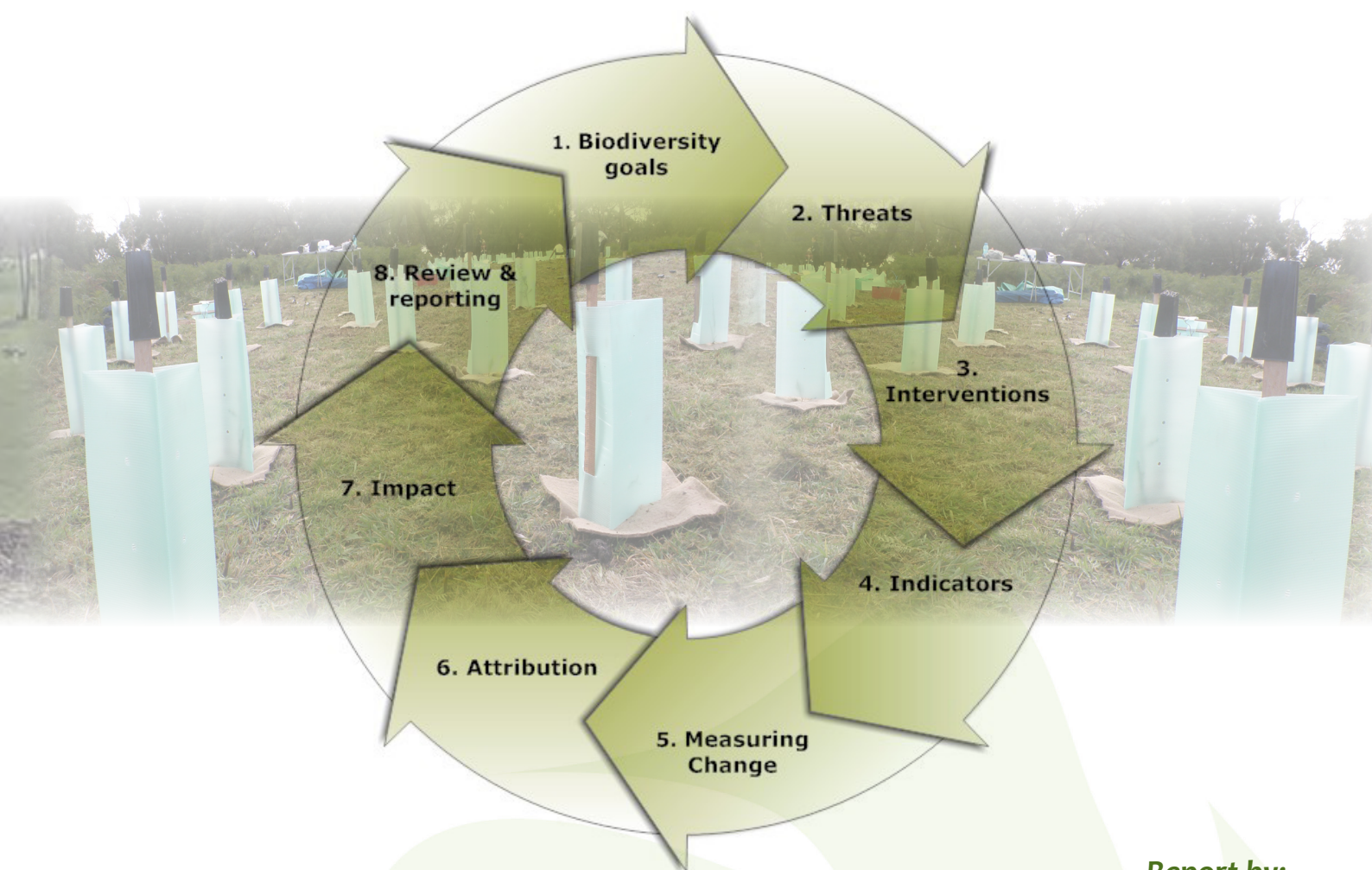




Applying the principles of adaptive management to the application, selection and monitoring of environmental projects



Report by:

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Purpose of Report

The report presents the findings from the Biodiversity Fund and Caring for our Country (Monitoring) Project, which involved the refinement of a conceptual model that applied the principles of adaptive management to the project application process. The report is an output of the Landscapes and Policy Research Hub.

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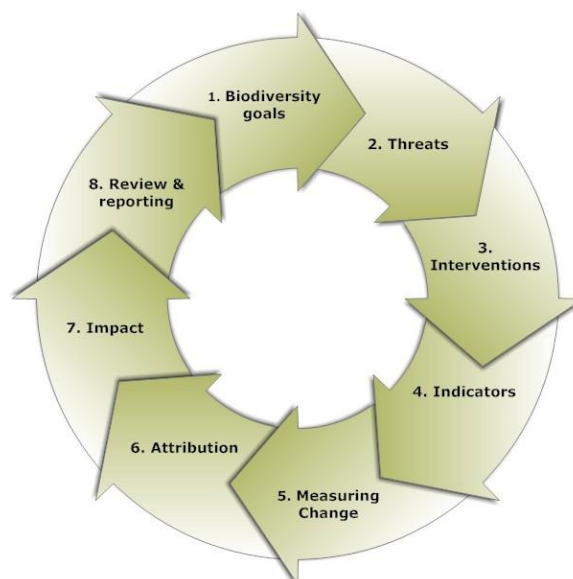


Executive Summary

The Landscapes and Policy Hub, established under the Australian Government's National Environmental Research Program, is researching tools, techniques and policy options for landscape-scale biodiversity conservation. The Biodiversity Conservation Division within the Department of the Environment invited the directors of the five National Environment Research Program (NERP) hubs to discuss options to improve the outcomes of the Land Sector Package and Caring for our Country programs through the design of scientific monitoring programs.

The Biodiversity Fund and Caring for our Country (Monitoring) Project arose from a proposal by the Landscapes and Policy Hub that an additional approach to improving the likelihood of measurable outcomes was to redesign the project-level application process as a series of steps based on the adaptive management cycle. The steps would require applicants to clearly articulate the goals of the project and provide sufficient information on the scale, timing, landscape context, assumptions and level of experience underpinning their proposed interventions to enable an assessor to estimate the likelihood of success. The project was funded to refine a conceptual model (see below) that applied the principles of adaptive management to the project application process.

The original conceptual model was refined by reviewing program-level goals and other background material for the Caring for our Country and Biodiversity Fund programs to ensure compatibility, and then tested by applying it to a selection of actual applications for completed projects considered by the department to have been successful. The findings from the project were then presented to fifteen staff from the department at a workshop in Canberra on 10 September 2013 to discuss the project outputs and their implications.



The project outputs described in this report include:

- A description of the Project-Level Adaptive Management Model, illustrated below.
- A suggested process for incorporating the Project-Level Adaptive Management Model into future funding application and assessment materials, and
- An example of a project application form and a project assessment form based on the model.

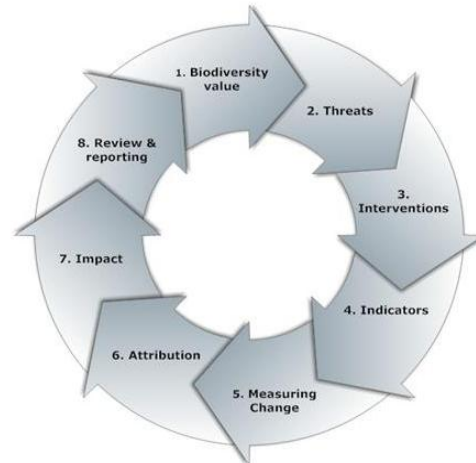
Project-Level Adaptive Management



Recommendations

Recommendation 1

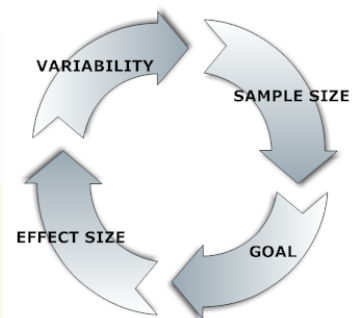
That publicly funded environmental programs adopt the modified adaptive management cycle described in this report to guide proponents through a logical sequence of questions to link their goals to intermediate and ultimate outcomes.



Recommendation 2

That large projects be required to develop a monitoring program capable of measuring change in their project goal by submitting a monitoring design during the course of their project that specifies

- The degree of impact they expect to see in their goal (the effect size)
- The natural variability in their goal or the means by which they will estimate that variability during the course of the project
- The sample size or number of replicate sites that will be monitored in order measure change in the project goal, based on a) and b) above.



Recommendation 3

That partnerships between project proponents and research groups, consultants or others skilled in monitoring design be encouraged and financially supported for a sub-set of large projects to build capacity in monitoring design and implementation amongst environmental managers in Australia.

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Frequently Used Abbreviations

CERF	Commonwealth Environmental Research Facilities Fund
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities*
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
MERI	NRM MERI framework: Australian Government natural resource management <i>monitoring, evaluation, reporting and improvement</i> framework
MNES	Matters of National Environmental Significance
NERP	National Environmental Research Program
NRM	Natural Resource Management
PAMM	Project-Level Adaptive Management Model

*On 18 September 2013, the Department of Sustainability, Environment, Water, Population and Communities became the Department of the Environment.

1. Background

1.1. Improving the Outcomes of Public Environmental Programs

The Australian Government invests in a range of funding programs designed to achieve cost effective and efficient biodiversity conservation and improved natural resource management outcomes at local and regional levels. The Department of the Environment's (formerly the Department of Sustainability, Environment, Water, Population and Communities) Caring for our Country and Biodiversity Fund programs offer funding to community groups seeking to protect the natural environment as well as economic incentives to private land holders seeking to protect threatened ecological communities.

The department sought the advice of the National Environment Research Program (NERP) on ways to improve the outcomes of the Land Sector Package and Caring for our Country Programs by seeking the input of the Hubs in the design of scientific monitoring programs.

At a meeting held in Canberra on 4 March 2013, the Landscapes and Policy hub suggested that there was potential to improve the outcomes of these programs by refining the project application and selection process to strengthen their relationship with the program. An initial conceptual model to guide this process was developed by Professor Ted Lefroy.

This project was subsequently proposed as a way of further testing and refining this conceptual model by analysing selected completed projects and the application and selection processes used in Caring for our Country and early rounds of the Biodiversity Fund. The intention was to align the project selection processes more closely to the program goals and hence improve the likelihood of achieving measurable outcomes from these two programs.

1.2. The Project Terms of Reference

The overall aim of this project was to help achieve better NRM policy, program and project outcomes by developing principles and criteria consistent with Adaptive Management that will assist departmental staff in revising guidelines for proponents and assessing applications for funding projects under future rounds of the Biodiversity Fund and Caring for our Country Programs.

This project entailed five key tasks:

1. Refine the project plan through an inception meeting with departmental staff to a) clarify the existing goals and expected outcomes of the Biodiversity Fund and the processes used in project application and selection, b) clarify the criteria to be used in selecting 'successful' past projects for use as case studies in this analysis; and c) identify the number of case study projects to be used in this analysis.
2. Examine the adaptive management model proposed by Ted Lefroy as a guide to project application and selection to identify the theoretical and practical assumptions underpinning each of the steps in the model, consider elements not included, and refine the model prior to application.

3. Apply the refined model retrospectively to a selection of ‘successful’ past projects to identify lessons from real world examples and build on their experience.
4. Formulate practical guidelines for project application and selection based on steps 2 and 3 above.
5. Present the project findings to departmental staff through a workshop to seek feedback and refine the approach as required.

2. Key Findings

2.1. Task 2 – Description of the Project-Level Adaptive Management Model

2.1.1. The Origins of the Project-Level Adaptive Management Model

In March 2013, a proposal was put to the Biodiversity Conservation Division that the likelihood of achieving measurable outcomes from public environmental programs could be improved by strengthening the logic and the quality of information provided by project proponents. An eight step model was proposed (Figure 1) based largely on the concept of Adaptive Management (Holling 1978). This model was also informed by two more recent observations in natural resource management. The first was the shift from a threat-based to an asset-based approach to natural resource management (Curtis & Lefroy 2010). The second was an outcome of the Landscape Logic project (Lefroy et al 2012) funded by the predecessor to the NERP program, the Commonwealth Environmental Research Facilities fund (CERF).

