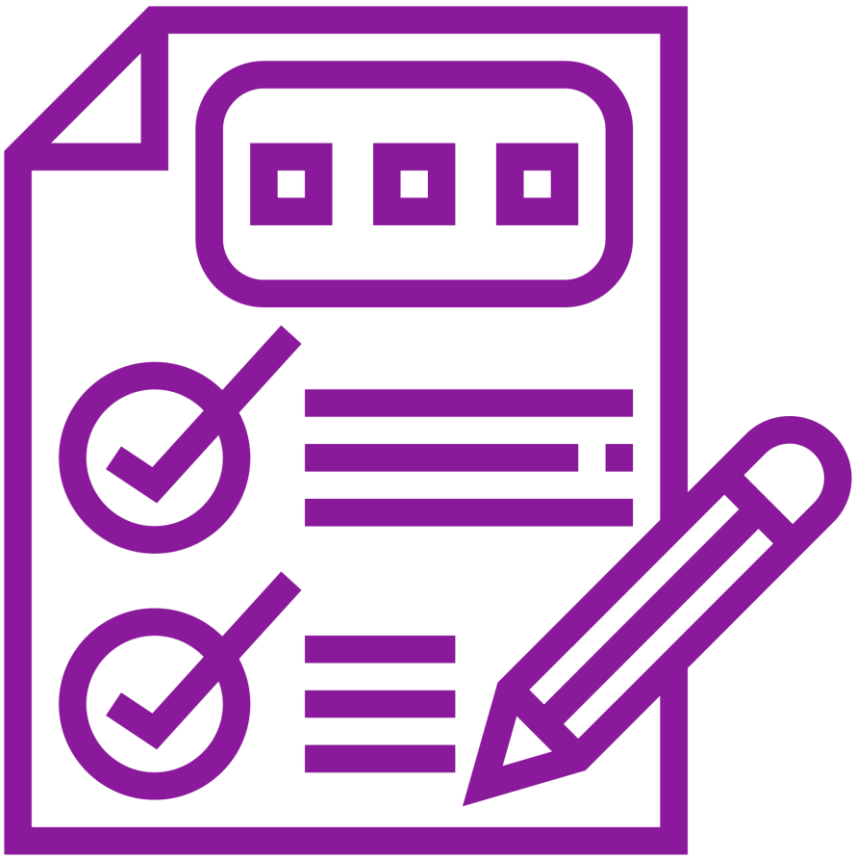
OPENAIR

Operational Network of
Air quality Impact Resources

Best Practice Guide

BP601 | Evaluate

Measuring impact



Introduction

All air quality monitoring activities should be undertaken with the intention to create impact. The OPENAIR Impact Planning Cycle[1] differentiates between **outcomes** (the direct result of project activities) and **impacts** (the wider implications of outcomes). Impacts emerge from project outcomes, and are the justification for acting in the first place.

Evaluation is a process for measuring and critically assessing impact. It can be conducted at the end of a project for reporting purposes, and can help to inform future projects, and contribute to broader knowledge and understanding. However, evaluation is not simply something that occurs at the end of a project. This chapter presents evaluation as an iterative process that can occur throughout a project delivery period.

Project impact can be measured using a **Project Evaluation Plan**, which can be developed based on the frameworks of the OPENAIR Impact Evaluation Cycle, and an associated evaluation methodology.

Who is this resource for?

This chapter is designed to be helpful to local government staff responsible for the design and delivery of an air quality monitoring project. It may also be of interest to staff in roles that support this kind of project, including senior management, community engagement teams, and marketing and communications departments.

How to use this resource

This chapter equips local governments with the tools to plan the evaluation of a smart air quality monitoring project. It focuses on the creation and delivery of a Project Evaluation Plan.

A Project Evaluation Plan is supported by a **business requirements document** and **data use action statement**, which are the focus for the first stage (*Identify*) of a project's Impact Planning Cycle. See the OPENAIR supplementary resource *Identify template* for step-by-step guidance on creating these.

[1] Please refer to the OPENAIR Best Practice Guide chapter *The Impact Planning Cycle overview.*

Understanding impact

Defining impact

Impact is defined as the goal of a project. It is the ultimate result of activities, and the justification for acting in the first place. Impact is distinct from project outcomes, which are the more immediate and measurable results of project activities.

Examples:

- A project activity might deliver community workshops promoting cycling to work. The *outcome* would be metrics relating to the number of workshops and attendees, and data from participant surveys (e.g. 80% of attendees said they would change their behaviour). The *impact* would be how many more people cycle to work as a result of attending the workshops.
- A project activity might be the creation of a new public health SMS alert, triggered by real-time data that indicates poor air quality. An *outcome* might be the total number of people signing up for that service. This might include demographic details (e.g. 50% of users were over the age of 60). The *impact* would be an improvement to public health.

QUICK TIPS FOR EVALUATION SUCCESS

- During project inception, dedicate time and funds for thorough evaluation as a critical project activity
- Consider your capacity for evaluation, and determine what you can achieve internally, and what you need to outsource
- Form and maintain strategic partnerships that can aid you in robust, ongoing impact evaluation
- Assign clear roles and responsibilities relating to evaluation
- Understand the Impact Planning Cycle from the start, and use it to create a strong business requirements document and data use action statement that define how planned activities will lead to desired outcomes and impacts
- Develop a detailed, customised Project Evaluation Plan near the start of your project, with key questions and approaches for collecting and interpreting evaluation data
- Plan to undertake evaluation as an active, ongoing process of iterative project development that occurs throughout the project.

Why is it important to measure impact?

- Impact measurement supports reporting on the success of a project, which can be critical for the acquittal of funding, and for securing future funding.
- Impact measurement supports critical evaluation of project design and strategy. In an iterative and cyclical approach to project design[2], the insights that emerge from critical evaluation can inform strategic improvements to the design and operation of a monitoring network, the interpretation of data, or the activities for impact that data supports.

In many cases, it can be quite difficult to measure impact. This is because impact can often relate to processes that occur after the fact, and beyond the direct visibility of a project. For example, measurement of health impacts can require extensive additional research that is well beyond the scope of any standard local government project.

Despite the challenges of impact measurement, it is important to clearly identify the impact that a project *intends* to create as part of a project plan. Regardless of whether impact can be directly measured, the impact goal itself (e.g. 'this project aims to improve public health') should still guide project design and delivery strategy.

For further guidance on impact planning, please refer to the OPENAIR Best Practice Guide chapter *The Impact Planning Cycle overview*, and the supplementary resource *Identify template.*

[2] See the Best Practice Guide chapter *The Impact Planning Cycle overview* for guidance on what this looks like.

The Impact Evaluation Cycle

Positioning the Impact Evaluation Cycle as a project tool

The OPENAIR **Impact Planning Cycle** (IPC) is a tool that can help local governments to maximise the impact of a smart air quality monitoring project. It features six stages (*Identify*, *Develop*, *Implement and operate*, *Manage and analyse data*, *Act on evidence*, and *Evaluate*), each comprising several tasks. See the OPENAIR Best Practice Guide chapter *The Impact Planning Cycle overview* for more detailed information.

The **Impact Evaluation Cycle** (IEC) is an iterative evaluation process that sits within the IPC, and supports evaluation of all six project stages (shown in Figure 1).

