roadmap for the city, established by the GAM in June 2022. The roadmap will include an air quality index and air quality monitors on the most congested streets of Amman to map levels of air pollution.
- Expanded walkability, particularly in areas near stations, to increase accessibility to public transport and reduce private vehicle usage.
- The introduction of 135 buses with eco-friendly engines and connected tracking systems. These are now in operation and the remaining 16 buses will be delivered by 2023.
- Meanwhile, the GAM has added a new article to the 2018 bylaw for building and zoning regulations. The article encourages green buildings by allowing extra floor area ratio or additional height to the building for constructions that are classified as green. This is a clear boost to the city's green buildings incentives policies.
- Finally, strategic policies have been implemented that increase green public open spaces in Amman from 1.6% to 2.5% of the area of the city. The policy goal will be achieved by planting around 7,000 donums as new green land to increase the per capita of open public green area from 3.22 m<sup>2</sup> in 2022 to 5 m<sup>2</sup> by the end of 2026.



Since September 2021, the city of Bengaluru has been undertaking the first stages of roadmap development to establish air pollution baseline levels.

The city has expanded its Air Quality Monitoring Network, which currently has 12 manual ambient air quality monitoring stations and seven continuous ambient air quality monitoring stations, managed by the Karnataka State Pollution Control Board. The city is in the process of setting up four further continuous air quality monitoring systems under the National Clean Air Programme (NCAP), to increase capacity and provide robust, accurate and reliable data sets. The city also has a network of more than 40 lower-cost sensors (since 2019) maintained by institutional and private partners, to increase monitoring capacity at a local level.

The city has published its study on the identification of polluting sources in Bengaluru – [Source Apportionment Study \(2022\)](#) – showing that the transport sector is the main contributor of  $PM_{2.5}$  air pollution, at 40%, whereas soil dust, at 51%, is the main contributor for  $PM_{10}$ . The city also published its [Emission inventory and pollution reduction strategies for Bengaluru \(2019–2022\)](#). In 2019, the transportation sector accounted for 55.3% and 67.2% of the total annual emissions of  $PM_{10}$  and  $PM_{2.5}$ , respectively. Road dust, along with re-suspended road dust, accounted for 23.8% and 8.3% of the total annual  $PM_{10}$  and  $PM_{2.5}$  concentrations, respectively.

The city is in the process of completing its climate action and resilience plan. Having established its greenhouse gas (GHG) emission baselines,

the city has committed to the [NCAP](#) target to reduce  $PM_{2.5}$  pollution in cities by 20–30%, compared to 2017 levels. In order to achieve these targets within a stipulated time period, the city has prepared an action plan with 44 actions. Currently the city is in the process of implementing these actions across various responsible departments.

The city is working to deliver several lines of work to tackle transport emissions. The Bengaluru Metropolitan Transport Corporation has increased the number of electric buses in the city and plans to have a fleet of 300 by October 2022, with another 921 on order.

The city has implemented a pedestrianisation project, designating a particular street ‘pedestrian-only’ on weekends. This has shown a clear improvement in air quality in terms of  $PM_{10}$  and  $PM_{2.5}$  concentrations, which were within the limits of the National Ambient Air Quality Standards across most weekends. This success led to another project in a busy shopping street in the heart of the city centre, converting it into pedestrian only. The city has plans to implement similar projects in other major busy market streets and areas. The city also implemented 55 km of roads in line with Tender SURE street guidelines. It will continue to improve more roads resulting in a more walkable and cycle-able city.

Another large effort to improve the city infrastructure is the extension of the City Metro Network. The city is working on the completion of 119.59 km in Phase-2, 2a & 2b (Airport line), and has submitted for approval the plans for the Phase-3 (79 km line).



Delhi is successfully fighting air pollution. The city has brought down the average annual  $PM_{2.5}$  levels by 25% when comparing 2016–18 values to the baseline of 2012–14. Delhi is a signatory to C40's Deadline 2020, where it pledged to create a strategy for a climate-resilient city in accordance with the Paris Agreement and reduce sectoral emissions by 50% by 2030. With the broader objective of becoming carbon neutral by 2050, the government of Delhi will continue to work towards establishing reduction targets that puts the city on a path to meeting and exceeding National Clean Air Programme (NCAP) targets by 2024.

