

Strength in Numbers

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



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The principal authors of this report are:

Breathe Cities

Chloe Watson
Luisa Miranda Morel
Cheran Suriyaprakasam
Toby Coombes

Clean Air Asia

Everlyn Tamayo
Enrique Mikhael Cosep
Maria Jannell Feliz Talavera
Ma. Cristine Faye Denna
Precious Benjamin
Dang Espita-Casanova
Glynda Bathan-Baterina



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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**.

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Abbreviations

AQHI	Air quality and health index
AQI	Air quality index
AQM	Air Quality Management
AQMP	Air Quality Management Plan
BMA	Bangkok Metropolitan Administration
CO	Carbon Monoxide
EPA	Environmental Protection Agency
EQuiPD	Equity in Air Quality Policy and Data Ecosystem
LCS	Low-cost air quality sensors
NO₂	Nitrogen dioxide
O₃	Ozone
PCAA	<i>Programa para Contingencias Ambientales Atmosféricas</i> (Environmental Contingencies Programme)
PICCA	<i>Programa Integral Contra la Contaminación Atmosférica</i> (Integrated Programme for Air Pollution Control)
PM	Particulate matter
SO₂	Sulfur dioxide
TA	Technical Assistance
UFP	Ultrafine particles
WHO	World Health Organization
WRF-Chem	Weather Research and Forecasting model coupled with Chemistry
ZUMA	<i>Zonas Urbanas por un Mejor Aire</i> (Urban Zones for a Better Air)

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.





Introduction

Why data matters in driving clean air action

From air quality measurements and emission inventories, to demographic information, lived experience insights, and survey results, data underpins ambitious city interventions to improve the air we breathe. Reliable and accurate data enables cities to understand pollution levels, identify emission sources, assess who is most exposed and affected, and determine solutions that deliver the greatest environmental, health, and economic benefits.

When applied effectively, data ensures that clean air policy design is evidence-based and informed by on-the-ground realities. This is essential for translating political commitments into impactful policies. Without credible evidence, cities risk misallocating resources, investing in mitigation measures that fail to deliver meaningful results or overlooking people that are most in need of air quality improvements. Making this data openly available and communicating it clearly helps foster a deeper understanding of air quality among residents, build public trust, and sustain the support needed to implement and maintain ambitious interventions.

While strengthening the systems to measure, analyse, and communicate air quality data is complex, and often limited by technical and financial resources, cities in the Breathe Cities initiative are proving these challenges can be overcome and the effort is worthwhile.

The opportunity for innovation

Building robust data systems traditionally required substantial technical expertise and financial resources, limiting what many cities could achieve. In recent years, however, innovations have helped accelerate action. This includes the growing availability of low-cost air quality sensor (LCS) networks and portable monitoring devices that complement reference-grade monitors, access to new data sources such as satellite data, advancements in data integration and modelling tools, and communication that enables citizen science, helping cities close data gaps. When cities embrace innovative approaches, they are better prepared to respond to current and future challenges. Crucially, these approaches span a wide financial spectrum: from low-cost, high-impact community perception surveys to higher-cost, high-impact continuous monitoring networks, allowing cities to scale their ambitions alongside their available resources and technical capacity.

In this report

This report highlights how cities with varying capacities are adopting data-informed approaches to strengthen air quality management (AQM) and improve air quality. Through inspiring case studies within the Breathe Cities initiative, as well as wider city-led efforts, it illustrates how city governments are measuring, using, and communicating data in innovative ways to drive clean air action.

The report is designed as a practical reference for AQM practitioners, city officials, and partners. The sections that follow outline how the report defines innovation and highlight four key innovation areas:

1



Data Collection:

Building a comprehensive air quality picture

2



Data Governance and Collaboration:

Unlocking the potential of data through strong institutional foundations

3



Analysis, Modelling, and Impact Assessment:

Evaluating how actions impact people

4



Communication and Engagement:

Empowering communities through data

These are followed by questions to help cities reflect on their current practices and identify next steps, alongside additional resources and tools.





What do we mean by innovation?

Defining data and innovation

This report aims to inspire and provide concrete steps for cities to adopt innovative ways to measure, use, and communicate data to drive clean air action. In this report, **data refers to the quantitative and qualitative information used to inform and assess air quality interventions. This includes measurements and modelling of air pollution, emissions inventories, socio-economic information, health incidences and outcomes, and recordings or documentation of lived experiences of those affected and survey results.**

In this document, **innovation is defined as new or improved tools, technologies, processes, and partnerships, adapted to a city's local context and based on latest evidence, that support cities to collect, analyse, and communicate data and shape effective and fair clean air action for all.** Innovation includes technological advancements, as well as new ways of integrating data across sectors, strengthening institutions, and engaging communities in generating and applying evidence. It can take the form of small-scale, incremental, context-specific improvements, as well as larger breakthroughs, adding value regardless of a city's starting point or capacity.

Ensuring communities benefit from innovation through data

Across the data management lifecycle, cities can use innovation to deliver fairly distributed tangible benefits that aim to benefit all residents, including those who experience the greatest air pollution burdens. The report considers how the innovations highlighted support this objective through three themes ¹:



Community participation:

Engaging residents as active contributors to community-generated data, through participation in citizen science initiatives and sharing of lived experiences, provides more granular insights about local air quality and resident experiences of it, helping to inform more targeted policies. Meaningful collaboration between communities and local governments, built on community-generated data, also strengthens mutual trust and empowers residents as advocates for their local communities. Putting data in the hands of communities allows them to monitor the implementation of interventions and assess whether commitments are being delivered as intended.



Fair distribution of benefits:

Data can help identify and prioritise which communities and locations are most at risk of exposure to poor air quality, enabling targeted interventions to deliver clean air benefits to those who need it most.



Helping communities adjust:

Data-driven planning can help identify those most affected by clean air policies. It can also guide the development of supportive measures that enable communities to better adapt, access new opportunities, and benefit from transitions. This approach is also key to ensure any potential additional burdens on communities that result from clean air policies are identified early and addressed or mitigated.





Innovative ways cities are measuring, using, and communicating data





Data Collection:

Building a comprehensive air quality picture

Pollution levels vary widely within and between cities, shaped by local geography, weather patterns, and emission sources. Accurate, open, and accessible air quality data helps cities build a clear, city-specific picture of air pollution and design evidence-based policies to address it. Through data insights, cities can ensure these policies also deliver wider benefits for residents and the city—from supporting climate mitigation and strengthening local economies, to improving health outcomes and urban livability.

A key challenge for many cities is the limited availability of data as well as difficulties integrating different sources of data, needed to fully understand the air pollution picture in their city. There is a need to complement data from reference-grade monitoring stations, which remain the benchmark for accurate measurements, with other data sources, especially when infrastructure and technical resources are limited.

How are cities innovating?

Embracing low-cost sensor technologies to better understand local air quality

New technologies are increasing accessibility to information relevant to AQM and expanding what cities can achieve.² Cities are using calibrated low-cost sensors (LCS) to complement reference-level monitoring and generate a richer, more contextualised evidence base. Wearable and mobile sensors can be used to measure personal exposure across daily activities and travel routes, generating health impact insights that fixed stations alone cannot provide. Together, these technologies are being used to:

1. Capture pollution patterns at the neighbourhood- or even street-scale, revealing hotspots and highlighting risks for groups who are most exposed to high levels of pollution;
2. Assess the impact of policies and interventions through local scale studies; and
3. Enhance public engagement through community-led monitoring and citizen science initiatives.