The OPENAIR **evaluation methodology** is a generic six step process for conducting evaluation, that can be applied at each stage in the Impact Evaluation Cycle. The process is summarised as:

1. Define desired outcomes for the project stage
2. Define the key questions for determining whether the outcomes are achieved
3. Investigate the key questions and collect evidence/responses
4. Interpret evaluation data and reflect on findings
5. Redesign the approach
6. Implement changes.

A **Project Evaluation Plan** is an actionable document. It should be developed for your specific project by applying the evaluation methodology at each stage of the Impact Evaluation Cycle.

Overview of the Impact Evaluation Cycle (IEC)

Measure overall project impact

IEC0: Measure the outcomes and impacts achieved
Measure the outcomes and subsequent impact created by project activities that make use of new air quality data (or insights derived from that data). There are three types of impact, each of which requires a slightly different approach:

1. Measuring pollution mitigation
2. Measuring exposure reduction
3. Measuring capacity building.

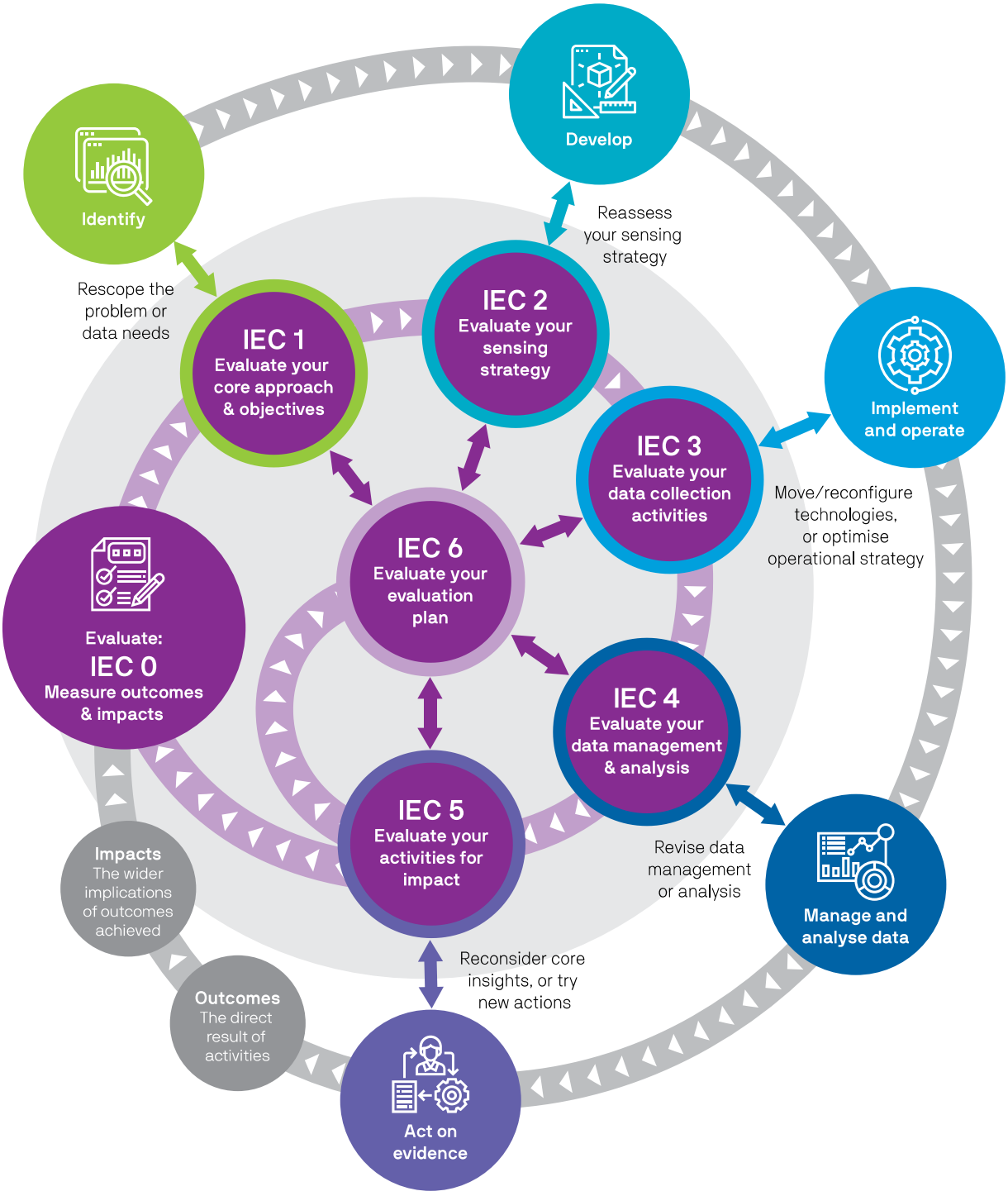


Figure 1. The OPENAIR Impact Evaluation Cycle

Evaluate project design and delivery

The evaluation methodology can be applied at stages 1 to 6 of the IEC.

IEC1: Evaluate your core approach and objectives
This stage checks that the core approach and objectives of your project continue to align with the needs and capacity of your organisation and primary stakeholders.

IEC2: Evaluate your sensing strategy
This stage checks that technology procurement choices, the overall design and methodology of a sensing solution, participatory processes, and data management and sharing all align with your data use action statement (which defines specific data needs, and how that data will be used to deliver impact).

IEC3: Evaluate your data collection activities
This stage checks that data collection activities serve your data use action statement, as well as broader project aims. It includes the activation and deployment of sensing devices, device and data verification, troubleshooting, IoT system operations, and cybersecurity considerations.

IEC4: Evaluate your data management and analysis
This stage checks that data management and analysis serve your data use action statement, as well as broader project aims. It covers data interpretation, data labelling, and data sharing.

IEC5: Evaluate your activities for impact
This stage checks that activities for impact (activities that leverage data insights) are supporting desired project outcomes and impacts. It includes evaluation of institutional capacity building, community engagement, approaches to data visualisation and discovery, and developing a community of practice.

IEC6: Evaluate your Project Evaluation Plan
This stage checks that your Project Evaluation Plan is supporting an evaluation process that aligns with your organisation's capacity and resources, and continues to deliver useful insights.

Evaluation methodology

The OPENAIR evaluation methodology is a six-step process for conducting evaluation. It can be applied within each stage of the Impact Evaluation Cycle.

1. Define desired outcomes for the project stage

These outcomes define success, and provide a benchmark for evaluation.

2. Define the key questions for determining whether the outcomes are achieved

Key questions[3] unpack each of the desired outcomes, prompting responses that can drive evaluation:

- **Descriptive** – what has happened?
- **Causal** – what caused these things to happen?
- **Relevance** – are the activities doing the right things?
- **Coherence** – how well does the activity fit the aims of the project?
- **Effectiveness** – is the activity achieving its objectives?
- **Efficiency** – how well are resources being used?
- **Impact** – what difference does the activity make?
- **Sustainability** – can the activity be sustained and/or will the benefits last?
- **Action** – what should we do next?

3. Investigate the key questions and collect evidence/responses

Consider which stakeholders to consult as you investigate key questions, and in what context/forum (e.g. discussions/interviews/workshop sessions).

Consider other quantitative sources of evaluation data (e.g. sensing device data records; policy documents; web page-tracking metrics), and how you will access them. Sources may be pre-existing data sets (owned by you or a third party), or may need to be compiled from scratch (e.g. via a survey). Consider the time/resources needed to source evaluation data. Is it up to date? Who owns it, and will they share the data? How often is it updated?

