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Assessing the capacity to manage natural resources in NSW

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Abstract

This report describes the development of a rapid, low cost, repeatable self-assessment process to monitor, evaluate and report progress towards the achievement of Target 13 – *an increase in the capacity of natural resource (NR) managers to contribute to regionally relevant natural resource management (NRM)* – one of the 13 NRM targets established under the NSW State Plan.

Chapter 1 places the requirement for monitoring, evaluation and reporting (MER) of the capacity of NR managers in the context of government policy currently driving the management of biodiversity, land and water in NSW.

Chapter 2 documents the approach taken to the MER of NR manager's adaptive capacity by the Target 13 project team and the testing of that approach in pilot trials with two NSW catchment management authorities (CMAs). In this approach, regional measures of adaptive capacity derived from secondary data sources were used to identify the multiple dimensions of adaptive capacity. Locally relevant measures of capacity for NRM were constructed via focus groups with participants drawn from pre-existing networks of NR managers (where available). These measures of NR manager capacity can be used to support a dialogue between NR managers, CMAs, industry and different levels of government, in order to prioritise collective action for building adaptive capacity for NRM. Use of a framework for Target 13 that is consistent with the national NRM monitoring framework ensures nesting of findings across regional, state and national scales to inform both NRM policy and practice.

Chapter 3 examines issues central to incorporating capacity assessment in CMA business processes and NRM policy formulation. These issues include the complementarity of the Target 13 assessment process with existing CMA community engagement activities, the scale of assessment and its representativeness and repeatability within the context of a continuing monitoring program.

The report aims to encourage the use of a consistent approach to monitoring NR manager capacity by providing a guide to the techniques and a description of the reporting products developed for NSW State of the catchments (SOC) reporting and NSW CMAs. Prototypes of the reporting products developed exclusively for participating CMAs are included in the appendices.

Acknowledgements

The success of this project relied heavily on the cooperation of NSW CMAs. We would like to thank everyone who was involved and in particular, would like to acknowledge the General Managers and staff of Central West, Hunter–Central Rivers, Lachlan, Murray, Western, Hawkesbury–Nepean and Sydney Metropolitan CMAs for their support and active participation in the project. We thank them sincerely for their willingness to try a novel approach to community involvement in NRM. We also thank the natural resource managers who participated in the workshops, for their involvement and contribution to the project.

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Acronyms

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ACARP	Australian Coal and Agriculture Research Project
CAPs	catchment action plans
CMA	catchment management authority
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DECCW	Department of Environment, Climate Change and Water
FMDs	farm management deposits
LEPs	local environmental plans
MER	Monitoring, evaluation and reporting
NR	natural resources
NRC	Natural Resources Commission
NRM	natural resource management
SENCC	Social and Economic National Coordination Committee
SOC	State of the catchments
SOE	State of the Environment

Glossary

Adaptive capacity	The set of resources available for adaptation, and the ability of a system to deploy resources effectively in the pursuit of adaptation. For NR managers, adaptation involves changes in practices that lead to improvements in the sustainability of resource use. Adaptive capacity is an emergent property of a system to adjust to or better cope with change and it is generally expressed as actions that lead to adaptation.
Capital	The assets people use to gain a living. They are the core aspects of a livelihood. Assets can be classified into five types – human, social, natural, physical and financial capital. People will access, transform and combine assets in different ways to support their livelihood and the need to adapt to change.
Catchment management authority (CMA)	A statutory authority with responsibility for NRM established across NSW to ensure that regional communities have a say in how NRs are managed in their catchment. A CMA works with farmers, Landcare and other groups, Aboriginal communities, local government, industry and state agencies to respond to the key NRM issues facing their catchment.
Collective action	The pursuit of a goal or set of goals by more than one person. In the context of NRM capacity, the goal is to identify actions that involve NR managers, CMAs, industry and state and national governments working together to build aspects of capacity and reduce constraints to NRM practice change.
Natural resource (NR) manager capacity	The ability of a group of NR managers to perform functions, solve problems, and set and achieve objectives that leads to improved NR outcomes. Capacity may include physical, institutional, social or economic means as well as skilled personal or collective attributes such as leadership and management.
Natural resource management (NRM)	The management of land, water, soil, native vegetation and biodiversity, with a particular focus on how management affects the quality of life for both present and future generations. NRM is congruent with the concept of sustainable development and recognises that people are an integral part of the cultivated landscape and that NR managers are key local stakeholders in the delivery of landscape scale change through their use and management of these resources.

