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Enabling adaptive management for regional natural resource management

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Executive summary

Adaptive management is a concept and process that has been widely promoted for many years as a way for managing complex issues. More recently the Australian Government has promoted adaptive management as part of the programs for achieving regional natural resource management (NRM). It is surprising that, despite its simple logic and wide acceptance as the way forward, the effective application of adaptive management principles and practices in NRM regions proves challenging and elusive. One reason may be the disconnect between the capacity of current political and funding mechanisms and the complex and changing needs of natural and human systems in the wide variety of Australian catchments. Another reason may be limited experience and capacities for achieving coordinated outcomes from the multistakeholder processes required for democratic NRM governance.

Coastal CRC researchers have endeavoured to address such challenges by reviewing accepted adaptive management methods and identifying effective approaches for the Australian context (2000 to 2003). The adaptive management framework identified by the Coastal CRC comprises six logical components including: *Information collation; Systems analysis and vision; Plan making; Implementation; Monitoring and reviewing;* and the core components of *People and processes*. The core components are at the centre of the whole process for facilitating the achievement of adaptive NRM outcomes. Coastal CRC researchers then tested this framework through investigating the awareness and application of adaptive management principles to regional NRM settings (2003 to 2006). A number of barriers were identified and tools such as network mapping and a relational database were developed to minimise uncertainty around roles and responsibilities and alignment of regional stakeholder efforts.

This paper summarises the results of the 2003–2006 ‘Enabling Adaptive Management for Regional NRM’ project, and demonstrates what can be done to streamline and enhance NRM in regions across Australia using the adaptive management approach and processes to overcome barriers to the collective planning, management and monitoring of the regional NRM initiative. Key recommendations include the need for: a *national roadmap* that guides multilevel implementation of adaptive management principles; *monitoring and review* of adaptive management to enable adjustment and improvement of regional NRM processes; and collective emphasis on *facilitation of network building, learning, negotiation and process management, the core components* of the adaptive management framework.

1 Introduction

The Australian Government is promoting a multistakeholder model for achieving improved regional natural resource management (NRM) outcomes through programs such as the National Action Plan for Salinity and Water Quality (NAP) and the extension of the Natural Heritage Trust (NHT2). State and increasingly local governments are also participating in this model. Through 2001 to 2004 the NRM Ministerial Council endorsed separate partnership agreements between the Australian Government and all State Governments in the delivery of NAP and NHT2 to achieve long-term strategic outcomes at national, regional and local levels.

These national programs support mechanisms for local people to have increased input into decisions on regional NRM strategies, management and monitoring of outcomes. Under NAP and NHT2, regional bodies develop regional NRM plans to achieve enhanced resource condition outcomes including improved water quality, improved vegetation and biodiversity management, improved estuarine health, improved soil condition, reduced extent of erosion and prevention and reversal of salinity. Related regional objectives include communities playing a key role in their future direction, improved productivity and profitability, skilled resource managers, enhanced protection and restoration of biodiversity, and more people taking an active role in improving the management of natural resources.

Regional NRM bodies in Queensland are run by boards that represent a wide range of community interests and are responsible for developing plans to address key NRM issues in their region. The boards employ a chief executive and some staff and use volunteers to achieve their charters in partnership with other regional organisations. This has enormous potential for increasing participation, ownership and commitment to achieving agreed on-ground NRM targets and outcomes. However, it also has potential for conflict among existing agencies in terms of different directions, roles and overlapping mandates and responsibilities.

Bilateral agreements between the Australian and State Governments indicate the high level of support for funding activities and developing institutional arrangements and partnerships for achieving targets in these regional NRM plans. These agreements place considerable responsibility on regional bodies and agency networks to develop and implement regional NRM plans that:

- cover the full range of NRM issues;
- are underpinned by good science;

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- have effective involvement of all key stakeholders;
- address underlying causes rather than symptoms;
- include policies for protecting the natural resource base;
- are consistent with other planning processes and legislative requirements;
- set regional targets that are consistent with national NRM standards and targets;
- identify actions to achieve regional NRM targets;
- evaluate the wider social, economic and environmental impacts of these actions; and
- enable continuous improvement of regional NRM processes (Australian and Queensland Governments 2004).

This multistakeholder approach to achieving improved outcomes is challenging and requires new structures and methods for deciding on and implementing NRM activities. As an example, the Bilateral Agreement between the Commonwealth of Australia and the State of Queensland requires that regional NRM stakeholders take an adaptive approach and 'enable lessons learned to be realised during the life of the program and to make necessary adjustments in response' (Australian and Queensland Governments 2004).