In cities with more limited monitoring infrastructure, these approaches are vital to fill immediate evidence gaps, demonstrate the scale and distribution of exposure, empower residents through data and build the case for sustained investment in stronger, more comprehensive measurement systems.³

Addressing data gaps through partnerships

To fill information gaps, cities often partner with universities, research institutions, and non-profit organisations to build robust low-cost monitoring networks, conduct short-term studies that map initial conditions, and identify priority areas for action. These collaborations not only generate early evidence when cities have limited resources but also help them tap into external technical expertise and build capacity. These efforts show that meaningful action can begin even before a comprehensive monitoring system is in place.

Establishing effective data management systems

Gathering data is only one part of the process. Cities also need practical and reliable systems to manage, integrate, visualise, and interpret the growing volume of information generated by AQM efforts. Many cities are turning to cloud-based platforms, automated quality controls, and integrated dashboards that combine data from multiple sources in real time. These systems allow cities to move beyond isolated datasets towards integrated evidence bases, helping decision-makers have clearer, faster insights into where pollution is coming from, which communities are most affected, and which interventions deliver the best benefits. Cities with dedicated air quality data management systems are better equipped to track trends, communicate risks, and support strategic planning. This helps leaders prioritise resources, target high-impact actions, and respond more effectively to emerging air quality challenges.

Measuring additional air pollutants

Air quality networks typically focus on regulated pollutants such as particulate matter (PM_{10} , $PM_{2.5}$), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), and ozone (O_3), supporting cities to prioritise and design effective air quality policies. However, once cities have well-established networks measuring criteria pollutants, some are choosing to expand their monitoring capabilities. There is a growing interest in monitoring super pollutants such as black carbon (BC) and methane (CH_4) to better understand the link between air pollution and climate change. Some cities are also expanding monitoring to include pollutants that are not yet widely regulated but are increasingly recognised for their health effects.

Paris, for example, is championing the targeted monitoring of ultrafine particles (UFP, particles < 100 nanometres) which can penetrate the lungs and bloodstream and thus pose higher health risks, but are not included in standard air quality monitoring. For cities that already have consolidated networks, expanding the scope of pollutants monitored can help them to build an even more detailed picture of pollution sources and design more targeted interventions that deliver even greater health, economic, and climate benefits.

ACCRA, GHANA



Filling data gaps with hybrid monitoring

Many cities struggle with the resources to establish and operate AQ monitoring networks. This results in gaps in spatial and temporal coverage of regulatory air quality monitoring, leaving residents and policymakers without localised information to guide decisions. Accra demonstrates that community-driven, low-cost approaches can meaningfully strengthen air quality monitoring while empowering residents with the knowledge they need to protect themselves from pollution risks.



Innovation

In collaboration with Breathe Cities, Accra has deployed a network of 60 LCS that provide neighbourhood-level insights into pollution patterns, complementing three new reference monitors deployed by the city.⁴ Data from this network is displayed on an open-access [website](#), showing station locations and real-time air quality index (AQI) values. It also provides visualisations such as monthly PM_{2.5} trends and a daily average calendar with intuitive colour gradients, making it easier for residents to recognise patterns and identify higher-risk days. These efforts build on the existing reference grade and growing LCS monitoring infrastructure operated by the Ghana Environmental Protection Authority (EPA) across the Greater Accra Metropolitan Area. This data is stored in a cloud-based system (Campbell Konect), which is accessible to authorised users. The city's network has been further enhanced through partnerships with local universities, international academic institutions, and non-profit organisations, who have conducted short-term measurement campaigns across the city, producing complementary datasets and helping to fill spatial and temporal gaps in the official network.⁵

Impact

The evidence base provided through the city's monitoring network directly benefits policy design, enabling the city to evaluate where interventions may be most impactful and track trends that would not be captured by regulatory stations alone. In particular, the data from the network has supported the development of district-level air quality action plans, and the enforcement of county-level bylaws on waste burning and other polluting activities.

LESSONS

This example demonstrates how a blended evidence base, drawn from regulatory and LCS monitoring and targeted research, can expand access to data and build capacity for evidence-based action, helping cities identify pollution hotspots, evaluate drivers of air pollution, and plan more effective clean air measures.



BANGKOK, THAILAND

Building a comprehensive air quality picture through integrated data

Bangkok is fast emerging as both a regional and global leader on air quality. By developing monitoring infrastructure that brings in data from many sources and building capabilities to integrate this with other information, Bangkok has been able to take a data driven approach to the development of air quality policies and actions despite having fewer resources relative to other countries across Asia.

Innovation

Expanding and diversifying the city's monitoring network has been a key part of the Bangkok Metropolitan Administration (BMA)'s air quality management strategy. Since the 1990s, the city's air quality monitoring network has expanded to more than 70 reference monitoring stations managed by the BMA and 12 stations owned by the national government. Over 800 LCS have also been deployed by partners from the academic and private sectors, providing detailed air quality data in locations not covered by reference stations, such as schools.⁶ Data from this hybrid monitoring network, overlaid on maps, allows the city government to identify pollution hotspots and track more granular trends. By integrating this information with other data, such as weather and traffic, the city can look at the impact of seasonal activities, atmospheric conditions (e.g., thermal inversions), and vehicle volume on poor air quality. Furthermore, combining ground monitoring data with satellite data, and integrating emissions inventory, hotspot, and meteorological data enables Weather Research and Forecasting coupled with Chemistry (WRF-Chem) modelling to forecast air quality.^{7,8} These systems inform the emergency responses issued during air pollution episodes. With support from Breathe Cities, Bangkok is also developing a database and dashboard that integrate air quality and public health data to help guide city decision-making. This work is complemented by community-led initiatives, such as programmes helping to mitigate the impacts of air pollution in schools, that empower community leaders to engage with and use air quality and health data.

Impact

All air quality information in Bangkok is publicly available on the [Airbkk](#) and [Air4Thai](#) websites and mobile applications, including public display boards on the streets. The BMA is using this data to inform the implementation of low-emission zones and the development of the district-level Air Quality Action Plan, ensuring health outcomes are embedded in decision making processes. These transparent systems and community-led initiatives also support residents to advocate for clean air measures and meaningfully participate in decision-making.

LESSONS

Bangkok's ability to build a robust data system has been enabled by the Thailand Pollution Control Department and BMA's investment in robust, high-performance computing infrastructure, and its deliberate engagement with local academic institutions, enabling more advanced data management and analytical capacity.⁹ The city maximised strong vertical integration between the BMA and national agencies, demonstrating how cities can leverage national infrastructure to enhance local analytical capacity.



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.



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

Building the air quality picture in cities through data collection is the essential first step towards effective pollution management. However, to ensure that this data can be used most effectively to inform policy and build wide support, cities must institutionalise the systems, processes, and skills needed to maintain, integrate, and use data over time.

How are cities innovating?



Combining data through cross-departmental collaboration

Air quality data provides a foundation for city action, but it becomes more powerful when it is linked with information from other sectors, such as health, transport, urban planning, land use, energy, and finance. When air pollution measurements are analysed alongside hospital admissions, traffic patterns, and fleet data, or used to inform investments in policy implementation, cities can better understand who is most exposed, what sources matter most, and where interventions will deliver the greatest benefits relative to their cost. Understanding which department owns which datasets and establishing formal data-sharing agreements with timelines and clear roles, shared platforms, and common standards can support city officials to open cross-departmental dialogue, plan together, justify joint investments, and align policies around shared outcomes.