Rural Livelihoods Analysis	A framework that allows for an integrative conceptualisation of capacity. The broad application of the framework grew out of the need to view change as a transformative process that affects people in different ways, and to focus on the consequences of variability and change for individuals and societies. The framework does not aim to present a model of reality but to help stakeholders, with their different perspectives, engage in structured, coherent and deliberative debate about the many factors affecting livelihoods, their relative importance and how they interact.
Spider web diagrams	Known more formally as 'livelihood pentagons', they are a graphical representation of the status and balance of the five types of capital used to assess adaptive capacity. They provide a point of entry into more detailed narratives of the importance of contextually relevant indicators that comprise each of the capitals.
Target 13	One of the state-wide NRM targets adopted in the NSW State Plan 2005. The target aims for '*an increase in the capacity of NR managers to contribute to regionally relevant NRM.*'

Summary

The New South Wales government has implemented 13 state-wide NRM targets. A monitoring, evaluation and reporting (MER) strategy was established to gather, interpret and report information relating to these targets. Target 13 deals with the ways people influence NR outcomes through their management of NRs.

Target 13

There is an increase in the capacity of NR managers to contribute to regionally relevant NRM.

This report has three aims:

1. To place the requirement for MER of the capacity of NR managers in the context of government policy currently driving the management of biodiversity, land and water in NSW
2. To document the Target 13 project team's approach to MER of NR manager adaptive capacity and the testing of that approach in pilot trials with two NSW CMAs
3. To encourage the use of a consistent approach to monitoring of NR manager capacity by providing a guide to the techniques and a description of the reporting products developed for NSW CMAs.

Why monitor NR manager capacity?

Target 13 seeks to monitor the capacity of NR managers as high levels of capacity are a precondition for successful practice adoption leading to improvements in NR condition. The project attempts to determine the extent to which those who make decisions about NRs both public and private – including farmers, peri-urban landholders, the mining industry, green-fields developers and local government – have the capacity to change their practices to manage NRs more sustainably and be less damaging to the environment.

How did we assess NR manager capacity?

Capacity to manage NRs has many dimensions. It depends partly on the skill and ingenuity of NR managers, partly on the resources they have access to, and partly on the institutional and policy environment in which they operate. All these factors become important in assessing capacity, and identifying what enables and constrains effective NRM, which has led to the application of a livelihood framework (Table 1) to provide a structure for understanding all these factors.

Previous research showed how the Rural Livelihoods Analysis could be used to broaden traditional diffusion of innovation approaches to understanding the adoption of sustainable farming practices by Australian land managers. However, national indicators of adaptive capacity lack the local relevance and community ownership necessary to guide contextually relevant strategies that trigger local action to adopt a change in management practices or mix of livelihood activities.

The description of the five capitals used in the Rural Livelihoods Analysis framework (Ellis 2000), and the indicators used by Nelson et al. (2010a) to construct a generic index of adaptive capacity of rural communities.

Table 1: The framework of capitals used in Rural Livelihoods Analysis

Capital	Definition of capital	Generic indicators
Human	The skills, health (including mental health) and education that contribute to the productivity of labour and capacity to manage land and other NRs.	Education of operator
		Education of spouse
		Health
Social	The family and community support available, and the networks through which ideas and opportunities are accessed.	Landcare membership
		Partners
		Internet
Natural	The productivity of land, and actions to sustain productivity, as well as the water and biological resources from which livelihoods are derived.	Mean pasture growth index
		Dams
		Vegetation potential
Physical	The infrastructure and equipment, and breeding improvements in crops and livestock that contribute to rural livelihoods.	Plant and machinery index
		Structures index
		Livestock index
Financial	The level, variability and diversity of sources of income sources, and access to other financial resources such as credit and savings that available to support rural livelihoods.	Capital
		Mean total cash income
		Access to finance

To ensure regional relevance, we used a participatory workshop approach with participants drawn from pre-existing networks of NR managers where available. For agricultural land managers, the process entailed asking communities of NR managers to identify aspects (indicators) of the five types of capital that constrained or enabled their ability to manage NRs, using a scale of 0 (effectively constraining NRM, high priority for action) to 5 (effectively supporting NRM, low priority for action) (Table 2, Figure 1). For each indicator, they were asked to suggest collective actions that might remove the constraint (or enhance the enabler). The aim was to use this list of actions to assist in directing investment of limited funding for NRM into areas where it should be of greatest benefit to NRM outcomes. The process could also assist in prioritising investment and enable MER on change in regional landholder capacity that results from action to build capacity.