This agreement acknowledges that while regional NRM plans may be accredited and actions financed on available science and information, these plans and strategies need to be continually developed and improved as new knowledge and information becomes available. The agreement requires that targets in NRM plans, regional investment strategies and partnership agreements be quantifiable and measurable to support evaluation and continuous improvement. Accountability arrangements are to be developed that enable the revision of targets, strategies and timelines in response to evaluation data or new knowledge.

While the agreement advises the application of adaptive management principles, in Queensland regions (or arguably in any region across Australia), such agreements offer little guidance for applying those principles to specific issues, or at different scales—or, in particular, for achieving effective NRM outcomes in the face of high levels of uncertainty of ecological response, together with the complexity inherent in multistakeholder processes and the interactions between social, ecological and economic aspects.

The Cooperative Research Centre for Coastal Zone, Estuary and Waterway Management (Coastal CRC) has been working with stakeholders in coastal

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areas for seven years and has a strong interest in regional NRM, as NRM practices in catchments impact directly on the health of coastal ecosystems. The Coastal CRC has been developing adaptive management principles and processes to enable more streamlined NRM management in regions across Australia. Adaptive management is promoted by the CRC for enhancing the ability of people involved with regional NRM to meet NAP and NHT2 requirements as well as dealing with high levels of complexity and uncertainty in managing coastal issues. This paper summarises the results, activities and recommendations for achieving 'adaptive' regional NRM based on the project, Enabling Adaptive Management for Regional NRM.

2 Background

What is adaptive management?

Adaptive management as a concept for natural resource and environmental management was originated by a group of US researchers who developed a set of techniques that integrated environmental issues with economic and social understanding (Holling 1978). Holling and co-authors were concerned that environmental impact assessment failed to deliver better environmental outcomes. They argued that environmental assessment should commence when the design process begins and set out to develop a set of techniques to: (1) deal with uncertain information; (2) mobilise available data on partially known processes; and (3) assist with the formation of objectives that are less sensitive to the unexpected. They emphasised a systems approach and communication as ways to achieve a better shared understanding of the problem (Gilmour *et al.* 1999).

Adaptive management is now recognised internationally as a systematic way to continually improve management policies and practices by learning from the outcomes of operational programs (learning by doing). Adaptive management is a mode of operation in which an intervention (action) is followed by monitoring (learning), with this information then being used to design and implement further interventions (acting again) to achieve a given objective, or maybe even modifying the objective itself (Alcamo *et al.* 2003; British Columbia Forest Service, undated).

Many of the benefits of adaptive management come from better knowledge of ecosystem response to management actions and monitoring of outcomes of decisions to anticipate ecosystem responses and make suitable adjustments where necessary. This improved knowledge minimises uncertainties and is therefore able to improve management decisions. The advantages of adaptive management are:

- A framework for better management—By systematically testing assumptions and seeing what works and what does not, stakeholders can proceed in the face of complexity and uncertainty and change and improve activities and interventions.
- An opportunity to learn—Adaptive management provides a mechanism to learn in an organised and efficient manner about what works, what does not, and why. And it can help build learning projects and organisations (Salafsky *et al.* 2001).

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- A decision-making structure—That allows managers to proceed systematically and responsibly in the face of uncertainty, gaps in understanding, and disagreement.
- A mechanism for improvement—More efficient and effective monitoring allows managers to evaluate reliably the effectiveness of alternative management actions on natural systems and build flexible management capacity (Taylor *et al.* 1997)

Adaptive management in Australian landscapes

In Australia though, adaptive management is relatively recent in implementation, with few examples of successful adaptive management for regional resource managers to draw upon (Allan & Curtis 2003). This makes key recommendations requiring the implementation of adaptive management for regional NRM (such as from the Australian and Queensland Governments bilateral agreement for delivering NHT2) a significant challenge. The agreement stipulates that adaptive management is required and says: “Adaptive management utilises monitoring and evaluation activities to form a feedback loop in order to make necessary adjustments to the program” (Australian and Queensland Governments 2004). But what are the accepted practices required for implementing adaptive management for NRM in Australia?

