Design for effectiveness evaluations

Effectiveness evaluations are used to determine the extent to which plan outcomes have been achieved and are primarily concerned with comparing actual outcomes with the desired outcomes or objectives. These evaluations rely on understanding and interpreting relationships between inputs and outcomes and are normally undertaken at the end of a program or sometimes mid-term in longer programs.

An understanding of other evaluations that may have been undertaken previously provides insights into the findings of an effectiveness evaluation. The relationship of each evaluation to the whole CAP cycle is therefore very important.

An effectiveness evaluation for NRM is complex. These evaluations are often performed at the end of a program when stakeholders who may be able to provide significant information are no longer available. In addition, actual outcomes may be much more influenced by issues such as policy change, drought or land-use change that are outside the control of a CMA.

For CAPs, where outcomes are defined in NRM, there is the potential that the interval before an impact can be measured will be longer than the 10-year term of the CAP. Further complexity may be added because:

- understanding of many ecological relationships is still evolving
- outcomes can be affected by social interactions.

It is important that an effectiveness evaluation of complex programs is designed from the beginning of the program and not left until the evaluation findings are required. The following issues should be considered:

- Effectiveness evaluations will require resource-condition monitoring because the majority of targets are expressed in this form. Implementation of these programs or reassurance that existing programs are suitable should happen in the early stages of each CAP and be monitored over the longer term.
- Resource condition monitoring relies on the maintenance of long-term partnerships to support the monitoring needs of CMAs. These should be identified and established early in the CAP development stage.
- More detailed data management systems need to be developed to manage diverse data needs and sources.

Due to the complex nature of effectiveness evaluations, the design should provide an approach that enables all assumptions, interpretations and relevant evidence to be transparent and repeatable. This will provide more confidence in the results for users of the information. Other complications are usually the result of program planning and include:

- poorly expressed objectives or outcomes
- poorly conceived assumptions that strategies or actions within a plan will lead to the desired outcome.

Design considerations

A number of CMAs are looking at strategic evaluations that will not only inform the effectiveness of their individual projects or programs but contribute to the effectiveness evaluations of the CAP.
Example: Incentive monitoring program in Central West CMA

Central West CMA has instigated a monitoring program to assist with the effectiveness of its incentives program. Most Central West incentive contracts contain a compulsory project monitoring component. The monitoring is designed to demonstrate the effects of a project over a number of years and engage landholders in data collection while at the same time building their confidence in program impacts.

The monitoring program is drawn from the previously successful Rangelands Assessment Program and will be applied to most terrestrial projects within the Central West catchment. The process involves collecting photo-point images and performing annual vegetation transects at a fixed location over five years. The adopted method is intentionally simple to encourage maximum possible participation from all incentive owners. A DVD produced by the CMA shows landholders how to undertake the monitoring and reporting. The aim is maximum possible uptake, rather than data of the highest possible quality.

The CMA believes that, in addition to evaluating the CAP, the benefits of this approach include:

- measuring project impacts which promote continuous improvement of a program
- a demonstration of investment returns on CMA incentives
- building community awareness of better land-use practices
- linking remote imagery databases to large on-ground data sets.

The table below summarises the design considerations for an effectiveness evaluation. These considerations are applicable to both project and program evaluations.

The evaluation questions are examples only as more specific questions are likely to be identified against an individual program or project.
### Design considerations for effectiveness evaluations

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<td>Measured outcomes versus desired outcomes</td>
<td>Experimental designs, e.g. group or area receiving the program compared with a group or area not receiving the program</td>
<td>In preparation for the CMA’s five-yearly review of its CAP, the evaluation team identified that the soil theme has sufficient monitoring information (based on an analysis of the lines of evidence) to allow outcome monitoring using information collected in monitoring programs by NSW NRM agencies, analysis of logic, investment information and relevant literature. The CMA was more concerned that there was less confidence in its existing lines of evidence for the aquatic health and native vegetation themes so it instigated a case study approach that would provide more detailed information and cover both these themes.</td>
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<td>What factors have affected those outcomes (positive and negative)?</td>
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<td>Should the program be modified to achieve better outcomes?</td>
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<td>What are the factors most critical to the achievement of a successful program?</td>
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Information management

Information management is a broad term which covers all the tools, systems and processes used to collect, record, store and access information. Information management considerations for evaluation design should be based on the information needs already identified.

