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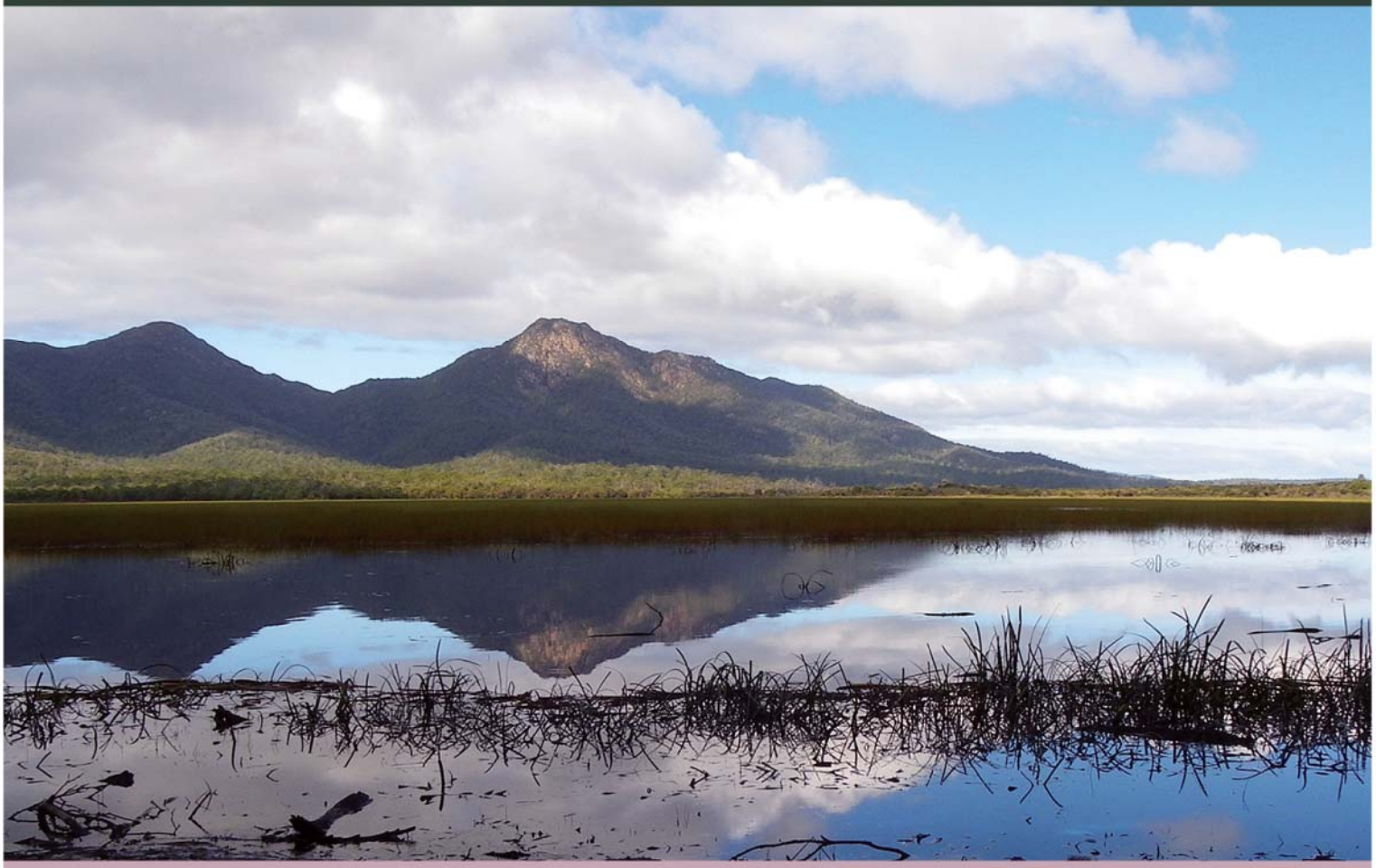

Adaptation Pathways:

a playbook for developing robust options for climate change adaptation in Natural Resource Management

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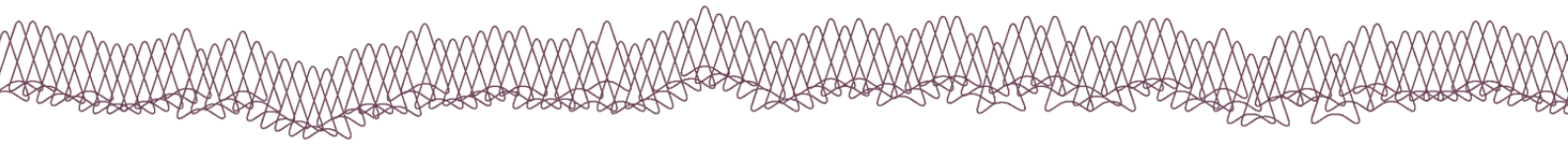

Foreword

We know that climate change is with us but how can we plan for such an uncertain future? This is the challenge facing natural resource management (NRM) organisations and local communities across Australia. We know that the earth is generally getting hotter, but where and when will the rain fall? How will our overseas markets react to climatic and other challenges? Some land use changes that might seem sensible from an economic point of view, will not be viable with changed land and water regimes. How will our rich biodiversity adapt and thrive in their changing environments? How can we plan to make sure they can adapt?