The shift from a threat-based to an asset-based approach occurred in the last decades of the twentieth century in response to the apparent failure of large environmental programs directed at threats such as soil erosion, dryland salinity, and invasive plants and animals for more than a century (Curtis & Lefroy 2010). The asset-based approach places a strategic focus on those parts of the landscape of high value, and attempts to manage the processes that threaten them at an appropriate scale, rather than attempting to defend large areas against broad-scale threats.

The Landscape Logic project set out to retrospectively assess the impacts of public environmental programs on two measures of environmental condition; vegetation extent and condition in north-eastern Victoria and water quality in rivers and streams in Tasmania. A finding common to both case studies was that it is necessary to answer three questions in order to establish the effectiveness of public environmental funding. First that the project goals include environmental states or conditions that are measurable and have recognised metrics. Second, that it is possible to distinguish between human and natural influences as the likely cause of any change that is detected in these goals. Third, that it is possible to attribute some or all of the human induced change to a particular environmental program.



The original conceptual model for improving project-level application and selection processes

The Adaptive Management Cycle and the Biodiversity Fund

Build the application and selection process around the modified adaptive management cycle opposite
(*Plan, Act, Monitor, Review*)

1. What are your biodiversity goal(s) in terms of regionally significant species or communities?
2. What are the processes that threaten these target species or communities (biological, physical, economic, cultural)? Over roughly what area in your region do these processes operate in relation to the species or communities that are the focus of your project? Over which of these do you consider management has most influence? Which threatening processes do you plan to manage through this project? (fragmentation, predation, competition, loss of habitat resources such as nesting sites, food sources or cover for movement etc)
3. What interventions do you propose to take to manage those threatening processes? Where and when do you plan to carry these out, and how much will they cost? What evidence do you have that these interventions are likely to be effective in minimising those threatening process? Please indicate the prior experience amongst your team in carrying out those interventions at the scale proposed?
4. What indicators will you use to detect change in your target species or community?
5. How do you propose to measure change in your biodiversity goal? Indicate your monitoring design including the use of controls, the number of replicates, and the scale, timing and budget for data collection.
6. How do you plan to attribute any change that you do detect to your intervention as opposed to other human or natural causes?
7. What target level of impact are you anticipating in response to your intervention (In other words, how will you know if you have succeeded, and what degree of success are you expecting)? How will that be reported?
8. How do you propose to evaluate the success of your project?

Each of the eight sections would require multiple questions that effectively lead proponents through the principles of landscape scale biodiversity management.

Most of the questions would fit under one of three categories;

1. Biodiversity conservation value of the project (1, 2, 3, 7)
2. Likelihood of success (3, 4, 5, 6, 7, 8)
3. Cost (3, 5)

Responses to these questions could be used to generate a simple index:

$$\text{Relative value of a project} = (\text{Biodiversity value} \times \text{likelihood of success}) / \text{cost}$$

which could be calculated using a combination of qualitative and quantitative information and used to assist project selection.

Ted Lefroy 18 March 2013

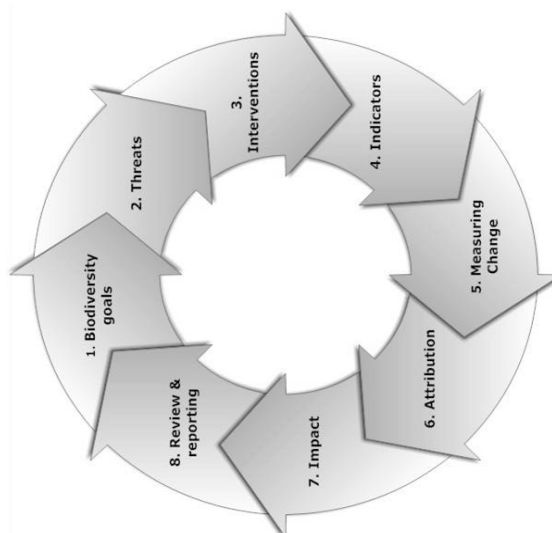


Figure 1 The original conceptual model for improving project-level application and selection processes, March 2013

Establishing that change has occurred, and attributing cause to a particular intervention, are both extremely challenging when dealing with environmental processes that occur over large spatial scales and long time periods. This has been a major shortcoming of the reporting of environmental programs, identified in several audits of public programs in Australia (ANAO 1997, ANAO 1998, ANAO 2001, ANAO 2008). Interventions may take decades to have a measurable impact, or require intervention over a large area before any change is detectable. Attributing change to a particular project or intervention may simply not be possible given the range of other human activities that can influence the state of the environment. However, the purpose behind the steps in the model presented here is to articulate these questions, and force proponents to consider how they could most effectively intervene to achieve measurable environmental goals. The steps lead proponents to establishing a hypothesis, a statement of what they expect to happen in response to their project activities, even if these are not measurable within the life of the project.

2.1.2. The Social and Institutional Aspects of NRM Underpinning the Model

This project was implemented to help increase the likelihood that the department would achieve desired outcomes from Caring for Our Country and Biodiversity Fund investments. These investments are part of a suite of policy instruments designed to support environmental management aimed at improving biodiversity and ecosystem resilience. Investing in environmental management necessarily involves informed choices about what projects (and their specified interventions) will most likely achieve desired outcomes. Making informed investments can be supported by using the Project-Level Adaptive Management Model.

The Project-Level Adaptive Management Model (PAMM) is based on some key assumptions in social science theory. The following material examines those assumptions and identifies gaps in the information used to formulate the original model shown in Figure 1. The Project-Level Adaptive Management Model was developed from the original conceptual model to incorporate some of these key ideas.

Resilient social and ecological systems

Environmental management focuses on improving the condition of our biophysical environment and natural resources. Resilience theory is useful for reminding us of the value of systems thinking. Systems thinking is about more than understanding our natural systems as it encourages us to consider the full range of interacting, interrelated, and interdependent social, institutional and biophysical components that form a complex and unified whole. The ‘whole’ in this case is people and nature interconnected. People and society (the social system) depend on the natural resources of an ecological system. These systems are always in a state of flux or change, are self-organising, exist across space and time and co-evolve (Folke et al 2002; Gunderson & Holling 2002)

Where these social ecological systems (SES) can adjust and reorganise in response to disturbances while remaining in a relatively similar form they are considered resilient (Walker et al 2010). Sometimes the response of a social-ecological system to some disturbance

can create whole new systems (transformation). At other times, we may seek to alter those systems in order to trigger transformative change.

Adaptive management and adaptive governance

Given these dynamic conditions, it is not surprising that uncertainty is an inherent feature of environmental problems and arises at many points in decision-making processes because of extended time scales, competing values and knowledge, lack of information, and difficulties in establishing cause and effect relationships (Dovers et al 2008). A useful tool in these settings is adaptive management. Adaptive management involves building planning cycles that are based on regular reflections on policy and program assumptions, learning from those assumptions and from observations of on-ground actions, and then making any required changes. In an NRM setting, adaptive management can be thought of as a practice for treating environmental interventions as experimental and learning process (Allan et al 2008) where we remain open to considering how well we are meeting our desired goals. However, implementation of adaptive management remains problematic, because of its ‘poor fit’ with current natural resource management culture which demands certainty and fails to embrace experimentation and failure (Allan & Curtis 2005: 423).

Governance theory can lend further insights into some of these more restrictive decision-making settings. Governance is about the interactions in social systems between structures, processes, and traditions that shape how power influences decision-making. That is, how responsibilities are exercised, who has a say, and how different forms of power are manifest (Lockwood et al 2010). Of particular interest to social scientists is how governance of natural resources can be more inclusive and rely less on markets and regulations to achieve desired outcomes. There has been increasing interest in community-based environmental and natural resource management interventions, and how their effectiveness can be improved by building on existing human and social capital and tailoring interventions to the most appropriate social and biophysical scales.

Engaging people in natural resource management

Flexible and inclusive environmental and natural resource management decision making requires more people understanding that the large scale of our environment problems requires the collective action of a disparate range of actors. Much of Australian’s land is under private ownership and management, and a large proportion of the Australian Government’s investment goes to private land managers. If we seek to improve natural resource management in the form of both social capacity and biophysical outcomes, there is an important role for social research.

Social theory demonstrates that environmental and natural resource management interventions often require rural landholders to change their land use and management practices. Engaging rural landholders in practice change is complex and difficult, because a large set of personal and societal factors influence their decisions about how and to what extent they will take up new or different practices. Moreover, these factors can vary across different settings, technologies, social systems and times (see Figure 2).

Factors Influencing Adoption of Sustainable Land Management Practice

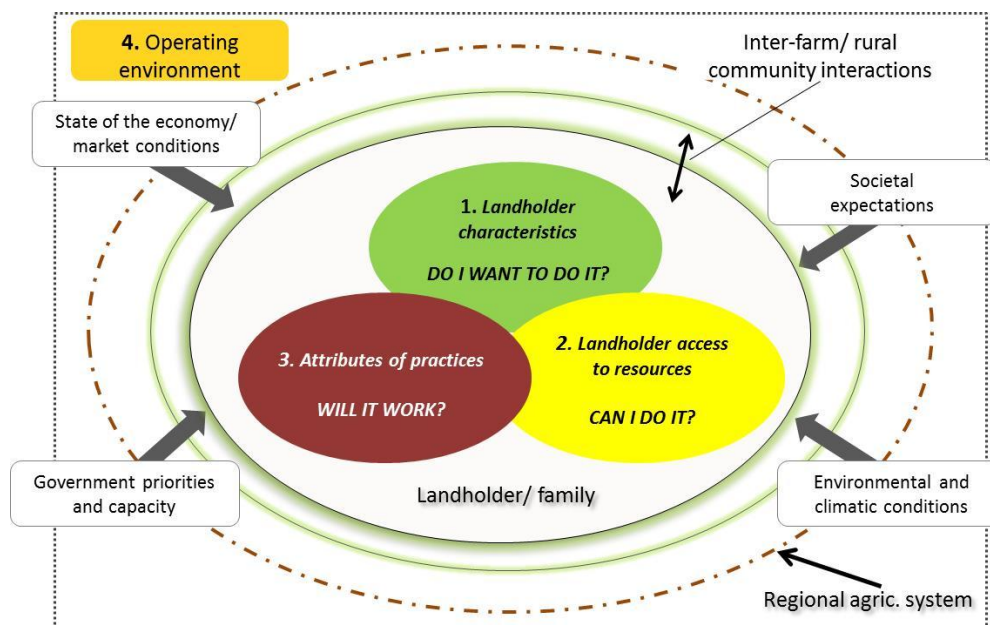


Figure 2 Factors influencing the adoption of sustainable land management practice.

Source: Mazur et al (2008)

Engaging people in practice change requires a suite of policy instruments. Those might include one-to-one or group extension; sharing the costs of work on private land where the public benefits exceed private benefits; establishing markets to ensure resources are used efficiently; regulation that ensures landholders meet a duty of care for the environment; and enforcement to ensure compliance with existing rules (Mobbs & Dovers 1999). The selection of policy instrument depends on confidence in the science underpinning decisions about ‘where we are headed and how to get there’ (Curtis & Lefroy 2010); the adoptability of the technology, land use or management practice; and the relative costs of different approaches (Pannell et al 2006).

Where there is relative confidence that recommended interventions will achieve the desired outcomes, then best-practice recommendations should apply. However, there still needs to be an assessment of the adoptability of those practices by rural landholders. For example, if there is a shortage of awareness, knowledge or management skills among landholders then activities that can fill those gaps are appropriate. If there is low confidence in a recommended practice, perhaps because elements of the technology are unproven or complex, then activities to trial those practices may be appropriate. If the recommended practice is very expensive, then some form of cost sharing between government and private landholders such as offering incentives might be appropriate.

Policy instruments that aim to facilitate personal engagement with landholders as individuals or groups also need to be underpinned by an understanding of the values, long-term plans, beliefs and attitudes of those being approached (Stern et al. 1999; Ajzen 1991). People will and do have different preferences for environmental conditions. For example, identifying which environmental assets ought to be maintained or improved is based on values as well as science. Desirable and achievable end-points are social constructs (Curtis & Lefroy 2010). That is, environmental targets do not exist ‘out there’ somewhere independent of our values, beliefs or understanding. Consequently, decision makers and land managers may need to negotiate with affected stakeholders (such as other landholders) to establish natural resource management targets and how those targets will inform future strategies. Those ‘negotiations’ would ideally be part of an adaptive management process, which would in turn require building positive social capital (see box below).