Consider the ethics of data collection from stakeholders, as well as from third-party sources. Consider how to record and store evidence/responses in an accessible, useful, and ethical way.

4. Interpret evaluation data and reflect on findings

If done collaboratively, this may be an extension of the discussions/interviews/workshop sessions held with stakeholders. Consider whether specialist expertise or tools are required.

5. Redesign the approach

If findings indicate that changes are required, redesign the approach to better support project aims, outcomes, and impacts.

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[3] Adapted from (BetterEvaluation, n.d.) and (OECD, n.d.).

If findings indicate good alignment (i.e. a positive evaluation), consider the reasons for success, and whether there are ways to improve the project by building upon these strengths.

6. Implement changes

Take practical steps to implement any changes identified, then move on to the next stage of the Impact Evaluation Cycle.

CREATE YOUR OWN PROJECT EVALUATION PLAN

The rest of this chapter explores the Impact Evaluation Cycle, and applies the evaluation methodology to guide you through the creation of your own Project Evaluation Plan.

You will need to identify your own specific indicators for evaluating project outcomes and impacts. Adapt the methodology at each stage of project evaluation to align with your project needs and organisational capacity.

Before you begin

Identify your capacity to complete evaluation

Evaluation can be a significant task. You may want to consider if this is something you can achieve yourself. There are a range of evaluation resources and experts/consultants in the evaluation field who can help with this. Building strategic partnerships with universities may be another way to gain assistance in evaluating your impact measurement.

Plan to evaluate as you go

The OPENAIR Impact Planning Cycle is a process of ongoing, iterative project development. You should ideally evaluate impact at each stage of the cycle, which can be approached using the Impact Evaluation Cycle (see Figure 1). This supports critical evaluation of project activities as you deliver them, creating an opportunity to learn from insights and adapt activities as you go.

To keep track of the evaluation process throughout a project's life cycle, it is helpful to establish evaluation tools and information management systems at the very start of a project. This might include a framework for recording and managing all the evidence and critical discussions associated with evaluation, and a database for storing it. It should be based upon the Project Evaluation Plan, and adapted to each stage of a specific project.

Consider evaluation stakeholders

You may also want to consider 'evaluation stakeholders'. These are people or groups with an interest or stake in the evaluation of your project, such as funders, project managers or officers, and those who are benefitting from the project (Department of Environment and Conservation (NSW), 2004). Aim to speak with these stakeholders as early as possible. Ideally, their perspectives and requirements should be incorporated into your Project Evaluation Plan from the beginning.

Establish evaluation roles and responsibilities

Assign responsibilities for leading the development of a Project Evaluation Plan, and for ensuring that evaluation tasks are completed in accordance with the plan. Ensure that this person or team has the skills, knowledge, and capacity to undertake these tasks effectively, and allocate time and resources to support them in their role(s) at all stages of the project.

Measure overall project impact

IEC0: Measure the outcomes and impacts achieved

A critical task of project evaluation is to measure the outcomes of project activities, and the subsequent impacts that result. This can only occur towards the end of a standard project impact cycle, once new air quality data is being collected and used to support activities for impact.

This task is assigned a 'zero' in the Impact Evaluation Cycle steps because – while it may be considered a foundation for deeper evaluation of all project stages – it is not necessarily the first form of evaluation that should be undertaken.

Three core types of impact

Figure 2 shows how impact on air quality can be split into three core types, each of which should be measured differently.

Figure 2. Three core types of impact from air quality monitoring activities

Together, these three core types of impact can be used to define all possible impacts relating to the use of air quality data. It can be helpful to understand which of these impacts defines your own project approach. In many cases, it is a combination of all three.

Example

Health impacts will always relate to some combination of:

- **pollution mitigation** (the air is cleaner and less harmful to people when they breathe it)
- **exposure reduction** (people are breathing less polluted air)
- **capacity building** (people have increased capacity to understand that a given activity has good/bad implications for their health or the health of others, and to change their behaviour/actions accordingly).

TIME FRAMES FOR IMPACT MEASUREMENT

Near-future (0-1 years)	Short-term (1-2 years)	Medium-term (2-5 years)	Long-term (5-10 years)	Very long-term (10+ years)

Engagement with air quality issues is a long-term commitment that requires action on a variety of fronts, and across several time frames. To measure the impact of these actions, it is necessary to consider *when* the impact may become apparent. Measuring too early or too late may give a false sense of what has been achieved, or be too late to inform decisions.

The scale of possible impact increases over longer periods. Strategic plans for impact creation may involve cumulative impact, from a series of steps. This means that measuring impact can be a long-term activity, which needs to be planned for and resourced.

For guidance on appropriate timing for impact measurements, see the OPENAIR supplementary resource *Activities for impact compendium*. It links a variety of activities (that might be supported by air quality data) to the time frames outlined above.

Measuring pollution mitigation

Pollution mitigation involves directly reducing the amount of pollution in the air, by reducing activities that create pollution, or by making those activities less polluting. It can be measured directly, as changes in observed air quality; or indirectly, by measuring activities that are known to result in pollution mitigation.

Directly measure pollution mitigation

To directly measure the impact of pollution mitigation, it is necessary to measure the degree by which the amount of air pollution impacting an area has reduced over a defined period (with a focus on the concentration of specific target pollutants, locations, times, trends, and correlation with known polluting activities). This might involve measuring changes in pollution creation at a source, or changes in ambient air pollution levels at a location of interest.

Refer to air quality data collected by your sensing devices over time. Data might come from smart low-cost sensing devices within your own network, or from higher-performance sensing equipment managed by third parties (e.g. private toll roads measure and publish ambient air quality data around tunnel

entrances). You may also choose to use your own higher-performance reference sensing devices, if a higher degree of accuracy and trust in data is required for reporting purposes.

Measure activities that are known to result in pollution mitigation

Measures of the prevalence of activities and interventions that lead to pollution mitigation can be used as a proxy indicator for pollution mitigation impact. Specific activities and interventions will vary by project; some examples are shown in Table 1.

Table 1. Examples of measurable activities and interventions that result in pollution mitigation

Activity or intervention	Examples of measurable indicators
Increase in walking and cycling	• People-counting technologies (e.g. silent Wi-Fi; image recognition) • Cycle path 'automatic tube counters' • Public surveys
Decrease in private vehicle use and freight vehicle trips, or in vehicle kilometres travelled	• Traffic-counting technologies (e.g. automatic tube counters; image recognition) • Public transport data (as a proxy for fewer private vehicle trips)
Prevalence of walking and cycling infrastructure	• Total length of separated cycleways • Total area of pedestrianised precincts
Prevalence of car-free, low-emission, or no-idling zones	• Total area of zones • Number of zones • Number of schools included within zones
Compliance policies on dust control measures for construction sites	• Local government or EPA compliance/infringement records for construction sites
Removal of woodfired heaters from homes	• Number of homes where heaters have been removed • Number of rebate claims (e.g. for reverse cycle air conditioners)
Reduction in uncovered coal trains passing through residential areas	• Official rail company records (if available) • Image recognition technology

Measuring exposure reduction activities

Exposure reduction activities reduce peoples' exposure to air pollution by physically separating them from polluted environments. This involves separating people from poor air quality in space (either by increasing physical distance, or ensuring physical barriers) or in time (e.g. schools avoiding outdoor play during heavy bushfire smoke).

There are two types of impact indicator for exposure reduction: direct and proxy.