For non-agricultural NR managers (ie local government officers, miners and land developers), focus was drawn on the institutional and organisational values/assets that these types of managers use to influence the condition of NRs. This was important because, unlike traditional farm businesses,

NRM takes place outside of the context of a rural household. In workshops with non-farm NR managers, three questions were posed:

1. How do non-farm NR managers influence NRM?
2. What is the capacity of non-farm NR managers to influence improved NRM?
3. What opportunities exist to improve NRM capacity for these non-farm NR managers?

The information gained from these workshop discussions was used to provide rich context over and above that provided by managers such as farmers.

What did we find?

Through the capacity assessment process, NR managers were able to self-assess their capacity for NRM. They identified sets of regionally relevant, contextual indicators of capacity that constrained or enabled practice change and rated the indicators according to the 0–5 scale. Furthermore, they provided a narrative about the regional importance of these indicators and identified actions that collectively with CMAs and state and federal governments could build aspects of capacity for NRM.

Table 2: Indicators and scores for a hypothetical catchment

Relative score / 5		Region			
		1	2	3	Average
Human	Enthusiasm and optimism	1	3	4	2.7
	Ageing farm managers	1	2	2	1.7
	Willingness to take risks and chan	1	3	2	2
	Resilience and mental health	0.1	1	2	1
	NRM education in schools	0.1	1	1	0.7
	Average Human	**0.6**	**2**	**2.2**	**1.6**
Social	Volunteering – participation	1	2	2	1.7
	Volunteering – lead & represent	1	1	1	1
	Young people in NRM	0.1	0.1	0.1	0.1
	Fear of policy	0.1	3	3	2
	Average Social	**0.5**	**1.5**	**1.5**	**1.2**
Natural	Pasture growth	4	3	2	3
	Water security	2	1	0.1	1
	Biodiversity	3	2	4	3
	Soil health	3	2	4	3
	Average Natural	**3**	**2**	**2.5**	**2.5**
Physical	Conservation farming equipment	3	2	2	2.3
	Efficient paddock	4	2	2	2.7
	Low input farming	4	3	1	2.7
	Average Physical	**3.7**	**2.3**	**1.7**	**2.6**
Financial	Off farm investment	3	3	3	3
	Off farm employment	1	4	5	3.3
	Availability of cash to do NRM	1	1	1	1
	Average Financial	**1.7**	**2.7**	**3**	**2.4**

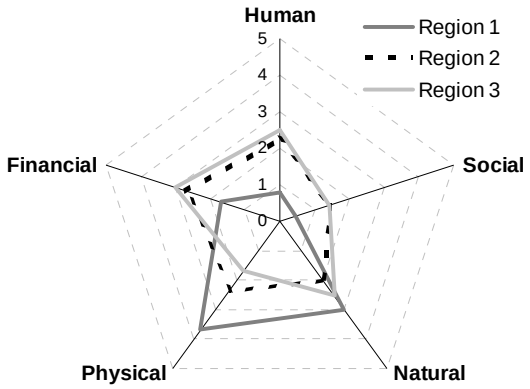


Figure 1: NRM capacity in hypothetical regions

The detailed findings of each workshop were reported formally to participating CMAs, regional summaries to the NSW MER strategy, and state-wide drivers of NRM capacity to the NSW State of Environment (SOE) reporting process.

Where to next?

For capacity assessment to become an input to the formulation of NR policy it needs to be incorporated into CMA business processes, as engagement with regional communities is a core function of CMAs. Issues of the complementarity of the assessment process with existing CMA community engagement activities, the scale of assessment and its representativeness all need consideration, as well as the repeatability within the context of a continuing monitoring program.

Community capacity assessment is still in the early phases of development. The modified Rural Livelihoods Assessment applied in Target 13 was a useful method to assess NRM capacity because it proved to be innovative, rapid, robust and potentially repeatable. However, successful implementation of continuing, state-wide capacity assessment will depend on potential users of the information being receptive to processes that generate largely qualitative findings from NRM stakeholders. For this to occur, NRM policy practitioners must accept that stakeholders are intelligent, responsible agents who are willing to act in the collective interest when institutional arrangements foster learning, allow co-design of institutional conditions and value reciprocity.