Strengthening in-house technical capacity

Equally important is sustained investment in people. Cities need staff who can deploy and maintain instruments, perform onsite quality control protocols, manage data systems, ensure data quality, run analyses, develop maps and indicators, and translate technical results into decision-ready insights. This requires continuous training, not only for air quality specialists, but also for staff in other departments who rely on this information and find it useful.

Actions can include investing in structured courses, regular hands-on data sessions, and guidance materials and tools, alongside the development of monitoring systems and plans. Partnerships with universities, technical organisations, and peer cities play a critical role in accelerating learning, transferring skills, and building confidence to operate and improve systems independently.

Cities have shown that investment in technical capacity can help them scale up their monitoring networks, strengthen internal coordination, and independently pursue new air quality initiatives. This is evident in Johannesburg, Accra, and Bangkok where Breathe Cities has supported data-related training and workshops for city officials. Leading action in this area has also taken place in many other cities around the world from Quezon City¹⁰, Kampala¹¹, and Addis Ababa to Santiago¹², where focused capacity-building efforts enabled sustained progress despite constrained resources.

Together, cross-departmental collaboration, shared and smart data systems (like dashboards and maps), and strong in-house technical capacity can turn AQM from a specialist function into a core part of how cities plan, invest, and act.





BOGOTÁ, COLOMBIA

Collaboration and data sharing across departments

Bogotá has sustained air quality action not only through policy commitments, but by systematically strengthening the institutions, data systems, and technical capacity required for implementation. Grounded in data from its long-term air quality monitoring network, the city's clean air plan has evolved from a primarily emissions-focused approach into a more comprehensive framework under the Strategic Plan for the Comprehensive Management of Air Quality in Bogotá 2030 - Plan Aire 2030. This newer plan brings together governance, regional coordination, air quality-climate linkages, risk management, and information systems, embedding AQM into the city's core planning and operational processes.

Innovation

A defining feature of Bogotá's approach is how evidence is generated and used across departments. This integrated way of working is clearly reflected in the city's approach to the Urban Zones for a Better Air (ZUMA) initiative - Bogotá's clean air zone. ZUMA was developed through collaboration between environment, health, mobility, and planning departments, using shared data on air quality, emissions, population density, social vulnerability, proximity to schools and health facilities, and exposure along major transport corridors. This integration has also supported the city to develop an Air Quality and Health Risk Index (IBOCA). This index serves as a tool to communicate, on an hourly basis, in a simple and timely manner, the state of air quality, the risk to human health posed by air pollution, and the corresponding level of action or cross-sectoral response.

Alongside these institutional processes, Bogotá has made sustained investments in in-house technical capacity. The city is training its own staff to develop emissions inventories, reducing reliance on external consultants and strengthening institutional continuity. By refining local emission factors within international modelling frameworks, technical teams have improved the accuracy and local relevance of their analyses. This has increased the city's ability to regularly update its evidence base, test scenarios, and support policy design with consistent, high-quality data.

Impact

Multi-sector evidence from cross-department collaboration allows the city to identify priority zones where pollution, health and economic impacts, and daily exposure intersect, and to coordinate targeted measures, such as cleaner transport, traffic management, greener public spaces, and stronger controls on polluting sources. ZUMA shows how shared data systems and joint analysis can translate technical evidence into targeted action. The IBOCA is guiding individual, community and institutional decision-making to reduce exposure to air pollution and prevent adverse effects on human health and the environment. With support from Breathe Cities, Bogotá has also been leveraging these cross-government approaches to accelerate the implementation of wider, ambitious clean air policy interventions across high-impact sectors like transport and construction.

LESSONS

Bogotá's experience shows that lasting progress depends on integrating data into institutions and enabling people to use it effectively. By building shared data systems, strengthening cross-departmental collaboration, and investing in staff skills over time, the city has created conditions for sustained AQM. Bogotá demonstrates how cities can build capacity step by step, using the data and tools they already have to turn technical work into durable, citywide action.





MEXICO CITY, MEXICO

Advancing clean air through sustained action planning

Once considered one of the most polluted cities in the world, Mexico City transformed its AQM through long-term monitoring that drove institutional coordination and adaptive policy. Fixed-site air quality monitoring began in the late 1970s, creating a critical evidence base that enabled the city to move from emergency response to structured AQM. Over time, this data supported the development of successive policies and plans, including the Environmental Contingencies Programme (PCAA), Hoy No Circula (vehicle travel restrictions), and the Integrated Programme for Air Pollution Control (PICCA), which helped establish national standards for fuel quality and vehicle emissions.^{13, 14}

Innovation

This city's strong data foundation has enabled the city to develop long-term planning and coordination frameworks for air quality. ProAire - the Air Quality Management Plan of the city and its metropolitan area was first introduced in 1995 and was typically designed to span 10 years, with updates through successive phases. The plans have supported the city to coordinate across institutions - for instance, the ProAire 1995-2000 created a Metropolitan Environmental Commission (CAM) to coordinate across state lines. Coordinating bodies such as the Megapolis Environmental Commission (including Mexico City, the State of Mexico, and 5 other States) continue to support the city in undertaking cross-jurisdictional action on the environment, particularly air quality. The city also maintains long-term partnerships with institutions, such as the Massachusetts Institute of Technology (MIT) and the Mario Molina Center, as well as other research centres and institutions, to ensure that each new ProAire is based on peer-reviewed atmospheric chemistry. With support from Breathe Cities, Mexico City is now building on its existing monitoring network by developing its first LCS monitoring network. This network will complement the existing regulatory system and generate hyperlocal and higher-resolution spatial data on air quality.

Impact

Successive ProAire phases have led to important advancements in air quality. For example, the ProAire 2002-2010 launched the BRT System, Metrobus, and the ProAire 2011-2020 expanded bike-sharing (Ecobici) and focused on PM_{2.5} particles. As conditions have evolved, so has policy. In response to elevated pollution levels in 2016, monitoring data triggered tighter contingency thresholds, expanded vehicle restrictions, and introduced on-board diagnostics for vehicle emissions testing. The new LCS network will help the city to identify pollution hotspots, supplement existing data, and work with civil society partners to design new policies and tools that combine health, pollution, and vulnerability data. Hyperlocal and higher-resolution spatial data will support the city to strengthen situational analysis, support environmental management, guide interventions, and help reduce public health inequalities, advancing the city's clean air and climate goals.