Human and Social Capital in NRM Engagement

Engaging stakeholders in processes involving dialogue, learning and action is best when dealing with highly complex problems that are resistant to resolution (that is, ‘wicked problems’). Those processes essentially equate to engaging and building human and social capital. Social scientists deliberately use the terms ‘engage’ and ‘build’, because all people possess inherent abilities and agency (ability to take action to meet their needs). Human capital means the skills and abilities of individuals (Castle 2002). Social capital refers to the relations, networks, trust among people; and the prevailing norms and institutions (or rules) that govern people’s interactions and can lead to further benefits (Sobels et al. 2001). Social researchers typically support inclusive approaches to NRM that move beyond government, where decisions are largely influenced by markets and bureaucracies, to forms of governance where a wider set of actors and arrangements are embraced (Lockwood et al. 2010).

Evaluating NRM interventions

Up until relatively recently, most evaluations of NRM interventions and investment have focused on the extent to which there have been positive changes in the biophysical environment. Many decision makers, resource managers and members of the public see improved condition of natural resources in the form of biophysical or natural assets as the ultimate outcome. However, achieving those outcomes typically involves engaging and building human capital in the form of knowledge, skills and abilities, as well as social capital in the form of networks, norms, trust and institutions. As we strive to achieve environmental condition targets, these changes in human and social capital are a critically important part of

our intermediate objectives. Appropriate indicators need to evaluate how and to what extent we are achieving those intermediate objectives.

Evaluating funding applications should focus on the extent to which proponents have used program logic, or theory of planned change, to design their projects. That is, there should be clear causal links between their chosen interventions and desired longer term and intermediate outcomes for their target assets. Funding applications must also include information about how proponents will evaluate their progress towards the eventual achievement of those different goals.

2.1.3. The Project-Level Adaptive Management Model

The basic structure of the Project-Level Adaptive Management Mode (PAMM) developed in Task 2 of this project is shown in Figure 3. The full description of each step is listed in Appendix 1. The Project-Level Adaptive Management Model closely resembles the original conceptual model (Figure 1) as it is based on the well-known adaptive management cycle of plan, do, reflect and revise. This basic structure involves clarifying the goal, what is to be done, how project progress will be monitored, how change will be measured and how lessons will be identified, reported on and shared. The Project-Level Adaptive Management Model varies from the original conceptual model in several respects:

- The names of the key steps are more descriptive and reflect the actions required.
- The main task descriptions are explained in more detail to show what specific analysis and actions were required, how the steps differed from each other, and highlight the logic of following such a sequence. In some cases, the emphasis of the tasks has changed to better reflect the program priorities of the Biodiversity Fund and Caring for our Country (for example, Step 1 requires proponents to clarify not just what biophysical values the project is seeking to protect, but also whether there are any cultural or social values being targeted).

The Project-Level Adaptive Management Model

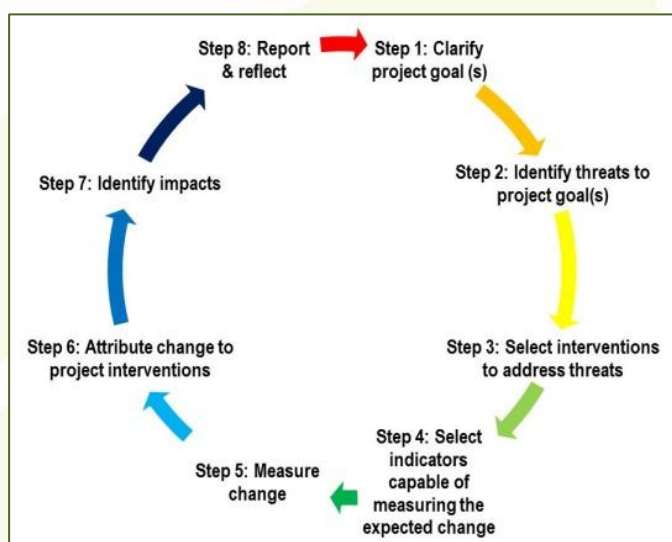


Figure 3
The Project-Level
Adaptive
Management
Model (PAMM)

2.2. Task 3 – Applying the Project-Level Adaptive Management Model to the Project Application Process

Selected Caring for Our Country and Biodiversity Fund documents (Table 1) were analysed to ensure alignment between existing processes and the Project-Level Adaptive Management Model approach, and inform development of Caring for Our Country and Biodiversity Fund guidelines and assessment criteria to support the approach advocated in the Project-Level Adaptive Management Model.

Table 1 Resources used to support Task 3

Task 3	Materials used for our analysis
Review application & assessment material	<p>Caring for Our Country 2013/14:</p> <p>Community Environment Grants Application Form</p> <p>Regional Delivery – Subproject application form (Part 2)</p> <p>Target Area Grants Guidelines pp. 34*, Application Form, Expressions of Interest Application and Assessment Forms</p> <p>Biodiversity Fund 2013-14:</p> <p>Assessment Criteria-Section 3.2 pp.27-29; Expressions of Interest Application Form; Full Application Form</p> <p>Online Assessment Tool user guide 2012</p> <p>Clean Energy Future Program:</p> <p>Assessment FAQs</p>

Key findings in relation to each step in the Project-Level Adaptive Management Model are described below.

PAMM STEP 1 - Clarify project goal/s

Analysis of the supporting documents showed that identifying and articulating clear program objectives is critically important if the highest priority environmental issues or assets are to be effectively targeted with available funding. Clear objectives enable grant proponents to match their approach and capabilities to program priorities. Clear and unambiguous terminology is an important part of this. One of the main objectives of applying the adaptive management cycle to project applications was to avoid confusion between means (what we plan to do, or management actions) and ends (our goals, what we want to achieve) which was common in the applications reviewed in the course of this project

As a starting point, the model uses the primacy of the objectives of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), including matters of national environmental

significance (MNES) and objectives related to threatened, endangered, or otherwise protected species and threatening processes. These objectives are complemented by those in related government NRM plans and policies and the investment themes and priorities for both the Caring for Our Country and Biodiversity Fund programs.

There is also an important role for proponents to nominate environmental priorities for their regions, such as regionally significant species, communities and threatening processes, guided by overarching program objectives. This grass-roots approach has strong advantages for community engagement and knowledge sharing, capacity building, and to sustain longer term program efficiency and effectiveness.

The PAMM has been designed to be used with objectives identified as high priorities by the department. The ability to also accommodate objectives based on state or regionally significant species, communities, ecosystem services, or cultural values is likely to result in a higher level of local and regional engagement and therefore more effective and efficient interventions.

Existing departmental documentation contains references to the importance of other government NRM programs, priorities and policies including Recovery Plans, Threat Abatement Plans and large-scale initiatives like the national reserve system. Proponents are consequently asked how their project objectives relate to these broader programs, policies and plans although the purpose of this is less clear. A more explicit narrative could demonstrate how a proposal will complement or leverage existing initiatives, or illustrate risks of duplication between new projects and existing initiatives.

The project proposals we reviewed when testing PAMM indicated that project ‘goals’ often refer to threatening processes or interventions rather than to the environmental ‘values’ or ‘assets’ that a program is seeking to conserve or enhance. The Project-Level Adaptive Management Model therefore requires in this step a clear focus on objectives directly related to regional, national, or state significant species, communities, ecosystem services or cultural value. This can then guide more effective risk assessment and the design of appropriate interventions.

The material we reviewed also included references to Caring for Our Country and Biodiversity Fund program objectives related to community engagement, community knowledge transfer and capacity building. In some cases, this was explicitly directed at Indigenous communities and in others, it related to communities within a priority NRM region. These are likely to be important program objectives across most regions and investment priorities, and could be formalised and described as such in program documentation. This would help to ensure that proponents develop strategies to achieve these objectives as part of their proposals.

PAMM STEP 2 - Identify threats to project goal/s

A key strength of the PAMM approach is clarification of the relationships between NRM goals, the threats to these goals, and the practical interventions needed to manage these threats. The program-level documentation we reviewed did not guide proponents through a systematic analysis of the scope and scale of threats to a given high priority asset, and how to identify the most appropriate threat as the focus of intervention.

Clear terminology to guide the identification and analysis of threats to species, communities, ecosystem services or cultural values, and to maintain focus on threats at this stage of the PAMM cycle is important. Less precise terms such as ‘issues’ can distract focus from a more targeted threat assessment, and lead proponents to consider objectives, threats and interventions in a less systematic and sequential way.

Similarly, some application process documentation refers interchangeably to goals and objectives, and threats and interventions without focusing on a more logical sequential analysis. Establishing a causal relationship between threats or threatening processes and environmental assets under protection or remediation is fundamentally important.

An important area for clarification is the relationship between threats targeted in a proposal and similar or related threats already emphasised or managed through an existing government plan policy or program. The extent to which threats identified in a project proposal are also being addressed through other plans or programs must be very clear to avoid duplication, and improve monitoring and reporting, particularly the attribution of outcomes to a particular intervention.

Existing documentation encompasses both the NRM related threats to a given project goal (as envisaged by PAMM Step 2) as well as risks to project management and governance. Typically, grant application and evaluation processes focus on the governance risks over those associated with managing the uncertainty inherent in complex natural and human systems, and interventions to achieve a given NRM objective.

Understanding the aggregate impacts of all threats on a given species, communities, ecosystem services or cultural assets and taking a structured approach to threat identification and management is more likely to ensure the more significant threats are identified and managed through appropriate interventions.

The value of the PAMM approach lies in this sequential, step by step identification of key uncertainties in the proposed interventions and the context in which they are being applied, and then providing a structured framework for proponents and assessors to consider the degree to which these risks may impact on species, communities, ecosystem services, or cultural objectives, and whether or not they can be adequately managed.

PAMM STEP 3 - Select interventions to address threats

Clear program objectives contribute significantly to the development of appropriate interventions. Caring for Our Country and Biodiversity Fund program documentation is arranged around investment themes, however they are not described in sufficient detail to elicit a clear hierarchy of objectives. This then complicates both threat assessment and the development and selection of interventions to address the most appropriate threats.

The PAMM guides proponents through a logical analysis of their proposed interventions to ensure that most foreseeable uncertainties that may compromise the success of interventions are managed appropriately (that is, risk management of proposed interventions). The intent is to reduce the inherent uncertainty of NRM interventions as much as possible. This has been addressed to some degree in existing documentation. However, a more explicit, step-by-step approach is required.

A similar logic applies to the proponents' capability and experience in managing the specific interventions they propose, and their track record in carrying out their proposed interventions. Knowing that experienced people are managing appropriate interventions improve the likelihood that projects will be effective and efficient. It also increases the likelihood that interventions have been realistically costed, including follow on funding to support ongoing outcomes.

Some of the documentation notes the importance of more innovative approaches to interventions. It is still important that proponents provide justification of the interventions, why it they have been chosen ahead of alternatives, and on what basis they consider they will be effective at addressing the threats to their goal.

PAMM STEP 4 - Select indicators capable of measuring expected change

Existing program documentation on the department's MERI¹ framework clarifies the role and importance of project-level monitoring, evaluation and reporting. This is more straightforward with a more obvious and direct link between a proposed intervention and a species, communities, ecosystem services, or cultural asset (objective). In cases where the chain of causality between proposed interventions and the assets is longer or more complex, there is more risk in the selection of appropriate indicators.

Effective integration of the department's own MERI framework with clearly articulated project-level monitoring is vital if individual projects are to contribute to program-level goals and reporting. To assist this, project application guidelines could include a list of indicators and their associated recognised metrics for commonly used ultimate and intermediate outcomes.

¹ MERI is the Australian Government's natural resource management *monitoring, evaluation, reporting and improvement* framework.

For example, intermediate outcomes for improved vegetation condition could be measured using the reduction in presence of herbivores, while the ultimate outcome could be monitored as a measured increase in recruitment of significant over story or understory species. For increased population viability of significant species, intermediate outcomes could be measured as reduced presence, extent or frequency of a major pest, predator or other threatening process, or an increase in the availability of suitable habitat resources such as seasonal food sources or nesting sites.

