Identify template

SR102

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Overview

This OPENAIR *Identify template* is a tool that has been created for use by local governments to assist with the establishment and business case development of an air quality monitoring program. The template sits within a broader suite of resources developed by the OPENAIR project. It will guide your organisation through the foundational thinking for a project, including project establishment, defining specific issues, identifying key stakeholders, and developing a vision for impact creation.

> **WHAT IS IMPACT DESIGN?**
>
> Impact design is a strategic approach to project development that connects planned activities with a specific issue, a group of stakeholders, and a clearly defined set of outcomes and impacts. It helps to maximise your chances of creating measurable and meaningful impact that aligns with the needs of your community, and with your organisation's strategic goals and responsibilities.

This template will help you to:

- establish your project (including roles, governance, and timeline)
- understand your progress on your smart city journey
- position your project relative to your policy environment
- identify a well-defined issue that provides a clear rationale to guide your sensing activities
- define the aims of your initiative
- consider your current data position and needs
- outline activities that create clear and measurable outcomes and impacts
- summarise your plan, and develop an initial Data Use Action Statement.

How to use this template

This template is the first in a series of OPENAIR templates that will guide your organisation through the planning and design of a smart sensing project. The *Identify template* covers the establishment of a new project, and the development of a business case. Subsequent templates will help your organisation make procurement decisions, and design your sensor network.

The beginning of this template contains a summary table for capturing your organisation's Impact Design Strategy (pages 5-10) as well as a framework for writing a Data Use Action Statement (page 11). It is recommended that you complete these *after* working through the rest of the template.

Begin by skipping to Section 1 (starting on page 13). Work through each section of this template, respond to the prompts, and develop the content for your Impact Design Strategy. When your organisation has completed all the sections, you will be ready to fill out the summary table and Data Use Action Statement template provided.

Creating your Impact Design Strategy and Data Use Action Statement

This section of the template summarises your chosen **Impact Design Strategy** and **Data Use Action Statement**. It references detail that can be completed in subsequent sections of the template. Once you have completed this section, print or save it as a separate reference document that can guide future design and evaluation work.

Sections:

1. Summary table: Impact Design Strategy
2. Data Use Action Statement

Summary table: Impact Design Strategy

The summary table below outlines the information required to design and implement a successful local government smart sensing project.

Section 1: Establish
1A) Roles, stakeholders, and governance

Key project delivery roles (Name, organisation, role)	
Collaborative partners (Organisation, role)	

Section 1: Establish	
Non-collaborative external stakeholders (Organisation)	
Teams or working groups (List any defined team or working group, and a quick summary of their role)	

1B) Plan a time frame for your project

Estimated start date	
Estimated end date	

Section 2: Understand

2A) Your smart city journey

Your organisation's current overall smart city maturity rating 1 (low) to 5 (high)	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
Progressing your organisation's smart city vision How will your organisation's new smart air quality monitoring project help you to develop your smart city maturity?	1. 2. 3.

2B) Your organisation's policy environment

Internal policy environment (List your organisation's main policies or strategies that will inform and support your initiative)	Environmental policy/strategy: Planning policy/strategy: Community engagement policy/strategy: Data policy/strategy: Smart city policy/strategy:

2C) Define your issue

What is your organisation's highest-priority air quality issue?	
Who is most affected by this issue, and why does it matter to them?	

Section 3: Design

3A) Your aims

What is your highest-priority aim for this initiative?	
Other aims	

3B) Your data

Your air quality data gap What data do you need to address your air quality issue?	1. 2. 3.
Your data plan Do you feel confident in your ability and plan to fill critical data gaps?	Y / N

3C) Activities, outcomes, and impacts

What are three initial activities your organisation will pursue to address the prioritised issue?	1. 2. 3.

Section 4: Your resourcing capacity

4A) Your people

Who leads?
(Senior management)

Who cares?
Who within your organisation cares about this issue, and is likely to have the remit and capacity to engage with it?

Who knows?
Who within your organisation has specialist knowledge that can support your efforts?

Strategic partnerships
Are there external partners who may be able to collaborate with you, and to contribute additional knowledge, expertise, or operational capacity?

HR gaps
Are there any areas of knowledge or expertise where you think your team may be lacking, but which you believe are likely to be important to achieving success?

4B) Your experience

Which past initiatives already delivered by your organisation relate to this new project?
(Name of project/initiative, contact person)

Section 4: Your resourcing capacity

4C) Your existing data access

Identify the **NSW Regulatory Air Quality Monitoring Stations** in your local government area, and your organisation's current level of access to that data.	1. 2. 3. 4. 5.
Are there any other local air quality or urban heat data sources that might be relevant to your project?	1. 2.

4D) Your existing assets

List any relevant existing environmental sensing devices within your organisation.	Make / Model	Quantity	Status
	1.		Deployed/ Not deployed
	2.		Deployed/ Not deployed
	3.		Deployed/ Not deployed

Make a note of existing data communications infrastructure or services within your organisation, that you plan to use for your project	Type	Coverage location(s)
	1. 2. 3.	
	Name of digital asset	Function (e.g. data storage)

Section 4: Your resourcing capacity		
Make a note of existing platforms, databases, portals, etc. that your project might be able to leverage or use.	1. 2. 3.	

4E) Funding	
Total potential internal income (Staffing + other allocations)	
Total confirmed external income (Awarded only)	
Total potential external income (Awarded, pending, and identified)	

What is a Business Requirements Document?

A Business Requirements Document (BRD) captures the business case for a project. Its content would normally reflect all (or part) of the information covered by this template, including a Data Use Action Statement.

Projects often choose to create a formal BRD for circulation within the host organisation, and among project partners. This makes sense for projects with many partners, where a BRD can provide clarity about scope, vision, roles, and expectations for everyone involved. A BRD can also be useful for promoting your project across wider professional networks, particularly during the early stages.

Depending on your organisation's project needs, you could choose to circulate a completed version of this *Identify template*, or you could capture this template's outputs in a more polished BRD format that fits with your organisation's brand.

Data Use Action Statement

A Data Use Action Statement (DUAS) explains how new data will enable **specific people** to address a **defined issue** through **specific activities**, to produce measurable outcomes and impacts.

A DUAS can be used as a resource to communicate the strategy behind your initiative. See Table 1 for a template that you can fill out for your organisation. Note that a project may have multiple Data Use Action Statements, so duplicate this template as required.

Example of a Data Use Action Statement

There is a **issue** with the level of vehicle emissions around a school entrance during drop-off and pickup times. This matters to parents of schoolchildren because they are worried about the impacts on their children's health. It matters to this organisation because of the stated goal in our Community Resilience Plan to create a healthy and liveable community.

Our **Strategic Planning Team** can address this issue. To do this, they need new **data** about particulate matter that's 2.5 micrometers or smaller ($PM_{2.5}$) associated with road traffic and exhaust gases (such as oxygen, carbon monoxide and carbon dioxide, commonly referred to as O_2, CO, CO_2 respectfully) collected from the school entrance during drop-off (8:00–9:30 a.m.) and pickup (2:30–4:00 p.m.) on weekdays (Mon–Fri). They will use this new data to support the introduction of a no-idling zone near the school entrance, and subsequently to evaluate the impact of the intervention on air quality.

This **activity/intervention** is intended to result in an **outcome** of a 90% reduction in the number of idling cars, causing a measurable drop in localised pollution during drop-off and pickup times. The main **impact** will be a reduction in the hours of exposure of schoolchildren to above-recommended air pollution levels to 0 hours per week. Secondary **impacts** will be improved health outcomes.

Table 1. DUAS template

Data Use Action Statement
There is a issue with [………………].
This matters to [*impacted stakeholder*] because [………………].
It matters to our organisation because [……………..…].
[*Data user*] is able to address this issue.
To do this, they need new data about [*parameter*], collected from [*location*], during [*time period*].
They will use this new data to support [*specified activity/intervention*].
This activity/intervention is intended to result in [*outcome*].
The main impact will be [*primary impact*].
Secondary impacts will be [*secondary impact 1, 2, etc.*].

Section 1: Establish

Sections:

1A) Roles, stakeholders, and governance

1B) Plan a time frame for your project

1A) Roles, stakeholders, and governance

Identify key roles and stakeholders

Start by defining your project team and critical stakeholder relationships (see Table 2). If there are any gaps, now is the time to establish who will fill them.