The Coastal CRC has identified and promoted an adaptive management framework (AMF) to improve planning and decision-making in Australia’s coastal zone. The AMF (Figure 1) is a modification of accepted adaptive management principles and has been designed to provide detail on necessary steps to achieve a sustainable outcome and to minimise the barriers that have hampered previous efforts to achieve effective regional NRM outcomes. The CRC suggests that adaptive management is required where there are uncertain and unknown responses to decisions and management actions. It may lead to changes in goals as further information becomes available, which in turn may trigger changes in priorities, structure, power and other institutional relationships. Such changes almost always produce uncertainty and stress, and a common response is to resist the changes that produce those effects. The AMF provides a structured basis for collaborative efforts of different stakeholders to work together and achieve common objectives through applying the concept of “learning by doing”. The AMF is a widely accepted, robust yet simple approach to managing complex issues and uncertain ecological and social responses.

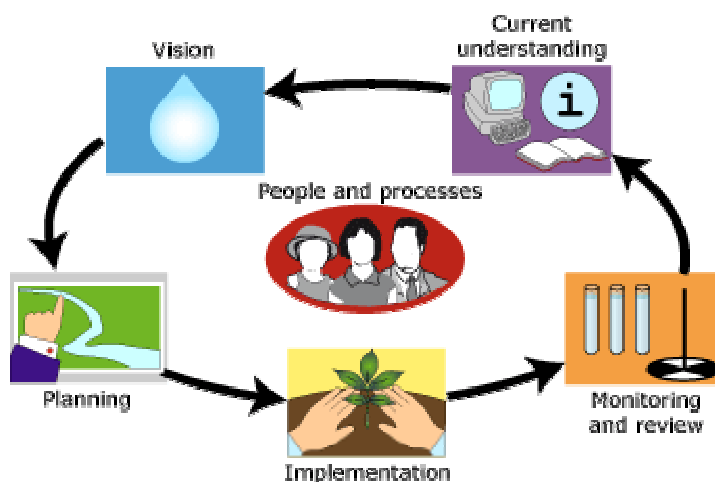


Figure 1: An adaptive management framework that illustrates the key components required to achieve a good outcome for a complex or multistakeholder decision (www.coastal.crc.org.au/amf/amf_index.htm and <http://www.coastal.crc.org.au/eam/index.html>)

The AMF includes six basic components:

Information collation: Where information from stakeholders and ongoing research is pooled and organised so it can be readily accessed and used to improve common understanding of NRM issues and opportunities.

Systems analysis and vision: Where stakeholders come together to develop their NRM vision and aspirations for a particular location, catchment or region and develop a systems approach to their assets to enable differing perspectives, values and beliefs and linkages between understandings to be explored. Concepts are refined to provide a workable understanding of the ecological system and its expected responses.

Plan making: Where stakeholders collectively establish NRM goals and targets and negotiate a preferred strategy based on consideration of multiple and sometimes conflicting objectives and possible trade-offs that may be required.

Implementing actions: Where stakeholders assign roles, responsibilities and resources to conduct the agreed actions for achieving goals and targets in the plan.

Monitoring and reviewing: Where stakeholders evaluate progress towards the vision, goals and implementation schedule and targets established at the start of the adaptive management process, and modify goals or practices as a result of emerging knowledge, using agreed review timelines.

Core components: Comprise the facilitation and management of the adaptive management process and the evolving knowledge where networking, learning, negotiation, conflict resolution and knowledge development processes are organised and facilitated among NRM stakeholders to ensure the adaptive management processes are effective and efficient in achieving the proposed outcomes (Lawrence *et al.* 2004).

Each component of the AMF represents a flexible, focussed activity with clear outputs, and is a logical step in a coordinated multistakeholder approach to achieve the best outcomes possible in the situation. These individual components are linked through an on-going, evolving process of actions and responses on foreshadowed timelines for review and further action.

Overcoming challenges for implementing adaptive management

Adaptive management does not represent a panacea for addressing the multiple social, economic, budgetary and scientific challenges that confront natural resources management (US NRC 2004). Arriving at judicious decisions on complex issues with unknown or uncertain responses requires greater time and inputs than for simple issues. This is particularly the case where there are multiple stakeholders involved or affected by the decision. This is seen as a major challenge to financial and political constraints where low cost and often 'quick fix solutions' are sought. However, despite the many decisions on NRM issues that have been made on partial information and have resulted in unintended consequences that are costly to amend or reverse, there seems to be currently no viable alternative process.