PAMM STEP 5 - Measure change

Establishing that change has occurred and, attributing cause to a particular intervention, are both extremely challenging when dealing with environmental processes that occur over large spatial scales and long time periods. This has been a major shortcoming of the reporting of environmental programs as identified in several audits of public programs in Australia (ANAO 1997, ANAO 1998, ANAO 2001, ANAO 2008).

Interventions may take decades to have a measurable impact, or require intervention over a large area before any change is detectable. Attributing change to a particular project or intervention may simply not be possible given the range of other human activities that can influence the state of the environment. However, the primary purpose behind the steps in the model presented here is to articulate these questions and assumptions, and force proponents to consider how they could most effectively intervene to achieve measurable environmental goals.

The ability to unambiguously measure change in the project goal is the most challenging aspect of any intervention and requires proponents to indicate in a proposal how they would answer two important questions about the nature of that goal.

1. What is the level of impact they expect to see as a result of their intervention, such as a 10%, 20% or 50% change, or prevention change of a certain level? In the language of statistics, this is the **effect size**.
2. What is the amount of **natural variability** in the goal as measured using the indicators selected in the previous step?

Armed with these two pieces of information, it is then possible to calculate the number of samples or replicate sites that need to be measured in treated and control sites in order to accommodate natural variability. Publications by Field et al (2007), Lechner (2012) and Reid et al (2013) provide useful guidance on these aspects of monitoring design using Australian examples of monitoring conservation and rehabilitation projects.

This is a step that most proponents will not be able to carry out without assistance. Even in the case of larger organisations with experience managing environmental projects, it will be necessary to form partnerships with research organisations, consultants or other groups

skilled in monitoring design, to establish a monitoring and evaluation program with the statistical power to establish whether any change has actually occurred. Even when change can be established, it may be challenging to attribute that change to particular interventions. However, as a basic requirement, large projects should be required to establish monitoring designs capable of establishing statistically significant correlations between interventions and response. Until publicly funded environment programs achieve this, external audits will continue to ask why it is not possible to see evidence of outcomes.

Monitoring design is a cycle within the larger Adaptive Management cycle

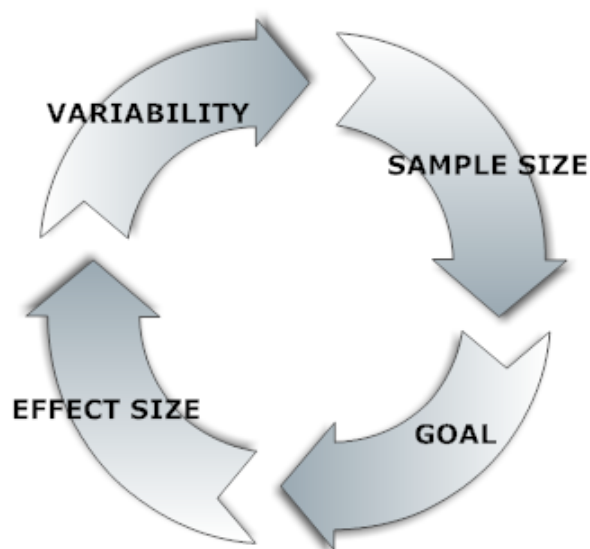


Figure 4 The steps required to establish a monitoring design capable of unambiguously detecting change in a project goal.

There are perfectly legitimate reasons why it can be challenging to provide evidence of environmental outcomes. The time lags between intervention and response, such as the multiple decades required between planting vegetation and provision of habitat resources by mature stands such as food or nesting sites, means that projects may not see the ultimate outcomes in their lifetime. Similarly, the large areas that require treatment in order to see a response in hydrologic processes, such as groundwater movement and reduced overland flow of sediments and nutrients into streams also, means that individual projects may not see their ultimate outcome until a threshold area has been treated, which may take many projects and many decades.

By following the steps in the adaptive management cycle, proponents should be able to articulate the ultimate outcome of their proposed intervention, the intermediate outcomes that are measurable within the life of their project and how this will contribute to some ultimate outcome.

Some objectives in public environmental programs relate to improving human and social capital. Evidence of improvement in skills and capacity to carry out environmental management are important intermediate outcomes and necessary for the long-term maintenance of environmental condition. One of the most significant of these is the capacity to effectively monitor change in response to interventions. Raising the level of awareness of the importance of monitoring design and the skills to implement sound monitoring programs is a significant outcome in itself.

PAMM STEP 6 - Attribute change to project interventions

There is limited discussion in existing program documents about the importance of attributing any environmental change to the specific project interventions. This is addressed at a very general level in the question from the guidelines ‘how will your project contribute to the (Caring for Our Country and Biodiversity Fund) investment themes?’ However to defend such a contribution, it will be necessary for proponents to specify *the type and extent of change* they expect their project to produce and how they will distinguish between change resulting from their intervention and other influences. The purpose of the logic presented in Steps 1 to 6 is to defend such a claim.

Attributing change to a particular set of interventions can be very challenging given the many dynamic and interacting influences acting on a given environmental goal. However, it is a fundamental feature of adaptive management to establish a hypothesis in the form of a statement that sets out the expected change in the goal as a result of the project. This requires the proponent to articulate the type and extent of change they expect to see as a result of their intervention. Without such a statement of expectations, there will be little if any opportunity to learn from the project and further our collective understanding.

PAMM STEP 7 - Identify impacts

The desired impact of proposed interventions is central to the PAMM approach and is heavily dependent on identifying clear project goals, identifying the threats to those goals and then selecting the most appropriate interventions for the identified threats. The role of the hypotheses that can pull all of this together succinctly; clearly illustrating threats and their relationship to interventions, and providing confidence about likely project outcomes.

PAMM STEP 8 - Report and reflect

As outlined above in the selection of appropriate project indicators (Step 4), stronger integration between project and program level monitoring, evaluation and reporting requires a chain of logic, using established indicators and their associated metrics, and a clear statement of expectations in the form of a hypothesis. This sequence should form the basis of project-level reporting, and enable links to be made between project and program level goals.

In this way, the principles of adaptive management are embedded in the scoping and design of projects and their evaluation, providing a link between project-level learning and program level achievements. This cycle can also form the basis of project reporting, with each report summarising the achievement of each step relative to the expectations outlined in the proposal, providing the basis for any variations required in the design and execution of a project.

The Nature Conservancy's Conservation Action Planning Methodology

The Nature Conservancy's Conservation Action Planning (CAP) approach was reviewed and provided some useful insights relevant to the further development of PAMM. Both are largely complementary with slightly different emphases. The Conservation Action Planning approach does not emphasise attribution of expected or observed change arising from interventions, and while slightly simpler, does offer good support for implementation, education and engagement of key stakeholders. Conservation Action Planning is well documented and resources are readily available online. It may be a useful supporting resource to guide further development of documentation supporting the PAMM approach.

2.3. Task 4 – Apply Evaluation Framework to Current Best Practice Cases

Department of the Environment staff provided a selection of recent Caring for Our Country and Biodiversity Fund grant applications for projects that were considered to be successful. Five of these, covering a range of project types and NRM contexts (Table 2) were evaluated against the Project-Level Adaptive Management Model to road-test the approach in the context of the department's program objectives and operating environment and identify gaps, omissions and potential areas for improvement.

Table 2 Resources to support Task 4 analyses

Task 4:	Application forms for funded projects:
Review best practice projects	<p>Caring for Our Country (2011/12) Naracoorte Caves addition - acquisition and addition to Naracoorte Caves National Park (South Australia) Reducing the threat of marine debris in the Great Lakes area (NSW) Macquarie Marshes ecological character improvement through weed and feral control (NSW)</p> <p>Biodiversity Fund (2011/12) Revegetation and habitat restoration of ephemeral freshwater grassy wetlands (vernal wetlands) and adjacent areas (South Australia) The WildEyre Conservation Alliance: Implementing NatureLinks across Eyre Peninsula (South Australia)</p>

Not surprisingly, there was some overlap between findings from this exercise, and those from earlier analysis of departmental grant guidelines, assessment criteria and frameworks, and program documentation such as the department's Caring for Our Country Business Plan 2011-12, and the 2013-14 One Land - Many Stories Prospectus of Investment. Key findings from the evaluation of the case study grant proposals, and supporting discussion are provided below.

In most cases the goals and objectives for each of the projects, and the importance of these against Caring for Our Country and Biodiversity Fund program objectives, could have been more clearly defined. The project objectives ranged from a desired NRM outcome, including conservation or management of a species, communities, ecosystem services or cultural asset, to mitigation or management of a threat or a threatening process. Along with this variation in objectives, the chain of causality between the threat and the species, communities, ecosystem services, or cultural asset, and between a proposed intervention and the threat were inconsistently described.

Where a threat to species, communities, ecosystem services, or cultural values was identified and discussed, there was usually very little discussion of additional risks or threats that may be occurring now, or may occur in future, to undermine the likelihood of successful project interventions.

Where there were references to an existing government plan policy or program (that is, species recovery plans, Threat Abatement Plans) these references, and their specific relevance to the project in question, were generally incomplete. Generally, the application forms did not illustrate how the project would complement existing initiatives, avoid duplication or address risks not already addressed by other government plans or policies.

Despite inconsistent treatment of the key steps in the Project-Level Adaptive Management Model approach, and a relatively low overall benchmark for these steps and competencies, there were examples in the case studies of projects that offered a high likelihood of strong return-on-investment. The Great Lakes marine debris removal project was one example where a community group with highly experienced and capable members developed well-considered and appropriate interventions for their region.

Despite the high quality and relatively low cost of the project, and the experience and capabilities of the group, there remained a significant gap between the project objectives (remove marine debris - a key threatening process) and the species, communities, ecosystem services, or cultural values being protected (Grey Nurse Sharks, Black Cod, marine turtles). The causal relationship between removing debris and benefits for populations of these threatened, endangered or protected (TEP) species were not discussed in any detail supported in the proposal.

If this were expressed as a hypotheses, or a statement of the expected type and degree of impact as a result of the project's interventions (that is, PAMM Step 7), the proposal might for example read as follows:

- If we remove marine debris from sites known to be frequented by threatened and endangered populations of species 1,2,3, there will be (unspecified) benefits for those species; or
- The Grey Nurse Shark recovery plan identifies marine debris at sites x, y and z as the single biggest manageable threat to the mature breeding population known to aggregate in this area. If we remove marine debris from these locations, and prevent the build-up of additional debris, we expect to observe through our monitoring program a cessation in the observed decline in the mature breeding

With or without a framework like the Project-Level Adaptive Management Model, there will always be some NRM grant applications promising good return-on-investment. Where there is a reasonably clear objective, a strong motive, and good people there are likely to be some good projects. The contribution of the Project-Level Adaptive Management Model is in institutionalising these success factors through a clear and logical process in the spirit of adaptive management and continuous learning. With this in place, there should be a substantially higher average return from Caring for Our Country and Biodiversity Fund projects. In this way, it should be possible to raise the standard of applications and projects, and extend this capability over time.

3. Recommendations: Opportunities to Improve the Biodiversity Fund and Caring for Our Country Projects

3.1. Key Workshop Findings

A workshop was held on 10 September 2013 with Department of the Environment staff. The aims of the workshop were to introduce the adaptive management model (PAMM), show how it was used to evaluate departmental application guidelines, application forms and application assessment forms, and to gain feedback from departmental staff on the utility of the Project-Level Adaptive Management Model for improving the quality of future Biodiversity Fund and Caring for Our Country application and assessment processes. Departmental staff were provided with the application form for a completed project deemed by the department to have been best-practice and invited to assess it using the Project-Level Adaptive Management Model application assessment form prior to the workshop.

Departmental staff were generally positive about the Project-Level Adaptive Management Model. It was acknowledged that the model could help improve the scientific rigour and defensibility of future funding applications. Funding applications would need to be modified to require proponents to provide different types and more detailed information about the conservation value and likely effectiveness value of their proposals. This was seen as complementing information on project governance and budget that proponents are currently required to provide. The workshop concluded with departmental staff providing recommendations for revising the application assessment form to improve its utility (see box below).

