Executive Summary

Strength in Numbers

How cities are innovating through data to unlock ambitious clean air action

Breathe Cities

An initiative delivered by Bloomberg Philanthropies, Clean Air Fund and C40 Cities.

Acknowledgements

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Breathe Cities at a glance

Breathe Cities is a global initiative supporting cities to clean the air and enhance public health. Delivered by **Bloomberg Philanthropies, Clean Air Fund and C40 Cities**, the initiative offers cities tools to take ambitious clean air action by expanding access to data and raising public awareness.

Launched in 2023 by Michael R. Bloomberg, the UN Secretary-General's Special Envoy on Climate Ambition and Solutions and founder of Bloomberg Philanthropies, and Sadiq Khan, Mayor of London and C40 Cities Co-Chair, Breathe Cities is accelerating action in 14 cities to improve the air 77 million people breathe.

To learn more, visit Breathe Cities' website or follow us on Instagram and LinkedIn.

Executive Summary

Cities are driving clean air action through innovative use of data

Around the globe, cities are taking ambitious steps to clean the air we breathe. Across diverse city contexts, data is central to this effort. **Data enables cities to strengthen evidence-based decision making and build sustained public support for ambitious clean air interventions.** Specifically, data supports cities to:

- Track air pollution levels, patterns, and trends.
- Identify emission sources.
- Assess how air pollution affects residents.
- Understand how residents perceive air pollution.
- Evaluate associated health and economic impacts.
- Measure progress and evaluate policy effectiveness.
- Determine groups and populations most exposed and affected, and enable a fairer distribution of benefits from action.
- Build sustainable public support for clean air interventions.
- Strengthen collaboration across sectors and departments.
- Build transparency, trust, and accountability with communities and stakeholders.
- Design evidence-based policies and regulations.
- Target interventions & financial investments where they will deliver the greatest impact

While measuring, managing, analysing, and communicating air quality data can be complex, cities worldwide are increasingly showing that by taking innovative approaches, they can accelerate action. Across different geographies, capacities and starting points, cities in the Breathe Cities initiative are innovating how they measure, use, and communicate air quality information in **four key areas**:

1 Data Collection:
Building a comprehensive air quality picture

Cities are expanding air quality monitoring through networks of low-cost air quality sensors that are complementing reference-grade monitors, community-generated data, and lived experience insights. Coupled with advanced analytics, these approaches improve spatial coverage, reveal pollution hotspots, capture how air quality is experienced at street and neighbourhood levels, and provide more granular insight to guide interventions.

2 Data Governance and Collaboration:
Unlocking the potential of data through strong institutional foundations

Cities are strengthening institutional systems to enable effective data sharing and use across departments within government and with external partners. They are also clarifying roles and responsibilities, developing shared frameworks, and upskilling personnel to help ensure the sustainability of efforts driven by data.

3 Analysis, Modelling, and Impact Assessment:
Evaluating how actions impact people

Leading cities are integrating air quality data with spatial maps, health metrics, and socio-economic indicators. This people-centered, spatially-driven approach enables cities to move beyond citywide averages to design targeted solutions, prioritise actions, and focus investments on specific neighborhoods to maximise health gains and ensure benefits reach those most affected.

4 Communication and Engagement:
Empowering communities through data

Cities are translating technical information into open and accessible formats and directly involving communities in data collection and decision-making. This strengthens public understanding of the impacts of air pollution and builds the public trust necessary for ambitious climate, clean air, and public health policies.

The case studies across Breathe Cities featured in this report provide several **key lessons to inspire other cities:**

Enhance data through innovative monitoring technologies.

New technologies, such as low-cost air quality sensors, are providing effective and affordable ways for cities to collect air quality data and use this to inform policies. Cities can build data collection capabilities over time, progressively strengthening and expanding monitoring networks and complementing them with other sources of data, leveraging external partnerships, satellite or remote sensing data, community-generated data, and lived experience insights to inform policy and programs and inspire action.

Invest in systems and people, not monitoring alone.

Data has greater impact when integrated across sectors and institutionalised in government processes. Systems that enable effective data-sharing mechanisms and continuous in-house capacity building ensure information is used consistently and effectively to guide decisions.

Connect data to people's lives to drive policy.