Table 2. Identifying key roles and stakeholders

Leadership and oversight
Senior staff within your organisation   Name: Title: Name: Title:
Asset managers
Current and future owners/managers of new technology assets within your organisation   Name: Title: Role:
Core project team
Project manager: Technology lead: Environmental lead:

Community engagement lead:

Other: Specify role:

Other: Specify role:

Collaborative partners

Define the role if your organisation does not yet have confirmed partners (this can, in turn, help you select the right partners)

Organisation:

Role:

Organisation:

Role:

Organisation:

Role:

Support roles

Consider technical, data analysis, administrative, and communications support roles

Name: Specify role:

Name: Specify role:

Name: Specify role:

Name: Specify role:

Non-collaborative external stakeholders

Organisation:

Organisation:

Organisation:

Formalise a project governance structure

A formal governance structure is critical for delivering a successful project. It establishes how different individuals, organisations, and interest groups will interact, and how decisions will be made. Figure 1 outlines the features of a generic project governance framework.

Key steps:

- Use Figure 1 as a reference to establish your own project governance framework
- Formalise decision-making processes and responsibilities relating to major and minor design decisions, risk management, and communications.
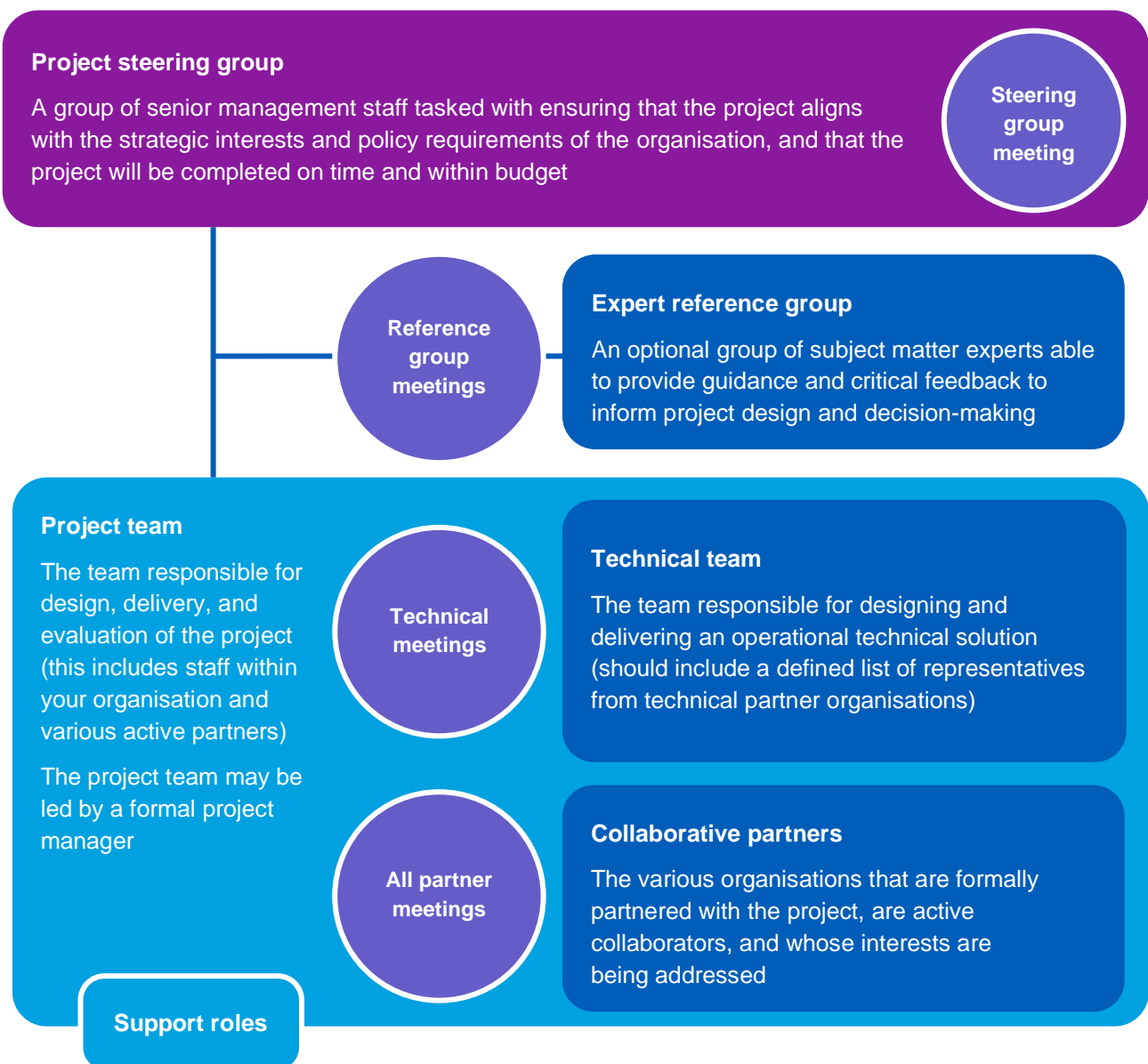- Establish a schedule for regular meetings within and between different groups

Project steering group

A group of senior management staff tasked with ensuring that the project aligns with the strategic interests and policy requirements of the organisation, and that the project will be completed on time and within budget

Steering group meeting

Reference group meetings

Expert reference group

An optional group of subject matter experts able to provide guidance and critical feedback to inform project design and decision-making

Project team

The team responsible for design, delivery, and evaluation of the project (this includes staff within your organisation and various active partners)

The project team may be led by a formal project manager

Technical meetings

Technical team

The team responsible for designing and delivering an operational technical solution (should include a defined list of representatives from technical partner organisations)

All partner meetings

Collaborative partners

The various organisations that are formally partnered with the project, are active collaborators, and whose interests are being addressed

Support roles

Figure 1. A generic project governance framework

1B) Plan a time frame for your project

Consider:

- What are the time frames that will impact your project?
- How long will it take for your organisation to achieve outcomes, and to see impacts emerge?

Table 3 presents a generic delivery template for a smart sensing project, and provides an overview of common project tasks and workflow. Fill in the 'estimated date' column to establish a rough idea of project length and impact time frames. To assist with this task, refer to APPENDIX: Smart sensing project time frames reference table.

Table 3. A summary of estimated project milestones

		Estimated date
Project start date	The date that your organisation commits to action and/or the point at which staff begin to spend significant time on project planning	
Milestone 1	Project established	
Milestone 2	Business Requirements Document (BRD) and/or Data Use Action Statement created	
Milestone 3	High-level design and procurement completed	
Milestone 4	Detailed design completed and approved	
Milestone 5	End-to-end data flow achieved	
Milestone 6	All sensing devices deployed and active; main phase of data collection begins	
Milestone 7	Data activation and early outcomes	
Milestone 8	Data-driven outcomes and impacts emerge	
Milestone 9	Evaluation and reporting completed	
Milestone 10	Project end date	

TIP: Table 3 includes a project end date. However, many smart sensing initiatives continue to operate and evolve beyond the initial project period. If this kind of open-ended approach can be resourced, it tends to support more substantial long-term outcomes and impact.

Section 2: Understand

Sections:

2A) Your organisation's smart city journey

2B) Your organisation's policy environment

2C) Define your issue

2A) Your smart city journey

Establishing and operating a network of smart low-cost sensing devices, and managing the data they produce, is a smart city activity. Local governments may all be at different stages in their journey towards becoming smart cities. The stage your organisation is at right now, and your organisation's aspirations for the future, are highly significant in terms of the type of smart air quality monitoring initiative you should pursue.

TIPS:

- If your organisation has very little in-house knowledge, policy, or investment in smart cities, and your team is unsure how your organisation will engage in this space in the coming years, pursue a stand-alone monitoring initiative that is relatively simple

- If your organisation is further along in its journey towards contributing to (or becoming) a smart city, there may be high-level, strategic aims linked to factors like technology procurement and integration that will fundamentally impact the design of your monitoring initiative.

Smart city maturity framework

A **smart city maturity framework** is a useful tool to help you determine where your organisation is up to on its smart city journey.

As you engage with this next step, it is strongly recommended that you refer to the UrbanTide 'Smart Cities Maturity Model' (2016)[1], which includes detailed descriptions of each of the **five smart city dimensions**, and the **five levels of associated maturity**.

On a scale of 0 to 5, where 0 is 'not even thought about it', 1 is 'very early engagement', and 5 is 'fully realised', identify where you think your organisation sits regarding:

Strategic intent. Successful smart cities have an effective strategy setting out how investment in data and digital technologies enables service reform and partner collaboration.

☐ 0   ☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5

Data. Successful smart cities effectively use their data assets to secure better outcomes. They invest in system-wide data capture, integration, and analytics capabilities.

☐ 0   ☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5

Technology. Successful smart cities invest in open, flexible, integrated, and scalable Information and Communication Technology (ICT) architectures that enable accelerated service innovation.

☐ 0   ☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5

Governance and service delivery models. Successful smart cities adapt traditional

Citizen and business engagement. Successful smart cities make best use of data and digital technologies to invest in enhanced openness and transparency.

☐ 0   ☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5

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[1] This resource was commissioned by the Scottish Government in 2016, and still remains one of the best open access tools available for assessing smart city maturity.