To address these challenges, NRM organisations across the Southern Slopes Cluster have worked together with the researchers from universities and state agencies involved in the Southern Slopes Cluster Climate Change Adaptation Research Partnership (SCARP). Together they have synthesised relevant information and importantly drawn on research in Australia and overseas to develop fit for purpose approaches that will assist NRM organisation embark on ongoing adaptation to climate change.

Partnerships and Pathways were the key elements in this endeavour.

SCARP has shown us ways we can look at our challenge from different points of view in order to develop and implement strategies. These new strategies will need to be workable over normal planning horizons, yet not compromise our options for the future. The resultant Pathways approach to planning for climate change adaptation will help us to do this.

This Playbook steps us through an adaptation pathways planning process, specifically developed for use in NRM. The Playbook also provides an overview and guide to the compendium of relevant information in SCARP's Portal Report.

Christine Forster AM

Chair, SCARP Steering Committee

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1. Context

This playbook[1] is a result of collaborative exploration, design and testing of the approach among the *Southern Slopes Climate Change Adaptation Research Partnership* (SCARP) research team and Natural Resources Management (NRM) planners from the nine agencies in the Southern Slopes region of Australia.[2] It should be considered a working document that will evolve and change through application and learning.

This playbook presents an approach to climate change adaptation planning known as adaptation pathways – 'an analytical approach to planning that explores and sequences a set of possible actions that are based on external developments over time' (Haasnoot *et al.* 2013:485). It guides users through five broad activities or 'plays' that make up an approach to pathways planning. It provides a brief description of each activity and directs the user to relevant sections of the supporting *Southern Slopes Information Report* (Wallis *et al.* 2014), which provides greater detail on each activity, including links to relevant resources and literature.

The five key activities of this approach to pathways planning are:

- Define objectives for pathways (Section 2.1)
- Understand the current situation (Section 2.2)
- Analyse possible futures (Section 2.3)
- Develop adaptation pathways (Section 2.4)
- Implementation, monitoring, evaluation, reporting, improvement (MERI) and learning (Section 2.5)

This playbook does not describe how to write or implement NRM plans or strategies for adaptation. Rather, it guides users through a process for identifying adaptation measures that can be used to draft an adaptation plan. This is not a prescriptive approach. Rather it seeks to reflect and support the typically non-linear, 'juggling' nature of NRM planning. This juggling metaphor (adapted from Ison 2010) usefully highlights that:

- planning can be a non-linear process, with several activities occurring at once
- planning can happen in different ways and describe different patterns
- it takes concentration to coordinate the synchronicity of everything 'up in the air'
- while attention may focus on one ball for a moment, the whole motion is being tracked
- planning, like juggling, requires particular skills obtained through practice

[1] 'A notional range of possible tactics in any sphere of activity'. Collins English Dictionary

[2] Corangamite CMA, Cradle Coast NRM, East Gippsland CMA, Glenelg Hopkins CMA, Local Land Services SE NSW, NRM North, NRM South, Port Phillip Westernport CMA, and West Gippsland CMA.

1.1 What is 'adaptation pathways' planning?

Adaptation plans must address a context of change and uncertainty. This is because while the overall trend of a warming climate is clear, there are inherent uncertainties in climate change projections and their downscaling, which are compounded in attempts to specify impacts on biophysical systems, especially at local scales (Schneider and Kuntz-Duriseti 2002). Moreover, greater uncertainties stem from social drivers, including our responses to change, our changing value systems, as well as intersections with other complex, dynamic social, ecological and economic systems. Common responses to this challenge of decision-making and action under conditions of uncertainty and change are to strive for an optimal static response, or to plan for a 'most-likely' scenario. Both approaches are destined for failure when "the future turns out to be different from the hypothesized future scenario(s)" (Haasnoot *et al.* 2013:485).

'Adaptation pathways' is an analytical approach to planning that is receiving increased attention as a means of undertaking planning and implementation that allows for uncertainty and change. It does this by encouraging consideration of multiple possible futures and the robustness and flexibility of options across these futures. Robustness is conveyed because options are 'tested' against plausible futures, and flexibility is conveyed because a diverse array of options have been considered and evaluated to avoid 'lock-in' and to inform future decision-making. Consequently, the approach enables NRM organisations to develop an array of options that work reasonably well across a wide range of circumstances both now and in the future (Moss and Martin 2012), and that provide for inevitable changes in those circumstances.