1. Introduction

1.1 Background

The NSW Government has implemented 13 state-wide NRM targets (Table 3). A MER strategy was established to gather, interpret and report information relating to these targets. The 13 targets are grouped under one of four assets: land, water, biodiversity and community (Natural Resources Commission [NRC] 2005). Community targets 12 and 13 deal with socio-economic aspects of the effects of NRM decisions on people, and the ways in which people influence NR outcomes through their management of NRs, respectively. Specifically, Target 13 seeks to demonstrate an increase in the capacity of NR managers for regionally relevant NRM.

This report has three aims:

1. To place the requirement for MER of the capacity of NR managers in the context of government policy currently driving the management of biodiversity, land and water in NSW.
2. To document the Target 13 project team's approach to MER of NR manager adaptive capacity and the testing of that approach in pilot trials with two NSW CMAs.
3. To encourage the use of a consistent approach to monitoring of NR manager capacity by providing a guide to the techniques and a description of the reporting products developed for NSW SOC reporting and NSW CMAs.

Table 3: NR assets and targets (adapted from NRC 2005)

Asset	Macro-environmental targets	Specific priority targets
Biodiversity	By 2015 there is an increase in native vegetation extent and an improvement in native vegetation condition	By 2015 there is an increase in the recovery of threatened species, populations and ecological communities
	By 2015 there is an increase in the number of sustainable populations of a range of native fauna species	By 2015 there is a reduction in the impact of invasive species
Water	By 2015 there is an improvement in the condition of riverine ecosystems	By 2015 there is no decline in the condition of marine waters and ecosystems
	By 2015 there is an improvement in the ability of groundwater systems to support groundwater dependent ecosystems and designated beneficial uses	By 2015 there is an improvement in the condition of important wetlands, and the extent of those wetlands is maintained
		By 2015 there is an improvement in the condition of estuaries and coastal lake ecosystems
Land	By 2015 there is an improvement in soil condition	By 2015 there is an increase in the area of land that is managed within its capability

Community	NR decisions contribute to improving or maintaining economic sustainability and social well-being	There is an increase in the capacity of NR managers to contribute to regionally relevant NRM

In the context of this report, the term 'NR manager' includes individuals or organisations in control of privately owned or Crown-leased land, that are recipients of government NRM investment funding and/or that significantly affect the likelihood of achieving the NRM targets. This group includes farmers, peri-urban land owners, green-fields developers, the mining industry and local government.

1.2 Why monitor NR manager capacity?

In describing the concepts underpinning the resilience of social-ecological systems, Walker & Salt (2006) note that the capacity of our communities, ecosystems and landscapes to provide the ecosystem services needed to sustain the well-being of society is increasingly challenged. Long-term environmental sustainability relies on maintaining this supply of ecosystem services not only from preserved natural areas (reserves and protected areas) but also from privately-owned areas (eg agricultural land). Brunkhorst (2001) suggests that even with a comprehensive protected areas system, ecosystem services from privately-owned land are essential to sustain ecological diversity, as most biodiversity will always be found outside the reserve system.

Governments have traditionally sought to preserve ecosystem services outside of reserve areas through environmental regulation. However, Walker & Salt (2006) suggest that traditional approaches to managing resources often fail to acknowledge that human and natural systems are inextricably linked (this linkage is recognised in the term 'social-ecological systems') and that such complex systems are adaptive and hence inherently unpredictable.

Outside of government regulation of the environment, improved NR outcomes at catchment scale rely heavily on the adoption of sustainable practices by private NR managers. In NSW, the state government seeks to influence the actions of private NR managers primarily through CMAs. Figure 2 depicts some of the relationships between regional communities, planning and investment by CMAs, NR managers and NR condition. Direct investment by government agencies in regional NRM also occurs but is not shown. CMAs are tasked with engaging their regional communities in the process of formulating catchment action plans (CAPs) to identify priorities for subcatchment scale investment in NRM. These plans are developed in the context of the Standard for Quality NRM (NRC 2005) and national and state government policies on NRM and the environment. CMA investment is primarily via financial incentives to regional NR managers to undertake on-ground works on private land and also through the provision of information, social networking activities and education focused on improvements to NR practices. All of these interventions can be defined as activities to build aspects of manager capacity. Target 13 seeks to monitor the capacity of NR managers because high levels of capacity are a precondition for successful practice adoption leading to improvements in NR condition (Cavaye 2005).