Collection and management of information for effectiveness evaluations should consider the following issues:

- Existing expertise and knowledge of each theme will be recorded in a range of literature and this information should be recorded and referenced as it is identified so that it can be referred to later. In addition, the experience of staff from the CMA, academia and other agencies will be invaluable and may need to be accessed.

- Knowledge of past planning, such as needs analysis, CAP development and the investment strategy, will be recorded in CAP documentation or CAP development papers.

- New knowledge of resource conditions, processes, interactions and pressures or needs should be recorded in appropriate systems. This information may be derived through a continuous ‘watching brief’ of case studies, on-ground experiences, etc. In addition, a new needs analysis may be required where the effectiveness evaluation is being undertaken as a part of redeveloping a long-term CAP. An information management system for this kind of information should be established so the information can be recorded as it becomes known.

- A CMA will need to record qualitative information or be able to easily search for relevant information. How to achieve this needs to be addressed.

Performance measures

Performance measures provide simplified information that may be derived from vast sources of primary quantitative or qualitative data, models or complex statistics. These are measures that best represent elements of a complex ecosystem or environmental issue and their application to complex environmental systems requires a detailed understanding of the system, processes and assumptions in order to ensure that the interpretation is correct.

Resource condition performance measures for a CAP should be seen as only one of the information needs required for an effectiveness evaluation.

Performance measures can operate at various temporal and spatial scales and may be ‘leading’ (that is, providing an early warning of changes within the ecosystem) or ‘lagging’ (showing changes in the ecosystem after they have occurred). A mix of leading and lagging indicators should be considered when defining relevant performance measures, particularly at the outcome levels in the program logic.

Resource condition performance measures should reflect the hoped-for outcome (target for CAPs). If the intention of the target is unclear, reference should be made to the supporting documentation and consultation (such as conceptual models and the results hierarchy) to determine an appropriate indicator. It is important to document these decisions for later evaluation and reporting. The intent would then be reflected by the success factor in the program logic table.

Attributes and available data

Attributes are the components that make up performance information. An attribute is a description of individual parameters or responses. Attributes for the performance measures need to be valid, measurable and applicable, and there are often multiple attributes for each performance measure.

The identifying performance measures attributes template in the evaluation toolkit (www.environment.nsw.gov.au/4emas/evaltools.htm) can be used to record available and required information for each performance measure.

It is also essential that the data sourced is compatible and of a standard that allows confident interpretation and aggregation if required.

Consultation with key stakeholders is necessary to determine whether they have monitored any of the attributes identified for the catchment and management targets. Where relevant monitoring has been or is being undertaken, its method and data quality should be documented. This allows linkages to be made, where possible, and the most cost-effective monitoring program to be recommended.

Monitoring method

Once the performance measures and attributes are confirmed, monitoring methods can be defined. This should be done through consultation with monitoring experts and relevant literature. Consultation with statisticians will add value, especially where the spatial and temporal variability of a performance measure needs to be addressed. Consultation with experts will provide information on:

- method
- monitoring frequency
- locations
- data interpretation and analysis
- quality control methods
- any assumption or monitoring implications.

The template for preparing performance measure profiles and monitoring plans in the evaluation toolkit (www.environment.nsw.gov.au/4emas/evaltools.htm) can be used to record the details and monitoring for each performance measure.

Advice on monitoring methods and standards is available from the NSW agencies’ MER theme teams for state-wide targets. The methods and protocols for the state-wide monitoring and reporting programs will inform monitoring needs and will be available as published documents when these programs are fully established.

Monitoring program design

The design of monitoring programs requires application of experimental design. An experiment is a specific type of scientific method used to study the effect of change. Monitoring design must be based on the issue or subject being studied, the conditions or context of the program and type of information required.

Controlled experimental design

The strictest application of experimental method tests hypotheses by introducing change in a single variable (the independent variable) to study the effect on another variable (the dependent variable(s)). To do this, all conditions must be kept constant or controlled.
Application of controlled experimental design is rare because of the difficulty of keeping conditions constant and generally requires laboratory conditions. It is generally used in physics and chemistry where conditions can be controlled.

The application of controlled experimental design in social and natural resource situations and so for evaluation of CAPs is not recommended mainly because it is not a true reflection of the environment being managed. There are also questions relating to:

- equity
- diversity and scale of issues being managed by the CAP
- temporal and spatial scales
- the need for the CMA to maintain a flexible and adaptable approach to investment over the longer term.