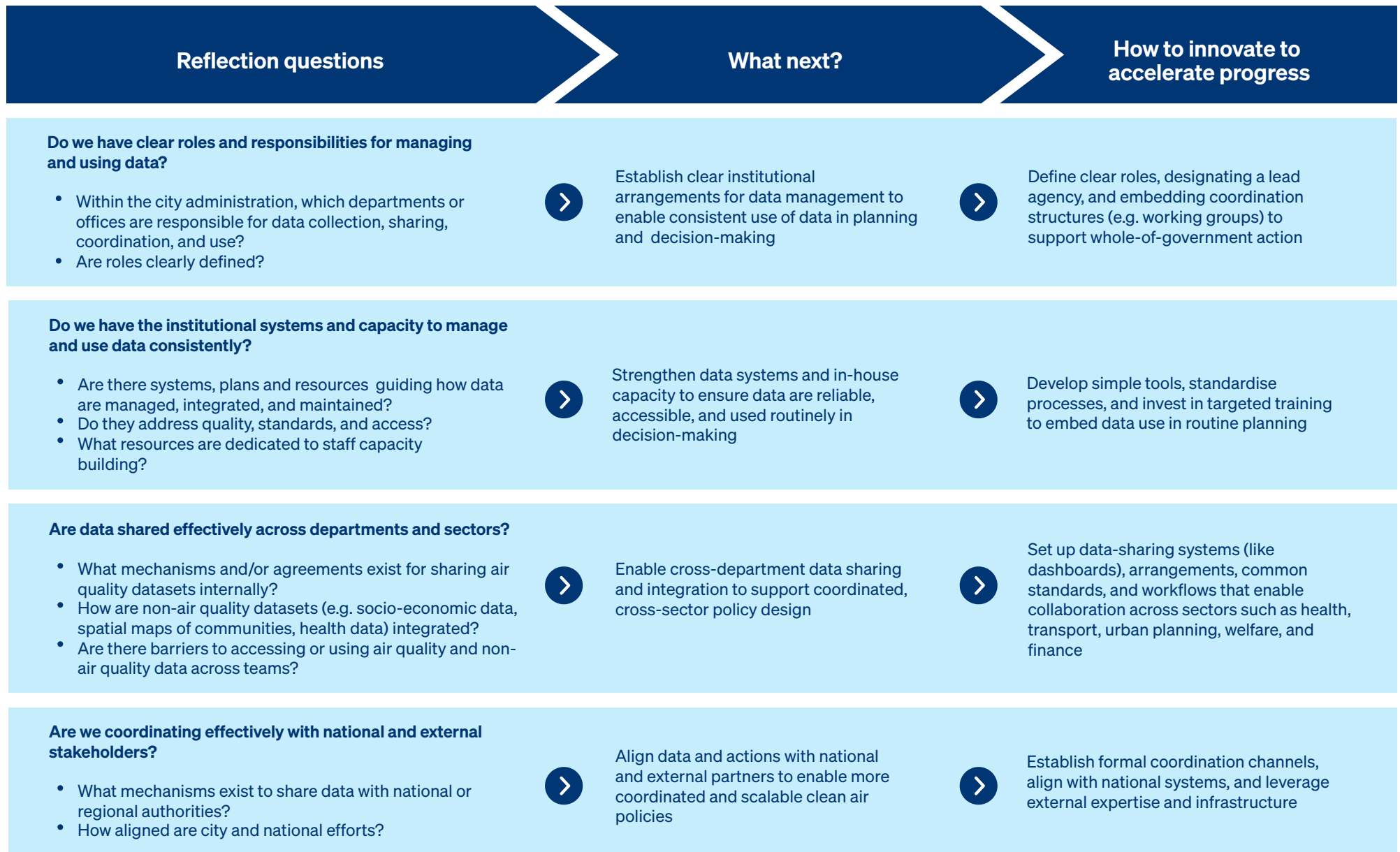
LESSONS

The city's approach highlights how innovative approaches to data, as well as strategic partnership with local institutions, can support and inform long-term institutional strategy and governance.



Innovation Area 2

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





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.



Analysis, Modelling, and Impact Assessment:

Evaluating how actions impact people

Air quality data is about more than just numbers on a map or technical reports; it tells us how air pollution affects people's health and wellbeing and city livability. By using data to understand who is most exposed, what the consequences are, and how policies will benefit people, cities can ensure that their actions directly improve residents' lives and build the public support needed to sustain ambitious clean air action.

How are cities innovating?

Translating data into health insights

Cities are translating air pollution data into health-relevant information through localised air quality health indices. These tools combine the effects of multiple pollutants into a single, riskbased indicator aligned with local air quality standards and conditions. Paired with early warning systems and public alerts, they help communicate not just current air quality, but what it means for the health of all residents, particularly for vulnerable groups such as children, the elderly, and those with existing health conditions. Translating complex data in this way supports more contextualised and informed decision-making by city leaders, enables cities to communicate information in ways that resonate and build public support, and enables residents to take timely, protective actions.

Supporting policies that benefit all

Cities are also strengthening their evidence base by linking air quality data with social, economic, and demographic indicators. Overlaying pollution exposure with factors such as income, age, health status, mobility patterns, or access to services helps reveal inequalities that are often hidden in citywide averages. These insights allow cities to identify communities facing disproportionate burdens and design targeted responses, such as clean air zones that align environmental action with social agendas and public health goals. In doing so, cities strengthen the connection between monitoring, policy design, and tangible improvements in local environments.

Highlighting the economic benefits of air quality action

Many cities are generating new types of data that make the case for clean air in terms that decision-makers and the public care about. This includes estimating the health and economic costs of air pollution and congestion, including assessing productivity losses and healthcare impacts. It also involves tracking the benefits and cost savings of targeted interventions such as pedestrianisation, street redesign, and transitions to cleaner household fuels, and quantifying job creation linked to cleaner transport, buildings, and energy systems. In doing so, cities are reframing clean air not only as a regulatory or environmental issue, but as a development, economic, and livability opportunity. These broader evidence frameworks help shift the conversation from “What does pollution cost?” to “What do we gain by acting?”. They allow cities to compare costs of inaction with the benefits of investment, to prioritise high-impact interventions, and to build stronger coalitions for change across health, education, welfare, transport, finance, and economic development departments.

These approaches show that going beyond air quality data is not just an added layer but can be a powerful catalyst for action. By integrating pollution data with health, and evidence on socio-economic disparities, cities can strengthen the case for ambitious policies, build public trust, and unlock wider benefits for climate, livability, and inclusive growth.



LONDON, UNITED KINGDOM

Quantifying the real-world impacts of clean air action

London has reframed air quality from an environmental metric to a lens to better understand how pollution shapes health, inequality, and everyday life across the city. This includes empowering citizens to monitor local pollution and understand the effects, by providing community groups with sensors through the Breathe London Community Programme, supported by Bloomberg Philanthropies (covered later in this report). By linking pollution levels from London's well-established air quality network to health outcomes, economic costs, and social vulnerability, the city has strengthened the case for ambitious and sustained action.¹⁵



Innovation

The city, in partnership with local institutions, has generated a range of evidence to quantify the real-world impacts of air pollution and air quality action. This includes:

- 1. Quantifying health and economic impacts:** Analyses show that air pollution imposes billions of pounds of annual costs through premature deaths, illness, lost productivity, and pressure on public services. By translating exposure into life years lost and economic impact, the city shifted the conversation from abstract concentration levels to tangible consequences, so decision-makers understand both the scale of the problem and the cost of inaction.^{16, 17, 18, 19}
- 2. Identifying communities and groups most affected and at risk:** Combining air quality data with demographic, health, and socioeconomic indicators, analyses reveal persistent inequalities in exposure, particularly for lower-income communities, ethnic minority groups, and people living along major traffic corridors. Shifting the focus from citywide averages to unequal impacts is helping develop targeted interventions towards those carrying the greatest burden.^{20, 21, 22}
- 3. Understanding the linkage between pollution levels and mobility and urban activity:** Evidence linking air quality with transport modes, car ownership, and pedestrian activity highlights how daily travel choices influence both emissions and health risks. Vulnerability and exposure maps help identify areas where high pollution coincides with high population activity, providing practical guidance for targeted interventions and street-level improvements.^{23, 24}

Impact

By connecting and analysing air pollution levels with other types of data and information, London strengthens the case for more ambitious policies and builds momentum for better government and public support. Ambitious policies in the city have contributed to such substantial pollution reduction that London met legal NO₂ limits for the first time in 2024, almost 200 years earlier than expected.²⁵

LESSONS

London demonstrates that air quality data has the greatest impact when it is linked to health, social disparities, and everyday life. By quantifying health and economic costs, identifying communities most affected, and mapping exposure alongside mobility and urban activity, cities can generate evidence to guide targeted interventions.