The influence of social systems on the environment is well established (eg Williams et al. 1998; DEC 2006). However, there is growing recognition that the natural environment makes an intrinsic contribution to the social well-being of communities (eg Eckersley, 1999), in addition to its contribution to economic sustainability (Costanza et al. 1997). Improvements in NR condition,

detected through monitoring of Targets 1 through to 11 ultimately lead to enhanced ecosystem services, the benefits of which accrue to the broader regional community. In turn, a community in which economic sustainability and social well-being (monitored under Target 12) are high, is more likely to be an active participant in and supportive of regional planning initiatives by organisations such as CMAs (Stone & Hughes 2002).

Cavaye (2005) described the contextual link between capacity (of individuals, organisations, communities and regions), NRM behaviours and practices and NRM outcomes as operating through a complex system of influence and feedback. For example, an individual landholder's capacity would include the knowledge, motivation, social networks and economic capacity to make transitions towards more sustainable NRM practices. Landholders appraise NRM practices under the influence of personal, economic, social and individual practice characteristics (Cary et al. 2001). NRM behaviours ultimately lead to improved NRM outcomes.

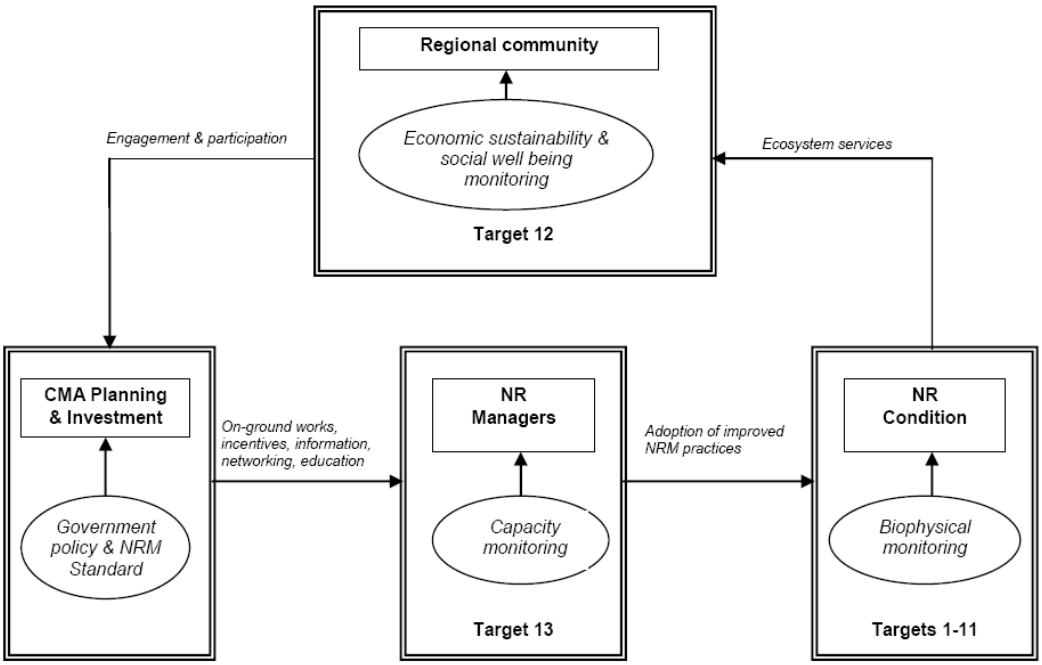
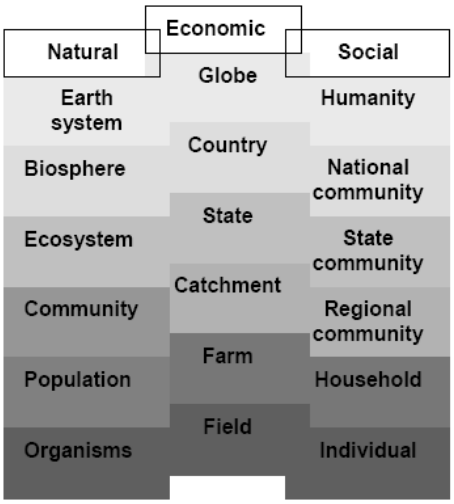