Revisions to the Project-Level Adaptive Management Model

- Use more direct and judgemental language throughout (for example, sound, appropriate, valid) to enable determination of the veracity, accuracy and clarity of the information provided, not just the amount of information provided.
- Make provision for one summary score for each step plus a box for comments, rather than asking assessors to score each point within every step as some form of weighting would then be required which would unnecessarily complicate the scoring process. The scoring is only intended to be used as a guide to project assessment and selection by rapidly identifying the very best and worst applications allowing more time to be spent on those intermediate.
- Reinstate the value for money equation set out in the original conceptual model (Figure 1): (conservation value multiplied by the likelihood of effectiveness) divided by the cost, where conservation value equals the sum of scores for PAMM Step 1 and likelihood of effectiveness equals the sum of scores for PAMM Steps 2, 3, 4, 5 6 and 7) and the cost is represented by a score relative to the other proposals within its particular size class (for example, projects up to \$250k).
- Require proponents to provide support for claims such as the significance of species or communities, the identification of major threatening processes, selection of interventions and the selection of indicators and metrics. This should be in the form of references to sources of information or hyperlinks to reports, recovery plans and other evidence.
- Provide more detail in PAMM Steps 4 and 7 (for example,. examples of indicators and metrics in PAMM Step 4, examples of the type and extent of impacts in PAMM Step 7).
- Eliminate duplication of questions on the capacity of the proponents to carry out the project. These should be restricted to PAMM Step 2 (interventions).
- Revisit the inclusion of all sub-steps in PAMM Steps 1 – 8 to simplify the assessment as much as possible.

3.2. Recommended Changes

3.2.1. Proposed Structure for Funding Application Guidelines, Application Forms and Assessment Forms

The basic conceptual structure for revising the department's funding application guidelines, applications forms and application assessment forms is shown in Figure 5. It provides for several different categories of information required by the department and allocates a separate section for the key components of the Project-Level Adaptive Management Model.

Conceptual Model for Revision

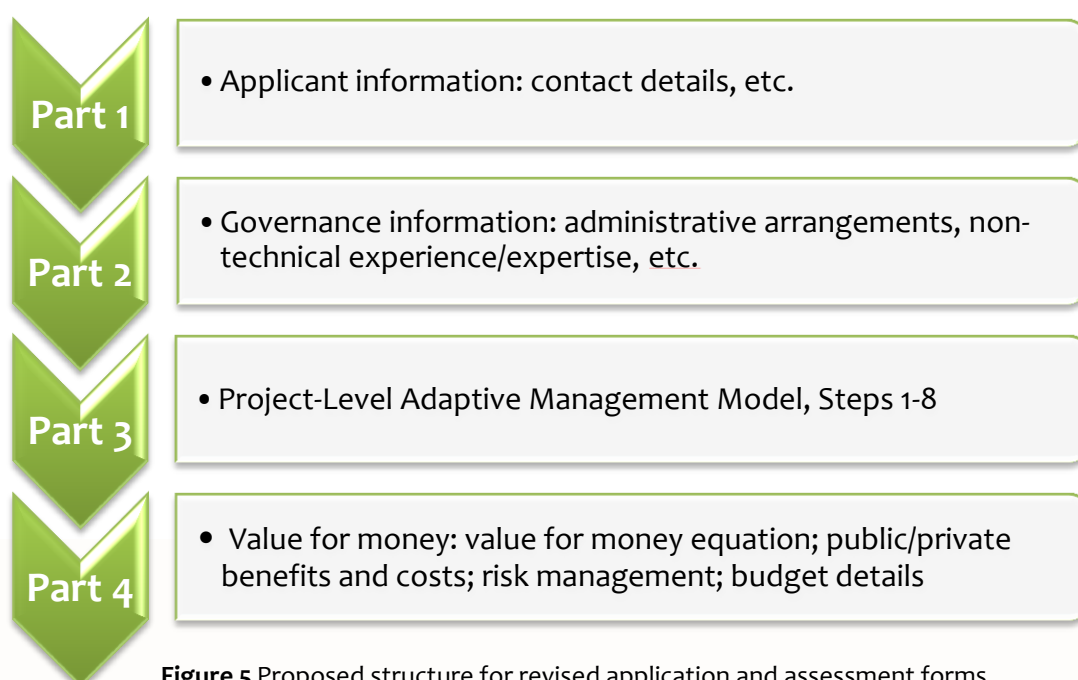


Figure 5 Proposed structure for revised application and assessment forms

3.2.2. Basic Funding Application and Assessment Forms

Examples of how the department might revise their Biodiversity Fund and Caring for our Country funding applications and application assessment forms appear in Appendices 2-3. These forms were prepared by integrating material from current departmental application and application assessment requirements, the Project-Level Adaptive Management Model and suggestions made by departmental staff during the workshop held on 10 September.

3.3. Practical and Logistical Considerations for Integrating the Model and Current Departmental Application and Assessment Forms, Guidelines

The project team recognises that there will be a number of social and organisational challenges involved in incorporating the additional level of detail required in the Project-Level Adaptive Management Model. While the brief for this project did not include a review of all those possible issues, below is a brief discussion of some factors relevant to monitoring, reporting and evaluation.

3.3.1. Incorporating Governance Requirements in Funding Applications

The Project-Level Adaptive Management Model (PAMM) provides a framework that helps to systematically identify and manage risks and uncertainty arising from the complexity and uncertainties inherent in natural and human systems. Risks associated with project governance, such as a proponents' capability and experience, their track record with similar projects, as well as quality assurance and project-level risk management are not covered in the PAMM steps but are also critically important.

To manage project governance risks more actively, particularly for larger or more complex projects (for example, project budget greater than \$100,000) a project plan that outlined in more detail the evidence required to support the projects hypothesis or statement of expectations could be required as a first milestone.

A template for such a project plan would need to include a summary of each of the steps in the PAMM process in the form of a program logic with the key assumptions relevant to each step, linked to the project activities and milestones in a Gantt chart to identify the timing of key activities and events including reviews at key stages rather than annual reporting, a risk management plan that outlines scientific, environmental, recruitment and for governance risks, plus a communications plan, and a stakeholder analysis.

A more systematic and detailed project budget template that included estimates of intervention costs and the likely longer-term maintenance costs beyond the life of the project would assist with comparisons of value for money and reduce the risks associated with project management.

To facilitate assessment of project proposals and evaluation of funded projects, proponents could be required to provide a brief summary in Part 1 that covers the following:

1. The project **goals** in terms of the significant species, communities, ecosystem services or cultural values that are its focus;
2. The key **threats** to those goals and how they were identified;
3. The proposed **interventions** and how they relate to the threats;
4. The **indicators and metrics** to be used in monitoring;
5. The project hypothesis in the form of a statement of the expected type and extent of **impact** of the project
6. The amount of **funding** requested

3.3.2. Ways to Further Develop the Use of the Model

Integrating the Project-Level Adaptive Management Model into the department's funding application and assessment processes does require proponents and assessors to understand more information than is required at present about the scientific effectiveness of projects, as opposed to information on how well projects comply with governance expectations. This may require investment in capacity building for both parties, but it is argued that without this capacity building on the part of funders and project proponents, it is unlikely that reporting of outcomes from publicly funded environmental programs will improve.

One form of capacity building would be to require all large projects to submit a monitoring design with sufficient statistical power, and to facilitate this by providing financial support for partnerships between project proponents and research groups, consultants or others skilled in monitoring design to assist with Step 5, measuring change.

This capacity building should be part of a larger effort to develop an understanding of the importance of monitoring design as part of the application and assessment process. As noted earlier (see Figure 2), the uptake of innovation is underpinned by potential users' judgement of the value and useability of the new practice. Additionally, stakeholders and community members are likely to have experience and knowledge that could lend valuable insights into further ways to improve the use of Project-Level Adaptive Management Model in the department's funding and assessment processes.

The Project-Level Adaptive Management Model and its integration into the department's funding application and assessment processes has been tested on selected application and assessment forms and trialled with a relatively small number of departmental staff. Further revisions to funding and assessment processes and forms should be tested with a larger sample of departmental staff (including project assessors, mediation boards), as well as states and territories², regional NRM groups, and project proponents.

² This is particularly relevant if some of the *Environment Protection and Biodiversity Conservation Act 1999* responsibilities are devolved to the states/territories.

4. References

- ANAO Australian National Audit Office (1997) 'Commonwealth natural resource management and environment programs', Audit Report no. 36 1996-97, Australian National Audit Office, Canberra.
- ANAO Australian National Audit Office (1998) 'Preliminary inquiries into the National Heritage Trust', Audit Report no. 42 1997-98, Australian National Audit Office, Canberra.
- ANAO Australian National Audit Office (2001) 'Performance information on Commonwealth financial assistance under the Natural Heritage Trust', Audit Report no.43 2000-01, Australian National Audit Office, Canberra.
- ANAO Australian National Audit Office (2008) 'Regional delivery model for the National Heritage Trust and the National Plan for Salinity and Water Quality', Audit Report no. 21 2007- 08, Australian National Audit Office, Canberra.
- Allan C & Curtis A (2005) Nipped in the bud: Why regional scale adaptive management is not blooming, submitted to Environmental Management. *Environmental Management*, 36(3):414-425
- Allan C, Curtis A, Stankey G & Shindler B (2008), Adaptive Management and Watersheds: A Social Science Perspective. *JAWRA Journal of the American Water Resources Association*, 44: 166–174. doi: 10.1111/j.1752-1688.2007.00145.x
- Ajzen I (1991) The theory of planned behaviour, *Organizational Behavior and Human Decision Processes* 50 (2): 179–211
- Castle Emery N (2002) Social capital: An interdisciplinary concept, *Rural Sociology* 67: 331-349.
- Curtis A & Lefroy T (2010) Beyond threat and asset-based approaches to natural resource management in Australia, *Australasian Journal of Environmental Management* 17: 134-141
- Dovers S, Hutchinson M & Lindenmayer D (2008) Uncertainty, Complexity and the Environment, in Gabriele Bammer and Michael Smithson (ed.), *Uncertainty and Risk: Multidisciplinary Perspectives*, Earthscan Publications Ltd, London, pp. 245-260.
- Field SA, O'Connor PJ, Tyre AJ and Possingham HP (2007) Making monitoring meaningful. *Austral Ecology*, 32: 485-91
- Folke C, Carpenter S, Elmqvist T, Gunderson L, Holling CS & Walker B (2002) Resilience and Sustainable Development: Building Adaptive Capacity in a World of Transformations, *AMBIO: A Journal of the Human*
- Gunderson L & Holling C (2002). *Panarchy: understanding transformations in human and natural systems*, Washington DC: Island Press.
- Holling CS (1978) *Adaptive environmental assessment and management*, Chichester: Wiley.
- Lechner AM, Arnold S, Fletcher AT, Gordon A, Erskine PD, Gillespie MJ and Mulligan DR (2012) Embracing modern ecological methods: Monitoring and monitoring for mine closure, not compliance. In *Proc. Life-of-Mine Conference, Brisbane, Queensland* 10-12 July 2012.
- Lockwood M, Davidson J, Curtis A, Stratford E & Griffith R (2010) Governance principles for natural resource management, *Society and Natural Resources*.
- Mazur N, Curtis A, Thwaites R & Race D (2008) Rural landholder adaptation to climate change. *Landscape Logic Technical Report No. 5*. Department of Environment, Water, Heritage & the Arts: Canberra.
- Mobbs C & Dovers S (Eds) (1999) *Social, economic, legal, policy and institutional R&D for natural resource management: Issues and directions for LWRRDC* (Occasional Paper 01/99), Canberra: Land and Water Resources Research and Development Corporation.

Pannell DJ, Marshall GR, Barr N, Curtis, A, Vanclay F & Wilkinson R (2006) Understanding and promoting adoption of conservation technologies by rural landholders, *Australasian Journal of Experimental Agriculture*, 46 (11): 1407-1424.