Your current overall smart city journey rating is (average of the five values)**:**

☐ 0   ☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5

Progressing your organisation's smart city vision

Key steps:

- **Consider** where your organisation is right now on its smart city journey.

- **Start planning** the next steps in this journey, with close reference to the Urban Tide 'Smart Cities Maturity Model' (2016). How might a new smart air quality monitoring initiative help your organisation take those next steps?

- **Identify (using Table 4)** up areas of progress that your new smart air quality monitoring initiative can support. Choose from: strategic intent; data; technology; governance and service delivery; citizen and business engagement

Table 4. Identifying areas of progress linked to smart city maturity that your initiative can support

Area 1
Area of progress:
What your want to achieve:
How the new initiative will help to do this:

Area 2
Area of progress:
What you want to achieve:

How the new initiative will help to do this:

Area 3

Area of progress:

What you want to achieve:

How the new initiative will help to do this:

2B) Your organisation's policy environment

Review existing local government policies, strategies, and other formal commitments that directly support engagement with air quality issues and/or a smart air quality sensing project.

Internal policy environment

To plan effectively, your must first take stock of your organisation's internal policy environment.

Environmental sustainability and climate change policy/strategy

Is air quality a key performance metric?

What is the metric?

Are there clear, measurable commitments related to air quality, and if so, what are they?

Are there specific air quality issues that are given particular focus (e.g. vehicle emissions)?

Planning policy/strategy

Does air quality feature as a concern/consideration in development approvals? If so, briefly summarise the types of development, the basic air quality requirements, and other relevant details of the policy position:

Types of development:

Air quality requirement:

Other relevant details:

Consider developments that would be potential air pollution sources, and developments that would be considered vulnerable receptor sites[2]:

Does local government have a position relating to the generation of air pollution associated with construction and civil works? Briefly summarise and include the name of the position document that covers this:

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[2] A vulnerable receptor site is a location associated with certain groups or demographics of people who are vulnerable to the environmental issue of focus; in this case, air pollution. Examples include schools, aged care, hospitals, and public housing.

Community engagement policy/strategy

Name your organisation's current community engagement plan (if one exists):

How does this plan support community engagement regarding environmental issues?

Are there existing community programs (such as citizen forums) that could be a useful platform to engage with your community during the development and implementation of a new smart air quality initiative?

Data policy

Name your organisation's current data policy document (if one exists):

Can this policy be appropriately and adequately applied to the storage, management, accessibility, and sharing of air quality data collected by local government within your LGA? Consider whether it covers the sharing of live data streams:

Smart city or similar technical policy/strategy

Name your organisation's current smart city or similar technical policy/strategy document (if one exists):

Other formal declarations or commitments

Are there any other relevant, formal local government declarations or commitments (e.g. has the mayor/elected official signed the C40 Clean Air Declaration)?

Regulatory responsibilities

In February 2022, the NSW Government released the Clean Air Strategy 2021-30. This strategy presents a cohesive set of priorities and actions to support liveable communities, healthy environments, and the NSW economy by reducing the adverse effects of air pollution on NSW communities.

The strategy sets out actions under **five priority areas** where the biggest gains for air quality and health can be made:

1. Better preparedness for pollution events
2. Cleaner industry
3. Cleaner transport, engines, and fuels
4. Healthier households
5. Better places

Local government authorities in NSW have an important role to play in progressing these strategic priorities, however these are not regulatory responsibilities.

Regulatory responsibilities in relation to air quality for local government in NSW derive from the following pieces of NSW legislation[3]:

- Protection of the Environment Operations Act 1997
- Environmental Planning and Assessment Act 1979
- Local Government Act 1993.

The main responsibilities of local government in NSW that relate to air quality are:

- Management of small businesses (e.g. service stations, printers, dry-cleaners)
- Domestic premises (e.g. wood heater smoke)
- Planning and development (e.g. transport planning, and development approvals)

Despite this, local governments in NSW (and across the whole of Australia) have no explicit legislative requirement to conduct air quality monitoring.

TIP: The NSW Environment Protection Authority (EPA) has developed a Local Government Air Quality Training Toolkit to provide information to local government officers to improve understanding and management of air quality issues under local government planning and regulatory control.

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[3] Similar legislation exists for other Australian states and territories.

2C) Define your organisation's issue

As your organisation begins to prioritise and define a specific and relevant air quality issue, keep an open mind, and think through all the issues that may potentially be relevant to your community.

Prioritise these issues according to need/importance, and ensure there is strategic alignment with local government strategies and policies.

Start broad

Brainstorm all the stakeholder groups in your community. For each group that may have concerns about air quality, define what your organisation thinks these might be:

Stakeholder group 1:

What you think their concerns might be:

Stakeholder group 2:

What you think their concerns might be:

Stakeholder group 3:

What you think their concerns might be:

Stakeholder group 4:

What you think their concerns might be:

[add more stakeholder groups as required]

Examples of community stakeholder groups to consider:

High-street businesses, hospitality businesses, schools, childcare centres, universities, children, parents, hospitals, local government employees, people using sports facilities, cyclists, wheelchair users, commuters using public transport, people living with asthma, pregnant women, homeless people, or Culturally and Linguistically Diverse (CALD) communities.

Prioritise

Key steps:

- **Rank** the identified stakeholder issues in terms of importance and urgency using Figure 2 as a guide. This will give you a priority rating (1 to 4).

- **Check** each priority rating against your organisation's internal policy priorities (see previous section '*Your policy environment*') to confirm alignment.

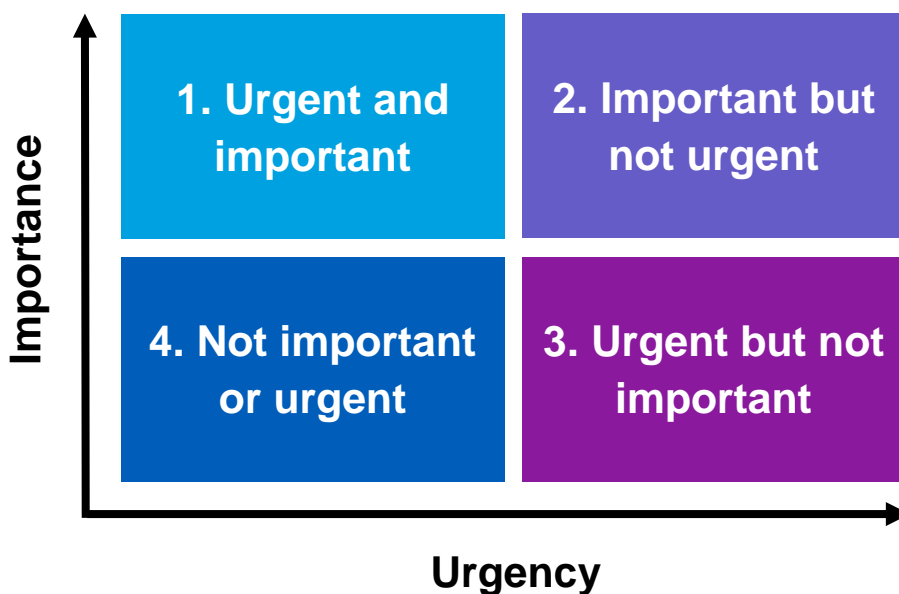- **Complete** Table 5 to summarise priority issues and their correlating policy/strategy

Figure 2. Ranking stakeholder issues based on importance and urgency

Table 5. Identifying issues and their correlating policy/strategy

Issue	Priority rating	Which policy/strategy priority does this issue relate to (if any)?
Example: Vehicle emissions outside school entrance during drop-off and pickup times	1	*Example*: Our local government's 'community healthy environment policy' has air quality as a key performance metric.

Which air quality issue (from the prioritisation exercise in Table 5) has been identified as the highest-ranked issue that also fits with your local government policy imperatives?

Focus

Once your organisation has prioritised one issue, you need to **develop a more detailed assessment** of it and start to bring together the elements of a Data Use Action Statement.

You may choose to repeat this section to cover additional issues, leading to multiple Data Use Action Statements, though it is advisable to keep a tight focus to help maximise chances of impact.

Air pollution

What are the pollutants?

What is causing the air pollution *(activity and source/location)?*

Stakeholders

Who is most affected by this issue?

Who else is impacted (secondary stakeholders or specific groups)?

TIP: Consider whether everyone in your community is impacted equally. In particular, consider the needs and experiences of marginalised and vulnerable groups and individuals.

Location

Where *exactly* is this air pollution being created? (e.g. Broadway and Railway Square)

Where are the people being impacted (defined as 'vulnerable receptor sites')?

Time

When and how often does this issue occur?

Consider daily, weekly, monthly, and annual cycles

Rationale

Why do you think this issue matters to your stakeholders?

Why does this issue matter to local government?

What specific policies, strategies, or commitments are in place that support local government action in this area?