Figure 2: Conceptual model of the relationship between regional communities, CMAs, private NR managers and NR condition

It is important to recognise that NRM is a human activity involving issues of scale (from single field to farm to region etc) and organisation (from individual to family to local community etc). In encouraging behavioural change for improved NRM outcomes, social, economic and biophysical perspectives become important. Each of these perspectives represents different conceptual paradigms and are made up of multiple hierarchical systems. The levels of these systems do not necessarily match in time and space (Figure 3). Nesting of indicators (Ewert et al. 2006) is one method of coping with the changes of scale and organisation (Figure 3) likely to be an inherent feature of the MER of NR manager capacity.

a. Multiple hierarchies



b. Increasing level of organisation with nested indicators

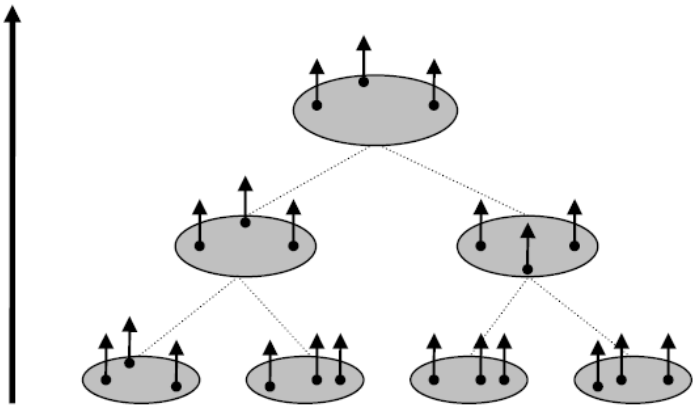


Figure 3: The related perspectives and hierarchical levels of NRM and the concept of nested indicators to assist in monitoring across levels of organisation (adapted from Ewert et al. 2006)

1.3 National framework

Activities to monitor and evaluate capacity for NRM are occurring at national, state, regional and industry levels.

The Australian government's National Land and Water Resources Audit (NLWRA) developed a National NRM monitoring and evaluation framework. Through the Social and Economic National Coordination Committee (SENCC), a number of projects to develop socio-economic indicators for NR management were conducted. One of those projects focused on adaptive capacity of Australian agricultural land managers.

Nelson et al. (2005) used Australian Bureau of Agricultural and Resource Economics (ABARE) farm survey data to apply the Rural Livelihoods Analysis Framework (Ellis 2000) to map the adaptive

capacity of Australian broadacre farmers. This enabled a nationally consistent comparison of regions in terms of adaptive capacity, and a preliminary discussion on the primary causes of vulnerability of NR managers in the agriculture sector. This analysis has subsequently been updated and enhanced by Nelson et al. (2010b) to employ a nested approach to weighting of indicators; this will enable the ability to 'drill down' through the variables to explore which components of adaptive capacity have the greatest influence in a particular region, and which indicators are most prominent.

Under the National NRM monitoring and evaluation framework, adaptive capacity is a useful concept because it includes the preconditions necessary to enable adaptation, including social and physical elements, and the ability to mobilise these elements through individual and collective action. Capacity partly depends on the diversity of assets and activities and the flexibility to substitute between them in response to external pressures. This includes the continual process of inventing, adapting and adopting more sustainable farming practices to anticipate and respond to change. Capacity can transcend changes in farm management to include broader livelihood strategies that farm families pursue, for example, through off-farm and non-farm employment. A more detailed discussion of the practical application of the Rural Livelihoods Analysis to NRM capacity monitoring at catchment scale follows in Chapter 2.

1.4 Target 13 project

The objectives for MER of NRM capacity under the state-wide NRM targets were to:

- develop participatory, low cost and repeatable socioeconomic data collection systems for CMAs and the NSW government
- create dual purpose socioeconomic indicators that:
    - support NR managers in their ongoing efforts to improve their management of NR
    - create practical catchment and state-wide reporting mechanisms for CMAs and the NSW Government
- conduct MER:
    - to satisfy the requirements of the NSW State Plan
    - that includes NR managers of regional significance to inform the preparation of SOC reporting.

