Smart Air Quality Monitoring

Smart air quality monitoring is a rapidly emerging field that refers to the use of smart, compact and low-cost sensing device technologies to capture data about air quality at the community scale, where people live, work and play. It is helping make information to support air quality action increasingly accessible to local government, communities and researchers.

SMART

Sensors are embedded in smart Internet of Things (IoT) devices that transfer data in near real-time, enabling large distributed networks and sophisticated data processing.

COMPACT

Sensing devices are typically the size of a lunchbox and can easily be installed in public spaces, taking up minimal space.

LOW-COST

'Low-cost' sensing devices range in price from a few hundred to several thousand dollars. This is 'low-cost' when compared with regulatory air quality monitoring equipment, which may be many tens of thousands of dollars.

Air quality monitoring for Smart Places

Smart air quality monitoring is fundamentally a smart city activity, and should be approached as such by local governments. The aim of a smart city or place is to connect people, place and technology to create outcomes that support a better quality of life for all through improved public health, environmental sustainability, a thriving economy, and a strong, fair and democratic civic culture.

Good smart city practice requires two key approaches:

1 Integration

Smart air quality monitoring should be established as part of a broader growing ecosystem of smart technologies and data flows, strategically integrated with the operational processes of local government and the broader social and institutional landscape of a place. This can support real-world practical outcomes across the entire organisation (e.g. transport planning; urban greening policy; events coordination; community services).