Risk

Summarise the risk posed by this issue

☐ Low   ☐ Moderate   ☐ High   ☐ Extreme

Use the Figure 3 to determine the level of risk:

Likelihood	Impact				
	Insignificant	Minor	Moderate	Major	Severe
Rare	Low ☐	Low ☐	Low ☐	Moderate ☐	Moderate ☐
Unlikely	Low ☐	Moderate ☐	Moderate ☐	High ☐	High ☐
Possible	Low ☐	Moderate ☐	High ☐	High ☐	Extreme ☐
Likely	Moderate ☐	High ☐	High ☐	Extreme ☐	Extreme ☐
Almost certain	Moderate ☐	High ☐	Extreme ☐	Extreme ☐	Extreme ☐

Figure 3. Likelihood/Impact matrix to determine the level of risk posed by the issue.

Describe what a 'do nothing' scenario for this issue might look like

Consider:

- The community response

- The strategic/policy implications for your organisation

- The resourcing and operational implications for your organisation

Section 3: Design

Your organisation should **develop a clearly defined use for the data** your project intends to produce, so that you can create measurable outcomes and impacts as a result of your activities.

Do not produce (or collect) data before you have a plan for how it will be used.

Sections:

3A) Your aims

3B) Your data gaps and needs

3C) Activities, outcomes, and impacts

> This section of the *Identify template* will draw on the information and steps outlined in Section 1, and guide you to the development of a **Data Use Action Statement** (the template for this is in the Overview section of this document). This is essential in terms of having a clear plan for how the data you collect will create measurable and targeted impacts.
>
> It is recommended that you work with the prioritised issue you defined at the end of Section 2.

3A) Your aims

For each priority issue, articulate SMART aims and summarise them in Table 6

SMART aims:

- **S** – Specific: What are your aims? Who benefits, and how?
- **M** – Measurable: How will you know when it has achieved this aim?
- **A** – Achievable: What would you need to do to achieve this aim?
- **R** – Relevant: Why does this aim matter?
- **T** – Timebound: When will you achieve this aim?

It is fine to associate multiple aims with one issue, though it may be helpful to list them in order of priority (highest first). Use Steps 1 to 5 to assist your thinking.

Step 1. What are the **S**PECIFIC aims of your air quality monitoring program?

Consider your aims with respect to:

- **stakeholders** (e.g. reduced exposure of schoolchildren)
- **local government benefits** (e.g. policy alignment, improved compliance management, improved planning approval process, workplace health and safety)
- **data-driven outcomes** (e.g. improved air quality, more walkable places)
- **process-driven outcomes** (e.g. engaged community, improved digital literacy).

Step 2. How could you **M**EASURE success for each of the specific aims in Table 6?

Consider a range of possible quantitative and qualitative benchmarks, including:

- **pollution levels** (e.g. National Environmental Protection Measures [NEPM])
- **attitudes** (e.g. community members report increased feelings of well-being)
- **business KPIs** (e.g. customer complaints; time taken to process DAs).

Step 3. How could you **A**CHIEVE each aim?

Consider:

- Who would take this on (and do they have capacity)?
- What would need to happen to result in measurable change?
- What would be your main actions or areas of agency?

Step 4. What is the **R**ELEVANCE of each aim?

Consider the project's primary stakeholders, and ask:

- Why does the person or group care?
- How would this make people's lives better?
- How would it directly benefit you?

Step 5. How much **T**IME is it likely to take to achieve each aim?

Although this may be difficult to estimate, write down a month and year by which each aim should be achieved. Even if this turns out to be inaccurate, it provides a useful initial indication, and may also help you manage short-, medium-, and longer-term outcomes.

Table 6. SMART aims

Specific	**M**easurable	**A**chievable	**R**elevant	**T**ime-bound

3B) Your organisation's data gaps and needs

Your organisation's data gaps

Consider what critical data is needed to address your issue and achieve your aims. What data do you currently have? What data do you need to find? **Write down current data gaps in Table 7**.

Table 7. Identifying your existing data gaps

#	Critical data Be specific. E.g. For air quality, consider: pollutant, pollution source, type of location	We have no data of any sort linked to this issue	We have data, but it is the wrong sort	We have data, but it is limited and does not support effective action
e.g.	PM$_{2.5}$ associated with road traffic, on roads next to schools	☒	☐	☐
1		☐	☐	☐
2		☐	☐	☐
3		☐	☐	☐
4		☐	☐	☐
5		☐	☐	☐

TIP: It can also be helpful to consider data gaps that do *not* relate to air quality or heat but are required to support your data use case. For example, planning data, pedestrian counts, traffic counts, community attitudes. Consider how your organisation will source this supporting data.

Your organisation's data needs

Once you understand your organisation's data gaps, you can **identify your orgnaisation's data needs**, and consider how to meet them. **Use Table 8** to describe how your project will meet the need for critical data.

Note: You can copy and repeat Table 8 for each data need.

Table 8. Understanding your organisation's data needs

Critical data need	*Copy a critical data description from column B of Table 7*
Third-party sources?	Before you consider collecting new data yourself, you should always research whether someone else is already collecting it (to avoid unnecessary effort/cost). Are there any organisations that might already have the type of data you need? List the names of organisations (e.g. Commonwealth and State government agencies; universities; private sector entities) and their data resources: 1. 2.

If no other organisations have the data your organisation need, you can proceed to planning your data collection

Location Where do you need to collect data?	Tick one or more options, and write in the specific location for each selection:	
	☐ Public space:	☐ Parks:
	☐ Private residential:	☐ Schools/childcare centres:
	☐ Private commercial:	☐ Sports facilities:
	☐ Roadside (major roads):	☐ Aged care facilities:
	☐ Backstreets:	☐ Outdoor events:
	☐ Pedestrian precincts:	☐ Other:
Urgency How soon do you need the new data?	☐ As soon as possible	☐ Within the next year
	☐ Within a few months	☐ No urgency

Timing When do you need to collect data?	☐ Summer	☐ All year
	☐ Winter	☐ Other:

Time frame For how long do you need to collect data?	☐ For a short period (1–6 months)
	☐ Over a medium period (6 months–3 years)
	☐ Over a long period (3+ years/permanently)

Internal data users When you collect/access new data, who will directly use it within your organisation?	Name (if known): Title/position: Department:
	Name (if known): Title/position: Department:
	Name (if known): Title/position: Department:

External data users When you collect/access new data, who will directly use it outside your organisation?	Community stakeholders/groups. Be as specific as you can (e.g. parents of children at primary schools in suburb X) 1. 2.
	Other organisations. Be as specific as you can (e.g. NSW DPE, local health district, or universities) 1. 2.

3C) Activities, outcomes, and impacts

Data is increasingly being applied strategically by local governments to create opportunities for greater impact, allow for real-time decision-making, and increase community engagement.

Data impacts can be planned using **activities ➔ outcomes ➔ impacts** pathways.

Activities are the things your organisation does in response to a defined issue to create outcomes and impacts. In this context, an activity should make use of new air quality data. The activity should only be possible once you collect/access this new data.

Outcomes are the direct result of activities. They must be measurable. Your organisation must have a clear idea of the outcomes you want to achieve (since outcomes directly support impacts).

Impacts are the direct result of outcomes. They should ideally be measurable, although this can be difficult with some types of impact (e.g. 'reduced exposure' can be quantified relatively easily, but 'improved health of schoolchildren', while a valid impact, is harder to quantify). An impact is the reason why your project exists.

Continuing to work with the issue your organisation prioritised at the end of Section 2, you can now **identify actions required to achieve impact**.

> **TIP:** The **OPENAIR supplementary resource** *Activities for impact compendium* provides in-depth information about activities that can be undertaken by local governments to create impact relating to air quality issues.

Data-driven impacts

What activities could be implemented to address the priority issue you have selected (there may be multiple)? For each activity, consider the desired outcomes and impacts and record them in Table 10.

Copy and paste Table 10 to cover additional activities. Table 9 provides an example to assist you.

Table 9. Example of a completed activity ➔ outcomes ➔ impacts template

Example activity	
Activities	
What is the proposed activity? *(Include location, time and target group)*	The introduction of a no-idling zone near a school **(location)** during drop-off and pickup times **(time)**, targeting the parents of school children **(target group)**.
How will the acquired data from this sensing project improve or enable these activities?	$PM_{2.5}$ and exhaust gases (O_2, CO, CO_2, and hydrocarbons) associated with road traffic will become the measured variable to determine success of the no-idling zone.
Outcomes	
For each activity, what are the desired outcomes? *(Include measurable variable and success criteria)*	A significant reduction, by at least 90% **(success criterion)**, in the number of idling cars **(measurable variable)** outside a particular school during drop-off and pickup times.
Impacts	
What will the primary impact be? *(Include measurable variable and success criteria)*	A reduction in the hours of exposure of schoolchildren to air pollution above levels recommended by the National Environmental Protection Measure **(measurable variable)** to 0 hours per week **(success criterion)** during school drop-off and pickup times.
Are there any additional impacts?	Supporting immediate as well as longer-term improved health outcomes among local schoolchildren, teaching staff, and parents.