To satisfy the reporting requirements under the State Plan, the Target 13 project team as a first priority focused on adapting methodologies and indicators developed for the national NRM monitoring and evaluation framework for monitoring of agricultural land managers. This is because:

- these managers are a key focus for NRM investment and CMA activity controlling most of the privately-owned land in NSW (Figure 4)
- the national NRM monitoring and evaluation framework provides a consistent reporting structure that allows nesting of state and regional capacity monitoring and includes generic indicators for agricultural land manager capacity

- robust secondary data are currently available through national surveys of land managers from ABARE and the Australian Bureau of Statistics (ABS), which is a cost-effective alternative to development and implementation of similar survey instruments at state level
- the methods adopted at the national level can be used as a basis for extending to other types of NR managers and seeking CMA feedback on local issues.

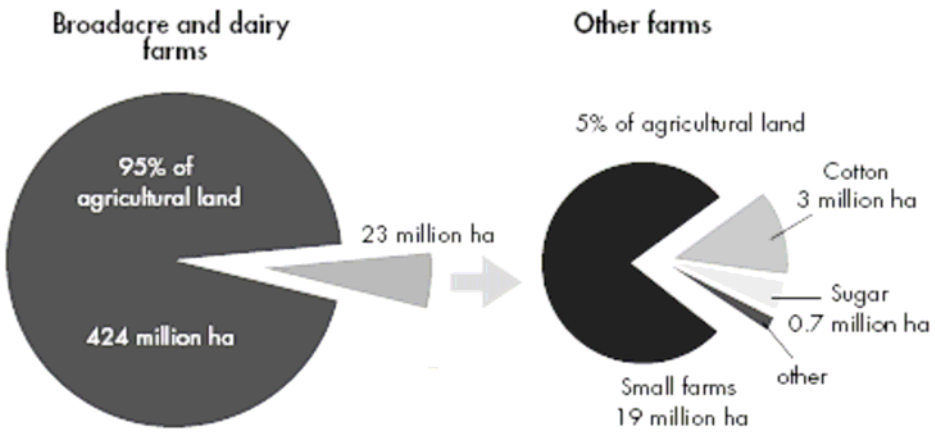


Figure 4: Ownership of agricultural land in Australia (adapted from Nelson 2004)

The Target 13 project established a collaborative research agreement with the Commonwealth Scientific and Industrial Research Organisation's (CSIRO's) Sustainable Ecosystems to:

- adapt products developed for the NLWRA by the CSIRO team to NSW's requirements for state and regional reporting through the NSW SOE and SOC reporting
- develop a rapid, participatory process (Participatory Rapid Appraisal) to test with CMAs the application of the national indicators and datasets to regional capacity assessment and encourage inclusion of relevant, local indicators of capacity.

The Target 13 team recognised that within any single catchment, broadacre agriculture land managers are not always the most significant NR managers at a local scale (Figure 5). Other types of NR managers may have a significant impact on the ability of a CMA to achieve local and regional NRM outcomes associated with CAPs. Therefore, the scope of the capacity monitoring project was broadened to include non-agricultural NR managers, such as peri-urban landholders and the mining sector, to ensure that SOC reports reflected their importance.