While adaptive management is a holistic alternative to reductionist science that actively involves social and political values in resolving ecosystem management issues (Allan & Curtis 2003), the many advantages of adaptive management have proven difficult to measure. One barrier is that the effective implementation of adaptive management requires significant investment in monitoring programs, staff numbers and institutional support. The inexact nature of the benefits from effective adaptive management can make these direct, up-front costs prohibitive for many stakeholders. Another barrier is that the need for long-term time frames for adaptive management requires patience from all stakeholders, including funding agencies and political supporters who work to different schedules (Salafsky *et al.* 2001). Enduring political approval and funding of adaptive management will require traditional economic analysis of investment in an ongoing manner (US NRC 2004).

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The Coastal CRC maintains that the benefits of adaptive management far outweigh the costs in the regional multistakeholder NRM environment. A key principle of the AMF is that regional NRM problems commonly involve large numbers of stakeholders. The AMF provides a guide for multistakeholder NRM groups to maintain constructive dialogue and processes that work towards improving capacity as well as achieving social, economic and environmental outcomes (Lawrence *et al.* 2004). Adaptive management needs to be scaled to the complexity of the issue and to the stakeholders affected, which will minimise some of the challenges in implementing AM.

The adaptive management approach has a clear role in educating both community stakeholders and narrowly focussed specialists, and it provides a setting for effective negotiation. The large number of NRM stakeholders is an opportunity because the diversity of perspectives provides a rich description of NRM issues and a range of alternative approaches. Large numbers prove a constraint though when developing management strategies that require broad stakeholder involvement and support for effective implementation. Adaptive management takes advantage of this opportunity by involving diverse stakeholders in joint analysis and solution of NRM issues. It deals with the constraint by using these joint activities to build mutual understanding and agreement among stakeholders (adapted from Gilmour *et al.* 1999).

3 Project aims

Following the development of the AMF in earlier CRC research (e.g. Bennett *et al.* 2002; Lawrence *et al.* 2004) and the signing of bilateral agreements that require regional NRM stakeholders to implement adaptive management, this project was undertaken to:

- investigate the extent to which adaptive management was understood and being used in regional NRM;
- identify the barriers to using an adaptive management framework;
- develop tools and conduct processes to assist the regional partners in implementing adaptive management in regional NRM; and
- document and disseminate the results, recommending a way forward for overcoming some of the barriers for adaptive management by using these tools.

The initial focus area was Central Queensland because:

- It is nationally recognised as a leading region in Australia for interagency NRM planning.
- A number of major scientific studies have been conducted in the Fitzroy region since 1999, developing tools and understanding of the catchment, as well as relationships with catchment stakeholders.
- It is also one of the Coastal CRC's four management study areas.

As the project progressed, south-east Queensland regions also actively sought to participate.

4 Methodology

First, a benchmarking study was conducted with central Queensland NRM stakeholders from regional body and key state government agencies to:

- investigate the extent to which they understood and use adaptive management principles and practices;
- identify barriers to effective application; and
- identify achievable tasks that would assist regional partners in implementing an adaptive management framework.

This benchmark study involved the completion of detailed surveys in interviews with key operational staff in the region. Information was collated and analysed in a benchmark statement that described the application of adaptive management principles and practices within the regional NRM institutional arrangements. Graphical assessments were provided including diagrams illustrating the acceptance and application of the various AMF components.

Two tasks were identified by regional NRM stakeholders as important for 'enabling' improved application of adaptive management. The first task focused on *network mapping* of regional NRM arrangements, and included maps outlining linkages among stakeholders and proposed roles and responsibilities. The second task was focussed on *improving the alignment* of the programs, assets, resource condition targets, management action targets and management actions in the Mackay Whitsunday NRM Plan with the outputs, strategies, programs and activities of Government agencies. NRM stakeholders in south-east Queensland requested involvement in this second task.

Finally, towards the end of the project, a survey was conducted to assess change in the application of adaptive management principles and practices by NRM stakeholders in central and south-east Queensland regions and identify impacts of the project activities. This survey retained the questions, structure and intention of the first phase benchmark. Additional questions were included based on findings from the benchmark, learnings from conducting the two tasks with regional stakeholders and further review of specific literature. The details of the project and the results are in the final report for the project (Leach *et al.* 2006).