Table 10. Activity ➔ *outcomes* ➔ *impacts template*

Activity #1

Activities	
What is the proposed activity? *(Include location, time and target group)*	
How will the acquired data from this sensing project improve or enable these activities?	
Outcomes	
For each activity, what are the desired outcomes? *(Include measurable variable and success criteria)*	
Impacts	
What will the primary impact be? (Include measurable variable and success criteria)	
Are there any additional impacts?	

Additional outcomes

In some cases, social engagement, education, upskilling and capacity building can be valued outcomes of activities that are just as important as addressing the air quality issue itself. Consider what additional outcomes might emerge from your proposed activities and list them below.

Organisational outcomes

What **internal organisational outcomes** are important for your organisation?

1.

2.

[Add additional lines as needed]

Examples of internal organisational outcomes include professional development, team building, system integration and technical maturity development, knowledge and insight development, and efficiency improvements.

What **outward-facing strategic outcomes** are important for your organisation?

1.

2.

[Add additional lines as needed]

Examples of outward-facing strategic outcomes include developing new industry or academic partnerships, or building a public profile for your organisation (e.g. for smart city leadership).

Community outcomes

How participatory will your project be?

Choose one of the following, that best describes your intended approach

☐ 1   This project will be an internal local government trial, and community engagement is not currently an active aim or concern. No data will be shared.

☐ 2   This project will have some community visibility. We expect to promote it through standard local government channels, emphasising key aims. Data sharing is a possibility, but it will require further consideration.

☐ 3   We will undertake some basic community consultation, with the intention of releasing some of the data as appropriate.

☐ 4   There will be strong participatory aspects to this project, with full open data release.

☐ 5   Community participation is central to all aspects of this project. Local government will be positioned as the enabling partner in a community-driven project.

Consider the importance of the following community outcomes

On a scale of 1 to 5 (where 1 is 'not at all important', 2 is 'slightly important', 3 is 'important', 4 is 'fairly important', and 5 is 'very important')

- Community members will be included as participants in the design of the project, with a direct say over scope, focus and strategy, fostering a sense of shared ownership

  ☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5

- Community members will engage in activities that support them in gaining knowledge and skills relating to technology, data and environmental issues

  ☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5

- Community members will be included as citizen scientists, actively supporting data collection activities. This will build understanding and trust in the smart technology and the data that it produces.

  ☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5

- Data from the project will be openly released to the community, and community members will be supported to discover, access, interpret and make use of that data

  ☐ 1   ☐ 2   ☐ 3   ☐ 4   ☐ 5

Section 4: Your organisation's resourcing capacity

You need to understand your organisation's current resourcing capacity to identify what else you might require for your air quality sensing initiative.

Sections:

4A) Your people

4B) Your experience

4C) Your existing data access

4D) Your existing assets

4E) Your funding capacity

4A) Your people

Who leads? Without clear top-down support and leadership, local government-led initiatives on air quality are unlikely to thrive or achieve their intended impact.

In Table 10, list at least one member of your organisation's senior executive leadership team who will support this initiative (and make sure to check in with them regularly).

Table 10. Identifying leaders

Person 1	Person 2
Name:	Name:
Title:	Title:
Department:	Department:
Contact details:	Contact details:

Who cares (and can take action)? Use Table 11 to identify allies who care about this issue within your organisation, and also have the remit and/or capacity to engage with it.

Table 11. Identifying allies

Person 1	Person 2
Name: Title: Department: Contact details:	Name: Title: Department: Contact details:
Person 3	**Person 4**
Name: Title: Department: Contact details:	Name: Title: Department: Contact details:

Who knows? Use Table 12 to identify people within your organisation with specialist knowledge that can support your efforts.

Table 12. Identify specialists

Person 1	Person 2
Specialist knowledge: Name: Title: Department: Contact details:	Specialist knowledge: Name: Title: Department: Contact details:
Person 3	**Person 4**
Specialist knowledge: Name: Title: Department: Contact details:	Specialist knowledge: Name: Title: Department: Contact details:

Who can join you in forming strategic partnerships? Use Table 13 to identify external partners who may be able to collaborate with you, contributing additional knowledge, expertise, or operational capacity.

Table 13. Identifying potential strategic partners

On air quality	
Name: Title: Department: Contact details:	Name: Title: Department: Contact details:

On smart technology	
Name: Title: Department: Contact details:	Name: Title: Department: Contact details:

On your chosen area of impact (e.g. traffic planning)	
Name: Title: Department: Contact details:	Name: Title: Department: Contact details:

Who can fill identified knowledge gaps? Use Table 14 to identify any people who have knowledge or expertise that your project team is lacking, but which you believe is likely to be important to achieving success.

Table 14. Identifying potential knowledge experts

Area 1	Area 2
Knowledge area: Name: Title: Department: Contact details:	Knowledge area: Name: Title: Department: Contact details:
Area 3	**Area 4**
Knowledge area: Name: Title: Department: Contact details:	Knowledge area: Name: Title: Department: Contact details:

4B) Tapping into existing experience

If you are planning a new air quality sensing network, make sure you seek out insights, wisdom, or practical strategies from past (or current) projects or initiatives with similar aims or strategies.

Table 15. Learning from past experience

Has your organisation delivered any initiatives (with or without sensing) focused on air quality in the past?	☐ Yes ☐ No
If **'Yes'**, complete the below:	
Name or description of past initiative	
Department responsible	
What was the issue?	
Where was it located?	
Who raised the issue, and who did it impact?	
What did local government do about it?	
Dates	
Name of key contact	
How much did the initiative cost?	
Has your organisation used any smart low-cost environmental sensing devices (of any kind) in the past?	☐ Yes ☐ No
If **'Yes'**, complete the below:	
Name or description of past initiative	
Department responsible	
What was measured?	

What was the purpose?	
What was the make and model of the sensing device(s)?	
How many devices were used?	
Where were they located?	
Start and end dates (or still active)?	
How much did the initiative cost?	

If you have the names or contact details for staff/stakeholders associated with past initiatives, or links to key reference documents, you can note them here:

4C) Your existing data access

Before you start your project, you should find out what data about air quality in your LGA is already available and accessible.

NSW regulatory air quality monitoring stations

The NSW Government operates an extensive network of regulatory air quality monitoring stations, with real-time data available online at the NSW Department of Planning and Environment's Air hub.

List the NSW regulatory air quality monitoring stations within your LGA:

1.

2.

3.

[Add more if required]

Additional available data

Other kinds of live or historic air quality data may also be available for your area.

Does local government own current or historic air quality data sets? ☐ Yes ☐ No

Provide details:

Does local government have relationships with third parties that might be able to provide access to air quality data of direct relevance? ☐ Yes ☐ No

Provide details:

Are there other types of data available that might help you plan your project (e.g. community survey results that capture attitudes and concerns about air quality)? ☐ Yes ☐ No

Provide details:

4D) Your existing assets

Existing hardware, services, and platforms all have the potential to support your organisation's smart low-cost air quality monitoring network, helping to reduce the upfront expenditure required.

Complete Table 16 and Table 17 to create a high-level overview of your **existing assets**.

> **TIP:** If you are not sure about the status/availability of certain assets, you can mark the relevant box to signal that more research is required.

Table 16. Existing sensing devices

Manufacturer	
Model	
Who did it impact?	
Communications technology used	☐ None (data logger) ☐ 3G/4G ☐ Wi-Fi ☐ NBIoT ☐ Open LoRaWAN (The Things Network, or TTN) ☐ Other ☐ Sigfox and proprietary LoRaWAN ☐ Not sure
Parameters measured	☐ Nitrogen dioxide (NO_2) ☐ $PM_{2.5}$ ☐ Sulfur dioxide (SO_2) ☐ PM_{10} ☐ Ozone (O_3) ☐ PM_1 ☐ CO ☐ Temperature ☐ CO_2 ☐ Humidity ☐ VOC
Number of devices currently operating	
Can these devices be relocated, or otherwise used to support your new project?	☐ Yes ☐ No
Key contact person	
☐ Not certain (more research required)	

Existing data architecture services

To qualify as an existing asset that can support your new sensing project, a platform or service must be suitable for ingesting and displaying live data streams.