Air quality data is most powerful when it reflects how pollution affects daily life. Framing evidence around health, cost of living, mobility, and general quality of life strengthens its relevance and impact. By integrating this evidence with spatial data, cities can better target interventions, prioritise actions, and focus investments on specific areas where the impact will be greatest. Elevating the importance of lived experience data and connecting this to technical findings helps build understanding and support for clean air action.

Put data in the hands of residents to strengthen action.

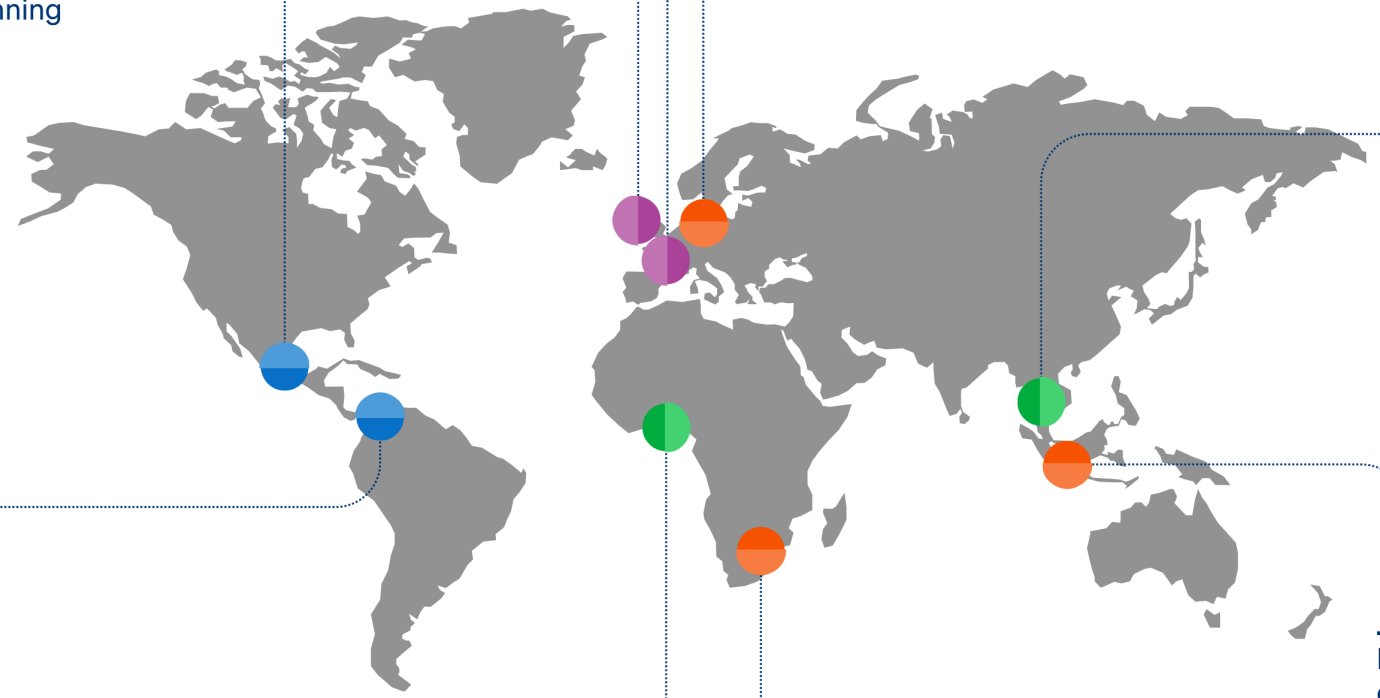
Supporting residents to access and interpret local air quality data with tools like open data platforms fosters public trust and enables community oversight of clean air action. Through community-led monitoring initiatives that involve residents as active partners in measuring local air quality, cities can expand monitoring coverage, improve local insight, and empower communities as champions for action. Together, these approaches position air quality data as a shared civic resource that empowers communities and supports locally grounded action.

This report is envisioned as a practical guide—including integrated case studies, a **toolkit** with reflection questions, and links to additional resources—designed to help cities use data more effectively and accelerate progress towards cleaner air, sustainable urban development, and healthier communities.

This toolkit was presented and validated in May 2026 at a Breathe Cities workshop in Mexico City that brought together city officials from 18 global cities.