5 Key findings

Main messages

The main messages about the awareness and implementation of adaptive management in the NRM regions studied based on the results of the project are given below. Project findings that support these messages are also presented:

1. Guidance for applying adaptive management

The adaptive management framework is generally considered the preferred option for integrated NRM in complex situations and for managing collaborative activities with stakeholders. Effective application of adaptive management can be time and resource intensive and thus needs to be tailored to the complexity of the issue. However *adaptive management is currently not entrenched in the thinking, language and practice of regional NRM stakeholders*, even though capacities to consider and discuss the different components of adaptive management appear to improve with time and as more mature relationships develop. A map is required to guide stakeholders and assist 'learning by doing' through the application of adaptive management principles and practices to NRM issues of varying complexity at national, state and regional levels. This map or guide will lead to efficiency in decision making by minimising confusion and enabling multistakeholder learning and collective outcomes.

Project finding 1

Inclusion of adaptive management principles and practices in regional body plan processes and agreements

After involvement with the project, Mackay Whitsunday Natural Resource Management group (MWNRM) inserted the term adaptive management in the regional body's mission statement: "To manage the natural resources and biodiversity by engaging our community and applying adaptive management" (MWNRM 2006). These stakeholders now maintain that the AMF provides a mechanism for longer-term improvement of processes and practices among regional NRM stakeholders and institutional networks for achieving targets in the regional NRM plan. The fact that adaptive management was not included by MWNRM previously would suggest that the term was not understood adequately. This is an issue for NAP and NHT2, where bilateral agreements between the Australian Government and the states specifically require regional NRM processes to be consistent with adaptive management principles.

2. A process and timeline to balance effort on the components (or stages) of adaptive management

The stages through which the regional NRM arrangements have been instituted in Queensland and throughout Australia largely follow the components of the AMF. These stages, however, are not articulated or operationalised within a clear framework for 'learning by doing' and achieving adaptive outcomes. Systematic application of each component is limited, primarily because regional stakeholders have been responsive to the planning and reporting requirements of NAP and NHT2 and have not been able to stand back from these requirements, critically reflect on developments and identify gaps.

There has been (perhaps understandably) an initial overemphasis on *planning* as a result of the program requirements, and subsequent funding schedules have focussed on rapid *implementation* of proposed actions. This has led to inadequate consideration of *monitoring and review* due to the time and funding pressures and limited connection of mandatory reporting requirements with learning and continuous improvement. A vision and timeline of *balanced efforts* against each of the AMF components in a cyclic process of improvement and change is required. This vision and timeline should reinforce that the AMF needs to be scaled to the complexity of the issue and the number of stakeholders involved or affected by the decision. This will communicate an overall plan, clear realistic expectations and apportion resources to the necessary components appropriately.

Project finding 2

Adoption and understanding of adaptive management practices in regional situations

As indicated by an initial benchmark study, further task activities and a follow-up survey, there are significant developments in how adaptive management principles and practices are implemented in central and south-east Queensland NRM regions between 2004 and 2006.

*Progress through the components of the adaptive management framework has been methodical and aligned with NHT2 and NAP reporting requirements, but arguably imbalanced with an overemphasis on **planning**, followed by rushed **implementation** and inadequate integration of **monitoring and review**. It also appears that while **information collation** and **systems analysis and vision** were regarded as 'completed', stakeholders found through time that these processes are ongoing and require further improvement. This highlights the strong need to continually return to different components of the adaptive management framework as the context of regional NRM processes changes.*

Project finding 3

Barriers to using an adaptive management framework

Regional stakeholders identified that a significant barrier to effective application of adaptive management is limited tools and capacities in the core components of the AMF, namely facilitation of network building, learning, negotiation and process management. As a result of the benchmarking process, two necessary tools were identified to address this: (1) a map of regional roles and relationships and (2) a tool for aligning strategies, programs and activities among regional stakeholders. A further barrier to adaptive management that stakeholders identified was the limited effort and belated emphasis on monitoring and review, which they regarded as a key component of adaptive regional NRM systems.

Project finding 4

The strengths, weaknesses, opportunities and threats of adaptive management for regional NRM

The results of the project are presented within a SWOT table which is intended to be used as a guide rather than a prescription.