Table 17. Existing data architecture services

Communications technology	Local government-managed gateways	☐ LoRaWAN (TTN) Number of gateways: Locations with signal coverage:
		☐ LoRaWAN (private) Number of gateways: Locations with signal coverage:
		☐ Sigfox Number of gateways: Locations with signal coverage:
		☐ Public Wi-Fi Number of gateways: Locations with signal coverage:
	Local government service agreements *(with an external telecommunications company)*	☐ NBIoT
		☐ 3G/4G(LTE)
		☐ LTE Cat-M1
	Key contact person	Name:
	☐ Not certain (more research required)	
Device hosting, management, and	Name of platform	
	Key contact person	Name:

basic data interpretation	☐ Not certain (more research required)		
Data management and storage	☐ Cloud storage	☐ AWS ☐ Azure ☐ Other:	
	☐ Local storage		
	Key contact person	Name:	
	☐ Not certain (more research required)		
Analytics and visualisation	☐ Council GIS platform	Name of platform:	
	☐ Other	Name of platform:	
	Key contact person	Name:	
	☐ Not certain (more research required)		
Data sharing	☐ Open data portal	Name of platform:	
	☐ Other	Name of platform:	
	Key contact person	Name:	
	☐ Not certain (more research required)		

4E) Your funding capacity

In this section, you will establish your staff allocation, funding position, and current budget for the activities you have proposed in Section 2C. This will also complement considerations around your organisation's policy environment and your people from earlier sections of this document.

Income

Internal funding

This is funding that is already available within your organisation, and likely pre-allocated to a specific department. If you are drawing on departmental funding, you need to consider the current staffing and operational budgets that could be allocated to your project.

Staffing budget

Reflect on the staffing resources you identified in Section 3A (Your people):

- Which staff would be allocated to the project?

- How much time would they be spending on the project?

For each staff member, calculate the departmental expenditure that would need to be allocated for their contribution. Fill out Table 18, replacing the example budget with your own calculations.

> **TIP:** In addition to considering existing staff, you should also consider staff who may be onboarded to assist with the project. Do not include temporary recruitments or contractors who would be covered by *external* funding sources.

Table 18. An example of a staffing budget

Department and position	Number of staff members (n)	Annual salary (s) (pro rata)	Months per year (m) (allocated to the project)	Days per week (d) (allocated to the project)	Yearly allocated amount ($): $n\left(\dfrac{s \times m \times d}{60}\right)$
Department of the Environment Environmental officer	1	$90,000	8	3	$36,000
Department of the Environment Graduate officer	2	$60,000	8	2	$32,000

Department of the Environment Graduate officer	1	$60,000	8	2	$16,000
Total staff funding allocation to the project *(From existing departmental budget)*				$84,000	

Operational budget

Reflect on your responses to the prompts in <u>Section 1B (Your policy environment)</u>. Do your existing policies or strategies provide rationale to support funding in this area? ☐ Yes ☐ No

Provide details:

Reflect on your departmental operational budget. Which areas of budget would be appropriate to allocate towards your project (e.g. a research and development budget, or a smart cities budget)? Include a dollar amount if possible.

Provide details:

External funding

This is funding that is external to your department or local government organisation, and most likely comes in the form of grants. Fill out Table 19 to identify sources of possible external funding, replacing the example budget with your own calculations.

TIP: In addition to considering current approved external grants, review all available grants (i.e. those received, applied for, or identified as future funding opportunities).

Table 19. An example of an external funding budget

	Funding body	Funding title	Years funded	Confirmed ($)	Applied (pending) ($)	Identified (not applied) ($)
1	NSW Government	Smart Places Acceleration Fund	2022-2023	$100,000		
2	XYZ Trust	Example	2022-2022			$50,000
3	Smart industries Pty Ltd.	Industry Partner	2022-2023	$25,000	$25,000 (in kind)	
			Income totals	$125,000	$25,000	$50,000
		Total <u>potential</u> external income		**$200,000**		

Expenditure

Developing an understanding of your planned project expenditure is a vital part of your business plan that helps to demonstrate that your project is affordable, sustainable, and justifiable.

In order to understand planned expenditure it is necessary to consider the high-level design of your project. This requires you to start thinking about the second stage of project delivery (Design), including:

- **Technology procurement**
    - Establishing the attributes of your sensing device network, including environmental parameters, data quality requirements, and communications technology
    - Procuring data services and data architecture (these are the services and platforms that need to be in place to support your project).

- **Deploying and managing**
    - The design and deployment of your sensing device network
    - Planning for the operational management of your sensing network and data assets
    - Knowing the time frames and key milestones you will be working towards.

There are two OPENAIR supplemental resources that can help you to explore these considerations:

1. *Technical requirements template*

2. *Sensing device deployment planning: high-level design template*

Avoid the fine details for now. Your aim should be to gather enough information from these templates to confidently scope a project budget based off some conservative estimates.

Also remember to consider your labour requirements, including existing capacity, partner capacities, and any contractors. Add time allowance for project delays.

Planning for the end of your project

A sensing network is a fixed asset, with ongoing operational costs. The lifetime of sensing devices may be several years and is likely to be longer than the planned period of your project (and project funding).

An important question you need to ask at the beginning of your project is**:**

What happens to your air quality monitoring network once your initial funding period ends?

Your first air quality monitoring project will most likely be framed as a 'pilot'. Many pilot projects are not extended beyond their official funding period. How can you avoid this happening? How can you make plans now so that your pilot project becomes an ongoing initiative that continues to deliver value to your organisation and community, and is financially sustainable?

Here are some general tips to help you plan for a long-term, sustainable project:

Identify

1. **Design your pilot project with a focused outcome in mind** and ensure that this outcome is one that is strategically important to your organisation (ideally with clear policy connections). If you can successfully achieve your planned outcome, you have proof of the value of the pilot. This creates the rationale for continued (or expanded) core funding from within your organisation.

Technology requirements

2. **Make design and procurement choices that maximise flexibility**, ensuring you can shift your focus and methods later. This lets you adapt what you are doing to meet new or different requirements attached to renewed funding.

3. **Consider reserving most external funds for capital expenditure** (which tends to be a one-off cost) and **earmarking internal resourcing for operational expenditure** (which tends to be an ongoing cost). This ensures that ongoing internal support is sufficient to keep your sensing network and associated services going over the longer term and frees you from over-reliance on grants.

Procure/deploy and manage

4. **Make design and procurement choices with operations in mind**. Think about how certain choices you make now might reduce operational costs later on (e.g. spending more on higher-quality batteries; or deploying devices on local government assets only, in easy-to-access locations). The aim is to keep your ongoing operational costs as low as possible, thus minimising the burden of supporting your sensing network in the longer term.

These topics are addressed in more details in the OPENAIR *Technical requirements template* and the *Sensing device deployment planning: high-level design template.*

APPENDIX: Smart sensing project time frames reference table

Table 20 contains a detailed generic structure for the delivery of a smart sensing project, from inception through to evaluation. Use it to help with the completion of **Table 3 (A summary of estimated project milestones)**.

Table 20. Smart sensing project time frames reference table

Project stage	Task	Task description	Time frame per task
Your project start date: _____			
Identify (Project establishment) 1-3 months	Approval and set-up	Approve and set-up your project internally: • Establish initial scope, vision, and high-level budget; and secure internal approval • Establish reporting requirements.	1-3 months
	Roles and governance	Establish roles and governance: • formalise a governance structure • set recurring meetings.	1 month
	Project time frame	Establish a project time frame, with a series of milestones.	1 month
Milestone 1: Project established			

Project stage	Task	Task description	Time frame per task
Identify (Project strategy) 1-4 months	Align with smart places best practice	Align your project with smart places best practice: • Align your project design with smart places best practice • Assess your progress on your organisation's smart places journey to help you determine the type of air quality monitoring initiatives you are ready to undertake.	1 month
	Identify and engage with key stakeholders	Identify and engage with internal and external stakeholders: • Identify community stakeholders and their air quality concerns • Identify stakeholders within your organisation (e.g. prospective data users) • Build strategic partnerships with a broader community of practice.	1-3 months
	Identify your strategic objective	Identify your strategic objective: • Prioritise a specific air quality issue; identify activities for addressing that issue; and develop clear project aims defined by outcomes and impacts • Define your air quality issue: What are the pollutants and the pollutant sources? Where and when is the issue occurring? Who is being affected? Who cares, and who benefits from any action taken? What are the risks of acting and not acting? • Review your organisation's policies/strategies (e.g. sustainability, planning, and data policies) to determine how they can support your project • Prioritise issues based on importance, urgency, and policy alignment • Consider which activities you want to support with data (e.g. mitigate pollution, reduce people's exposure to pollution, or build capacity to engage with these issues) • Think about the aims of your air quality monitoring project, and define them in terms of planned outcomes and impacts.	1-3 months