In this report, ***innovation*** is defined as new or improved tools, technologies, processes and partnerships, adapted to a city's local context and based on the latest evidence, that support cities to collect, analyse and communicate data and shape effective and fair clean air action for all.

Innovative ways cities are measuring, using, and communicating data



London, United Kingdom
Quantifying the real-world impacts of clean air action

Paris, France
Creating child-friendly streets with air quality data

Mexico City, Mexico
Advancing clean air through sustained action planning

Brussels, Belgium
Enabling citizen-led air quality mapping for action

Bangkok, Thailand
Building a comprehensive air quality picture through integrated data; From technology to data-driven insights on air quality health risks

Bogotá, Colombia
Collaboration and data sharing across departments

Jakarta, Indonesia
Mobilizing youth to drive a cleaner, healthier future

Accra, Ghana
Filling data gaps with hybrid monitoring

Johannesburg, South Africa
Using community perception surveys to shape clean air action

Breathe Cities

Annex A

City toolkit

Using this table to guide city action

This table is designed as a practical reflection tool for city AQM practitioners to assess their current capacities. Cities can use it at several key moments, including when developing or updating air quality management plans (AQMPs), before launching new monitoring sites or communication campaigns, or during periodic review of their institutional and technical capacity. At each of these moments, cities can pause to ask the questions in the table, consider which recommendations are feasible, and explore the featured case studies for inspiration.

The goal is to use these questions as prompts to spark discussion, identify gaps, and plan interim targets and improvements. Embedding this tool into regular planning cycles helps cities make data-informed decisions that progressively strengthen their AQM system and maximise the health, economic, and environmental benefits that can be reaped from better air quality.

Innovation Area 1

Data Collection: Building a comprehensive air quality picture

Reflection questions	What next?	How to innovate to accelerate progress
Do we have sufficient monitoring coverage to understand pollution patterns? • What monitoring systems are in place, how are they resourced, and how frequently are data collected? • Do we have access to hyper-local data (e.g. at neighbourhood and street level)?	Expand monitoring to capture spatial variation and hotspots, enabling clear identification of high-pollution areas for targeted interventions	Deploy locally calibrated LCS to fill gaps, run short-term hotspot studies (e.g. deploying a portable air quality monitor for 2–4 weeks), and complement with satellite or remote sensing data
Are we using external and complementary data sources effectively? • Do we use national, academic, or satellite data? • How are these used in planning and decision-making? • If yes, how do we take into account the strengths and limitations of these data sources?	Integrate multiple data sources into a working evidence base to generate actionable insights more quickly, even with limited in-house capacity	Leverage external datasets and partnerships with local universities and academic institutions; combine sources pragmatically while recognising limitations
Do we understand the sources of pollution and where they are concentrated? • How are emission sources identified and mapped? At what scale?	Use source information to prioritise interventions, enabling targeted action on high-impact sectors	Develop or update emissions inventories and overlay with monitoring and hotspot data

Where to look for more guidance

Opportunities and challenges for filling the air quality data gap in low- and middle-income countries

This article sets out practical steps to expand air quality monitoring through coordinated action among governments, private enterprises, international organisations, academia, and civil society. It emphasises the use of emerging technologies, context-specific approaches, and institutional capacity building to ensure sustainable progress.

United Nations Economic Commission for Europe (UNECE) - An Introduction to Emissions Inventories

This UNECE workshop slide deck offers an overview of emissions inventories, covering their drivers, policy requirements at international and national levels, methods, and outputs.

Urban Emissions.Info – Primer on Source Apportionment

The primer summarises the principles of source apportionment studies and outlines the steps involved in both top-down and bottom-up approaches.

A framework for advancing independent air quality sensor measurements via transparent data generating process classification

This paper presents a proposed framework that distinguishes independent air quality sensor measurements from processed data products to improve clarity, reliability, and appropriate use of sensor-based air quality data.