The government of Delhi has undertaken the first stages of roadmap development to establish baseline levels. The city is on a path toward achieving the WHO Air Quality Guidelines thanks to ambitious programmes that are being implemented to reduce air pollution.

The government continues to expand its knowledge about the city's air pollution. An example of this is its partnership with the Indian Institute of Technology Kanpur, to commission an air pollution source apportionment study identifying Delhi's internal pollution contributors. In addition, since 2020, the city has offered the Green Delhi app, a mobile-based grievance redressal application, which has boosted public engagement in monitoring and preventing localised sources of pollution.

The government of Delhi is working to tackle sources of air pollution in various sectors.

The effective management of dust emanating from construction sites is key to improving air quality levels in the city. The Ministry of Environment, Forest and Climate Change of India has instituted the State Level Environment Impact Assessment Authority for the National Capital Territory (NCT) of Delhi. Based on the committee's findings, in 2021 the government of Delhi announced a set of 14 guidelines that private construction companies must follow to prevent dust pollution.

Currently, all construction sites above 20,000 m<sup>2</sup> are mandated to install reference grade monitors (US EPA approved system) to keep track of dust emissions as a part of the monitoring and granting of environmental clearance to projects.

Delhi is currently working to electrify 80% of its bus fleet. The city will introduce 8000 electric buses by 2025 and set up EV charging infrastructure for public transport vehicles. This will be the highest proportion of electric buses in a public transport fleet in India. Additionally, through the Motor Vehicle Aggregator Policy, the government is drafting guidelines on electric vehicle transition targets for aggregators operating in Delhi. Further, the Department is working on mandating pollution under control certificates for dispensing and selling petrol, diesel, CNG to motor vehicles. The intent is to create a policy that ensures high polluting vehicles that do not comply with emission norms are not travelling in the capital.

The government of Delhi has undertaken multiple initiatives to facilitate the collection of segregated waste and reduce the production and consumption of identified single use plastics. A three-day fair to promote the alternatives to single-use plastic (Plastic Vikalp Mela) was held and a policy is being drafted to identify strategies to encourage and increase the adoption of single use plastic alternatives within the National Capital Territory.

By expanding green areas, the government of Delhi is ensuring that continued action is being taken to mitigate climate change and reduce air pollution. Delhi joined C40's Urban Nature Accelerator committing to conduct a gaps analysis and map of where new greening is needed, identify opportunities for existing green spaces by 2023, and implement new or enhanced public green spaces and green streetscapes in areas with the greatest impact for the most vulnerable by 2026. The city currently has 11 city forests serving as the green lungs. The government is working on improving access for citizens to these city forests in an environmentally friendly and sustainable way.



The implementation of Dubai's Air Quality Strategy 2017–2021 achieved emissions reductions in the city. The overall target of the strategy was to achieve 90% clean air days, which was met with a recorded 99.1% clean air days in 2021.

In addition, the city is currently working in the development of the Dubai Air Quality Strategy 2030 to set new emission reduction targets that align with the United Arab Emirates (UAE) National Air Quality Agenda 2031 and the commitments made by the city with C40 Cities.

In 2021, the UAE issued a General Environmental Policy that includes improving air quality as one of its main priorities. The policy sets out targets and indicators, as well as programmes and initiatives. One of the air quality targets is to achieve the  $PM_{2.5}$  WHO Interim Target-1 of  $35 \mu g/m^3$  by 2030. Additionally, the UAE National Air Quality Agenda 2031, which aligns with the General Environmental Policy, was launched in September 2022.

The city has also started conducting works for the characterisation and source apportionment for particulate matter air pollution. To build on the work by national government, the city will develop new air quality reduction targets to achieve compliance with the WHO Air Quality Guidelines by 2030.