Table 1: Strengths, weaknesses, threats and opportunities of adaptive management for regional NRM

	Strengths	Weaknesses	Threats	Opportunities
Regional NRM bodies and stakeholders	<ul style="list-style-type: none"> • Recognises NRM planning and implementation as an adaptive learning process • Multiple stakeholders are able to contribute in a 'collaborative' manner • Increased ability to 'align' efforts among stakeholders • Improved potential to achieve effective NRM outcomes through increased ownership of issues and collaboration for resolving these issues • Ability to handle issues with uncertain and unknown responses and make adjustments in a logical manner 	<ul style="list-style-type: none"> • The NRM arrangements are tied to NHT and NAP schedules and do not appear to have adequate time for reflection and consequent revision of plans or activities • Managing the diversity of stakeholder interests without a good process can lead to non-effective outcomes • There is inadequate time for the regional NRM model to establish legitimacy and trust in the process (e.g. on-ground works, outcomes) • Inadequate support and resources are provided for effective facilitation of networks, learning and negotiation (core components and processes) • Inadequate support and time for the monitoring and review Component leads to poor learning and little adjustment of strategies in response to new information 	<ul style="list-style-type: none"> • Uncertain and conflict-ridden multistakeholder processes may stall the process and give adaptive management a bad name when there is no alternative • Slow achievement of 'outcomes' may reduce further political and funding support • Overemphasis on planning and hasty implementation risks burnout and inadequate contributions to monitoring and review and further iteration through AMF components • Traditional expectations and approaches to achieving NRM outcomes by agency staff restrict sharing of power and responsibility in regional NRM networks • Achievements aside, still limited guarantee of accreditation and ongoing funding for the effort and resources invested 	<ul style="list-style-type: none"> • Increased ability to share power and resources in true partnerships for effective decision-making • Better means of identifying roles, responsibilities and opportunities for achieving adaptive outcomes • Can provide an effective way of demonstrating outcomes to regional, state and national stakeholders by framing activities in a systematic process of learning and improvement and monitoring and adjustment of strategies
Government agencies	<ul style="list-style-type: none"> • Increased capacity to achieve policy outcomes through regional NRM arrangements and governance structures • Improved capacity to feed back regional NRM context into government policy, community development initiatives and state planning processes 	<ul style="list-style-type: none"> • Commitment to involvement in regional NRM arrangements by agency management is slow and cautious, which limits potential of regional agency staff to contribute effectively in regional partnerships • Many sections of government agencies do not see they have a role in multi-party regional NRM arrangements 	<ul style="list-style-type: none"> • Fear of losing power, authority and responsibility to regional NRM bodies and stakeholders • Ongoing reluctance by some agency sections and stakeholders to participate may limit the real potential to achieve collaborative and adaptive outcomes 	<ul style="list-style-type: none"> • Increased opportunity to save costs by sharing some regional service delivery functions (e.g. extension) to regional NRM arrangements • Potential to embrace the multistakeholder approach to achieving NRM outcomes and adjust government policy and legislative mechanisms to reflect regional needs and contexts

3. Core components of adaptive management are essential for effective collaboration and decision-making and require more resourcing to achieve effective outcomes

Throughout Australia the regional NRM arrangements are actually quite complex multistakeholder institutional arrangements. *The 'core components', the people and processes of adaptive management, are critical for effectively driving and facilitating the AMF in these NRM regional arrangements.* The core components relate to the facilitation of network building, learning, knowledge development, negotiation and process management within regional networks.

A key challenge with the core components is that the role and responsibility for 'facilitation' does not seem to be clearly specified within some regions. In central and south-east Queensland it appears that facilitation of regional coordination processes central to adaptive management is largely driven by state government staff (e.g. regional coordination groups involving state, regional body and industry stakeholders). Wider ownership and commitment of resources to the core components will improve adaptive management through more effective collaboration and collective decision-making.

Project finding 5

Balancing the cyclic nature of adaptive management

It appears difficult for people to continually think about all components of the AMF in a systematic manner. Stakeholders tend to focus on the component they are currently concerned with and only occasionally consider how this fits in with the bigger picture. This may be a natural tendency; however, the apparent risk is that if the early stages of the AMF are overemphasised, the later stages will be given limited consideration as time and enthusiasm run out. A robust and systematic process is required to ensure adequate time and energy is preserved for the later stages of the framework. Streamlining the achievement of effective NRM outcomes requires balanced effort across all components of the AMF in an ongoing manner.

4. Tools and capabilities to improve alignment of programs and activities

Many different organisations are involved in NRM activities and it is important to ensure their actions are effective, cover the full range of issues and are not overlapping. For truly adaptive management in the multistakeholder regional NRM arrangements *effective capacities and tools* are required to address issues of 'alignment' among the strategies, programs and activities of stakeholder sectors. Specific issues include coordination of efforts in each component of the AMF and alignment of programs from state agencies with agreed targets in regional NRM plans. The relational database developed in the project is one tool supporting alignment efforts but additional tools are required.