Innovation Area 2

Data Governance and Collaboration: Unlocking the potential of data through strong institutional foundations

Reflection questions	What next?	How to innovate to accelerate progress
Do we have clear roles and responsibilities for managing and using data? • Within the city administration, which departments or offices are responsible for data collection, sharing, coordination, and use? • Are roles clearly defined?	Establish clear institutional arrangements for data management to enable consistent use of data in planning and decision-making	Define clear roles, designating a lead agency, and embedding coordination structures (e.g. working groups) to support whole-of-government action
Do we have the institutional systems and capacity to manage and use data consistently? • Are there systems, plans and resources guiding how data are managed, integrated, and maintained? • Do they address quality, standards, and access? • What resources are dedicated to staff capacity building?	Strengthen data systems and in-house capacity to ensure data are reliable, accessible, and used routinely in decision-making	Develop simple tools, standardise processes, and invest in targeted training to embed data use in routine planning
Are data shared effectively across departments and sectors? • What mechanisms and/or agreements exist for sharing air quality datasets internally? • How are non-air quality datasets (e.g. socio-economic data, spatial maps of communities, health data) integrated? • Are there barriers to accessing or using air quality and non-air quality data across teams?	Enable cross-department data sharing and integration to support coordinated, cross-sector policy design	Set up data-sharing systems (like dashboards), arrangements, common standards, and workflows that enable collaboration across sectors such as health, transport, urban planning, welfare, and finance
Are we coordinating effectively with national and external stakeholders? • What mechanisms exist to share data with national or regional authorities? • How aligned are city and national efforts?	Align data and actions with national and external partners to enable more coordinated and scalable clean air policies	Establish formal coordination channels, align with national systems, and leverage external expertise and infrastructure

Where to look for more guidance

Urban Health Capacities Assessment and Response Resource Kit

This kit equips multi-sectoral teams to evaluate whether an initiative can achieve its goals in complex urban settings. The kit provides a structured framework in the evaluation of key capacities across four domains (i.e. informed decision-making, monitoring, and evaluation; policies, programmes, innovation, and change; resource management; and partnerships, participation, and knowledge sharing) at individual, organisational, and systemic levels, with real-world city examples.

Mapping opportunities for training in air pollution and health for the health workforce

This report maps training programmes on air pollution and health for health workers, analysing their strengths and gaps against nine criteria, such as accessibility, accreditation, and teaching methods. Through expert interviews, an online survey of over 400 health organisations, and extensive research, 18 training programmes were identified.

Clean Air, Healthy Planet: A framework for integrating air quality management and climate action planning

This guide outlines nine steps for cities to align AQM with climate action. It emphasises setting visions and strategies that address the climate crisis, air pollution, and public health simultaneously, with recommendations to encourage synergies, avoid trade-offs, and set emission reduction targets for PM2.5 and CO2e.

Toward a healthier world: Connecting the dots between climate, air quality, and health

Based on research with 25 cities, this report demonstrates how cities can leverage evidence to link climate, air quality, and health, thereby strengthening the case for action. It introduces a toolkit and methodology that enable cities to quantify the multiple benefits of climate initiatives.

Innovation Area 3

Analysis, Modelling, and Impact Assessment: Evaluating how actions impact people

Reflection questions	What next?	How to innovate to accelerate progress
Are we integrating different types of data to prioritise, target, and design policy interventions? • What health, social, demographic, and economic data[i] are used in understanding who is most exposed to and affected by air pollution? • How do air quality, health, and socioeconomic data inform which sectors or actions are prioritised and how interventions are designed?	Identify high-risk areas and populations to design targeted, people-centred interventions	Combine air quality and wider datasets (e.g. population, health, spatial data) to guide policy choices, working across departments
Are we making a strong case for action and assessing whether policies deliver results? • How does our department evaluate policy effectiveness over time? • How are impacts assessed across health, economic, and social outcomes (e.g., job creation, livelihoods, accessibility)?	Quantify multiple benefits (e.g. air quality, health, job creation, livelihoods, cost burden, and accessibility) and track outcomes to strengthen the case for action	Use available tools and indicators to estimate impacts, and embed evaluation into policy design (e.g., before-after analysis)
Do we have the capacity to sustain data-driven decision-making? • What technical skills and resources exist to model and evaluate the impacts of policy over time?	Build and maintain analytical capacity to support continuous, data-driven decision-making	Invest in training, tools, and partnerships while strengthening in-house capability over time

i This could include resident age, sex and gender, income, migration status, county of origin, racial or ethnic identity, religious affiliation, primary language spoken, education level, employment status, and occupation. They might also include area-level variables like poverty rates or joblessness rates.