Project stage	Task	Task description	Time frame per task
	Identify your data needs	Identify what data is needed to support the aims of your project, and consider how you will obtain it: • What data do you need to support the aims of your project? Consider types of pollutants; sources of pollution; locations of pollution; and other types of data required for interpretation of your primary data set (e.g. meteorological data) • Plan the collection of new data to support your project aims and planned activities by deciding where to collect it; when and for how long it will need to be collected; and intended data users (internal/external) • Think about existing internal data resources, as well as accessible external data. Can existing data support your project aims? Do you need to collect new data using sensing devices, or can you meet your aims using existing data?	1 month
	Review your existing capacity	Review your organisation's existing capacity to support your project: • Review your human resources, and consider who within (or beyond) your organisation can contribute leadership skills, expertise, operational capacity, and time to your project. Can you draw on expertise, knowledge, or insights from similar past projects? • What existing technology, infrastructure, and other assets does your organisation have that can directly support your project? • Are there services, programs, or initiatives run by your organisation that align with your project aims, and can help you deliver your planned activities? • What internal and external financial resources are available? • Develop a detailed operational budget that incorporates these capacities.	1 month

Project stage	Task	Task description	Time frame per task
	Plan your evaluation strategy	Plan a high-level evaluation strategy: • Plan how and when you will measure outcomes and impacts • What are your Key Performance Indicators (KPIs)?	1 month
	Develop a Business Requirements Document and Data Use Action Statement	Formally capture your business case and data use case: • Create a document that captures your business case, such as a Business Requirements Document (BRD) • Create a Data Use Action Statement (DUAS) that describes the air quality issue; the stakeholders impacted by the issue and why they care about it; the data you will collect to better understand the issue; the activities you will implement to address the issue; and the outcomes and impacts that you are aiming to achieve.	1 month
Milestone 2: Business Requirements Document and Data Use Action Statement formally created			
Develop (High-level design) 3-8 months	Plan participatory approaches	If you plan to include citizens in the design of your project and the collection of data, develop a strategy and methodology for delivering this: • Plan who you will engage and how, where, and when you will engage them • Participatory approaches need to be incorporated into a project from early on, and should inform all other design decisions that you make (e.g. technology procurement choices, data sharing, and deployment planning).	1-3 months
	Develop technical requirements	Develop a list of technical requirements for devices, platforms, services, and platforms, based on the requirements of your business case and data use case:	1-3 months

Project stage	Task	Task description	Time frame per task
		• Identify smart air quality sensing devices (and supporting data services and platforms) that can meet the needs of your project and organisation • Establish a data architecture that defines the integration of sensing devices, data communications, platforms, and services.	
	Develop a high-level approach to data management and sharing	Develop a high-level approach to data sharing that can guide the design of your project from an early stage: • Decide who you plan to share data with (e.g. internally, with project partners, and/or with the public) • Decide which data you plan to share (e.g. all or only some data, or abstracted summaries only) • Develop a clear justification for your organisation's data-sharing plan, including how you intend for recipients to make use of the data • Establish a data management and sharing plan for your project, including data administration roles; ethical considerations/risks relating to the collection, management, and sharing of project data; and data access privileges.	1-3 months
	Develop a high-level design plan for deploying sensing devices	Plan the design of your organisation's air quality monitoring network, balancing the needs of your data use case against practical and operational constraints: • Develop a high-level design plan for deploying a sensing device network, including general locations to deploy devices; what to mount them on; how to mount them; and how to support their operation (e.g. communications and power requirements).	1-3 months

Project stage	Task	Task description	Time frame per task
	Plan and procure data communications	Develop a detailed plan for sensing device data communications: • If you use devices with data communications that require private gateways (e.g. Wi-Fi, LoRaWAN), determine how many and where to deploy them, and create detailed deployment plans and secure approvals. This may involve a Radio Frequency (RF) mapping exercise[4]. • If you use devices with data communications that make use of existing communications infrastructure and services (e.g. 3G/4G/NBIoT), make a plan to establish services that meet the needs of your project • Select and procure data communications hardware and/or services, as well as additional mounting equipment if required (e.g. masts or power supply).	2-6 months
Milestone 3: High-level design and procurement completed			
Develop (Detailed design) 3-8 months	Deploy and test communications infrastructure	Deploy and test private communications infrastructure (if required): • Ensure that gateways function reliably, and that undeployed test devices are connecting and sending data through them • Conduct on-the-ground surveys to check the viability of signal coverage in all the general locations where you plan to deploy devices. This provides more detailed empirical understandings than those gained from RF mapping.	1-3 months

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[4] Radio Frequency (RF) mapping involves the use of a 3D topographic model with functions relating to the propagation of the radio communications in question. Virtual gateways and sensors can be located within the model to provide an estimation of signal coverage and strength. The approach is useful but somewhat limited as it does not incorporate the effects of buildings and vegetation.

Project stage	Task	Task description	Time frame per task
	Plan and approve details of all sensing device deployments	Develop detailed documentation for each specific device deployment: • Develop and approve detailed deployment documentation for each sensing device in your network, specifying exact mounting, power supply, and communications solutions, as well as micro-siting details (e.g. height above ground or orientation) • This level of detail is contingent upon having active communications in place, allowing you to confirm viable connectivity.	1-6 months
	Procure devices, platforms, and services	Procure technologies to support your project, informed by the initial technical requirements and additional needs/constraints of your deployment plan: • Select and procure exact numbers, models, and configurations of sensing devices, power supply solutions, and mounting equipment. • Select and procure platforms and services to host and manage devices, store and manage data, and analyse and utilise data.	1-6 months Note: the minimum lead time for international shipping tends to be 8 weeks. Global events (such as a pandemic, or chip shortages) can significantly extend this.
	Develop a data schema	*Note: a data schema is the blueprint for managing your project data. The task of developing a data schema is part of Stage 4 (Manage and analyse data) in the OPENAIR Impact Planning Cycle. However, it may be necessary to develop the data schema earlier in your project, during the design stage.* Tasks include: • Establish a project data schema document that lists and characterises all of the telemetry and metadata fields you will capture	1-2 months

Project stage	Task	Task description	Time frame per task
		- Ensure that the data schema meets the needs of end users by actively working with them, and adapting the schema as needed - Establish a master document to store metadata, and a process for collecting and managing it.	
Milestone 4: Detailed design completed and approved			
Implement and operate (Set-up and testing) 4-8 months	Calibrate sensing devices	Ensure that devices are calibrated to meet the needs of your organisation's data use case: - Calibration may require your own co-location process, either for all devices that you are deploying, or for a representative sample of devices (refer to the OPENAIR Best Practice Guide chapter *Sensing device calibration* for further guidance) - Calibrate individual devices as required and develop data correction factors formulated for your context and data use case.	1-4 months
	Procure device deployment services	Select and procure services for the deployment of all sensing devices: - Refer to your detailed device deployment documentation to develop a step-by-step deployment methodology to support device deployment activities by a third party - This deployment methodology should include instructions relating to: assembly of components and mounting equipment; device activation; device micro-siting guidelines; installation method for all types of mounting infrastructure; verification and quality control procedures; deployment metadata capture and record-keeping; and workplace health and safety	1 month

Project stage	Task	Task description	Time frame per task
		• Arrange in-person briefings with prospective installers to introduce example equipment and supporting documentation (and to enable them to quote accurately on the provision of services) • Procure services according to standard organisational procedures • It is recommended that you oversee and approve a demonstration installation prior to commencing main deployment activities.	
	Develop operational procedures, and procure operational services	Develop operational procedures, and procure operational services: • Establish operational procedures and a routine audit/maintenance schedule • Establish contracts/services for device management and field maintenance; managed communications; platform and data management; and data storage • Clearly appoint operational roles and assign responsibilities (internally and with contractors) • Configure automated device/network management alerts (if supported by your IoT platform) to support standard operations.	1 month
	Integrate systems	Integrate all the technology components of your organisation's smart sensing system: • Integrate your chosen data communications solution with your IoT platform • Establish data storage and management that is aligned with your organisation's data schema, and integrate this with your IoT platform • Onboard devices into your communications server and IoT platform (this means that devices are registered and recognised throughout the system, and that pathways for data flow from devices through to a database are established).	1-6 months Note: the time required may vary considerably, depending on the complexity of the data architecture and the amount of

Project stage	Task	Task description	Time frame per task
			custom development required.
	Conduct test device deployments	Conduct test device deployments to verify deployment methodology and end-to-end data flow: • Deploy two or three test devices in a controlled location with strong communications coverage • End-to-end data flow means that data is flowing from devices through all layers of the IoT architecture, to be stored in the database.	1 month
Milestone 5: End-to-end data flow achieved			
Implement and operate (Full network deployment) Minimum 2 months	Install and commission the full device network	Install the full network of sensing devices: • Acceptance test all devices (confirm activation prior to deployment) • Assemble devices with mounting solutions and supporting equipment • Deploy devices, and capture deployment metadata • Verify reliable data flow from devices to data storage for a planned test period • Verify device deployment metadata and initial data quality • Commission devices and begin the main period of data collection for your project.	1-3 months