BANGKOK, THAILAND

From technology to data-driven insights on air quality health risks

Bangkok is leveraging existing academic and government expertise on the linkages between air quality and health to develop new decision-making and communication tools.



Innovation

The Asian Institute of Technology (AIT) is developing a system to automatically integrate emissions and air pollution data into data dashboards. With Breathe Cities' support, Bangkok is also integrating health data into its air quality index, building a combined air quality and health index (AQHI), which will inform health-based interventions and targets to reduce air pollution. This effort is anchored in strong partnerships with public health centres, alongside different government agencies such as the Department of Medicine, the Department of Healthcare, the Department of Strategies and Evaluation, and the Department of Environment to ensure responsible data sharing and long-term sustainability. This work is accompanied by capacity building for healthcare professionals, policy makers, and city leaders to strengthen their ability to use an integrated data system and translate insights into informed decisions. In parallel to the index, Bangkok is also developing an air quality and vulnerability mapping tool. The city is creating an integrated, interactive map covering all 50 districts through audits of existing data systems, collaboration with public, private, and civil society stakeholders, and alignment of air quality, spatial, and socioeconomic data.

Impact

Together, the AQHI and vulnerability mapping will support risk-based early warning, guide inclusive interventions, and make air quality and health risks visible, actionable, and understandable to the public. This integrated approach strengthens impact-driven decisionmaking that supports the most vulnerable communities.

LESSONS

Bangkok has shown that effective health-based impact assessment relies not only on advanced modelling, but on strong data governance and coordination between agencies and different levels of government. By investing in the capacity of people to interpret data, the city has ensured that technical evidence translates directly into durable, citywide action.



PARIS, FRANCE

Creating child-friendly streets with air quality data

Evidence linking air pollution exposure to adverse health impacts in children, especially those in early childhood, has prompted cities to rethink how streets around schools should function.²⁷

Innovation

Paris' 'school street' approach restricts vehicle access around schools during key hours to reduce pollution, noise, and safety risks. Paris introduced school streets in 2019 as part of a broader strategy to reduce car dependence and improve urban livability. Since then, the initiative has expanded steadily, reaching around 300 school streets by the start of the school year in 2025.²⁸ Unlike temporary closures used elsewhere in Europe, many of Paris's school streets have been permanently pedestrianised, with greening measures helping create cooler, safer, and more inviting spaces for children and the rest of the community.^{29, 30}

To guide and strengthen the policy, the city used air quality data to prioritise schools most in need of a school street, based on high exposure to air pollution. The city now intends to assess conditions before and after pedestrianisation, including reductions in NO₂ concentrations near the schools, and improvements in noise and heat exposure. Breathe Cities is supporting the city's ambitious efforts by partnering with local grassroots organisations to educate, raise awareness, and engage the public in better understanding air pollution. Activities include public events and workshops in schools, working across high schools, middle schools and primary schools in Paris and the larger metropolitan area.

Impact

By framing school streets not only as a traffic intervention but as a response to documented air pollution, noise, and heat risks, Paris has aligned the initiative with wider city objectives, including public health protection, climate adaptation, and neighbourhood livability. Using air quality and traffic evidence to prioritise intervention around schools, the city translated technical indicators into visible improvements in children's everyday environments.

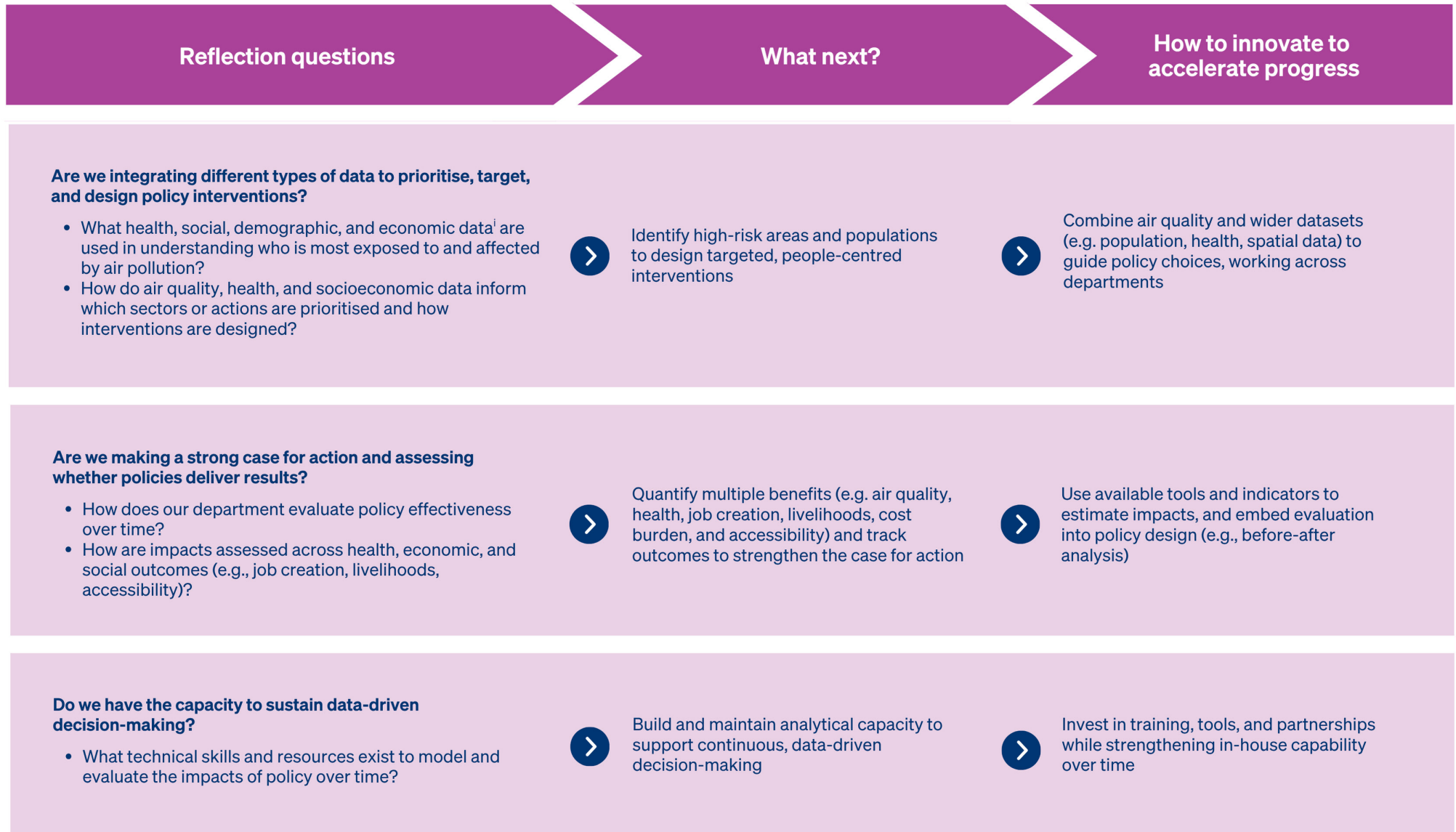
LESSONS

Paris demonstrates how data can be used to prioritise interventions that contribute to wider benefits for communities and that air quality interventions gain traction when they are framed as responses to public values, such as child health and livability.