Where to look for more guidance

WHO – Health impact assessment (HIA) methods

This web article explains the stages, methods, and benefits of applying HIAs to policies, projects, and programmes, ensuring health considerations are integrated into decision-making.

AQMx - Air Quality Management Guidance

The Air Quality Management Exchange Platform (AQMx) provides curated guidance for air quality managers across 8 areas, including health impact assessment and environmental impacts assessment.

Air Quality through Urban Actions (AQUA) Tool

The AQUA tool is a user-friendly Excel model that helps cities and policymakers assess the health and economic benefits of emissions reduction. Pre-loaded with national-level data from reputable sources, like the World Bank and Global Burden of Disease, AQUA is especially valuable for cities with limited local data. The AQUA Transport Module is an extension to the AQUA tool. It can be used to rapidly calculate emissions from the transport sector and analyse changes in emissions from a range of transport policies.

Clean Air Zones Toolbox

The toolbox, structured in three parts, provides a comprehensive guide to transformative change for thriving, inclusive, and healthy cities. Part 1 offers a technical guide for introducing Clean Air Zones, including recommendations on data cities should gather to demonstrate why a Clean Air Zone is needed and measure its effectiveness.

Innovation Area 4

Communication and Engagement: Empowering communities through data

Reflection questions	What next?	How to innovate to accelerate progress
Are we communicating air quality data in ways people understand and can act on? • How are real-time air quality alerts and health advisories communicated to residents? • Are messages clear, timely, and actionable during high pollution episodes?	Communicate air quality data in clear and relatable ways to enable residents to understand risks and take protective action	Use simple indices, real-time alerts, and locally relevant messaging across multiple channels
Are we tailoring communication to build trust and relevance across different groups? • How does the city adapt communication based on perception data and lived experience? • How do different groups perceive and respond to air pollution information?	Tailor communication using audience insights to build trust and ensure messages resonate with different groups	Use perception surveys and engagement activities to understand audiences and refine messaging based on local context
Are we engaging communities as active partners in generating and using data? • In what ways are communities involved in data collection (e.g. citizen science, community monitoring)? • Are communities engaged in designing monitoring networks or research activities?	Engage communities as partners in data generation and use in order to shape inclusive solutions and strengthen public buy-in and support	Support citizen science, community-led monitoring, and participatory approaches (e.g. sensors in community spaces, grassroots involvement)
Are we enabling communities to use data to support and influence clean air action? • How are communities supported to use data to track progress and hold institutions accountable? • How is data used to train and engage residents, especially disproportionately affected groups[ii], to raise awareness and build support for policies and behaviour change?	Enable communities to access and use data to build support for policies and strengthen accountability	Provide accessible platforms, tools, and guidance that allow communities to interpret data and engage in decision-making processes

ii This could include resident age, sex and gender, income, migration status, county of origin, racial or ethnic identity, religious affiliation, primary language spoken, education level, employment status, and occupation. They might also include area-level variables like poverty rates or joblessness rates.

Where to look for more guidance

Air Quality Communications Toolkit

This Toolkit serves as a comprehensive resource to help cities communicate their initiatives and progress in tackling air quality challenges. This document equips cities with practical tools to engage stakeholders, raise awareness, and foster meaningful action towards cleaner and healthier environments.

The Breathe London Blueprint

This guide, based on the Breathe London initiative, provides a framework for using hyperlocal air quality data to support city air quality communication. It demonstrates how high-resolution data from low-cost sensors can be used to make air pollution 'visible' to the public through interactive maps, empowering residents to reduce their personal exposure.

Clean air action: applications of citizen science to identify and address air pollution emission sources

This paper highlights how citizen science initiatives explore air pollution sources, drawing on reflections from a purposive literature review of 33 case studies. It offers insights into the ways citizen science methodologies address pollution sources; outlines source-specific outcomes in policy, practice, and behavioural change; and proposes future approaches to strengthen participatory science focusing on pollution sources.

Inclusive Planning: Executive Guide

This executive guide underscores the significance of inclusive climate action in urban planning. It outlines principles and policy recommendations to ensure that fairness and socioeconomic context are central to climate decisions and showcases tools and case studies that cities can draw upon. It is accompanied by a suite of tools and resources, including the following data related modules:

- Conducting a city needs assessment
- Identifying indicators for monitoring and evaluation

Annex B

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