> Pathways consist of a sequence of adaptation options and interim targets that are directed to achieving long-term adaptation objectives
> (Moss and Martin 2012).
>
> The options and targets are reviewed through efficient and transparent processes as new knowledge becomes available
> (Yohe and Leichenko 2010).

Adaptive planning has a long history in environmental management (Holling, 1978; McLain and Lee, 1996). Robust, flexible planning for climate change also has a well-documented history in the decision and policy sciences. For example, Lempert *et al.* (1996:236) argued that "a simple adaptive strategy, designed to be robust across many plausible futures, performs better on average than policies optimized for particular best-estimates of the future, unless we are virtually certain that one best estimate is correct."

In an adaptation context, this idea has been most explicitly addressed in the 'adaptation pathways' approach (e.g. Haasnoot *et al.* 2012 & 2013; Wise *et al.* 2014).

The pathways planning approach presented in this playbook is informed by these histories and draws from a range of literature, case studies, resources, current applications as well as the experiences of the NRM organisations in the Southern Slopes region in applying the concept.

1.2 Why adopt a pathways approach?

Regional NRM organisations need to be able to justify, prioritise and implement actions, while at the same time recognising and allowing for future changes in ecosystems, values, knowledge, as well as socio-political and climatic systems. A pathways approach is directly applicable to this need to plan for change and manage uncertainty by helping organisations to:

- **Adopt strategic rather than reactive planning.** Instead of being driven by current policies and conditions, a pathways approach encourages creative and forward thinking about potential and desirable futures.
- **Develop an adaptively robust strategy** that facilitates to short-term actions (such as addressing immediate issues of habitat loss and invasive species) that leaves options open and provides a guiding framework for monitoring the robustness of specific options across possible futures (Butler *et al.* 2013; Haasnoot *et al.* 2013:485). Sequencing a range of such actions identifies when, why and how to change course (Yohe and Leichenko 2010), and provides for a living strategy rather than a 'set and forget' plan.
- **Use vulnerability assessments for action planning** to address underlying drivers of those vulnerabilities.
- **Adopt a social learning approach to adaptation** – through co-learning among decision-makers, researchers and other relevant stakeholders, issues and problems can be actively reframed in order to define a greater array of potential options, actions and roles (Downing 2012; Mediation 2012; Wise *et al.* 2014). Adopting a learning approach to planning, aids in greater insights into the current situation and can facilitate identification of more innovative transitional and transformational pathways.
- **Facilitate salient and credible dialogue** with and among stakeholders about acceptable and unacceptable conditions and changes, possible adaptation options and pathways preferences.
- **More readily recognise potential maladaptive actions** - undesirable outcomes can result from a narrow focus on simple cause-effect relationships or assumptions that individual approaches or policies are 'right' (Wise *et al.* 2014). Using a pathways as an analytical approach can help identify when an option or pathway may shut-down future options (thus reducing plan robustness)
- **Support best practice in regional NRM -** existing good practice helps to reduce vulnerabilities to climate change impacts, and using pathways planning allows organisations to commit to short-term actions within a framework that guides the robustness, including flexibility, of future actions (Albrechts, 2004 and Ranger *et al*., 2010 in Haasnoot *et al*. 2013:485).

Finally, for NRM organisations involved in the AdaptNRM program, SCARP's approach to pathways planning accords with the AdaptNRM project principles for adaptation (CSIRO 2014) of considering multiple possible futures, planning to learn, being explicit about values and knowledge, and enable action where there is not complete knowledge or consensus.

1.3 How can we use a pathways approach in adaptation planning for NRM?

A pathways approach to adaptation planning comprises five basic activities or 'plays' (Figure 1 below) that are broadly familiar across most NRM and adaptation planning practices. However, addressing the challenges of adapting with a changing climate has implications for all stages of planning and requires a reflexive approach to planning. This means that instead of following a directly linear process, lessons and insights gained at each stage may be cause for reflection upon and possible changes to choices and outcomes of the preceding stages. (Hence, the relevance of the juggling metaphor mentioned earlier).

A pathways approach can be incorporated into existing adaptation planning processes (E.g. Eyre *et al.* 2013) or can be used to develop an adaptation plan through its stepwise, analytical approach for exploring and sequencing a set of possible actions based on alternative external developments over time, informed by analyses of potential lock-ins and path dependencies (Haasnoot *et al*. 2013).