Direct indicators of exposure reduction

Direct indicators of exposure reduction measure human behaviour, activity, and health relative to polluted environments.

Direct quantitative indicators: Might involve counting the number of exposed people, or the period that people are exposed to pollution above a defined threshold.

Direct qualitative indicators: Might involve surveys, interviews, or participant journals that explore behaviour/activities, with a focus on motivations, concerns, emotions, etc.

Participative design and citizen sensing methodologies present opportunities to integrate the measurement of exposure reduction into project delivery (e.g. citizen scientists might keep personal journals as part of their data collection activities)[4].

Exposure reduction can also be measured directly through public health studies. Like many other studies into direct indicators of exposure reduction, these would require a separate, extensive program of research, involving considerable additional planning, time, budget, and external knowledge or expertise. This kind of work would generally be undertaken by an independent research partner.

Proxy indicators of exposure reduction

Proxy indicators of exposure reduction measure changes in the design of the environments (cities, buildings, and services) in which people spend time (see Table 2). Certain changes indicate that individuals are less likely to be exposed to pollution. Proxy indicators are more easily tracked and interpreted by a local government authority than direct indicators, as they tend to be more reliant upon existing data and internal knowledge and expertise.

[4] Please refer to the OPENAIR Best Practice Guide chapters *Participative design practice* and *Citizen sensing* for detailed guidance on these topics.

Table 2. Examples of proxy indicators of exposure reduction

Proxy impact type	Examples of proxy indicators
Changes to the urban landscape that reduce human exposure to air pollution	• Distance of vulnerable receptor sites (e.g. childcare centres) from known pollution sources • Number of receptor sites within range of a pollution source (e.g. number of homes within a 1km radius) • Metrics relating to known pollution sources within an area of concern (e.g. number of construction sites; KMs of highway; number of road tunnel exhaust stacks within 2km of residential zoning) • Metrics relating to vegetation barriers near pollution sources such as roads (e.g. KMs of highway) • Tree canopy coverage in urban areas • Metrics relating to traffic and traffic congestion (e.g. traffic counts; times of day) • Inclusion of outdoor air quality priorities in development control plans
Changes to buildings that reduce human exposure to air pollution	• Inclusion of indoor air quality priorities in development control plans • Metrics relating to the use of diesel backup generators (or clean alternatives) • Air tightness testing of buildings • Metrics relating to the capacity of HVAC systems to maintain indoor air quality within recommended safe levels (e.g. number of buildings with HEPA filters)
Changes to public services that reduce human exposure to air pollution (separation by time or space)	• Service access locations within polluted environments (e.g. bus stops) • Reduction in bus routes/trips through street canyons • Metrics relating to the provision and use of community clean air shelters (e.g. number of people who use them)

Measuring capacity building activities

Capacity building refers to activities that increase the ability of people or organisations to understand and respond effectively to air quality challenges. Three kinds of capacity building will be considered:

- internal capacity building
- community engagement
- building a community of practice.

Evaluating internal capacity building

Internal capacity building refers to project activities that involve staff members, teams, or departments within your organisation in the design and delivery of the project, or in the use of project data. There tends to be an emphasis on leveraging value from project data by ensuring that it is discoverable, accessible, trusted, understood, and utilised as widely as possible within your organisation.

Outcomes of internal capacity building can be measured based on the activities themselves, and on the level of engagement that occurred (see Table 3). Impacts occur as a result of successful engagement (see Table 4).

Table 3. Examples of internal capacity building outcomes

Outcome type	Examples of outcome indicators
Project activities delivered successfully	• Number of staff members involved in delivery of various project activities • Internal (e.g. interdepartmental) collaboration • Number of internal engagement events held • Number of internal articles or announcements made • Number of internal resources created
Internal engagement with project activities	• Number of staff members, teams, or departments to attend internal engagement events (e.g. data discovery and access workshops) • Measures of internal access (e.g. data downloads by staff) • Demographic details of staff (who, where, and when)

Table 4. Examples of internal capacity building impacts

Impact type	Examples of impact indicators
Behaviour changes among staff	• Changes in how staff commute to work (e.g. active transport uptake) • Demographic details of staff (who, where, and when)
Knowledge and skill creation within your organisation	• Increased environmental literacy among staff • Increased trust in data by staff members • Increased confidence among staff to discover, access, visualise, download, and utilise data
Data-driven capability and innovation within your organisation	• The number of programs/initiatives/services/operations managed by your organisation that improve what they do or how they do it (based on the use of project data) • Instances where data is used to help determine strategic priorities, and develop new or improved policies/strategies/guidelines

Evaluating community engagement

Community engagement refers to any project activities that involve active engagement or participation of community members or groups in the design and delivery of the project, or in the use of project data. More participatory modes of engagement often seek to deliver impacts relating to community capacity and empowerment.

Outcomes of community engagement can be measured based on the activities themselves, and on the level of engagement that occurred (see Table 5). Impacts occur as a result of successful engagement (see Table 6).

Table 5. Examples of community engagement outcomes

Outcome type	Examples of outcome indicators
Project activities	• Number of community engagement events held • Number of media articles or social media posts • Number of public resources created • Number/proportion of resources in formats that are accessible to all members of your community
Community engagement with project activities	• Attendance at engagement events • Active participation and participant experience • Measures of public access (e.g. website hits, brochures taken, data downloads, mailing list subscribers) • Number of citizen sensing devices connected • Demographic details (who, where, and when)

Table 6. Examples of community engagement impacts

Impact type	Examples of impact indicators
Behaviour changes in community	• Uptake of electric vehicles • Increase in walking/cycling • Homes that have stopped using woodfires for home heating • Demographic details (who, where, and when)
Knowledge and skill creation within community	• Increased environmental literacy among community members • Increased trust in data by community members • Increased confidence among community members to discover, access, visualise, download, and utilise data • Increased advocacy and change-making knowledge and skills • Demographic details (who, where, and when)
Increased political influence of community	• Evidence of community members accessing more platforms (e.g. media articles; radio) to increase the visibility of the community position • Evidence of community members being quoted/cited in media • Increase in positive coverage of (or trust in) community positions in the media • Increased size, reach, and connectedness of community advocacy networks • Demographic details (who, where, and when)
Data-driven innovation within community	• The number of unique data applications by individuals, groups, or businesses • Demographic details (who, where, and when)

Evaluating building a community of practice

A community of practice fosters collaboration, knowledge sharing, and data sharing among a community of organisations and individuals with a shared interest. This creates shared value for the whole community. An organisation engaged with local air quality issues and smart low-cost sensing can actively contribute to (and build) an associated community of practice. This is an effective strategy for large-scale capacity building.

Activities that build a community of practice require an investment of time and resources. It is useful for an organisation to evaluate these activities to assess their effectiveness, justify the effort and expense involved, and improve how they are delivered in future (see Tables 7 and 8).

Table 7. Examples of community of practice outcomes

Outcome type	Examples of outcome indicators
Community of practice activities	• Number of events held • Collaborative initiatives (e.g. writing a white paper) • Number of resources created by (or for) a community of practice (e.g. a best practice guide) • Number of collaborative funding submissions • Number of awards won by projects involving a coalition of partners • Creation of data sharing infrastructure
Engagement with community of practice activities	• Number of partner organisations • Diversity of partner organisations • Attendance at community of practice events (e.g. attendee numbers; organisations) • Active participation in collaborative community of practice initiatives • Number of downloads or uses (within your own organisation) of shared resources produced by a community of practice (e.g. a best practice guide) • Number of instances that your organisation shares detailed information about project activities (e.g. reports; case studies; presentations) • Metrics associated with your own external data sharing activities (what, when, how much, and with whom?)