Reid T, Hazell D and Gibbons P (2013) Why monitoring often fails to inform adaptive management: a case study. *Ecological Management and Restoration*, 14: 224-27

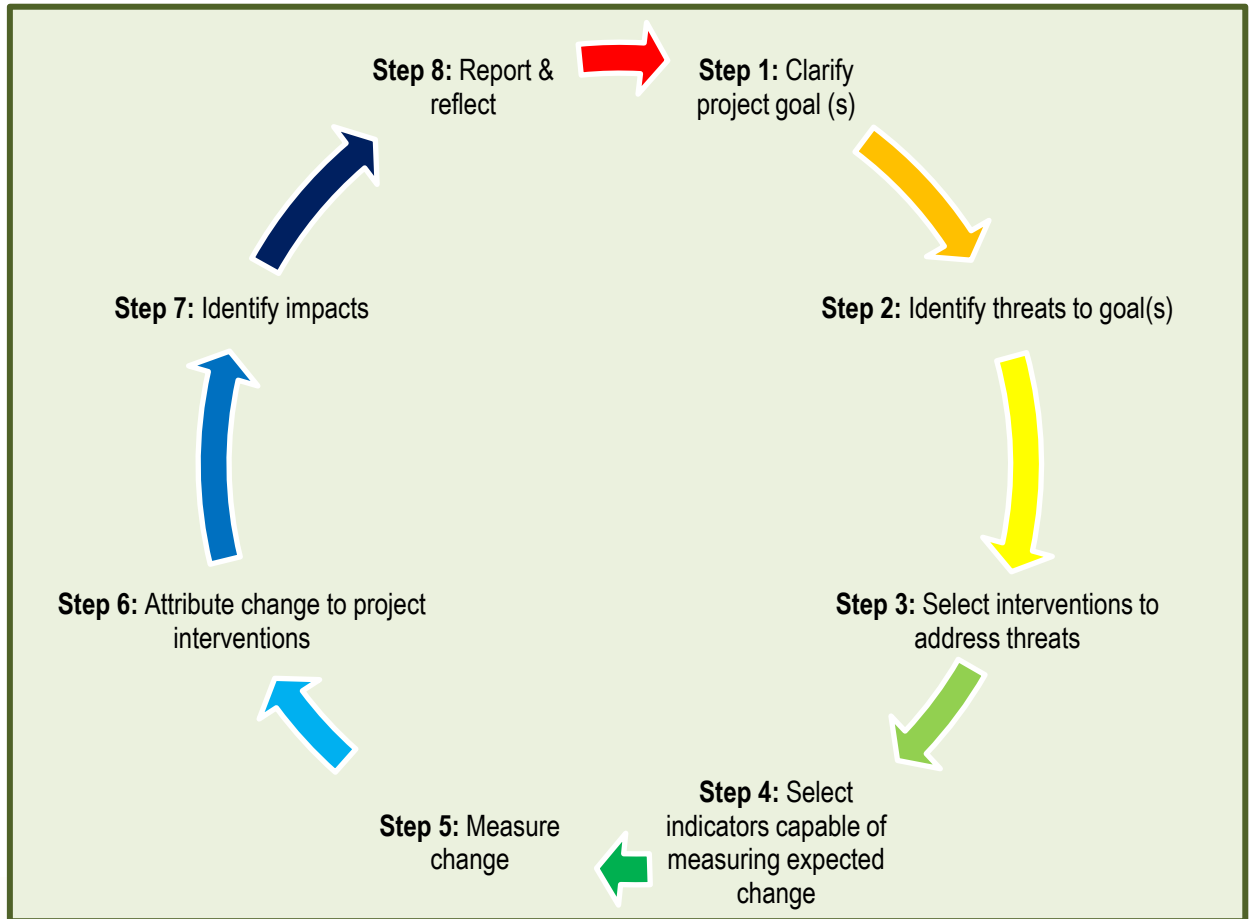
Sobels J, Curtis A & Lockie S (2001) The role of Landcare group networks in rural Australia: exploring the contribution of social capital, *Journal of Rural Studies* 17: 265-276.

Stern PC, Dietz T, Abel T, Guagnano GA & Kalof L (1999) A value-belief-norm theory of support for social movements: The case of environmental concern, *Human Ecology Review*, 6, 81-97

Walker B, Sayer J, Andrew N & Campbell B (2010) Should enhanced resilience be an objective of natural resource management research for developing countries? *Crop Science*, 50(Supplement 1), S10 - S19. doi: 10.2135/cropsci2009.10.0565



APPENDIX 1 Project-Level Adaptive Management Model



Project-Level Adaptive Management Model Components

Step 1: Clarify the project goal(s)

It is important to ensure that programs and projects goals be focused on an achievable **outcome**. Often program and project goals end up being focused on some form of intervention or activity. Program or project goals must be specific and clarify the funding proponents' 'hypothesis' – that is, what is that they think will happen as a result of what they plan to do.

It is important for programs or projects funded under the Biodiversity Fund and Caring for our Country to consider:

- Whether their project goal addresses a nationally or regionally significant species, community, ecosystem service or cultural value.

If their project goal(s) **does not** specifically address a significant species, community, ecosystem service or cultural value; then funding proponents should consider:

- Whether they have in fact identified a **threatening process** as the goal of their project, rather than a significant species, community, ecosystem service, or cultural value³;
- If they have, then they need to consider and specify **which** species, community, ecosystem service or cultural value that process is threatening.
- They should then describe how and to what extent their group has sufficient technical knowledge of this species, community, ecosystem service or cultural value to describe its habitat, abundance, viability or other requirements to make this the goal of your project. If they are unsure whether they have that knowledge or not, they should consider whether they can partner with a research organisation with appropriate expertise to identify a process that could help them address their uncertainty about their expertise.

If the funding proponent has not or cannot do this, then the department and the applicant should reconsider the feasibility of submitting the application for funding in its current state. It may require additional research and/or be reoriented to focus on an identified nationally or regionally significant asset.

³ The Department of the Environment should have a list to refer applicants to: for example, fire regime, feral animals, weeds, diseases, etc.

Project-Level Adaptive Management Model Components	
<p>Step 2:</p> <p>Identify threats to project goal(s)</p>	<p>Once the project goal(s) have been clarified and/or realigned to focus on a significant species, community, ecosystem service and/or cultural value, it is time to describe the processes threatening those goals. This step should include details about :</p> <ul style="list-style-type: none"> • Why and how the process is threatening the goals (for example, scale, extent of impact); • How and to what extent funding proponents have influence over each of these threatening processes; • Which threatening processes can best be managed through the designated program or project; • The extent to which they and the project partners have sufficient technical knowledge of the processes threatening the target species, community, ecosystem service, or cultural values that are the goals of this project; and • How and to what extent those threats can be addressed in a cost-effective manner and within program/project budgets.
<p>Step 3:</p> <p>Select interventions to address threats</p>	<p>Once the threatening processes have been analysed and described, one can proceed to selecting and describing the most appropriate interventions that will be used to manage those threatening processes. Funding proponents should be required to⁴:</p> <ul style="list-style-type: none"> • Demonstrate that they have sufficient and appropriate scientific evidence that those interventions are likely to be effective in minimising the listed threatening processes; • Clarify how dependent the interventions are on seasonal (and other?) conditions (for example, drought & tree planting) • Clarify how and to what extent these interventions require the cooperation of other people, groups, or organisations; the likelihood that those people are likely to accept and/or adopt these interventions; and • Provide details about how they will engage those parties. <p>Uncertainty is inevitable in NRM. Therefore, funding proponents need to have considered what uncertainties they face in undertaking their selected interventions. In addition, they should have outlined strategies to manage those uncertainties.</p> <p>It is at this point that funding proponents provide more specific detail about how they propose to undertake those interventions, including listing:</p> <ul style="list-style-type: none"> • The locations in which they will be undertaken • The time period(s), sequence, and over what seasons and time of year; and • Which people, groups, and/or organisations will be involved. <p>The project team should also be able to describe their relevant prior experience in carrying out these kinds of interventions at the scale proposed. There should also be specific information about the cost of each intervention in the project budget.</p>

⁴ Applicants could be asked to provide a 'mudmap' of the area and intervention (sites of intervention, study area, region; small, medium, large scale)

Project-Level Adaptive Management Model Components	
<p>Step 4:</p> <p>Select indicators</p>	<p>Once goals have been clarified, threatening process identified, and interventions selected, it is time to select indicators to measure any change in the project goal(s). These will be the target significant species, communities, ecosystem service or cultural values). Selected indicators must be capable of expressing change in their project goal(s) (that is, be recognised or accepted indicators and metrics of improvement in the presence, abundance or value of significant species, communities, ecosystem services or cultural values).</p>
<p>Step 5:</p> <p>Measure change</p>	<p>Proponents need to indicate how they will answer the following questions about their monitoring design during the course of the project.</p> <ol style="list-style-type: none"> What is the level of impact they expect to see as a result of their intervention (i.e. the effect size such as a 10%, 20% or 50% change). What is the anticipated amount of natural variability in the goal measured using the indicators selected in the previous step, and how this will be confirmed during the project? From these two pieces of information, the number of samples or replicate sites that need to be measured along with control sites in order to accommodate natural variability. Useful references that provide guidance on these aspects of monitoring design using Australian examples include Field et al (2007), Lechner (2012) and Reid et al (2013). <p>Additional information includes:</p> <ol style="list-style-type: none"> The time of year that monitoring will be carried out, the number of control sites where no intervention will occur, the number of observers and the costs of training them, and the total area being monitored. The measures of human and social change to be used (for example, skills, knowledge, networks, etc.⁵ Demonstrated capacity and technical expertise required to collect and analyse these data or the partnerships that exist or are planned with groups that have these skills. The costs of monitoring are included in the project budget

⁵ Human and social capital is discussed further in this Project Report. These assets require particular expertise to identify appropriate and sound ways to measure and monitor them.

Project-Level Adaptive Management Model Components	
<p>Step 6:</p> <p>Attribute change to project intervention(s)</p>	<p>Attribution is very complex and cannot always be achieved, particularly in the lifetime of a project. A large number of factors can influence NRM outcomes. Consequently, we must frequently rely on strong inference based on sound theory and observation. However, given the investment of public funds for environmental change, we expect that proponents will have thought about how they could attribute any change that is detected to their particular intervention. For example, social and economic changes in wider society (for example, recessions, commodity prices, attitudinal change, new knowledge and technology, government policies), climate change, natural variability in populations of target plants and animals and their competitors and predators, seasonal conditions, drought, floods, etc.</p> <p>Project proponents need to indicate whether they expect to detect any change in their project goal(s) (that is, the target species, communities, ecosystem service and/or cultural value(s)) during the life of the project.</p> <p>If they do, then they need to explain how they plan to link that change to their project's interventions – as opposed to any other human or natural causes.</p> <p>If they DO NOT expect to see change during the life of the project, then they need to explain what intermediate measures (for example, human and social change⁶; change in other environmental parameters/conditions) they will use to indicate that their intervention is likely to contribute to change in their goal in the future (for example, rabbit control to improve recruitment of tree species)⁷. And they should be able to explain how these measures will cause change in their project goals.</p>
<p>Step 7:</p> <p>Identify impact(s)</p>	<p>It is also important to be able to describe what degree of impact one can expect to detect as a result of their project interventions (for example, evidence of recruitment of an overstory species in woodland habitat as an ultimate goal; or evidence of decline in a major threat such as presence of herbivores that inhibit recruitment of plant species as an intermediate goal). This statement represents the 'hypothesis' of this project. In other words, this is the proponent's statement of their expectation of the degree of impact they will have on their chosen goal.</p>
<p>Step 8:</p> <p>Report and reflect</p>	<p>And finally, adaptive management is about learning. Project should have clear information about how key lessons from the information gathered during Steps 4 – 7 will be captured, reported on and shared to leverage the value of the project and inform future projects.</p> <p>There should be processes to do this during the life of the project, as well as into the future. It is critically important to have a continual process of reflection in order to improve on NRM performance and outcomes.</p>

⁶ The Department of the Environment should compile a list of widely accepted and reliable measures of human and social capital for applicants to refer.

⁷ Again, the Department of the Environment should compile a list of widely accepted and reliable measures of intermediate biophysical and social change for applicants to refer.