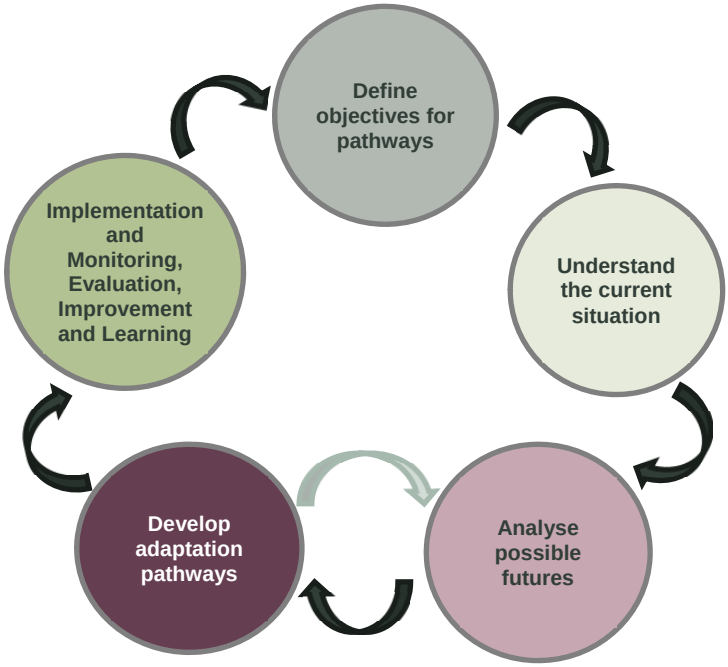
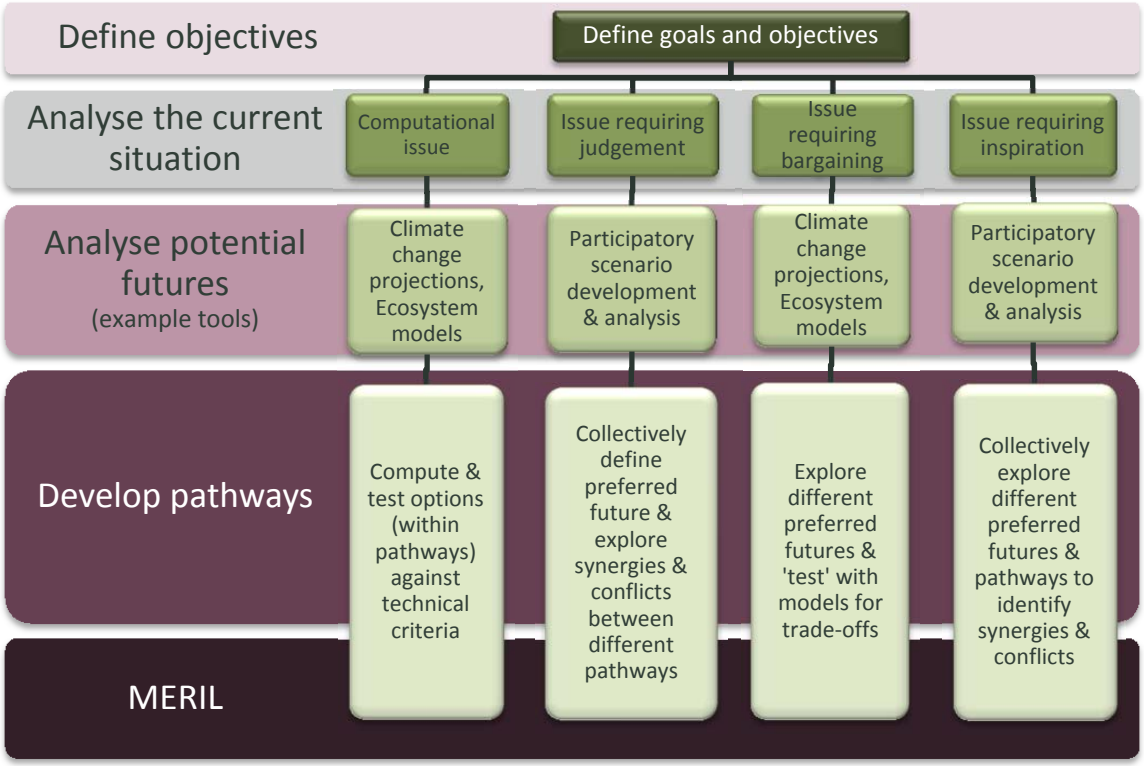


Figure 1 Five stages of an approach to adaptation pathways planning

2. The ‘Plays’

This Section outlines each of the five stages, or plays, as depicted in Figure 1 above, and provides links to relevant sections of SCARP’s Portal Report. It is broadly structured around the following ‘decision process’, wherein after defining the goals and objectives, there is a need to understand how the ‘problem’ or current situation is structured. This understanding can then more effectively guide decision and planning approaches used in developing a pathways-based plan.