Table 8. Examples of community of practice impacts

Impact type	Examples of impact indicators
Behaviour changes in the community of practice	• Increased collaboration between organisations and sectors • Adoption of policy that encourages collaborative approaches • Improved standard of knowledge capture and transfer at the end of projects • Increased willingness and capacity for sharing live environmental data
Knowledge and skill creation within the community of practice	• Projects delivered that demonstrate established best practice • Dynamic best practice that responds to changing needs and wider trends (e.g. as evidenced in project reports) indicates a high level of active knowledge and skill sharing within the community of practice
Increased political influence of the community of practice	• Policy (new or amended), particularly at state or national level • Standards (new or amended) • Increased public funding of projects and/or aligned research • Incorporation of agenda points into official political priorities (e.g. election campaigns; 'Premier's priorities') • Media coverage
Data-driven innovation within the community of practice	• Innovation enabled by widespread data and knowledge sharing (measurable as stand-alone initiatives, awards, etc.) • Growth and maturation of use cases for air quality data collected with smart low-cost sensing technologies

Evaluate project design and delivery

Once you have measured the outcomes and impacts of your project, you need to evaluate all aspects of project design and delivery. Following the steps of the Impact Evaluation Cycle (IEC) will help you understand why things turned out as they did, and how the project can be improved in future.

Full project evaluation can be undertaken either as an end-of-project critical reflection exercise, or as a more iterative, embedded approach that occurs in parallel with project delivery.

> "Evaluation is a systematic process of collecting credible data and using it to make judgements about the worth of [the project's impact] at any point in [the project's] life cycle. Ideally, evaluation starts from the moment you design your [project] and runs through the [project's] life cycle"
> (Department of Environment and Conservation (NSW), 2004, p 6).

IEC1: Evaluate the core project approach and objectives

Core project approach and objectives are defined during the *Identify* stage of the Impact Planning Cycle, and recorded in your business requirements document (BRD). The BRD includes details of project roles and governance framework, project aims, and planned outcomes and impacts. It culminates in the creation of a data use action statement (DUAS), which clearly and succinctly defines precise data requirements, and how that data will be used, and by whom, to create impact[5].

Desired outcome 1A: Alignment with business requirements document

The business requirements document aligns with the needs and capabilities of your organisation and project stakeholders.

Key questions

- Are project stakeholders still engaged?
- Are there new stakeholders not previously considered?
- How well are the assigned roles and governance framework supporting the aims and outcomes of the project?
- Is the air quality issue identified still a priority for one or more of the project stakeholders?
- Do project aims still align/resonate with the concerns and interests of all stakeholders?
- Are there new aims that were not previously captured?
- Does the data use action statement still make sense?
  - *Is the precise nature of the problem still accurately captured, or does it need updating?*

[5] Please refer to the OPENAIR supplementary resource *Identify template* for assistance in developing a BRD and DUAS.

- *Are project data requirements the same, or have they changed?*
- *Are data users the same, or have they changed?*

Investigate and redesign

Speak with key partners and stakeholders in an appropriate forum/context, and critically reflect on these key questions relating to your BRD and DUAS.

Record discussions (with permission), including clear responses to each of the key questions. Take minutes/notes and circulate these among participants.

Include interpretation of responses as part of the main group discussion. Consider reasons for misalignment and/or alignment, and design implementable responses.

DATA USE ACTION STATEMENT

A data use action statement (DUAS) explains how new data will enable **specific people** to address a **defined problem** through **specific activities**, to produce **measurable outcomes and impacts**. It is created using the following format:

> There is a problem with […].
>
> This matters to [*impacted stakeholder*] because […].
>
> It matters to our organisation because […].
>
> [*Data user*] is able to address this problem.
>
> 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.*].

A DUAS is a vital reference when it comes to evaluating project approach, objectives, and sensing strategy.

IEC2: Evaluate your sensing strategy

A sensing strategy is created during the *Develop* stage of the Impact Planning Cycle, to meet the needs of the project that are defined in the business requirements document. It covers technology procurement choices, the overall design and methodology of a sensing solution, participatory processes, and data management and sharing approaches.

Desired outcome 2A: Appropriate procurement choices

Procured technologies are appropriate for supporting the delivery of data that serves the data use action statement.

Key questions

- Are there problems with the functionality of the sensing devices?
  - *Can device functionality issues be resolved by recalibrating hardware or software settings, or are they fundamental to the design?*
- Are there problems with the accuracy or reliability of data being produced?
  - *Are these problems related to innate design constraints of the sensing devices?*
- Are there problems with the wireless communications?
  - *Can you solve these problems through recalibration of settings, or by moving devices/gateways, or are they tied to more fundamental constraints of the technology?*

Investigate and redesign

You will need to understand the quality and reliability of the data you are collecting (conduct an analysis), the limitations of calibration and correction, and what this reveals about the fundamental design and performance of procured technologies. Speak with key partners and stakeholders in an appropriate forum/context, and critically reflect on the key questions relevant to your business requirements document.

Record discussions (with permission), including clear responses to each of the key questions. Take minutes/notes and circulate these among participants.

Include interpretation of responses to questions as part of the main group discussion (e.g. why do we think this is happening?). Consider reasons for misalignment and/or alignment, and design implementable responses.

Desired outcome 2B: Appropriate sensing methodology

The design of the sensing network and the sensing methodology are appropriate for serving the data use action statement (DUAS).

Key questions

- Do you have permission to deploy sensing devices in locations that serve the DUAS?
- Do you have enough individual sensing device units to collect the data required?
- Are sensing device power requirements being met?
- Are sensing devices reliably communicating data over the wireless communications network?
- Is the micro-siting of devices (e.g. choice of mounting infrastructure; height; orientation; nearby objects) appropriate for ensuring trusted data of appropriate quality?
- Are sensing devices and communications gateways deployed in ways that support ongoing practical, safe, and sustainable operations?
- Are sensing devices appropriately calibrated to support optimal data quality, and does this adequately serve the DUAS?
- Are sensing devices configured to provide data at a reporting interval that serves the DUAS (e.g. one measurement reported every 15 minutes)?

Investigate and redesign

[Same as for *Appropriate procurement choices* above]

Desired outcome 2C: Effective participation

[*If relevant*] The approach to participation and citizen sensing is appropriate, and aligns with the aims of the project and the DUAS.

Key questions

- Does the participatory design or citizen sensing approach being taken align with initial aims?
- Are participatory approaches reflected in the project governance structure?
- Has recruitment been successful? Consider accessibility and inclusivity.
- Is genuine, enthusiastic, and sustained participation and co-design occurring?
- Are citizens able to engage with sensing technologies and/or data confidently and effectively, in ways that improve their skills/knowledge and empower them to take action?

Investigate and redesign

A survey of participants may be required. Additional data about attendance and participation may also be useful. It may be helpful to take this information to a group discussion with key stakeholders to explore, reflect, and redesign the approach.

Desired outcome 2D: Appropriate data policy

Data management and sharing aims/requirements are supported by appropriate internal data policy.