Innovation Area 3

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



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.

Communication and Engagement:

Empowering communities through data

Air quality policies are most effective when they are supported by and reflect the realities of the people they are meant to protect. By making air quality data open and accessible and prioritising communication, cities can strengthen public awareness and understanding of air quality impacts and interventions, and build trust and accountability. Cities are now recognising that engaging residents as active participants in data collection and policymaking processes, rather than only passive recipients of information, can further strengthen both public support and policy impact.



How are cities innovating?



Refining communication strategies through data insights

Understanding how different groups perceive air pollution is often the first step in developing effective communication strategies for air quality and clean air policies. Surveys and community consultations can help cities identify awareness gaps, differing levels of concern, and priority audiences. At the same time, communities themselves can be empowered to generate and share perception data through grassroots citizen science, participatory research, and local forums. Enabling residents to surface and communicate their own insights strengthens the evidence base and reduces reliance on city-led processes alone. These combined approaches support more targeted communication and educational efforts, helping shape messages, policies, and interventions that resonate with lived realities.



Making air quality data open and accessible

Cities are increasingly making local air quality data open and available to the public, through tools such as open-access platforms, mobile apps, and public display boards. These tools often use interactive maps, colour coding, and visuals, accompanied by clear explanations to make complex data accessible and understandable to residents and decision-makers. Making air quality data openly available supports collaborative action across city government, builds public air quality awareness and understanding, and improves public oversight and accountability of city action.³¹ It can also help to build credibility and trust among residents and empower them as advocates and champions for clean air action.



Supporting community-led data projects

Beyond making data accessible, some cities are also involving residents directly in producing and communicating the data itself. In London, communities are driving local clean air action through the Breathe London Community Programme³², where neighbourhood groups and local organisations have been given sensors, and are supported by academic partners to measure pollution in their own streets. This approach expands monitoring coverage and captures the realities of everyday exposure at the neighbourhood scale. Residents were supported not only to lead their own monitoring campaigns but to interpret findings, link them to lived experience data and use them to inform dialogue with city authorities. This open, near-real-time platform enables communities to explore the connections between air quality, traffic, street design, and daily activities, transforming measurements into clear, locally relevant messages that support advocacy for school streets, safer walking routes, and healthier public spaces. The community programme is part of Breathe London³³, which started as a pilot LCS network to better understand public exposure to air pollution and improve monitoring network coverage. It has since evolved into a collaborative, community-centred network providing increasingly granular, hyperlocal data, growing from 100 sensors in 2018 to over 400 monitoring locations.



Bringing data to life through culture, arts and sport.

Other cities are showing that engagement does not have to rely on technical tools alone to be effective. In Nairobi, air quality data is being translated into music, dance, visual art, and storytelling through partnerships with artists, educators, and community groups.³⁴ In Rio de Janeiro and Johannesburg, the 'It's In The Air' Campaign partnered with Breathe Cities alongside community events with athletes, doctors, and mayors globally to connect clean air with health and sports. By bringing air pollution into cultural and public spaces, cities are reaching audiences who may never engage with technical dashboards or reports. These creative formats connect data to everyday experience, elevate local voices, and make pollution a visible and shared concern, broadening who participates in the conversation and how. Engaging younger generations offers another powerful pathway to long-term impact. Creative, participatory approaches such as citizen science, interactive learning tools, or design-based exercises help make complex data accessible while encouraging young people to imagine healthier, cleaner neighbourhoods and their role in shaping the city's future.

Together, these approaches show how data-driven public engagement can turn air quality information into an open and accessible shared resource. By involving communities in meaningful ways, cities can build trust, support inclusive decision-making, and ensure that clean air action benefits all residents.

Denver's Love My Air Programme^{35, 36, 37}

Denver's Love My Air programme is a citywide initiative designed to reduce air pollution exposure through providing visible, accessible, and actionable air quality information to Denver's diverse residents. Launched in 2018 with support from Bloomberg Philanthropies, as a winner of the Mayors Challenge, the programme has since expanded with support from the Kaiser Permanente Community Health Fund at The Denver Foundation. The programme has grown from an initial network of low-cost air sensors at public school campuses, expanding to high quality, multipollutant monitors in six locations, including local health care centres, museums and parks. By providing real-time, actionable data through interactive educational kiosks and a mobile app, the city ensures air quality information is visible and accessible to the local community. This transparency enables residents to better understand air quality impacts and make informed decisions about their health.

JOHANNESBURG, SOUTH AFRICA

Using community perception surveys to shape clean air action



© Zaheer Cassim

Innovation

With support from Breathe Cities, Johannesburg used public perception data to turn resident voices into actionable evidence for clean air action. Through a citywide survey, which was co-developed with Breathe Cities, the city systematically gathered insights into how people experience air pollution, how concerned they are about its impacts, and how well existing actions are understood. The survey was designed to capture views across different neighbourhoods and demographic groups, providing a broad, city-level picture of lived experience. There were a total of 3,000 respondents across all seven regions of the city. Data was collected through in-person interviews, with local fieldworkers trained to administer the survey. Following the initial data collection, focus group discussions were also conducted to expand on the information from the survey.³⁸ Rather than treating public engagement as an afterthought, the city used this evidence to better align air quality priorities and future policies with lived experience across different communities.³⁹

The findings revealed high overall concern about air pollution and its associated health impacts, but with low awareness of existing air quality policies and interventions. Importantly, the data also showed variation across age groups, with younger residents expressing lower levels of concern despite regular exposure to pollution in their daily environments.⁴⁰ These insights pointed to the need for more targeted, inclusive engagement strategies that reflect how different groups perceive and interact with the issue.

Impact

Johannesburg translated these insights into action by tailoring communication and participation efforts to the groups most in need of awareness-raising. In response to lower concern among youth, the city and its partners developed targeted outreach and training initiatives that equip young people to become advocates for cleaner air with the knowledge and tools to generate data using mobile sensors and the citizen science “Cityzens” app.⁴¹ Physical activity has also been used as an entry point to widen participation in air quality measurement and advocacy, including integrating air quality monitoring by equipped and trained youth clean air advocates along the Soweto Marathon route to connect sport, health, and pollution exposure in a tangible way. Using perception data in this way ensured that engagement efforts were grounded in evidence about who needed to be reached and how, while expanding opportunities for youth-led data generation and advocacy for clean air.

Beyond these targeted efforts, the survey also provided a credible foundation for wider public campaigns and city-wide engagement around clean air zones and future interventions. The findings also informed the design and ongoing development of the city’s Clean Air Zone policy.

LESSONS

By using a structured, repeatable survey approach to inform policy design and public communication, Johannesburg demonstrated how perception data can bridge the gap between technical policy goals and public understanding. The experience shows that well-designed perception surveys can be a practical, low-cost entry point to build trust, guide action, and lay the groundwork for inclusive clean air policies.

BRUSSELS, BELGIUM

Enabling citizen-led air quality mapping for action

Brussels expanded how it measures and understands air pollution by placing residents at the centre of data collection.