2.1 Defining objectives for pathways

Developing objectives is a critical first step to thinking through options that could contribute to achieving the broad goals of an NRM strategy. Ideally, objectives articulate specific, precise and measurable targets that relate to the achievement of a goal. Such measurable objectives (e.g. KPIs or performance measures) provide the basis for developing and evaluating options as well and monitoring, evaluation and learning.

As detailed in Section A4 of the Portal Report, a vision frames the overall plan, providing context for the goals and objectives. Goals outline broad aims and aspirations encapsulating general statements of intent and purpose.

2.1.1 Why work with objectives?

Objectives are critical to developing adaptation pathways because they establish the boundaries of the issues or systems of concern, which is important in focussing:

- the scope of the following stages;
- the purpose of options that will be identified; and
- a central criteria against which potential options are evaluated (i.e. to what extent or under what conditions might this option contribute to the attainment of the objective?)

Sections A1 through to A4 of the SCARP Information Portal provide more information on approaches to developing objectives that relate to goals and a vision. A useful way to develop objectives for pathways is to start with the existing objectives within a catchment strategy.

The complexity of NRM in a changing climate means that developing options, and implementing and evaluating them, could result in objectives being revised, tweaked or even abandoned. Section A4 of the Portal Report outlines Dunlop *et al*.'s (2013) approach to evaluating existing objectives to make them 'climate change-ready'.

2.2 Understanding the current situation

This activity is about gathering intelligence around what is at stake for whom, and what is already known and being done about the situation. Development of a good knowledge base underpins subsequent stages of analysing possible futures and developing pathways. It involves three sub-steps.

- Analyse the current situation, including a reflection on historical drivers of the current situation
- Characterise or frame the situation/problem
- Use those insights to inform approaches to analysing futures, and to inform the identification and evaluation of options

Basically, this stage aims to describe 'the problem' and diagnose approaches to address it that are fit for purpose (at this point in time).

2.2.1 Why do we analyse the current situation?

Analysing the current situation enables NRM planners to define how futures analysis will be conducted, who needs to be involved in the identification and prioritisation of options, and how potential actions/options might be selected, implemented and evaluated. Ultimately the analysis will:

- provide insights into social, economic and environmental drivers of the problem, thus allowing better targeting of possible management options
- inform the types of actions that can effectively reduce the vulnerability of a system or asset to specific impacts of climate change
- help identify robust, 'no-regret' options

Understanding how the issue is currently constructed helps inform how a pathways approach might be used in developing adaptation plans. Table 1 depicts four broad 'problem' or issue types based on a simple but useful and widely-accepted classification system (applied later in Pathways section).

Table 1 Framework and typology of issue types on two axes of scientific certainty and level of agreement / values divergence (following Hoppe 2011)

Far from certainty about system or asset	***Issues requiring 'judgement'*** Experimental intervention Adaptive management Social learning Collaboration	***Issues requiring 'inspiration'*** Leadership Reframing Social Learning Adaptive Governance Collaboration Re-framing
Close to certainty about system or asset	***'Computational' issues*** Analysis Computation of options Implementation	***Issues requiring 'bargaining'*** Trade-offs Co-operation Define common ground
	Close to agreement about goals	**Far from agreement about goals**

2.2.2 How might we analyse the current situation, including historical drivers?

A broad literature on decision-making under uncertainty suggests six main aspects to consider in assessing current situations. These aspects include the degree of agreement about goals among stakeholders and the extent of certainty / uncertainty about the systems (Table 1). Other aspects are scale, capacity, urgency, and the number of stakeholders. Taken together, and especially when explored with stakeholders, analysis of these elements can help to understand issues. It is important to remember that judgements about these categories are largely subjective and interpretive. Therefore, it is useful to use rigorous processes and instruments to ensure diversity of perspectives from across the catchment as well as possible.

Section B1 of the SCARP Portal Report provides guidance for exploring the current situation, including the influence of history on that context. This analysis fits easily with existing approaches and tools. For example, existing DPSIR (Drivers, Pressures, States, Impacts and Responses) analyses can help inform actions that could reduce or remove an existing pressure, or influence a driver, all of which can aid in reducing the system or asset's overall vulnerability to different climatic changes and impacts of those changes. Section B2 of the Portal Report outlines key International conventions and agreements, as well as National and State policies that relate to climate change adaptation and NRM and play their part in the current (and future) situation.

2.3 Analysing possible futures

In this stage, a set of possible futures is developed and explored. The key system drivers, identified and described in the current situation analysis, provide the basis for developing future scenarios. Incorporating climate change into this stage of planning provides a challenge and opportunity to think about immediate and medium term (e.g. 5-10 year) strategy in the context of much longer term environmental change.