Project stage	Task	Task description	Time frame per task
	Undertake troubleshooting	Troubleshoot any issues that arise: • Establish a troubleshooting period following the deployment of a sensing network, where any issues with devices (or the collection of reliable, trusted, and useable data) are diagnosed and addressed • Anticipate having a strong initial focus on troubleshooting, before transitioning into less-demanding, open-ended operational activity.	1-3 months
	Collect and store sensing device data	Ensure that a majority of your sensing devices are correctly and reliably collecting data, and storing it in your organisaiton's database.	Open-ended and/or continuous
	Engage with cybersecurity	Ensure that appropriate cybersecurity measures are in place: • Speak with your IoT service providers about cybersecurity risk and mitigation • Aim to implement best practice identity and access management • Implement IoT system security to ensure that data is protected (both in transit and at rest), and that appropriate authentication is applied to any system providing data collection or device control.	1 month
Milestone 6: All sensing devices deployed and active; main phase of data collection initiated			
Manage and analyse Minimum 2 months	Correct and harmonise data	Correct and harmonise all incoming data prior to storage: • Apply correction factors to incoming telemetry (for calibration and environmental interference)	Open-ended and/or continuous

Project stage	Task	Task description	Time frame per task
		• Harmonise all incoming data with your project data schema.	
	Apply data quality controls	Apply data quality controls to static data sets, or as an automated platform function: • Key actions include data cleaning (detecting and either removing or fixing data anomalies and outliers); abnormal trend detection; and data completeness checks • Configure data quality control functions (in cases where they can be automated into an IoT platform) to process live data streams • Undertake operational data verification to improve trust in, and usability of, your data (e.g. verify environmental data against external references; and/or cross-verify data from multiple devices in your own network).	Open-ended and/or continuous
	Complete a Master Metadata Record	Complete a Master Metadata Record: • Capture all the metadata field entries for the project in a Master Metadata Record (these entries might relate to devices, administration, deployments, telemetry, data harmonisation, data users/owners, or data sharing) • Make sure that this record is available to everyone who requires access • Formalise a process for updating the record, and tracking any updates.	1-3 months Note: this can vary depending on how much metadata collection is needed, and how complex or time-consuming that collection is.
	Identify and integrate	Identify and integrate complementary data:	<1 month

Project stage	Task	Task description	Time frame per task
	complementary data (if required)	• Complementary data is third-party data that supports the use or analysis of your own 'primary' sensing device data • Complementary data may include other types of environmental data (e.g. meteorological or regulatory air quality data), or non-environmental data that relates to your focus issue (e.g. traffic/pedestrian counts) • Complementary data streams should be integrated into your organisation's data store or analytics platform.	
	Analyse data	Apply data analysis to meet the needs of your organisation's data use case: • Data analysis includes a range of approaches of varying complexity (the specifics of your organisation's data use case will dictate your requirements and associated effort) • Common analytics approaches include statistical analysis; temporal interpolation; spatial aggregation and interpolation; complex geospatial system modelling; and AI and machine learning applications • Data analysis can be applied manually (to exported static data sets), or it can be built into the functionality of an IoT or data platform with varying degrees of sophistication.	Open-ended and/or continuous
	Manage and share data	Manage and share data in line with the aims of your business case and data use case: • Assess your organisation's data to determine what you will share, and how you will share it • Create a data management and sharing plan to support accountable, safe, and responsible sharing of data	Open-ended and/or continuous

Project stage	Task	Task description	Time frame per task
		• Assign roles and responsibilities for the management of data and data sharing within your organisation • Establish data sharing infrastructure and management systems • Depending on your organisation's data use plan, share data internally, externally with select partners, and/or openly with the public • Ensure access to data and/or data insights is provided to stakeholders engaged in your chosen activities (e.g. colleagues, partner organisations, or community members).	
Milestone 7: Data activation and early outcomes achieved			
Act on evidence Minimum 2 months	Develop insights, and build an evidence base	Interpret the results of data analysis to resolve actionable insights: • Build insights based on data analysis to create a foundation for action on your chosen air quality issue • Evaluate your organisation's data collection and data analysis methodologies. If necessary, update your approach to improve or focus your data-driven insights.	Open-ended and/or continuous
	Plan and implement activities for impact	Plan and implement activities for impact: • Work with stakeholders to plan and implement data-driven activities that result in planned outcomes and impacts • Activities can include those that are justified by data-derived evidence and insights, or those that are more directly responsive to live data streams	Open-ended and/or continuous

Project stage	Task	Task description	Time frame per task
		• Communication about your project may have started much earlier in the process, but the main effort is likely to occur now, when you have clear insights and activities that you can share • Communication may include the production of official, outward-facing reports, articles for publication, and presentations about your project at events and conferences.	
	Build institutional capacity for impact creation	Engage people from within your organisation with your project, and support impact creation at an institutional scale: • Build awareness and understanding of your project within your organisation (including the issue you are addressing; your data collection activities and the data that you are producing; the data-driven insights that are emerging; and the data-driven activities you are undertaking to address your chosen issue) • Connect data resources with potential data users, and ensure that people are supported to confidently and effectively access and utilise data and insights • Develop institutional procedures and practices to support optimal ongoing utilisation of project data within your organisation.	Open-ended and/or continuous
	Engage your community with data	Actively engage specific sectors of your community with data and insights, to deliver social impact: • Identify specific priority stakeholder groups in your community, and conduct activities to understand their concerns, behaviours, and motivations relating to air quality	Open-ended and/or continuous

Project stage	Task	Task description	Time frame per task
		• If disadvantaged or marginalised groups have a stake in your project, reach out to colleagues who have expertise in working with those groups to seek their advice on your engagement strategy • Develop active programs and initiatives to engage priority stakeholder groups (by supporting participation, education, empowerment, capacity building, and impact creation).	
	Support data discovery and visualisation	Design and implement user interfaces for data discovery and visualisation: • Design and implement tools and strategies that can be used to communicate air quality data to stakeholders and collaborators in meaningful and useful ways • Consider integration of your organisation's data with existing interfaces and platforms that already have established user bases, allowing you to reach a large existing audience (e.g. integration with internal systems within your organisation that are widely used by many departments and staff, such as a city-wide digital twin; website widgets that display live data updates; automated social media alerts linked to live data; or open data portals).	Open-ended and/or continuous
	Build communities of practice, and share knowledge	Build and engage with communities of practice, and share knowledge and insights from your project: • Actively build and engage with communities of practice for smart air quality monitoring • By connecting with others, knowledge and insights can be shared, collaborations can be created, new funding can be accessed, and increased value and impact for communities can be leveraged	Open-ended and/or continuous

Project stage	Task	Task description	Time frame per task
		• Report on key aspects of your project (e.g. project design and governance, methodologies, network and system design, data use cases, and data insights) • Engage in critical reflection, and capture deep methodological and process learnings and insights that can help others doing similar work • Publish and actively share these reports and insights with your community of practice.	
Milestone 8: Data-driven outcomes and impacts have been achieved or are emerging[5]			
Evaluate Minimum 1 month	Evaluate all aspects of your project	1. Evaluate your business case and Data Use Action Statement 2. Evaluate data collection and data efficacy 3. Evaluate data insights 4. Evaluate data sharing 5. Evaluate your data-driven activities for impact.	>1 month[6]
	Evaluation reporting	Report on and publish the results of the evaluation process.	1 month
Milestone 9: Evaluation and reporting completed			

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[5] Desired outcomes and impacts are not always achieved within the tight timeframe of a project. Sometimes, there may be evidence that they are emerging, and this may need to suffice at the point of project reporting.

[6] Note: a cyclical and iterative approach to impact creation should allow for continuous and ongoing evaluation. See the OPENAIR Best Practice Guide chapter *Measuring impact* for further support.

Project stage	Task	Task description	Time frame per task
Project wrap-up Minimum 1 month	Post-project operations planning	Put plans in place for handover and ongoing operation of the sensing network and all associated digital infrastructure and services.	1 month
	Project wrap-up	Process any required funding acquittals, and wrap-up internal project administration.	1 month
Milestone 10: Project completed			

Associated OPENAIR Resources

Best Practice Guide

Sensing device calibration

This Best Practice Guide chapter provides guidance on the calibration of smart low-cost air quality sensing devices. It discusses calibration, co-location, decision-making, and developing and following a plan.

Measuring impact

This Best Practice Guide chapter provides guidance to assist with the measurement, evaluation, and reporting of impact created through a local government air quality monitoring project.

Supplementary resource

Activities for impact compendium

This resource presents a detailed compendium of activities that can be undertaken by a local government to create impact relating to an air quality issue. Activities are categorised into four impact areas: transport; built environment; green infrastructure; and community engagement.

Further information

For more information about this project, please contact:

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This supplementary resource 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. Visit www.openair.org.au for more information.

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