Project finding 6

Tools to improve adaptive management in multistakeholder NRM regional networks

Drawing from the benchmark and the expressed needs of regional stakeholders, three tools were developed to focus and facilitate interactions and improve achievement of adaptive outcomes in the regional NRM arrangements:

- a. A methodology for conducting benchmarking processes with multistakeholder NRM networks to assess and identify barriers and opportunities in the effective application of adaptive management principles and practices.*
- b. A methodology for undertaking network mapping exercises with multistakeholder NRM networks to assist regional stakeholders frame, understand, communicate and further improve interaction and decision-making structures and processes.*
- c. A relational database that organises and presents government agency program and activity information alongside targets and actions within regional NRM plans in an easy-to-understand format. The relational database improves interactions, understanding and negotiations between NRM stakeholders, who are all seeking 'transparent alignment' of activities to achieve common resource condition targets in the regional NRM plan. Agency and regional body information can be presented at appropriate levels and in a layout that reduces complexity, enabling improved comprehension and discussion and therefore more informed negotiations for aligning programs and activities and achieving common outcomes. The database was tested with stakeholders involved with the regional alignment challenges in south-east Queensland. This demonstrated that accessibility of data and potential to compare datasets is greatly improved using this tool. The database is being used to support ongoing alignment negotiations in the region and is also being included in 'ViSTA', the major platform for integrating data and information from the fifteen regional bodies in Queensland (<http://www.vista.net.au/portal/index.html>). A pilot study is targeting alignments between the Burnett-Mary regional NRM plan, Natural Resources, Mines and Water's (NRMW) Regional Information System database and NRMW's outputs, strategies, programs and activities in the south-east Queensland region.*

5. Resolving complex multistakeholder issues requires balanced commitment

For effective and truly adaptive management, all stakeholders involved require the willingness and capacity to 'put things on the table' (e.g. departmental regional deliverables and activities) and to take a collaborative and inclusive approach to doing business.

Project finding 7

Commitment to regional partnership model of engagement

Complicating factors in the regional NRM arrangements include the lack of long-term certainty about the future of regional bodies and funding arrangements for regional NRM. This means that agencies tend to see regional NRM bodies as transitory and thus appropriate investment of resources is not forthcoming or because of legislative provisions and corporate responsibilities, agencies are not willing to share decision-making.

6 Further work required

This Coastal CRC project has been a short-term contribution towards the achievement of larger-scale NRM outcomes through improved adaptive management. Issues identified through the project that require further and ongoing attention include:

- 1. Agreement on roles and responsibilities:** Improved agreement on roles and responsibilities among regional NRM stakeholders is an essential ongoing need for achieving adaptive outcomes. Benchmarking, networking mapping and interactions around alignment in central and south-east Queensland NRM regions helped move toward improved understanding of essential roles and responsibilities within these multistakeholder networks. Regional NRM stakeholders indicated that stronger relationships lead to a better knowledge of roles and responsibilities, improved processes of deliberation and thereby more adaptive outcomes.

While this project contributed to stronger relationships and understanding of 'who should be doing what' in these regions, further work is required to ensure roles and responsibilities are and remain clear. Benchmarking, network mapping and negotiations around alignment also need to be applied at other regional, state and national scales. It is suggested that improving multistakeholder deliberative processes to resolve complex issues around roles and responsibilities may require further work on conflict resolution, mediation and negotiation:

- a. Where entrenched positions prevail and trust is low, *conflict resolution* may be required initially, where mediators help clarify common ground among differing parties and initiate dialogue processes (Galtung 2006).
- b. Where stakeholders are more prepared to collaborate and trust is stronger, *integrative negotiation* is proposed as a methodology where stakeholders identify together the best way to negotiate and collectively draw on values to clarify personal and agency objectives to plan future interactions (Lewicki *et al.* 2001, 2003). Facilitated integrative negotiation among key national, state and regional level stakeholders (using a mediator) will assist in encouraging the use and benefits of participatory adaptive management for regional NRM efforts.