Designs for the effectiveness evaluation are likely to be quasi-experimental, non-experimental or a combination of both.

**Quasi-experimental designs**

These are similar to experimental designs but without the same degree of control. There are a few quasi-experimental designs that could be applied to a CAP evaluation and each has its strengths and weaknesses. These include:

- matched group designs
- time series or intervention designs
- longitudinal designs.

A **matched-group design** could compare two subcatchments: one receiving funds for specific management action-related projects and the other not. This type of design may introduce a bias as groups or subcatchments are not selected randomly but selected for activities in a priority investment area or because of the timing for that particular investment.

Matched-group design is more likely to be useful within a case study or applied at a project scale rather than whole-of-CAP scale. An example is where a CMA wants to better understand why some landholders access funds for on-ground works where others do not.

A **time-series or intervention design** will take measures over the long term, including before and after the management intervention being investigated. This design method is particularly useful if there is already a relevant monitoring program for a catchment target in place, as this information can be drawn upon to understand intervention impacts. This design can be problematic where NRM programs have been in place before CAP implementation, but activities may have been more sporadic, less strategic and on a smaller investment scale. Another possible issue is the impact of externalities.

A **longitudinal design** will follow the same management intervention or group over a longer period but the monitoring will need to start before the particular investment commences. This design has similar issues to time series.

**Non-experimental designs**

Non-experimental designs relevant to evaluating effectiveness of a CAP include:

- outcome monitoring designs
- case studies
- qualitative and quantitative surveys.

*Outcome monitoring* using performance measures should be in conjunction with other supporting evaluation information to determine the effectiveness of CAP implementation. The
performance measure needs to be relevant to the catchment target, i.e. a measure of performance against the target. If it is not relevant to the catchment target, it will be difficult to determine how effective NRM investment has been.

Case studies use a variety of data-collection methods to obtain an in-depth understanding of significant activities, often relying on qualitative and quantitative information. The use of case studies for significant management activities is proposed for the evaluation of CAPs where there is a need to supplement existing information to address specific evaluation questions.

Qualitative surveys use questions to find out information about outcomes. For example, if a CMA needed to better understand the role of an NRM education program, surveys addressing awareness, participation and behavioural change could be undertaken. Surveys are a technique that may be applied within case studies. Qualitative information can add value to quantitative data by helping to understand why quantitative results are being achieved. Quantitative surveys are designed to allow detailed statistical analysis of the survey results. Design of questions is critical to avoid bias in the survey information. Many surveys are designed to enable both qualitative and quantitative information to be gathered.

Combination designs

The multiple lines of evidence approach uses both quasi- and non-experimental design methods supported by the use of other relevant information such as:

- published literature
- catchment reports
- research findings
- project monitoring programs
- descriptive and spatial information on investment trends and outputs (e.g. annual reports, investment strategies and spatial outputs from a land management database).

Expert advice on developing new information to inform the evaluation, advice on monitoring procedures, standards and protocols should be sought.

Database systems

Information storage and retrieval procedures for NRM agencies are specified in the Draft Natural Resources Information Management Strategy (NSW Government 2002; available at www.nrims.nsw.gov.au). Information management practices for natural resource management agencies in NSW must be consistent with NRIMS. The strategy identifies the coordination, communication, quality, data management and access requirements for natural resource information and is consistent with national standards and requirements. All CMAs will need to consider these requirements when they wish to serve information to an agency database.

The Commonwealth Government has identified the need for more strategic data collection to ensure data is accessible and available to the community and all levels of government. An effort to promote the development of linked NRM data and information systems is under way through:

- strategic or information-sharing partnerships with government and research organisations such as –
  - Office of Spatial Data Management (www.osdm.gov.au/)
  - Australian Spatial Data Directory (asdd.ga.gov.au/)
  - ANZLIC the Spatial Information Council (www.anzlic.org.au/)
Spatial Sciences Institute (www.spatialsciences.org.au)
Cooperative Research Centre for Spatial Information (www.crcsi.com.au)

- nationally linked data and information systems through the implementation of an Australian natural resource information infrastructure (ANRII) (www.anra.gov.au/topics/publications/national/introduction.html).

The Commonwealth and NSW Governments are working closely together on managing NRM information. NSW is also moving toward more broadly available and publicly accessible NRM information.