APPENDIX 2 Sample Funding Application Form

Part 1 – Applicant Information

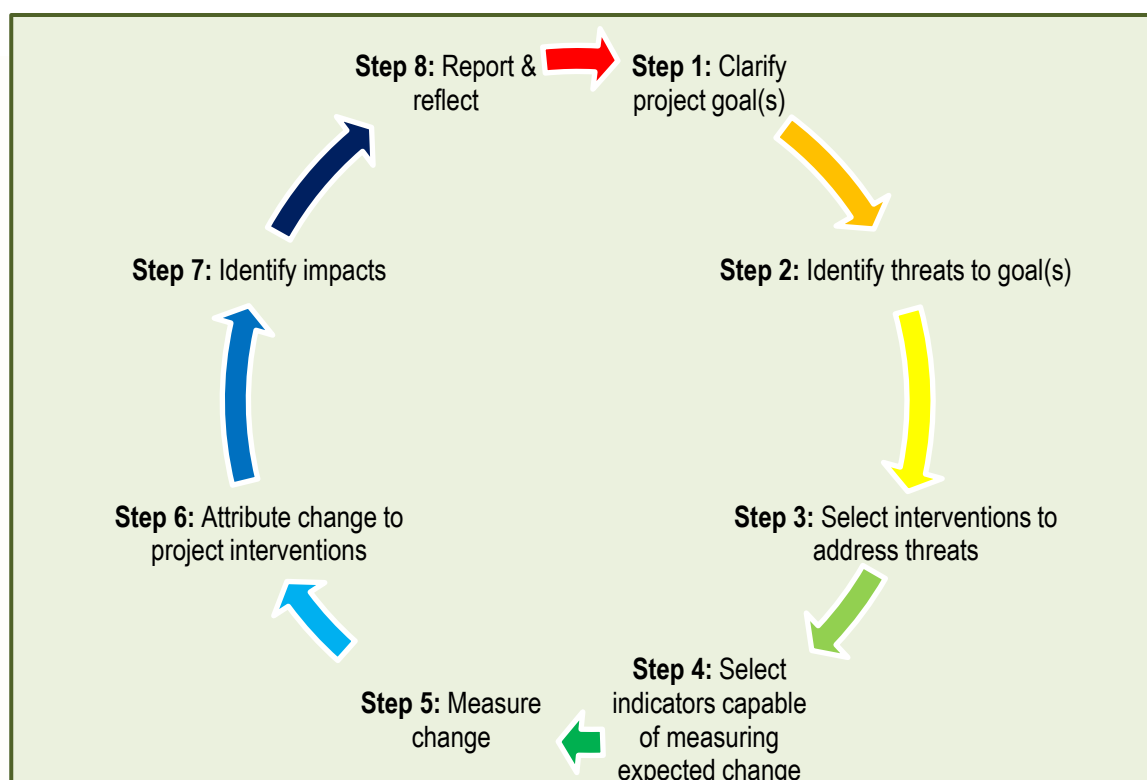
This section would contain items about the applicant organisation or group contact person details, authorised person details that the department currently requests in its funding application forms.

Part 2 – Governance Information

This section would contain items that demonstrate the administrative arrangements and non-technical capacity of the application organisation or group to deliver the project that the department currently requests in its funding application forms. For example, xxxx

Part 3 – Project-Level Adaptive Management Model

The following items in this section will ask you to justify the scientific logic underpinning your project. These items have been developed by using element of the Project-Level Adaptive Management Model (PAMM) explained in the X Funding Guidelines (see pp. X-X).



PAMM Components	Application Components
Step 1: Clarify your project's goal(s)	<p>A. Please specify whether your project goal addresses a nationally or regionally significant species, community, ecosystem service or cultural value.</p> <p>If your project goals do not specifically address a significant species, community, ecosystem service or cultural value please go to Item B.</p> <p>B. Please consider whether you have identified a threatening process as the goal of your project, rather than a significant species, community, ecosystem service, or cultural value. If you have, please specify what species, community, ecosystem service or cultural value this process is threatening?</p> <p>C. Please specifically describe what evidence you have to support your explanation, such as which scientific studies and/or legislation or policy documents.</p> <p>D. If you are unsure of how to adequately describe the key features of the species, community, ecosystem service, or cultural value in order to make it the goal of your project (as opposed to making an intervention the goal of your project), you may need to reconsider your application. It may warrant additional research to make it a viable project proposal. And you may wish to partner with a research organisation with appropriate expertise to identify a process to help you address this uncertainty.</p>
Step 2: Identify threats to your project goal(s)	<p>A. Please list the threatening processes that present the most important obstacles to achieving your project goal(s) (that is, the identified significant species, community, ecosystem service or cultural values). You should include an explanation of:</p> <ul style="list-style-type: none"> i. Why (for example, scale, extent of impact). ii. How and to what extent you have influence over each of these threatening processes? iii. Which threatening processes can best be managed through this project? iv. How they are covered cost effectively and within your project budget.

PAMM Components	Application Components
Step 3: Interventions to address threats	<p>A. Please list and describe what interventions you are proposing to manage those threatening processes⁸? Your description should including an explanation of the following:</p> <ul style="list-style-type: none"> i. The evidence you have that these interventions are likely to be effective in minimising those threatening processes? ii. How dependent the interventions on seasonal (and other?) conditions (for example, drought and tree planting) iii. How and to what extent these interventions require the cooperation of other people, groups or organisations; the likelihood that those people are likely to accept and/or adopt these interventions; and your overall approach to engaging them. <p>B. Uncertainty is inevitable in NRM. How have you considered the uncertainties for your interventions, and what strategies have you prepared to manage them?⁹</p> <p>C. Please describe how you are proposing to undertake these interventions, including</p> <ul style="list-style-type: none"> i. Listing the locations in which they will be undertaken ii. The time period(s), sequence, and over what seasons and time of year iii. Which people, groups, and/or organisations will be involved <p>D. Please describe your project team's prior experience in carrying out these interventions at the scale proposed.</p> <p>E. Have you specified the cost of each of these interventions in your budget?</p>
Step 4: Selecting indicators	<p>Please list the indicators you will use to detect change in your project goal(s) (that is, the significant species, communities, ecosystem service, or cultural values) to demonstrate that your project will be having an impact?</p> <p>Please indicate what scientific studies and/or legislation or policy documents you have used to support your selection of these indicators.</p>

⁸ Maybe get them to provide a mudmap of area and intervention (sites of intervention, study area, region = small, medium, large scale)

⁹ Categorise a to b – for example, series of boxes after textual explanations, and this should enable some scoring.

Step 5:
**Measure
change**

A. Please describe your project's monitoring design, including:

- i. The level of impact they expect to see as a result of their intervention (i.e. the effect size such as a 10%, 20% or 50% change).
- ii. The anticipated amount of natural variability in the goal measured using the indicators selected in the previous step, and how this will be confirmed during the project?
- iii. From these two pieces of information, estimate the number of samples or replicate sites that you will need to measure to accommodate natural variability. Useful references that provide guidance on these aspects of monitoring design using Australian examples include Field et al (2007), Lechner (2012) and Reid et al (2013).

Additional information includes:

- iv. The time of year that monitoring will be carried out, the number of control sites where no intervention will occur, the number of observers and the costs of training them, and the total area being monitored.
- v. The measures of human and social change to be used (for example, skills, knowledge, networks, etc.¹⁰
- vi. Demonstrated capacity and technical expertise required to collect and analyse these data or the partnerships that exist or are planned with groups that have these skills.

B. Specify the costs of monitoring in the project budget.

¹⁰ Human and social capital is discussed further in this Project Report. These assets require particular expertise to identify appropriate and sound ways to measure and monitor them.

<p>Step 6:</p> <p>Attribute change to project interventions</p>	<p>A. Given that a large number of factors can influence NRM outcomes, it can be difficult to determine whether our efforts have contributed to desired change. Please indicate whether you expect to detect any change in your project goal(s) (that is, the target species, communities, ecosystem service and/or cultural value(s)) during the life of this project.</p> <p>i. <i>If yes</i>, please summarise how you plan to link that change to your project's interventions as opposed to any other human or natural influences.</p> <p>ii. <i>If no</i>, what intermediate measures (for example, human and social change¹¹; change in other environmental parameters/conditions) will you use to indicate that your intervention is likely to contribute to change in your goal in the future (for example, rabbit control to improve recruitment of tree species)¹². How will these measures cause change in your project goals?</p> <p>iii. Please indicate how you will distinguish between: any change caused by human and natural influences; AND any change resulting from your project and other human interventions (where it is possible to distinguish between change caused by natural and human influence).</p>
<p>Step 7:</p> <p>Identifying impact</p>	<p>Please describe what degree of impact are you expecting from your intervention (for example, evidence of recruitment of an overstory species in woodland habitat, proportion of community change).</p>
<p>Step 8:</p> <p>Reporting & reflection</p>	<p>A. Please describe how key lessons from the information gathered during Steps 4 – 7 will be captured, reported on, and shared to leverage this value and inform future projects.</p> <p>B. Please describe what process(es) will be used during the life of this project to reflect on the appropriateness of your project's goals and approach.</p> <p>C. Please describe what process(es) will be used in the future to reflect on the appropriateness of this project's goals and approach.</p>

¹¹ Will need to unpack that (for example,. no. of people completing relevant training course, certification, etc. like Birds Australia), effective partnerships, networks,

¹² Need to add a list of examples. Use social as well as biophysical

Part 4 – Value for Money

1.1 Capacity to deliver

- Please describe the general capability and capacity of your organisation in delivering similar projects.
- Please describe the general capability and capacity of any project collaborators and/or partners.
- Please describe how you/your organisation will maintain or build on the project benefits beyond the lifetime of this project?

1.2 Project governance/management

- Please provide an overview of the management arrangements for this project (for example, a project plan that specifies how key project phases and activities will achieve the stated project outputs and outcomes)¹³
- Please describe the arrangements your organisation has in place to ensure the quality of project activities and outputs (for example, quality assurance program, 3rd party accreditation such as ISO9001?)

1.3 Risk management

Please define the major risks associated with this proposal and what management actions you will put in place to minimise or avoid these risks.

What are the risks?	Degree of risk's impact	Likelihood of risk occurring	Overall risk	Mitigation strategy

1.4 Budget, Costs and benefits

- Request for budget details as per appropriate departmental requirements (for example, activity to be funded, eligible items, cost, source of funding, etc.)
- Please describe the public and private costs and benefits of this project.

¹³ Note: for projects greater than \$50k an appropriate project plan could be provided as part of first milestone. Minimum requirements could be Project Objectives, Project activities/workplan, Milestones, Gantt Charts, Key Assumptions, process to handle difficult Issues and/or scope changes and project variations, risk management, project reporting, communications plan, stakeholder analysis and functional relationships

APPENDIX 3 Sample Funding Application Assessment Form

Part 1 – Applicant Information

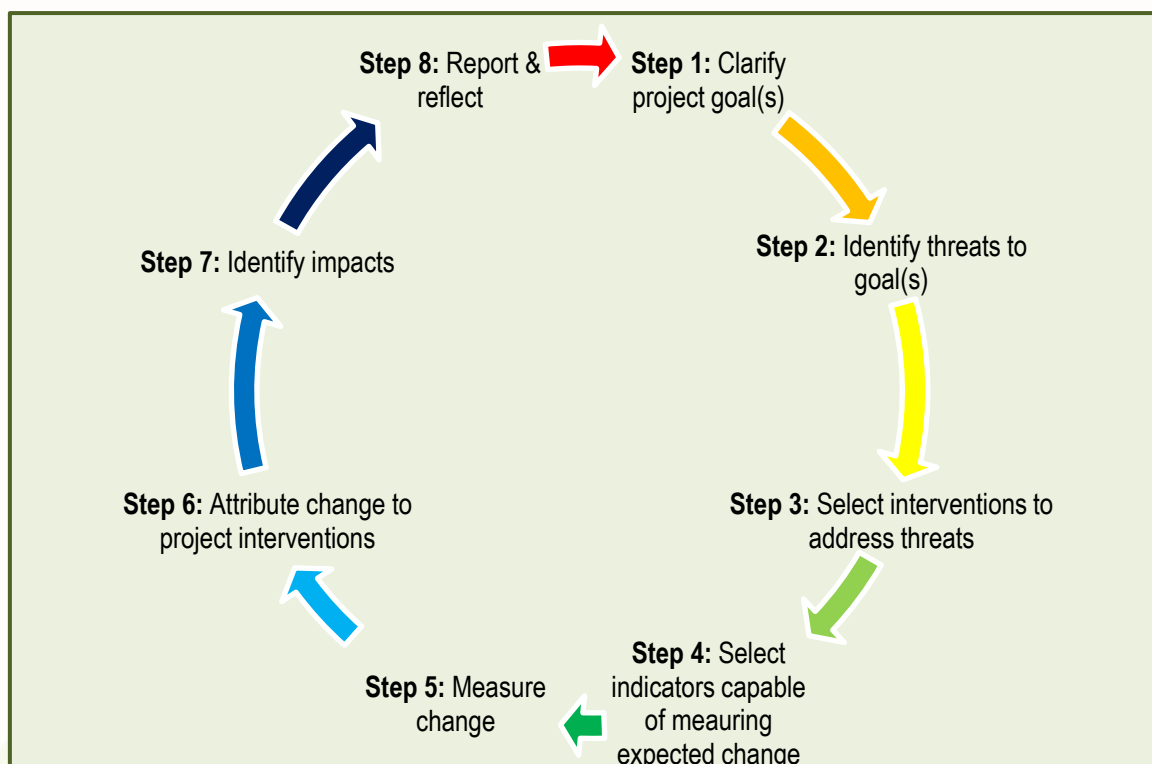
This section would contain items about whether the applicant has provided the relevant organisation or group contact person details, authorised person details that the department currently requests in its funding application forms.