At such timescales climate change is not the only driver of system change. Complex NRM problems are affected by policies, markets, and people's perceptions and values, among many other factors. Consideration of such drivers of change in developing future scenarios can be informed by scientific (e.g. climate change projections) as well as creative processes. For example, foresighting techniques can combine socio-economic and climate scenarios to define plausible futures and means of accomplishing preferred futures by actions relevant to local or regional drivers of change.

Recently updated CSIRO climate change projections are likely to be one key source of data in this sort of analysis; as are any risk or vulnerability assessments. In the Portal Report various sections cover the ways to understand climate projections (Section C1), and apply them to different problem types (Section C6). Climate change drivers and impacts are covered in Section C2. The Portal Report also summarises and provides links to useful literature regarding ecological processes and systems (Section C4) and the potential implications of climate change for NRM assets:

C3.1 Terrestrial biodiversity
C3.2 Freshwater systems
C3.3 Coasts and estuaries
C3.4 Marine ecosystems
C3.5 Land, soil and agriculture

2.3.1 Why analyse a range of possible futures?

The future is uncertain and any single projection of what the future holds is more than likely to be wrong. If we pick a single future scenario, we are likely to develop the wrong options for the long term. By developing a range of scenarios we can test options against these plausible futures and assess which are robust or flexible or both.

2.3.2 How might we analyse possible futures?

The choice or relevance of future analysis methods should be informed by the type 'problem' that the current situation presents. Section C6 Futures Analyses of the Portal Report will be particularly useful here. It outlines and provides links to a range of tools and methods for describing potential futures. Section C5 points users to some regionally-relevant studies of climate change impacts.

2.4 Developing adaptation pathways: identifying and prioritising options

Identifying and prioritising options is at the core of adaptation pathways planning. The basic process identifies potential adaptation options, considers how robust these may be across the potential futures developed in the previous stage, as well as their flexibility. Then possible turning, tipping and trigger points are identified. The aim is to identify alternate options that could result in the attainment of objectives. The process draws on outputs from the current situation and futures analyses.

2.4.1 Why develop pathways?

As described in the preceding section, pathways development allows NRM organisations to justify, prioritise and implement actions that take into account climate change and associated changes in ecosystems, values, knowledge, as well as socio-political and economic conditions.

2.4.2 How can we develop potential pathways?

Section 2 of the Portal Report details one approach to identifying and evaluating potential adaptation pathways, including tools and methods. Broadly, there are six steps in identifying adaptation pathways for a particular objective:

1. Identify options to address existing drivers of vulnerabilities under current conditions
2. Identify tipping points, turning points and trigger points (see Box 1, p. 17)
3. Identify alternate and additional options that could help address objectives under the range of potential futures
4. Sequence potential actions into draft pathways (document)
5. Analyse and evaluate the pathways
6. Finalise and document or map pathways

Development of pathways does not have to result in a 'train line' diagram, although such diagrams are useful communication tools. For planning purposes a well-structured table can be just as useful.

> *How* a pathways approach might be used will depend on the type of issue as understood through current situation assessment.

While there are a number of ways in which 'pathways' can be generated, there are some basic components/stages for thinking about/ working through the process. Table 2 (below) summarises ways in which a pathways approach might be used for different types of NRM issues.

Table 2 Issue types associated with NRM objectives and an overview of how a pathways approach might be adapted to these

Far from certainty about system or asset	***Issues requiring 'judgement'*** There is *high uncertainty* about the system and *stakeholders agree* on the objective (low values divergence). For example: • Stakeholders agree that about the goal to maintain water quality and estuarine 'health'; • But the concept of health is ambiguous; the system drivers are many and complex; there is limited knowledge regarding some of these factors and dynamic interactions among them. • A pathways approach is selected to identify a preferred future, then work to identify pathways (as combinations of actions) that would be needed to be taken to get there (Backcasting).	***Issues requiring 'inspiration'*** There is *high uncertainty* about the system and *stakeholders disagree* on the objectives (high values divergence). For example: • Fire management to maintain both ecological and socio-economic values is contested and complex/uncertain. • A pathways approach is used to map out various options that variously to achieving each and both objectives. The different options are then be compared to identify synergies and differences. • The entire process results in substantial learning through meaningful discussion about the challenges of trying to achieve both objectives, and the potential for transformative and innovative options.
Close to certainty about system or asset	***'Computational' issues*** There is *low uncertainty* about the system and *stakeholders agree* on the objectives (low values divergence). For example: • Enabling retreat of beach-nesting birds threatened in the coastal reserve system: • This land is set aside for the purpose of conservation (agreed objective) and there is a high degree of certainty about the impacts of sea-level rise on these species • options are developed by experts and assessed through modelling studies or other technical approaches because of extensive knowledge and research.	***Issues requiring 'bargaining'*** There is *low uncertainty* about the system and *stakeholders disagree* on the objectives (high values divergence). For example: • Enabling retreat of coastal ecosystems onto private land: • Unlike the situation in the public reserve system, have differing objectives and perspectives about the value of coastal ecosystems, and knowledge about the viability of retreat pathways is limited by policy uncertainty (for instance, about potential land tenure changes in the future). • A pathways approach is used to explore the possible futures and options for various stakeholder groups to identify common ground and potential trade-offs.
	Close to agreement about goals	**Far from agreement about goals**