Key questions

- Do you have a data management and sharing plan for your project?
- Does organisational data policy support the effective management, access to, and utilisation of project data within your own organisation?
- Does organisational data policy cater for the sharing of live environmental data with other organisations (e.g. state government)?
- Does organisational data policy support a process for determining the appropriate release of data that can be applied to the project?

Investigate and redesign

Refer to project documents and to your organisation's existing data policy. Compile a report on any data sharing that has occurred to date. It may be helpful to take this information to a group discussion with key stakeholders to explore, reflect, and redesign the approach.

IEC3: Evaluate your data collection activities

Data collection activities occur during the *Implement and operate* stage of the Impact Planning Cycle. They cover the activation and deployment of sensing devices, device and data verification, troubleshooting, IoT system operations, and cybersecurity considerations.

Desired outcome 3A: Appropriate calibration of sensing devices

Sensing devices are calibrated to ensure that data quality meets the needs of the project.

Key question

- Are devices calibrated to ensure that data quality is optimised to meet the needs of the DUAS?

Investigate and redesign

Assess data quality by comparing it with data from higher-performance reference equipment.

You may also need to review calibration correction methodologies, to check for errors or opportunities for improvement.

Desired outcome 3B: Successful device activation and deployment

Sensing devices are successfully activated and deployed in all planned deployment locations, with data flows being collected and stored.

Key questions

- Are sensing devices successfully onboarded and appropriately configured?
- Are sensing devices passing initial acceptance testing?
- Are sensing devices being installed successfully, in line with the sensing strategy?
- Are sensing devices passing field testing and being commissioned?

Investigate and redesign

Conduct an audit of all sensing devices in your network. Record which stage of the activation and deployment process each device is at (see the OPENAIR supplementary resource *Air quality sensing device activation and deployment checklist*). Use troubleshooting methods to understand why common issues might be occurring (see the OPENAIR supplementary resource *Sensing device troubleshooting: extended guide*).

Desired outcome 3C: Successful initial verification of sensing devices and data

The location and installation of all sensing devices has been verified. All data sent from devices has been initially verified following deployment, relative to the needs of the project.

Key questions

- Are devices actually deployed where they should be?
- Are devices installed according to the approach defined in the sensing strategy?
- Are devices initially reporting data that is reliable and accurate, relative to the needs of the project?

Investigate and redesign

Conduct physical inspections and take detailed field notes. Analyse initial data received from devices to determine reliability and accuracy. Discuss any issues with relevant stakeholders to determine a course of action.

Desired outcome 3D: Successful sensing device operation

Following commissioning, sensing devices are operating reliably, as expected, and in a way that ensures continuous delivery of trusted and useable data, to meet the needs of the project.

Key questions

- Are sensing devices connecting with the wireless communications network to reliably report data, and continuing to do so in a stable fashion over time?
- Are sensing devices continuing to operate in a stable way that ensures the ongoing collection of trusted data (of a type and quality that serves the needs of the project)?

Investigate and redesign

Audit your telemetry records to infer data communications gaps. Analyse a longer period of data (>1 month) received from devices to determine the ongoing stability of data reliability and accuracy. Discuss any issues with relevant stakeholders (e.g. your project's technical team and/or contractors) to determine a course of action.

Desired outcome 3E: Successful IoT system operation

All IoT systems (including wireless communications, platforms, and data storage solutions) are operating reliably, as expected, and in a way that ensures continuous capture, storage, and access to data, to meet the needs of the project.

Key questions

- Is the wireless communications network operating correctly and reliably?
- Is the IoT platform reliably hosting devices, and ingesting, interpreting, and managing their raw data?
- Is the database reliably storing incoming data, and ensuring access to past data, in a way that serves the DUAS?

Investigate and redesign

Obtain a record of data transactions via your communications network server (or infer issues by analysing your own telemetry record). Audit your telemetry record, checking for gaps and correct interpretation. You may then wish to call a meeting of your technical team and technical service providers to discuss findings and explore responses.

Desired outcome 3F: Appropriate cybersecurity measures

Cybersecurity risks have been assessed and are well understood. Appropriate measures are in place to mitigate those risks.

Key questions

- Are you confident that cybersecurity risks have been adequately assessed and understood?
- Are data access roles and permissions well-defined and implemented?
- Are other best practice cybersecurity measures in place to ensure mitigation of any identified risks?

Investigate and redesign

Use the OPENAIR Best Practice Guide chapter *Cybersecurity for smart air quality monitoring networks* to check your risk assessment, and implement best practice measures. It may be helpful to engage members of your organisation's IT team to assist with this evaluation activity. An external assessment of a project's cybersecurity can also contribute a useful and impartial perspective.

IEC4: Evaluate your data management and analysis

Data management and analysis occurs during the *Manage and analyse data* stage of the Impact Planning Cycle. It covers data interpretation, data labelling, and data sharing.

Desired outcome 4A: Appropriate data correction and harmonisation

Data received from sensing devices is being appropriately corrected to optimise data accuracy, in line with the needs of the project. If data for one variable is being collected using more than one type of device, then it is being harmonised into a single format (to enable direct comparison and aggregation).

Key questions

The following questions may or may not apply, depending on the nature of your project.

- Is data being corrected for systemic bias associated with all devices of one type?
- Is data being corrected on a per-device basis to account for inter-device variability?
- Is data being corrected for calibration drift?
- Is data being corrected for different types of particulate pollution?
- Is data being corrected for relevant environmental interference (e.g. temperature and humidity)?
- Is data being harmonised in accordance with a project data schema?

Investigate and redesign

Some (or all) of these data corrections will be relevant to your project. Review data quality relative to a trusted reference (ideally via outdoor co-location with a regulatory monitoring station) to determine which types of data correction are required. Assess the effectiveness of corrections that *are* being applied, relative to reference data. Discuss the design of corrections with your technical team, and investigate potential improvements.

To assess harmonisation, try undertaking an activity that requires it (e.g. the sharing of data from multiple sources under a single API, or data analysis using data from multiple sources). The ease with which these tasks are achieved is indicative of successful harmonisation.

Desired outcome 4B: Appropriate data quality control

Data received from sensing devices is being cleaned and verified to meet the needs of the project.

Key questions

- Can you reliably detect and respond to data quality issues on an ongoing operational basis?
- Is data stored in your database in a useable and trusted condition, with no unexplained outliers?

Investigate and redesign

Assess data quality by analysing data records, and checking for anomalous data points, abnormal trends, and data incompleteness. Engage with data users to understand their perspectives on data quality and useability, and to what degree they trust the data. Engage with the project technical team and service providers to analyse automated quality control functionality in the IoT platform, and investigate potential improvements.

Desired outcome 4C: Effective data analysis

Data is being analysed in ways that support the needs of the project.

Key questions

- Is current data analysis producing insights that address the needs of the DUAS?
- Are data users using data insights as planned, and to what degree do they trust those insights?

Investigate and redesign

Review data analysis outputs directly, to check that they address the needs of the DUAS.

Engage with data users to understand their current use of (and trust in) the data analysis outputs. This might include a survey or a focus group. Discuss gaps, barriers to use/trust, and areas of improvement.

Speak with the technical team responsible for the design and functionality of the data analysis capabilities, and explore ways to improve those capabilities based upon your review and end user engagements.

Desired outcome 4D: Appropriate data labelling

The format and labelling of all project data, including telemetry (the variables measured) and metadata (supporting contextual information), is defined in a data schema that aligns with best practice data labelling standards (and has applied these to all project data). This provides a foundation for effective data analysis and sharing.