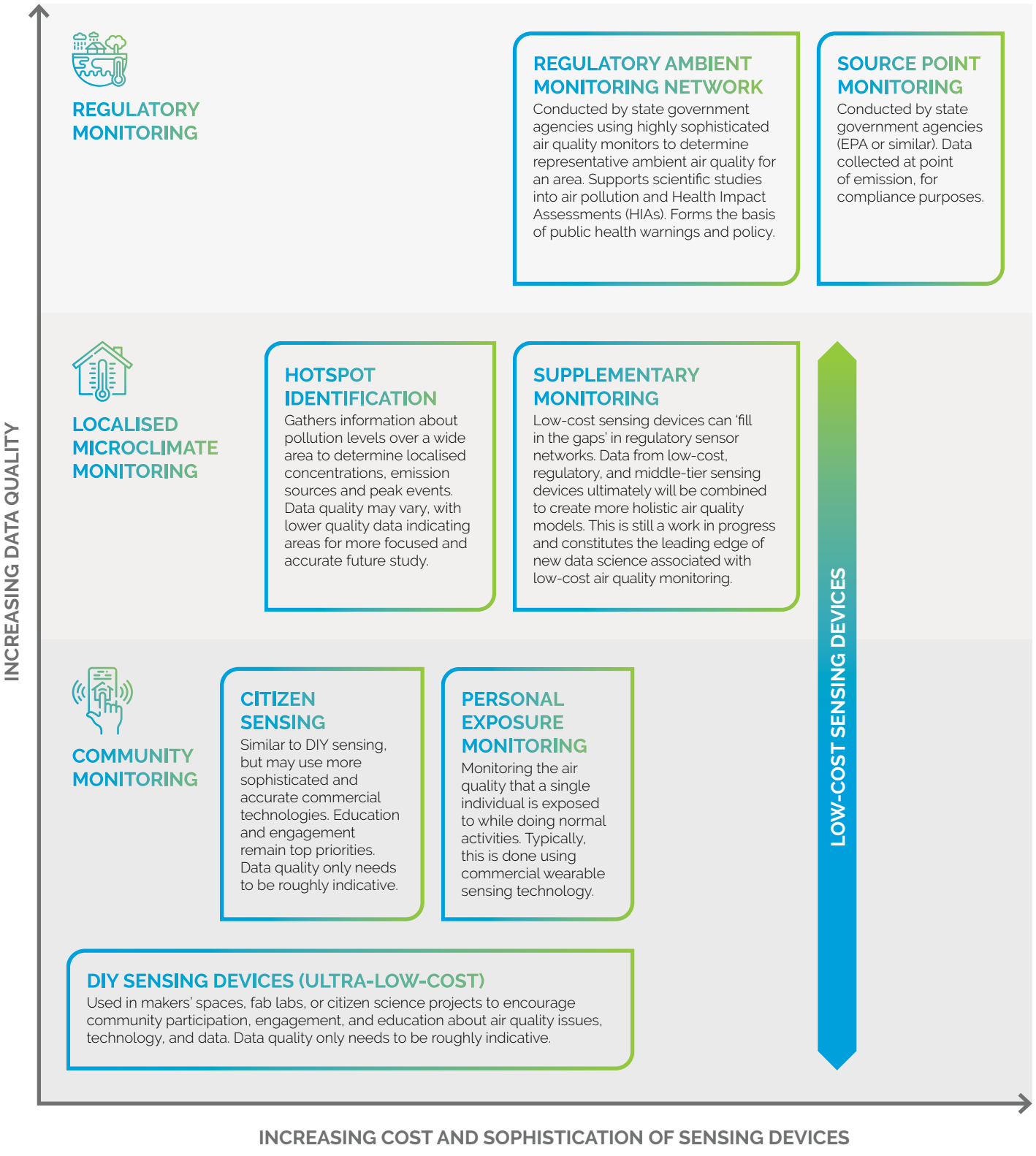
2 People first

Work with the needs of community placed front and centre, with citizens included as active co-creators of smart solutions and outcomes. Air quality affects us all and smart air quality monitoring is a powerful new tool to support engagement and participation.

For further in-depth guidance, please see the NSW Smart Places Strategy and Playbook.

Different types and scales of air quality monitoring

Until recently, the only type of air quality monitoring happening at significant scale was regulatory monitoring, conducted by state government agencies. With the rise of the Internet of Things (IoT) and smart cities, low-cost sensing devices are driving a paradigm shift in how air quality monitoring can be done, and promise to dramatically improve our understanding of and response to air quality issues at a local level.



A gamechanger for local governments

Community-scale
Capture air quality data at the community scale, where people live, work and play.

Understand hotspots
Understand where and when highly localised pollution hotspots occur. This can directly support policy development, priority activities, spending, and communications, and enables more informed, evidence-based engagements with authorities such as the EPA.

Support participation
Smart low-cost sensing devices are particularly suited to citizen science and community action. Local governments can support such activities to achieve educational and participatory outcomes.

Deep insights
Data from smart low-cost air quality sensing devices can be brought together with other types of data, such as people and traffic counts, to reveal complex place-based interrelationships.

Respond in real-time
Live data supports a targeted real-time response to events (e.g. highly localised public alerts on bushfire smoke or asthma risk).

Own the agenda
New affordable sensing device technology puts the air quality agenda directly in the hands of local governments and enables citizen engagement supported by locally relevant data, which has often not been possible before.

Own the data
Local governments can manage and share data on their terms, in accordance with their own policy and strategy.

Flexible technology options
Many approaches and combinations to suit different needs and budgets.

LOW-COST SENSING DEVICES ARE DRIVING A PARADIGM SHIFT IN HOW AIR QUALITY MONITORING CAN BE DONE

'Filling in the gaps'

Regulatory monitoring stations are located away from pollution hotspots to capture data that is representative of larger areas, providing an accurate overview of average air quality. However, we know that air quality can vary significantly at smaller scales, with some places experiencing highly localised pollution. Smart low-cost sensing technologies can 'fill in the gaps' in regulatory monitoring networks. Through the application of emerging data science, it is possible to dramatically improve our understanding of how air pollution is formed and dispersed, how it impacts vulnerable populations, and how to reduce its impact.