Innovation

With support from Bloomberg Philanthropies, the city led a large-scale citizen science initiative called *CurieuzenAir* ⁴², mobilising 3,000 participants to measure nitrogen dioxide (NO₂), a key indicator of traffic-related pollution. In a month-long campaign in 2021, a hyperlocal map of NO₂ concentrations was generated, revealing sharp differences in air quality at a resolution rarely achieved through fixed monitoring stations alone. The project combined widespread participation with transparent data sharing. Results were published on an open-access platform with interactive maps and clear explanations, making complex data accessible to residents, planners, and decision-makers. While the findings confirmed that overall air quality had improved compared to previous years, consistent with the trends at regulatory stations, most residents were still exposed to concentrations above the most stringent WHO guideline, particularly along busy roads. Making these contrasts visible helped link traffic patterns, urban design, and daily exposure in a way that resonated beyond technical audiences. With support from Breathe Cities, the network of diffusion tubes is being expanded, strategically located at pollution hotspots in communities most affected by air pollution. The project is also expanding its network of community ambassadors, who help raise awareness, encourage sustained air quality action, and strengthen engagement among residents. This expansion focuses on directing monitoring and outreach towards communities that face the highest levels of pollution exposure and related health risks. The results from this project will also help inform the 2027 Low-Emission Zone phase of the city.

Impact

Led by local universities and nonprofit organisations and in partnership with the city's environmental department and media outlets, *CurieuzenAir* demonstrated how citizen-generated data can complement official monitoring and build public ownership of air quality evidence. In the years since, Brussels has embedded these lessons into its ongoing work. Citizen science has informed follow-up monitoring initiatives, such as bicycle-based sensors for measuring NO₂.⁴³ This expanded evidence base has strengthened support for citywide measures, including the progressive tightening of Brussels' Low Emission Zone, which has contributed to sustained reductions in traffic-related pollutants and full compliance with the EU annual NO₂ standards at monitoring sites.⁴⁴

LESSONS

These efforts show how citizen-led monitoring, in partnership with local institutions, can act as a catalyst, expanding data coverage, reinforcing trust in official systems, and helping cities sustain momentum for cleaner transport and long-term air quality action.



JAKARTA, INDONESIA

Mobilising youth to drive a cleaner, healthier future

Jakarta engaged young people in air quality action by translating complex environmental data into a creative, participatory experience.



Innovation

Through an initiative supported by Breathe Cities, C40's Reinventing Cities initiative and Minecraft Education, and implemented in collaboration with the Jakarta Environmental Agency and local education partners, more than 2,000 students aged 6 to 18 from over 300 schools were invited to design a low-emission neighbourhood using Minecraft Education. The competition was grounded in real air quality challenges and city policy goals, enabling students to learn how climate action can shape the city they will inherit.⁴⁵ By using a familiar, interactive platform, the city made complex issues (such as pollution sources, transport choices, and urban design) accessible and relevant to younger audiences and their everyday lives.

Impact

By placing youth at the centre of the clean air conversation, the initiative helped build awareness, strengthen environmental literacy, and foster a sense of ownership over future urban environments. Students' designs highlighted priorities such as cleaner mobility, greener streets, and healthier public spaces, offering insights into how communities, particularly younger generations, envision a low-pollution future.

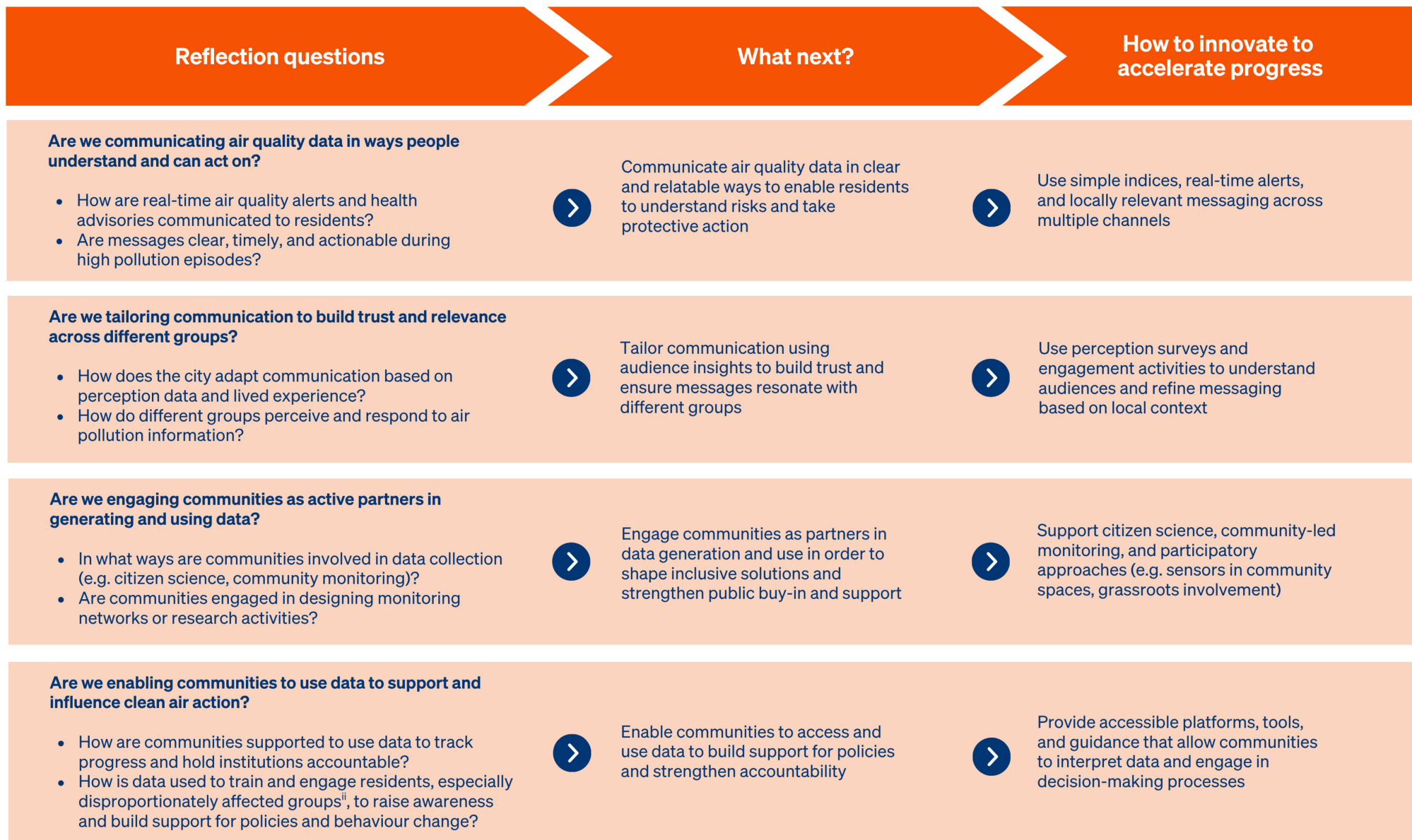
LESSONS

Jakarta shows how cities can translate air quality data into accessible and engaging formats to broaden public understanding and participation. More broadly, this approach highlights that effective communication is about enabling people to understand and relate air pollution data to their daily lives. By connecting scientific evidence with lived experience through interactive, participatory platforms like Minecraft Education, cities can support more impactful clean air action.



Innovation Area 4

Communication and Engagement: Empowering communities through data



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](#)



Conclusion and Scaling City Action

While the challenges posed by air pollution are shaped by unique local factors, such as geography, resources and legal frameworks, all cities have the capacity to harness data as a powerful tool for clean air action. Strategic and innovative use of data can help cities deliver impactful policies and actions that benefit all residents, including those most affected by poor air quality.