Key questions

- Is there an appropriate and comprehensive project data schema in place?
- Does your data schema align with FAIR Guiding Principles?
- Is the data schema being effectively applied to all project data?
- Is current data labelling supporting effective data analysis and sharing?

Investigate and redesign

Critically reflect upon the project data schema with the full project team. This might include a meeting or workshop with technical staff and contractors, as well as people responsible for managing network deployment and operations, and people who manage data sharing. Address the key questions, and methodically work through the FAIR Guiding Principles[6] to check and confirm their application, noting areas where your data schema can be improved.

[6] FAIR Guiding Principles are guidelines designed to improve the “Findability, Accessibility, Interoperability and Reuse of digital assets”. Paragraph 1 of (GO FAIR, n.d.)

Desired outcome 4E: Appropriate data sharing

Project data is being shared (or is ready to be shared) in a way that is safe, trusted, ethical, and aligned with organisational data policy.

Key questions

- Does your organisation have a data policy, and does it support your data sharing activities for this project? If not, ensure that a project plan covers your needs.
- Do you have a data management and sharing plan for the project?
- Do you have an agreed and trusted process in place for determining whether to release project data, and any conditions or constraints associated with that release?
- Do the actual outcomes of data sharing to date align with the risk assessment conducted prior to this data release?

Investigate and redesign

Identify key documentation. A survey of data users (those accessing and using sharded data) may be helpful. Speak with internal stakeholders about their trust in the data sharing process. It may be necessary to review and update documentation and/or the data release process, in response to group discussion and reflection.

IEC5: Evaluate your activities for impact

Activities for impact occur during the *Act on evidence* stage of the Impact Planning Cycle. These refer to any activity that utilises data or data insights to achieve a desired outcome and impact. This stage of the Impact Evaluation Cycle involves evaluation of institutional capacity building, community engagement, approaches to data visualisation and discovery, and community of practice development.

Well-designed and well-delivered activities for impact are critical for achieving planned project outcomes and impacts. They are, in turn, dependent upon effective and appropriate execution of all earlier project stages.

Desired outcome 5A: Effective and sustainable activities in a desired impact area

Activities for impact are occurring in one or more of four impact areas: transport; built environment; green infrastructure; and community engagement. Activities are effective in creating desired outcomes, and can be sustained for a desired period.

Key questions

- Is an activity for impact being undertaken in line with your DUAS?
  - *Is project data currently being used to support an activity for impact?*
  - *Is project data of appropriate quality and reliability to support your activity for impact?*
  - *Are the planned data users being successfully engaged?*
  - *Are data users able to access and utilise project data effectively, and as planned?*
  - *Are outcomes occurring as planned?*
  - *Are outcomes of the activity measurable?*

- Do activities for impact align with organisational values, strategy, and priorities?
- Can activities for impact be optimised and sustained, or are there practical, financial, administrative, legal, or ethical issues/barriers to success?
- In light of your efforts to date, is there justification for a change in approach that might have knock-on effects on data requirements?

Investigate and redesign

A meeting or workshop discussion involving the people responsible for delivering activities for impact, data users (who may or may not be the same people), and staff who have an understanding of organisational values, strategy, and priorities (ideally senior management). Discuss the key questions, and explore challenges and various 'what if' scenarios. If necessary, consider updating the strategic approach to an activity, or the DUAS.

Desired outcome 5B: Effective institutional capacity building

Effective internal engagement with the project and the data it produces is occurring, ensuring that the project delivers measurable value for your organisation.

Key questions

- Do people within your organisation (who might find value in your project data) know of the data's existence?
- If they do know about it, can they easily access it?
- Are people within your organisation actually accessing project data?
- Are people accessing project data more than once (evidence of ongoing interest, rather than just initial curiosity)?
- Do data users within your organisation find project data to be valuable?
- Do data users within your organisation have the necessary skills and support needed to discover, access, and make use of project data?

Investigate and redesign

Conduct a survey or focus group of internal data users to explore the key questions. There may also be reports from your data platform/portal that provide information about who is accessing project data, when, and how often.

You may wish to engage with your IT team, internal communications team, business development team, or specific target departments (e.g. strategic planning) to explore how data can be leveraged to support better outcomes for your organisation and staff.

Desired outcome 5C: Effective community engagement

Effective community engagement with the project (and the data it produces) is occurring in a way that is accessible, inclusive, and empowering for participants, delivering measurable benefits for the wider community.

Key questions

This outcome only applies to projects where data (or data insights) are released to the public.

- Do community members (who might find value in project data) know of the data's existence?
- If they do know about it, can they easily access it?
- Are community members actually accessing project data?
- Is the community responding with active interest to the project and/or the data it is producing?
- Are you reaching diverse community stakeholder groups/demographics, or are there important groups that you are failing to reach (e.g. English as a second language communities; elderly people; or parents of schoolchildren)?
- Does everyone with an interest in the project and its data have the opportunities, skills, and support they need to engage and actively contribute in a way that feels positive and empowering for them?
- Do community members who are actually engaging with project data consider it to be valuable to themselves or to their community?
- Are existing community engagement initiatives led by your organisation supporting the discovery, comprehension, and utilisation of project data in effective ways?
- Are existing community engagement initiatives sustainable?
- Are there ways to build greater self-sufficiency in community, allowing your organisation to step back in terms of its active role and responsibility?

Investigate and redesign

A community survey or focus group will be required to explore key questions. There may also be reports from your data platform/portal that provide information about who is accessing project data, when, and how often.

You may wish to engage with colleagues who deliver community engagement initiatives, and your communications team, to critically explore survey/focus group results and other supporting data. Consider ways to improve community engagement outcomes in the future.

Desired outcome 5D: Effective data access and visualisation

Air quality data is being accessed by (and communicated to) data users in meaningful and useful ways.

Key questions

- Is data available to be discovered, accessed, queried, visualised, and downloaded by your target data users?
- Does the design of data platforms/portals, and the associated user experience, best serve the needs of data users?

Investigate and redesign

This topic should be investigated as part of stakeholder surveys or focus groups (internal staff and external community), as an extension of the capacity building and community engagement evaluation approach.

You may wish to engage an expert in user interface design and experience to explore areas for potential improvement.

Desired outcome 5E: Building a community of practice

Your organisation is engaging with (and contributing to) a community of practice in ways that increase the overall impact of sensing activities, increase organisational capacity, and position your organisation as a leader and innovator.

Key questions

- Are existing partnerships serving the project and its aims?
- What new partnerships might help to leverage the value of the project?
- Have 'data champions'[7] been established?
  - *If not, would they be worth considering?*
  - *If they have, are they successfully fulfilling the role envisaged for them?*
- Are efforts to promote your organisation's work to an external community of practice producing the desired results, and how could your approach be improved?
- Does organisational policy align with (and support) engagement with a community of practice for smart low-cost sensing?
- Does your organisation have clearly articulated and recognised aspirations (e.g. for innovation or leadership) that drive active engagement with a community of practice for smart low-cost sensing?

Investigate and redesign

A consideration of partnerships might involve an audit of all stakeholders, to reflect on existing relationships, and the strengths and capabilities of each stakeholder. You might discuss this in a

[7] Data champions are people who advise the way data is handled. (University of Cambridge, n.d.)

workshop session with colleagues, and explore ideas for pursuing new partnerships, or putting additional effort into existing ones. This discussion could also include an exploration of creating data champions.

