Sensing device procurement

When it comes to choosing a smart low-cost air quality sensing device, a wide variety of options are available. The different characteristics of devices on the market can be overwhelming, and make the selection process difficult to navigate. This factsheet will guide you through that process, and help you to choose devices that work for you.

Key points:

- The cost of devices can range from a couple of hundred dollars, to several thousand dollars per unit.
- A device needs to meet the data collection requirements of your project, while also ensuring that you can support it through set-up and ongoing operation.
- When selecting a device, aim to find an optimal balance between cost, performance, functionality, and the practical constraints that you are working within.

The selection and procurement process

1. **Establish a business case** and data requirements
2. **Develop an understanding of your technical requirements** and plan the design of your sensing network
3. **Select device types**, communications, power, and an Internet of Things (IoT) platform
4. **Select and procure** data communications hardware/services
5. **Activate data communications** and test coverage at all deployment locations
6. **Plan and approve** details of all sensing device deployments
7. **Place an order**
8. **Shipping** (8-10 weeks)
9. **Device onboarding** (1-2 weeks)
10. **Receive devices** (occurs after onboarding, if onboarding is covered by your device/platform provider)

Fit-for-purpose devices

The performance of low-cost sensing devices varies enormously. Try not to consider this in absolute terms; rather, choose the device that is most fit-for-purpose. Device performance and quality of data produced only matter relative to your intended use of that device and its data.

For example, a very basic device might be ideal for engaging students or community groups on air quality. A mid-range device might easily serve a project's needs and provide significant cost savings, where a top-of-the-range option would be excessive.

TIP: It is recommended to allow at least six months for the full selection and procurement process

Factors for the selection of sensing devices

The selection of an appropriate smart low-cost sensing device for an air quality monitoring project can be aided by referring to a framework of ten key factors. Carefully consider each factor relative to your business case, data requirements, and practical constraints – this will enable you to develop a list of technical requirements relating to the performance, functionality, and design of your ideal air quality sensing device.

ENVIRONMENTAL PARAMETERS MEASURED

Identify the primary and secondary environmental parameters that need measuring, and ensure that a chosen device(s) can measure them.

ENVIRONMENTAL FACTORS AND ROBUSTNESS

A device may be exposed to environmental conditions (e.g. water, salt, UV, thermal radiation). Understand how device design can ensure robustness and protection.

DATA APPLICATION AREA

Use the OPENAIR *A framework for categorising air quality sensing devices* to understand how sensing devices with different performance metrics can be appropriately applied to different types of data use case.

LIFETIME REQUIREMENT

The functional lifetime of a sensing device relates to a mix of factors, including device complexity, quality, sensor lifetime, battery lifetime, communications, various configurable settings, and design modularity.

SENSOR PERFORMANCE AND TECHNICAL REQUIREMENTS

Understand how to interpret data quality metrics reported on device specification sheets (e.g. error/accuracy, range, resolution, correlation/R2, reporting interval).

POWER SUPPLY TECHNOLOGY

Understand the practicalities and pros and cons of three types of device power supply options: battery-only, solar + battery, and mains power.

COMMUNICATIONS TECHNOLOGY

Smart devices use a variety of data communications technologies. Understand the pros and cons of the different options.

SIZE, FORM, AND AESTHETIC

The aesthetic qualities of devices can matter if they are to be deployed in public places. Consider pole clutter minimisation and the size, form, and aesthetics of the device, solar panel, and mounting assembly.

PROPRIETARY TECHNOLOGY VS OPEN TECHNOLOGY

Commercial devices and systems range from proprietary products or services, to more open technology options. Understand the pros and cons of each approach.

MODULARITY

Some commercially available sensing devices are designed as modular systems that allow different sorts of sensors to be added or removed, and/or component upgrades. This can improve future flexibility of the technology and extend its lifetime.

Additional considerations

The selection of sensing devices should be done with consideration of ongoing operational capacity, and the broader data services and platforms that will support the devices.

Operations and maintenance of your sensing device network

A network of smart sensing devices requires ongoing operational support and maintenance. This carries resourcing demands, in terms of operational expenditure and staff capacity. It may also require certain skills and expertise. When you select devices, consider how you will continue to support them, particularly if you have relied upon external funding for initial capital investment. Certain types and designs of device require more support and maintenance than others. Service models associated with commercial devices can also vary, placing different demands on your staff and resources.

The design of your data architecture

Smart air quality monitoring devices require various data services, and platforms to support them. The complete system of devices, services and platforms exists as an integrated whole – referred to as a 'data architecture'. If you need a more open and modular architecture that integrates with existing enterprise systems, or hosts multiple device types, data streams and applications, then you may need to choose devices (and platforms) that can be easily and effectively integrated into that modular architecture. Certain proprietary technologies may lack the flexibility required to achieve this.

Qualities and attributes of your IoT platform

An IoT platform hosts your smart sensing devices. Many options for sensing devices come with an IoT platform as part of a complete service package – once a device is chosen, you are stuck with the platform and whatever qualities and attributes it has. It is therefore recommended you consider your platform needs when selecting your devices, making sure you can align them with your device choice.

Photo: Lake Macquarie City Council

Associated OPENAIR resources

Please see the OPENAIR Best Practice Guide chapter *Sensing device procurement* for further guidance on this topic.

The *Technical requirements template* and *A guide to developing technical requirements* are detailed, practical tools that will walk you through the processes outlined in this factsheet.

A range of other OPENAIR resources also provide guidance on specific topics mentioned above, including:

- *A framework for categorising air quality sensing devices*
- *Data communications procurement*
- *Sensing device deployment planning: detailed design*
- *Air quality sensing device activation and deployment*
- *Platforms and digital services criteria*
- *IoT system operations.*

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 is coordinated by the National Smart Sensing Network (NSSN) and delivered in partnership with the University of Technology Sydney, Australian National University, Western Sydney University.

OPENAIR is made possible by the Smart Places Acceleration Program under NSW Government's Digital Restart Fund.

20231025 F201 Sensing device procurement Version 2 Final

Image source: Lake Macquarie City Council