2.4.3 One approach to developing pathways

What follows is a brief description of each stage of developing adaptation pathways once an objective is agreed. Each description includes the intent or key question/s, with links to relevant parts of the Portal Report - Section 2 contains useful tools and methods. This is not the definitive approach to developing pathways. It is presented as an initial guide for NRM agencies wishing to explore application of the concept.

Identify existing and potential options to address existing pressures, threats and drivers of vulnerabilities

The aim of this stage is to identify what is currently being done to manage the system related to the objective. Additional actions that could address the objectives are also identified. Futures analysis is not considered at this point, and options are considered within existing constraints. Key questions are: what is currently being done and what else could be done to create specific outcomes under current conditions?

Section D2 of the Portal Report describes some approaches and methods that can be useful for specific types of issues. An example tool for 'documenting and mapping options' is provided in an excel spreadsheet.

Identify potential tipping, turning and trigger points (see Box 1)

This stage explores the potential implications of climate change for both the system being managed and the existing options that comprise the current management regime. Current management options are tested in a range of plausible futures (this helps to inform Step 3). By combining information from the current situation and future analyses, this stage seeks to identify potential thresholds/ tipping points and possible turning points for options (Box 1). It is also the stage that futures analysis is used to identify potential tipping points in the systems/assets themselves. It seeks to identify the kinds of conditions under which:

- an existing or potential future action may no longer be effective;
- a system or asset threshold might be reached; and
- an asset or system might change (these changes may be directly driven by climate change, or driven by changes in surrounding land use).

Such system changes and robustness of options into the future provides an understanding of the conditions that might prompt us to change management. For example, we might shift from maintaining or buffering a system to transitioning from one system state to another (e.g. from an alpine system to a sub-alpine system).

Box 1: Tipping, turning and trigger points

Tipping points - What is likely to change in the biophysical system?

These are *biophysical thresholds* where the magnitude of change means the current management strategy will no longer be able to meet the objectives. Identifying these helps to indicate whether and when other options are needed. An example of a tipping point is when an estuarine salt marsh or mangrove community, which cannot retreat because of geological or infrastructure constraints, becomes permanently inundated under sea level rise scenarios.

Turning points - What are the plausible 'game changers' in the socio-economic conditions or rules?

These are situations in which a *social–political* threshold is reached. This may be due to climate change (Werners *et al* 2013), or changes in formal policy objectives as well as informal societal preferences, stakes and interests. For example, a policy change relating to the mechanism for pricing carbon can lead to landscape scale changes in re-afforestation with implications for conservation, livelihoods and rural communities. A social threshold relevant to south-eastern Australia may be the point at which too many regional landholders are 'absentees' to effectively enact community-based NRM.

Trigger points—When do we need to start?

Trigger points mark the necessary lead time for action before a turning point is reached. They are also defined by how long a decision to change takes to be made and implemented. However, this aspect of defining trigger points stems from the next stage of identifying alternate options. They are a crucial part of a pathways approach; enabling plans to be strategic and anticipatory, rather than reactive and ad hoc.

Details for this stage are described in Sections C6 and D2 of the Portal Report.

- Futures Analyses can be used along with other tools, such as guidance on validly generating a range of potential future scenarios (e.g. VCCCAR scenario planning guidance).
- Section D2 provides guidance on Evaluating tipping, turning and trigger points. They should be negotiated with stakeholders, including experts.

Identify alternate and additional options that could help address objectives

This stage is about identifying adaptation options, beyond existing management actions. It seeks to identify options that may avoid, limit or remove the impacts of climate change and other socio-political-economic and environmental factors. These options are evaluated for robustness across plausible futures, and the triggers that could make them necessary are discussed.

Two major aspects need to be documented: the potential options, and an initial evaluation of their tipping, turning and trigger points. Section D2 of the Portal Report sets out some Fundamentals for adaptation in NRM, as well as some generic Types of actions to support adaptation in NRM.

Section D1 of the Portal Report also describes considerations for mitigation and sequestration options that could also be considered within the context of adaptation actions. Section D2 of the Portal Report outlines a process that can help with identifying potential adaptation options. Identified options can be added to the 'documenting and mapping options' spreadsheet. Tipping, turning and trigger points also need to be identified for these actions.