You might also audit all of the external engagements for a project to date, and apply a cost benefit analysis (or similar method) to determine the best strategic use of time and resources going forward.

A review of internal policy, strategy, and informal aspirations relating to innovation, leadership, and engagement with a community of practice could lead to an internal advocacy drive that aims to strengthen these positions. It may be beneficial to collaborate with colleagues within your organisation who have similar external engagement and leadership goals, but who work on different topics or in different departments.

REPORTING IMPACT

At the end of a project:

- A natural time to report the results of impact evaluation is towards the end of a major project delivery period, during the *Evaluation* stage of the Impact Planning Cycle. At this time, a comprehensive evaluation of all aspects of project delivery should be undertaken, leading to a final report. Reporting may be shared with select stakeholders, or openly published, and should contain critical reflections on all aspects of project delivery, as well as recommendations for future improvements.

As you go:

- Additionally, evaluation can (and should) also occur as a more active process throughout the entire project delivery process. This means that impact reporting occurs as you go, in line with each of the main project stages. This type of internal reporting may align well with established project reporting frameworks, particularly in cases where a project is structured around the delivery of milestones.

IEC6: Evaluate your Project Evaluation Plan

Over time, the nature and focus of a project can evolve. Each stage of a Project Evaluation Plan must be adapted to stay aligned. For this reason, it is important to include an evaluation of your own Project Evaluation Plan (to complete the Impact Evaluation Cycle).

The evaluation methodology framework described earlier in this chapter is designed to be applied at each stage of the Impact Evaluation Cycle, with key questions and methods appropriate to each stage. This produces a Project Evaluation Plan, which should be evaluated in this final stage.

Desired outcome 6A: Project Evaluation Plan aligns with capabilities to produce useful insights

Your Project Evaluation Plan is well aligned with the flow of your project and with your capabilities, both within your organisation and among key project partners. The evaluation process is producing useful insights that are informing the iterative development of the project, resulting in increasing impact creation.

Key questions

- Are the desired outcomes defined for each project stage still aligned with the overall aims, and planned outcomes and impacts of your project, or do they need updating?
- Do key questions for each stage of the Impact Evaluation Cycle provide a complete picture?
- Are current methods of engaging stakeholders in evaluation exercises/discussions working for you, and for stakeholders? Are there changes you might make to your approach?
- Are you capturing and sharing evaluation data in ways that optimise engagement with it by select stakeholders? Are there changes you might make to your approach?
- Are you able to access desired third-party evaluation data?
- How accurate and reliable is your evaluation data? Do you trust it? Pay particular attention to third-party sources.
- Are there any ethics concerns relating to the evaluation process itself?
- Do you have the tools, knowledge, and expertise required for reliable and trusted interpretation of evaluation data at every stage of the Impact Evaluation Cycle?
- Is project governance and reporting flexible enough to support the kinds of iterative changes or redesign suggestions emerging from your evaluation process?

Investigate and redesign

Critically reflect on your Project Evaluation Plan. Consider all desired outcomes and key questions. Some of the most useful insights may occur through workshop discussion with core partners. Ensure that the core team discusses *expectations* of the Project Evaluation Plan versus *actual* evaluation tasks undertaken. Make sure that people feel supported and confident in conducting evaluation tasks, and that they have the capabilities needed to do them well. Ensure that tasks are not overly onerous or time-consuming, and be realistic about what is achievable, balancing effort against benefit.

Consider how the project has changed since its inception, based on responses to iterative evaluation. Check foundational documents and milestone reports, and have a core group reflection about the journey so far, with discussion of any obvious inflection points. Discuss governance and reporting structures, and consider ways that these might be updated to support better project outcomes.

In order to investigate the effectiveness and appropriateness of evaluation sessions, consider asking all session participants to complete a short survey to capture feedback. This survey can also investigate participants' views on their engagement with evaluation data.

Conduct a review of all evaluation data requirements in your Project Evaluation Plan, and assess deficits in availability and accuracy. This may require a one-off verification exercise for some data sets.

Consider an ethics review of some (or all) of your evaluation processes.

References

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Additional resources

NSW Government Premier's Department* | *Evaluation Toolkit for government agencies

The *Evaluation Toolkit* provides advice and resources for government agencies planning and conducting a program of evaluation. It includes seven steps for planning and implementing a program evaluation.

Global Evaluation Initiative* | *BetterEvaluation

BetterEvaluation is a knowledge platform and global community for better evaluation and decisions. It is written clearly in plain English, and contains a wealth of definitions and step-by-step advice (including suggested frameworks, methods, and tools, and how to use them). BetterEvaluation is part of the Global Evaluation Initiative, an international network of organisations and experts supporting governments to strengthen monitoring, evaluation, and the use of evidence.

Organisation for Economic Cooperation and Development (OECD) Development Assistance Committee (DAC) Network* | *OEDC DAC Network on Development Evaluation

This website contains a range of widely applicable guidance and resources on best practice evaluation.

Network of Networks for Impact Evaluation* | *NONIE Guidance on Impact Evaluation

A detailed guide to impact evaluation best practice, compiled by NONIE (which comprises the OEDC DAC, United Nations Evaluation Group, and various other peak global bodies).

The Australian Institute of Family Studies* | *Practice resources for evidence and evaluation support

This website has links to a wide range of resources to support evaluation design and practice.

Pacific Research and Evaluation Associates* | *Community Sustainability Engagement Evaluation Toolbox

This toolbox shares strategies used in the evaluation of community sustainability engagement projects that aim to change household behaviours. It brings together several best practice evaluation methods, and is packaged in a user-friendly format.

Associated OPENAIR resources

Best Practice Guide chapters

The Impact Planning Cycle overview

This Best Practice Guide chapter introduces the OPENAIR Impact Planning Cycle, a simple, practical framework designed to assist local governments with impact planning for a smart air quality monitoring project. The Impact Planning Cycle is a planning tool that can help to maximise the impact of a project, and address the needs of an organisation and community.

Activities for impact

This Best Practice Guide chapter introduces a range 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.

Participative design practice

This Best Practice Guide chapter provides guidance for inclusion of participatory design approaches in a smart air quality monitoring project. Participatory design is where citizens can become active co-designers of a project, and may take ownership of key aspects of its delivery. The chapter explores the benefits of participatory design for local governments in this context, practical approaches to implementation, and common challenges that may arise.

Citizen sensing

This Best Practice Guide chapter provides guidance relating to a type of citizen science known as ‘citizen sensing’. This is where citizens play an active role in the collection of air quality data using low-cost sensing devices. This chapter explores the benefits of this approach, practical considerations, and common challenges.

Cybersecurity for smart air quality monitoring networks

This Best Practice Guide chapter provides guidance on key cybersecurity considerations for local governments establishing smart low-cost sensing networks and supporting platforms and services.

Supplementary resources

Identify template

This template supports creation of a business plan and 'data use action statement' as strategic foundations for a smart low-cost sensing project.

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.

Sensing device troubleshooting: extended guide

This resource presents an extended, systematic list of problems that can arise with smart low-cost air quality sensing devices and the provision of useful data. It includes practical information to help diagnose, fix, and mitigate each type of issue.

Air quality sensing device activation and deployment checklist

This resource provides extended guidance on activating and deploying smart low-cost air quality sensing devices. The process begins with onboarding and configuration of devices, includes testing and installation, and ends with commissioning.

Further information

For more information about this project, please contact:

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This Best Practice Guide chapter 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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