Part 2 – Governance Information

This section would contain items about whether the applicant has provided details about the administrative arrangements and non-technical capacity of the application organisation or group to deliver the project that the department currently requests in its funding application forms.

Part 3 – Project-Level Adaptive Management Model

The following items in this section will ask you ***to rate how well*** the funding proponents have justified the scientific logic underpinning their project. These items have been developed by using element of the Project-Level Adaptive Management Model (PAMM) explained in the Assessor Guidelines (see pp. X-X).



Please examine each element in the table, and place the number for your score in each space provided for 'Your Assessment Score'.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5
PAMM Component	Application Components <i>Please rate your level of agreement with the following statements</i>			
Step 1: Clarify the project goal(s)	A. The applicant has provided a clear and accurate indication of whether their project goal addresses a nationally or regionally significant species, community, ecosystem service or cultural value.			
	i. The explanation is supported by specific reference to scientific studies and/or legislation or policy documents (for example, pp. 3-12 of the Biodiversity Conservation Strategy)			
	Assessor comments (optional): 			
	B. Where the goal is a threatening process, the applicant has provided a sound explanation of the species, community, ecosystem service or cultural value that is under threat. <i>(Note to Assessor: if the applicant has not identified a nationally or regionally significant species, community, ecosystem service or cultural value of a threatening process this application warrants serious reconsideration, and/or perhaps additional research)</i>			
	Assessor comments(optional): 			
	Overall Score for Step 1 =			

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5
PAMM Component	Application Components <i>Please rate your level of agreement with the following statements</i>			
Step 2: Identify threats to the project goal(s)	B. The applicant has provided a list of threatening process that present the most significant obstacles to achievement of their project goal(s).			
	i. That list includes a realistic description of the scale and extent of the major threatening processes			
	ii. That list includes a valid explanation of how and to what extent the project is likely to have influence over each of the major threatening processes			
	iii. That list includes a valid explanation of which threatening processes will be managed through this project, supported by appropriate evidence supporting these claims			
	iv. The applicant has adequately described the extent to which they and the project partners have sufficient technical knowledge of the processes threatening the target species, community, ecosystem service, or cultural values that are the goals of this project.			
	Assessor comments (optional): 			
Overall score for Step 2 =				

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5
PAMM Component	Application Components <i>Please rate your level of agreement with the following statements</i>			
Step 3: Select intervention s to address threats	A. The applicant has provided a list of proposed interventions that are appropriate for managing the identified threatening processes.			
	i. The applicant has provided sound evidence that the interventions they propose are likely to be effective at minimising the major threatening processes affecting their goal(s).			
	ii. The applicant has provided a reasonable explanation of the extent to which the interventions are dependent on seasonal and other conditions (for example, drought and tree establishment)			
	iii. The applicant has provided a reasonable explanation of how and to what extent these interventions require the cooperation of other people, groups, or organisations; and the likelihood that those people are likely to accept and/or adopt these interventions; and their approach to engaging them.			
	Assessor comments for Step 3A (i-iii) (optional):			
	B. The applicant has provided a sound explanation of the uncertainties related to their interventions, and provided reasonable strategies for managing those uncertainties.			
	Assessor comments for Step 3B (optional):			
	C. The applicant has provided adequate details about how they are proposing to undertake these interventions.			
	i. The applicant has listed the locations in which the interventions will be undertaken			
	ii. The applicant has listed the time period(s), sequence, and over what seasons and time of year the interventions will be undertaken.			
iii. The applicant has listed which people, groups, and/or organisations will be involved				
Assessor comments for Step 3C (i-iii) (optional):				

Step 3: Select intervention s to address threats	D. The applicant has provided a sufficient description of their project team's relevant prior experience in carrying out these interventions at the scale proposed.
	Assessor comments for Step 4D (optional):
	E. The applicant has specified the cost of each of their interventions in their project budget.
	Assessor comments for Step 4E (optional):
	Overall score for Step 2 =

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5
PAMM Components	Application Components <i>Please rate your level of agreement with the following statements</i>			
Step 4: Select indicators	The applicant has provided a comprehensive and appropriate list of indicators that are capable of expressing change in their project goal(s) (that is, recognised or accepted indicators and metrics of improvement in the presence, abundance or value of significant species, communities, ecosystem services or cultural values).			
	i. The selection of indicators is supported by specific reference to scientific studies and/or legislation or policy documents (for example, pp. 3-12 of the Biodiversity Conservation Strategy)			
	Assessor comments for Step 4(optional):			
	Overall score for Step 4 =			

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5
PAMM Components		Application Components <i>Please rate your level of agreement with the following statements</i>		
Step 5: Measure change	A. The applicant has described a sound and reliable monitoring design for their project , which includes, as appropriate:			
	i. Reliable measures of biophysical change based on multiple sites with information provided on the time of year measurements are to be taken, the number of observers, the number of control sites to be assessed where no intervention will occur, the location of sites and the total area over which monitoring sites will be located.			
	ii. Reliable measures of human and social change to be used? ¹⁴			
	Assessor comments for Step 5A (i-ii) (optional):			
	B. The applicant has specified the cost of each of the monitoring activities in their budget.			
	C.			
	Assessor comments for Step 5B (optional)			
Overall score for Step 5 =				

¹⁴ Human and social capital is discussed in this Project Report. These assets require particular expertise to identify appropriate ways to measure and monitor them.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5
PAMM Components		Application Components <i>Please rate your level of agreement with the following statements</i>		
Step 6: Attribute change to project interventions		<p>A. The applicant has indicated whether they expect to detect any change in their project goal(s) (that is, the target species, communities, ecosystem service and/or cultural value(s)) during the life of their project.</p> <p>i. If yes, the applicant has provided a clear and reasonable indication of how they will attribute any measured change in their project goal(s) (that is, the target species, communities, ecosystem service, and/or cultural value(s)) to their interventions</p> <p>ii. If no, the applicant has provided a clear and reasonable indication of what intermediate measures (for example, human and social change¹⁵; change in other environmental parameters/conditions) they will use to indicate that their intervention is likely to contribute to change in their project goal in the future (for example, rabbit control to improve recruitment of tree species)¹⁶.</p> <p>B. The applicant has provided a clear and reasonable indication of how they will distinguish between:</p> <p>i. Any change caused by human and natural influences; and</p> <p>ii. Any change resulting from their project and other human interventions (where it is possible to distinguish between change caused by natural and human influence).</p>		
		Assessor comments for Step 6 (optional):		
		Overall score for Step 6 =		

¹⁵ Will need to unpack that (for example, no. of people completing relevant training course, certification, etc. like Birds Australia), effective partnerships, networks,

¹⁶ Need to add a list of examples. Use social as well as biophysical

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5
PAMM Components	Application Components <i>Please rate your level of agreement with the following statements</i>			
Step 7: Identify impacts	<p>The applicant has provided a clear and reasonable description of the degree of impact they are expecting to detect as a result of their intervention (for example, evidence of recruitment of an overstory species in woodland habitat as an ultimate goal; or evidence of decline in a major threat such as presence of herbivores that inhibit recruitment of plant species as an intermediate goal).</p> <p>This statement represents the hypothesis of this project, in other words the proponent's statement of expectation of the degree of impact they will have on their chosen goal.</p>			
	Assessor comments for Step 7 (optional):			
	Overall score for Step 7 =			

Strongly Disagree	Disagree	Unsure/ Neutral	Agree	Strongly Agree
1	2	3	4	5
PAMM Component	Application Components <i>Please rate your level of agreement with the following statements</i>			
Step 8: Report & reflect	<p>A. The applicant has described a valid process for identifying, capturing, reporting on and sharing the key lessons learned from the information gathered during Steps 4 – 7. .</p>			
	Assessor comments for Step 8A(optional):			
	<p>B. The applicant has described a valid process to be used during the project for reflecting on the appropriateness of the project goals and approach.</p>			
	Assessor comments for Step 8B(optional):			
	<p>C. The applicant has described a valid process that will be used in the future to reflect on the appropriateness of the project goals and approach.</p>			
	Assessor comments for Step 8C(optional):			
Overall score for Step 8 =				

OVERALL SCORING FOR SECTION 3

PAMM Components	Formulas	Your Score
Step 1: Clarify the project goal(s)	Conservation Value: Steps 1 + 2 + 7 =	
Step 2: Identify threats to the project goal(s)		
Step 7: Identify impacts		
Step 3: Select interventions to address threats	Likelihood of Effectiveness: Steps 3 + 4 + 5 + 6 =	
Step 4: Select indicators		
Step 5: Measure change		
Step 6: Attribute change to project interventions		
FINAL SCORE for PAMM Components	Project value = (Conservation Value x Likelihood of Effectiveness)/Cost*	

* The cost of each application form could be scored from 1 – 5 by placing each project's cost in its 20th percentile relative to the others being assessed: 1 = for the lowest, 5 = for the highest. This simplifies the final calculation (that is, dividing conservation value + likelihood of effectiveness by a number between '1' and '5'). The ranking would then be done by ranking them from highest to lowest cost in MS Excel.

Part 4 – Value for Money

1.2 Capacity to deliver

Strongly Disagree	Disagree	Unsure/ Neutral	Agree	Strongly Agree	Not Applicable
1	2	3	4	5	N/A
PAMM component	Application components <i>Please rate your level of agreement with the following statements</i>				Your score
The applicant has provided information demonstrating that their group/organisation has the required general capability in delivering similar projects.					
The applicant has provided information demonstrating that their project collaborators/partners have the required general capability in delivering similar projects.					
The applicant has provided a valid description of how they will maintain or build on the project benefits beyond the lifetime of this project.					
Total score for Step Capacity to deliver =					

1.3 Project governance/management

Strongly Disagree	Disagree	Unsure/ Neutral	Agree	Strongly Agree	Not Applicable
1	2	3	4	5	N/A
PAMM component	Application components <i>Please rate your level of agreement with the following statements</i>				Your score
The applicant has provided an adequate overview of the management arrangements for this project (for example, a project plan that specifies how key project phases and activities will achieve the stated project outputs and outcomes) ¹⁷					
The applicant has provided an adequate description of the arrangements they have in place to ensure the quality of project activities and outputs (for example, quality assurance program, 3rd party accreditation such as ISO9001)					
Total score for Project governance and management =					

¹⁷ Note: for projects greater than \$50k an appropriate project plan could be provided as part of first milestone. Minimum requirements could be Project Objectives, Project activities/workplan, Milestones, Gantt Charts, Key Assumptions, process to handle difficult Issues and/or scope changes and project variations, risk management, project reporting, communications plan, stakeholder analysis and functional relationships

1.4 Risk management

Strongly Disagree	Disagree	Unsure/ Neutral	Agree	Strongly Agree	Not Applicable
1	2	3	4	5	N/A
PAMM component	Application components Please rate your level of agreement with the following statement				Your score
The project applicant has provided a realistic description of the major risks associated with the proposal and identified appropriate management actions they will put in place to minimise those risks.					

1.5 Budget, Costs and benefits

Strongly Disagree	Disagree	Unsure/ Neutral	Agree	Strongly Agree	Not Applicable
1	2	3	4	5	N/A
PAMM component	Application components Please rate your level of agreement with the following statement				Your score
The project applicant has provided a detailed budget as per departmental requirements					
The project applicant has provided a comprehensive description of the appropriate public and private costs and benefits of this project.					

Hub Acknowledgements



Australian Government

Department of the Environment

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