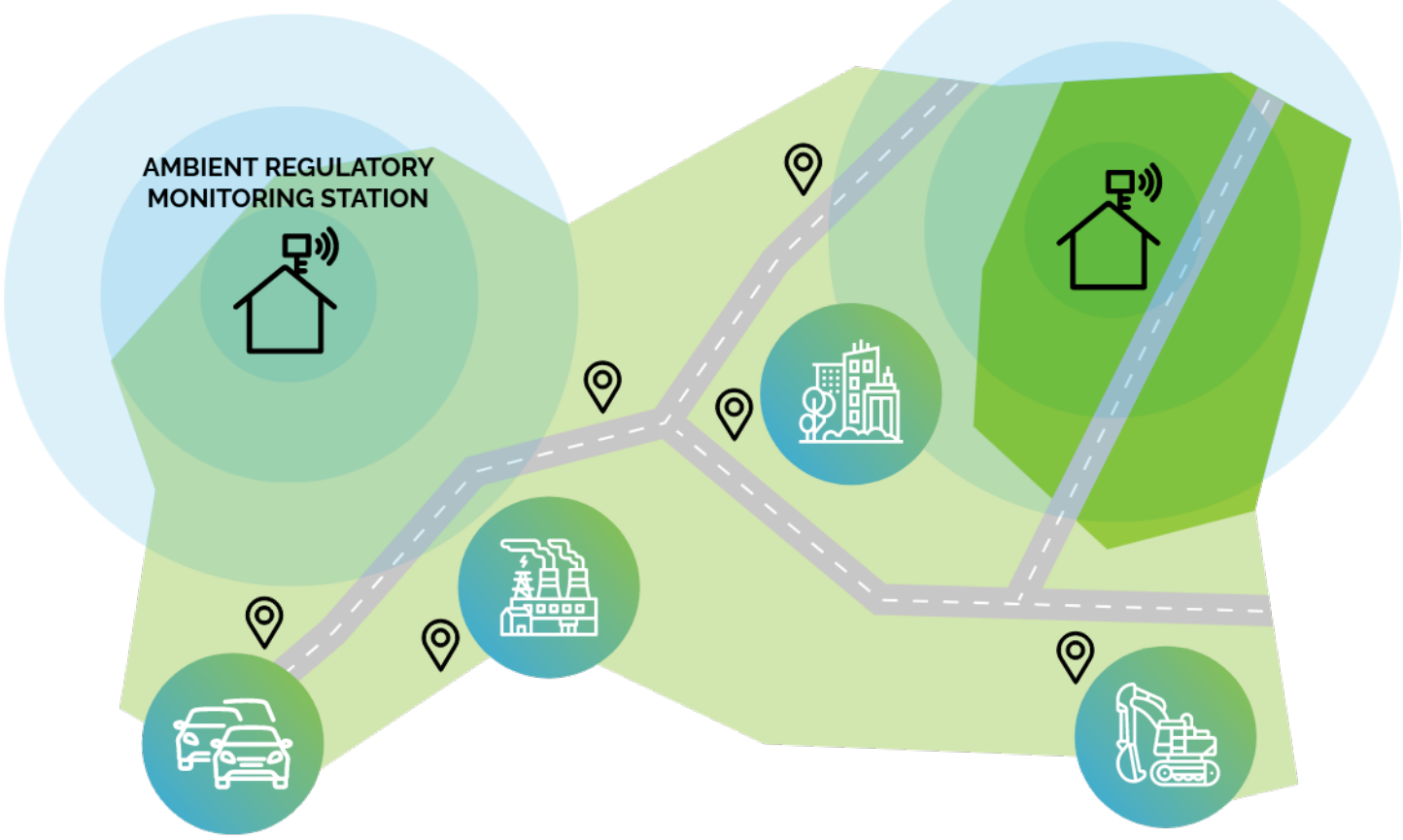
Regulatory air quality monitoring may be thought of as the critical foundation upon which local government-led monitoring rests. Local government air quality data can be understood and have its value increased in the context of regulatory data.

No single technology or approach is 'best'. All are complementary, and a hybrid approach to data gathering and interpretation holds the most promise for understanding and effectively responding to urban air quality concerns, now and into the future.

This requires:

- Collaboration between local governments and multiple state government authorities, the wider community, universities and the private sector through growing a community of practice.
- Establishment of best practice approaches to smart air quality monitoring to ensure that data is collected, interpreted, managed and shared to an appropriate standard. Only then can we start to gather trusted, usable and comparable air quality data for the benefit of everyone.
- The OPENAIR project exists to pursue these two goals with the aim of increasing the value and uptake of smart air quality monitoring in NSW and across Australia.

LOW-COST SENSING DEVICES can capture localised conditions and 'fill in the gaps' in the regulatory framework



A smart low-cost
air quality sensing device

Further reading

The following resources represent the current best guidance on smart low-cost air quality monitoring available globally:

- Making the invisible visible: A guide for mapping hyperlocal air pollution to drive clean air action, Environmental Defence Fund (2019), (www.edf.org/sites/default/files/content/making-the-invisible-visible.pdf)
- The Breathe London Blueprint: How cities can use hyperlocal air pollution monitoring to support their clean air goals, Environmental Defence Fund (2021), (www.globalcleanair.org/files/2021/02/EDF-Europe-BreatheLondon_Blueprint-guide.pdf)
- iSCAPE: Improving the Smart Control of Air Pollution in Europe (www.iscapeproject.eu)
- Air Sensor Toolbox, United States Environmental Protection Agency (www.epa.gov/air-sensor-toolbox)

FIND OUT MORE AND ACCESS OPENAIR RESOURCES

This factsheet is part of a suite of resources designed to support local government action on air quality through the use of smart low-cost sensing technologies. It is the first Australian project of its kind. Check the project website for resources and updates on post project collaborations: **www.openair.org.au**

OPENAIR

NSSN NSW Smart Sensing Network

UTS Institute for Sustainable Futures

NSW GOVERNMENT

POWERED BY THE DIGITAL RESTART FUND

OPENAIR is made possible by the NSW Government's Smart Places Acceleration Program.
20231025 F103 Smart air quality monitoring Version 2 Final

Image source: Lake Macquarie City Council.