- 2. Efficient achievement of effective long-term NRM outcomes in NRM regions:** Achievement of effective NRM outcomes requires the *ongoing* application of adaptive management principles within regional NRM arrangements in a systematic manner. Unless adaptive management principles inform, and are explicitly included within, successive national and state programs, there is a considerable risk that many regional NRM outcomes will be lost or discontinued. The adoption of adaptive management principles requires further work and investment in education of NRM stakeholders at national, state and regional scales in how to apply the AMF in complex multistakeholder networks. Ongoing work is required to advocate and further develop adaptive management principles for the achievement of truly adaptive regional NRM outcomes. Communication products and websites advocating adaptive management in regional NRM arrangements can be accessed at <http://www.coastal.crc.org.au/eam/index.html>.

7 Conclusions and recommendations

The main conclusion is that the adaptive management framework provides the only workable process in which multiple stakeholders can be brought together to develop plans, implement activities and monitor progress in the achievement of agreed natural resource condition targets in the face of uncertain and unknown interactions and responses. Effective regional relationships and a good understanding of 'who should be doing what' take time to develop but are essential to achieving adaptive and effective NRM outcomes. In order to put adaptive management into practice in regional multistakeholder settings, however, those involved need to tailor interactions to include increased reflection and action with all components of the adaptive management framework.

The following recommendations for 'enabling' the application of adaptive management principles and practices for regional NRM build on the conclusions, key messages and results outlined above:

1. **A national roadmap for adaptive management:** A roadmap is needed for providing guidance on appropriate timelines and levels of investment required for adaptive management at different degrees of complexity and scales of operation. The roadmap will:
 - a. Advocate the values of adaptive management and choosing the most appropriate process for the issue as well as identifying the stakeholders involved and affected
 - b. Highlight the benefits of adjustment and revision for plans and actions based on monitoring and review of goals and progress
 - c. Identify and provide options for minimising some of the barriers and difficulties of applying adaptive management principles and practices in regional NRM (e.g. examples of small achievable tasks that engage regional NRM stakeholders and assist application of adaptive management)
 - d. Include tools for dealing with complex issues and dilemmas inherent within the multilevel/multistakeholder NRM environment. The particular dilemma of 'alignment' among agency partners' strategies, programs and activities requires decision support tools for dealing with large amounts of information and complex institutional and relationship structures

- e. Outline how the political process can enhance adaptive management and reinforce progress of major community processes that are working and achieving agreed outcomes, rather than 'hijacking' the process to satisfy vested interests

A national roadmap for adaptive management needs to be prepared through collaboration with federal, state and local government and regional NRM stakeholders to steer regional NRM processes toward collective learning, continuous improvement and sustainable outcomes. Future national NRM programs (after NAP and NHT2), as well as state and regional initiatives, need to be adaptive in their own right and map the adaptive management components into operational timelines and funding schedules with *distinct* stages, timelines and outcomes. This will allow the necessary time for reflection and revision of plans and strategies to happen at national, state and regional scales with stakeholders more able to 'learn by doing' and achieve adaptable outcomes.

2. Monitoring and reviewing adaptive management in regional NRM

arrangements: Assessing the adaptive capacity of decision-making and governance practices within NRM regions encourages regional bodies and stakeholders to consider issues and opportunities that impact upon adaptive management of natural resources. Ongoing monitoring and review of adaptive management enables improvement of multistakeholder, institutional arrangements for the achievement of sustainable NRM outcomes through time. Coordinated monitoring and review of adaptive management is needed on an ongoing basis at regional, state and national scales to identify the limitations in achievement of adaptive NRM outcomes, which can then highlight actions needed to improve adaptive management and sustainable outcomes at each scale.

3. Collective emphasis on facilitation of network building, learning, negotiation and process management (core components of the adaptive management framework)

Implementation of the regional NRM arrangements is a complex endeavour involving multiple stakeholders at different scales, complete with different agendas, needs and levels of uncertainty. *Increased ownership and commitment of resources* is required for the facilitation of effective network building, learning and negotiation processes in regional NRM arrangements. This is essential for developing effective professional relationships. NRM stakeholders will gain value from increased trust and reciprocity, which in turn will lead to improved collaboration, collective decision-making and convergence around complex

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issues at all scales. Further benefits include better capacities to deal with transitions with staff changes and as program directions alter. The development of a common language and context for thinking about and applying all components of the adaptive management framework in regional NRM will also be a major advantage.

Further challenges from this research are to communicate the above recommendations to national (e.g. Departments of Environment and Heritage, and Agriculture, Fisheries and Forestry), state and regional agencies to enhance learning and to explicitly include adaptive management principles and practices in future large-scale programs such as the current NAP and NHT2 programs.

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