Lessons from cities across the world

The case studies featured in this report demonstrate some of the ways cities engaged in the Breathe Cities initiative are innovating through data. It is clear that innovation can come from harnessing new technological advancements like low-cost sensors, as well as how governments build capacity, integrate diverse datasets, and engage their communities.

Several examples began as small and short-term initiatives. These efforts laid the groundwork for broader policies and long-term strategies now in place, reinforcing the message that progress is possible without waiting for sophisticated systems.



Key takeaways for cities and partners

While the previous chapter of this report provided specific next steps for cities looking to make progress under each innovation area, the following points represent the key take-home messages for cities looking to scale their efforts:

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 it 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 effective action.

Invest in systems and people, not monitoring alone

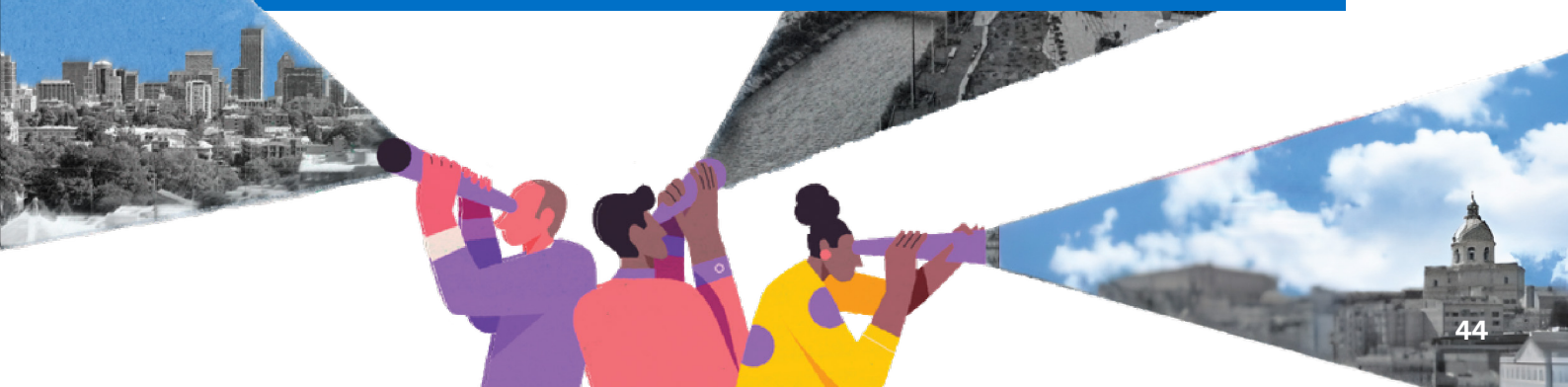
Data has greater impact when integrated across sectors and institutionalised in government processes. Systems that enable effective data-sharing mechanisms and continuous in-house capacity building ensure information is consistently used to guide decisions.

Connect data to people's lives to drive meaningful 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 (e.g. through open data platforms) helps foster public trust and enable 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 advocates and champions for action. Together, these approaches position air quality data as a shared civic resource that empowers communities and supports locally grounded action.



As air pollution challenges evolve, so too must the ways cities respond. The innovations highlighted here offer a foundation for cities to draw on and adapt to their unique contexts. Crucially, the rapid acceleration of these data-driven tools allows governments to close capacity gaps between cities faster than ever, unlocking immediate and significant public health benefits. With strong environmental ambitions, sustained commitment, and the foresight to anticipate emerging climate realities, cities everywhere can make full use of data to accelerate progress towards healthier, more sustainable and inclusive urban environments.





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.

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.





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 dataⁱⁱⁱ 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

ⁱⁱⁱ 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.



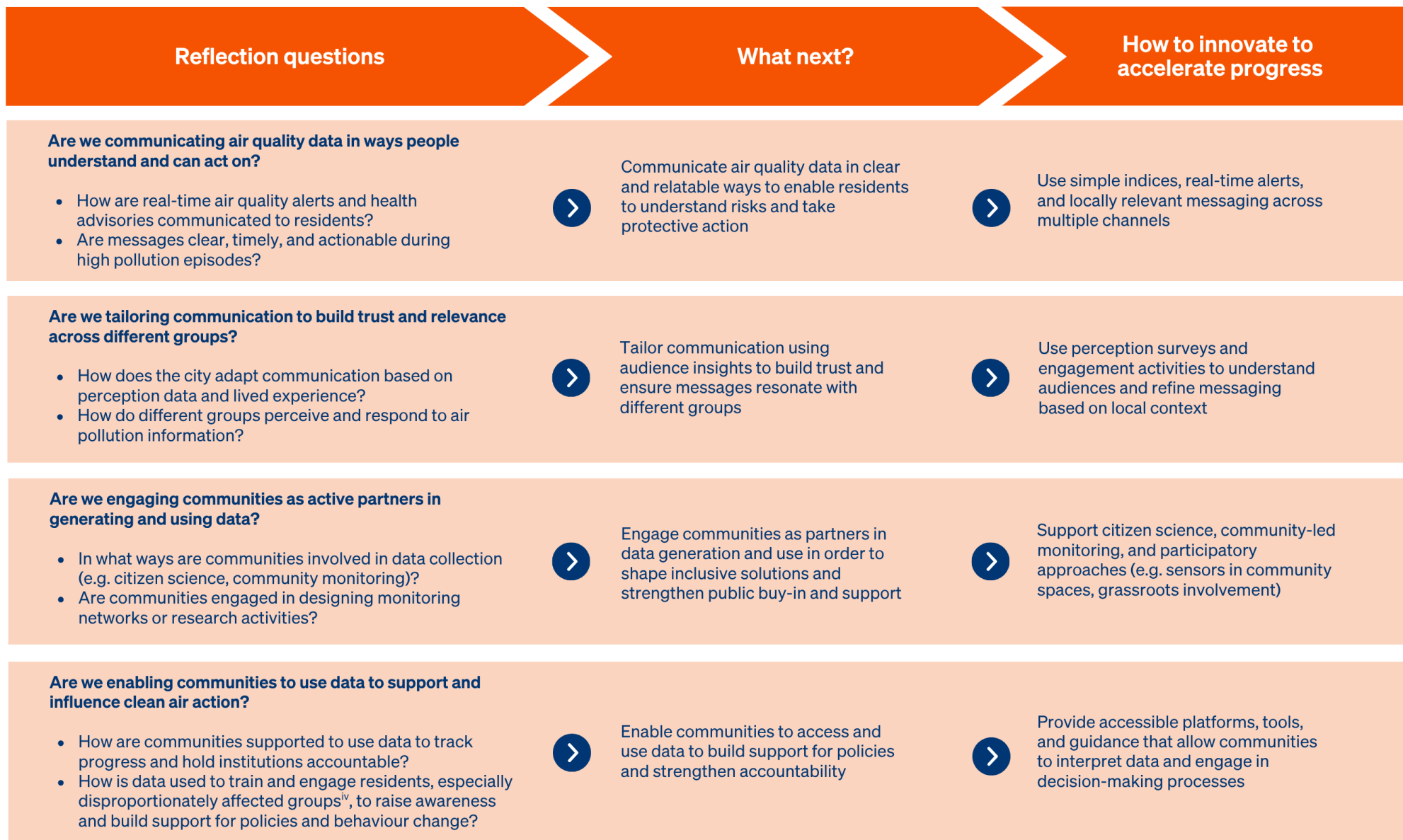
Clean Air Zones Toolbox

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



^{iv} 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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