Sequence potential actions into DRAFT pathways (document)

This stage draws all the previous work together to sketch out the sequence of potential options to create pathways. Previously defined tipping, turning and trigger points are used to identify sell-by-dates or conditions when or why a specific option no longer works, as well as points before these when action needs to or can be taken. Section D2 of the Portal Report also provides guidance on mapping or sequencing pathways. The simplest method is with paper and pen.

Analyse and evaluate the draft pathways

This penultimate stage has the primary objective of mapping which pathways (or sequences of options) are preferred. It involves stakeholder and expert input to evaluate the draft pathways against high-level criteria, which will include:

- One or more of the Portal Report 'Fundamentals for adaptation in NRM'
- Cost-benefit and opportunity cost
- Robustness across future scenarios
- Potential for maladaptation
- Other physical, socio-political, financial constraints

Worksheet 2 and 3 of the 'documenting and mapping options' spreadsheet provides a list of these criteria and place to record the assessment of each pathway.

Select and document (or map) pathways

This last stage is involves drawing up final pathway maps. The sub-section 'Map pathways' in Section D2 of the Portal Report provides links to some basic, free online mapping software that may be useful. As was highlighted earlier, it is not necessary to develop a 'train line' diagram. A detailed table can serve just as well.

2.5 Implementation, Monitoring, Evaluation, Reporting, Improvement and Learning (MERIL)

NRM organisations span boundaries between local communities and local, state and Commonwealth governments. They link science and research with local knowledge and practice, and often mediate between competing goals and interests. This means they are continually convening and linking knowledge with action, policy with practice and insight with experience. They are in many ways, key conduits and facilitators of learning among these stakeholders.

Given that the future is not predictable, adaptation depends on learning and responding effectively to lessons learned, as well as experience, changing circumstance and new knowledge. Crucially, implementation of a pathways approach depends upon a sound Monitoring, Evaluation, Reporting and Improvement (MERI) system focused on learning.

2.5.1 What does climate change mean for implementation of NRM?

Implementation takes many forms and is a core, well-developed practice within NRM organisations. Because implementation of NRM strategies is beyond the responsibility of any one organisation, NRM organisations are well-practiced at collective action, which requires clear allocation and coordination of roles and responsibilities. Climate change won't alter this. However, supporting the skills and capacities for adaptation planning and implementation across organisations and groups involved in NRM is a key activity that will need to shift with a changing climate. SCARP has developed an Adaptive Capacity Handbook (in development), which outlines some key resources and capabilities that organisations and groups will likely need in order to be adaptive.

SCARP has also worked with Southern Slopes regions to develop protocols and practices for using means-to-ends diagrams and rule sets to link regional prioritisation with local implementation (Section D3). This includes adaptive systems that enable changing values, policies and knowledge to be updated as necessary.

2.5.2 Why establish a MERIL system at the outset?

Given that the future is not predictable, adaptation depends on learning and responding effectively to lessons learnt, as well as experience, changing circumstance and new knowledge. This means a sound MERIL system is fundamental to adaptation, and enabling both adaptive management and governance. Monitoring of key indicators of systems change (e.g. tipping, turning and trigger points) underpins decision-making about adjustments to strategies, operational plans and implementation practices. This includes monitoring the biophysical, social, economic and political systems.

MERI can help make successes reproducible. It makes the strengths and weaknesses of different forms of activity, intervention and investment explicit. The L for 'learning' in MERIL is also crucial. Learning takes many forms. Formal lessons about what worked and didn't through implementation can link back to higher level strategies and policies through good MERI and governance across local, regional, state and national scales.

2.5.3 How can we establish a MERIL system?

The Portal Report sets out some key considerations for establishing a MERIL system, including embedding MERIL throughout a plan and its implementation, as well as linking M&E to goals and objectives, setting indicators, and key considerations for M&E.

Section F1 describes the role of feedback in NRM planning and implementation.

Section F2 describes approaches to monitoring, evaluating and learning.

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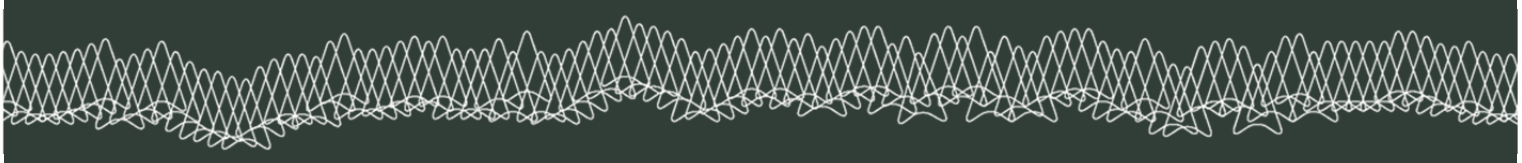
For more information about SCARP, please go to:

utas.edu.au/tia/programs/ssp/about-participatory-action-research/southern-slopes-climate-change-adaptation-research-partnership



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