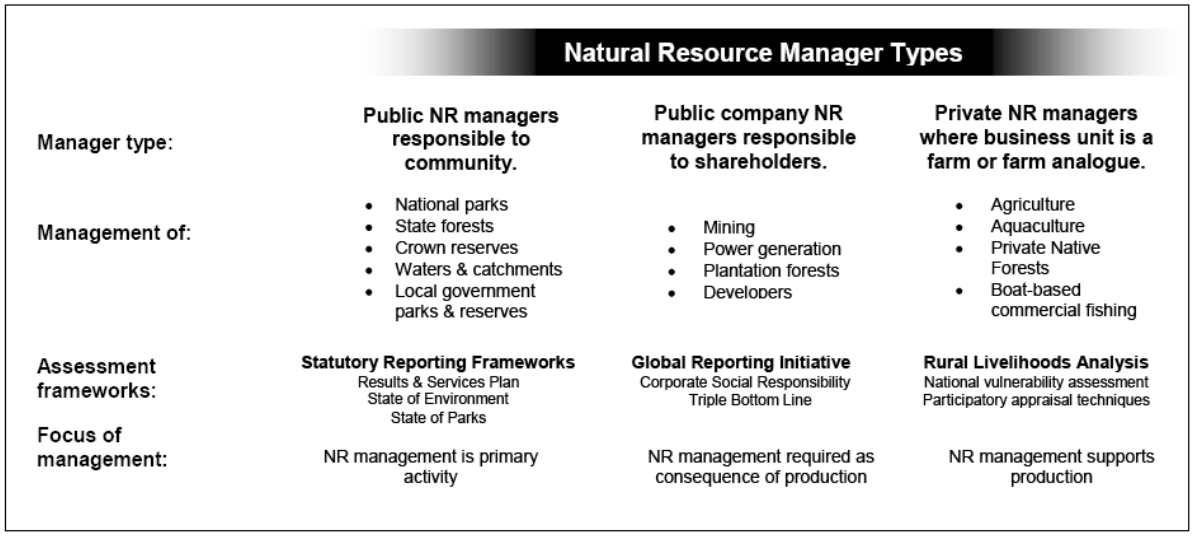


Figure 5: The broad spectrum of NR that managers may be represented within NSW regions and should be included in a comprehensive capacity assessment

Faced with the diversity of NR managers in NSW and constrained by the limited resources available to establish and maintain the MER program, the Target 13 project needed to develop an approach to local monitoring of NRM capacity that was flexible, adaptive and participatory with industry groups and CMAs.

In relation to non-agricultural NR managers the Target 13 project aimed to:

- collaborate with CMAs to identify the most significant non-agricultural NR managers contributing to CAPs outcomes
- examine options for engagement with these managers that might inform an assessment of local NR manager capacity
- use the Target 13 collaborative arrangements with research partners to explore the most appropriate methods for incorporating information about non-agricultural NR managers into catchment reporting products.

In Chapter 2, we describe the trialling of an application of the Rural Livelihoods Analysis framework to assess the adaptive capacity of regionally relevant NR managers that is consistent with the principles outlined above.

2. Rural livelihoods analysis enabling NR managers to self-assess their adaptive capacity[1]

2.1 Introduction

Rural land managers in Australia are significant custodians of the NR, which they draw upon to create diversified on- and off-farm livelihood strategies. There are multiple influences on the ability of farmers and other land managers to adopt sustainable farming practices. Adoption depends partly on a person's skill and ingenuity as a manager, partly on the resources they have access to, and partly on the institutional and policy environment in which they operate (Rogers 2003; Nelson et al. 2006). A challenge faced by land managers is to build the productivity and profitability of the agricultural enterprises contributing to their broader livelihood strategies without depleting NRs such as soils and water on which these depend. Sustainable NRM contributes to much more than agricultural productivity and rural livelihoods. It also contributes strongly to the cultural identity of rural communities and the agrarian identity residual among many urban Australians (Hayman & Cox 2005).

The adoption of sustainable farming practices takes place against a backdrop of significant global change and uncertainty in markets, climate and resource access. Australian farmers and the rural communities in which farmers live are constantly adapting to multiple markets, environmental and social drivers of global change. Australian rural industries and communities have a long history of adapting to declining terms of trade, climate variability and change, and changes in the condition of, and access to NR. However, the social consequences of global change suggest that some individuals and communities find it easier to cope than others. An understanding of why adaptive capacity varies between groups of NR managers is essential for developing practical opportunities for building capacity.

It is logical to combine the monitoring and reporting of adaptive capacity with the engagement and decision-making processes between community-based NRM groups, CMAs, industry and governments through which it can be built. Although incongruent, this separation of prediction and monitoring from processes triggering action is common when the interests of scientists dominate environmental research agendas (Sarewitz 2004). One way to avoid falling into this trap is to create reporting mechanisms that support both policy and practice. Effective reporting systems for the NSW government that target adaptive capacity also need to enable community-based NRM groups across the state to self assess their capacity to manage NR and identify and prioritise opportunities to build it. While rural communities are constantly adapting to global change, many of the skills, knowledge and resources embedded in best practice may be poorly recognised. Making these elements of adaptive capacity more explicit can help to identify priorities and trade-offs involved in building them. This makes it easier for community based NRM groups to evolve mutual priorities for building capacity with government and industry policy advisers seeking to create a supportive policy environment for adaptation.

1 This chapter is a modified version of Brown PR, Nelson R, Jacobs B, Kokic P, Tracey J, Ahmed M & DeVoil P 2010, 'Enabling natural resource managers to self-assess their adaptive capacity', *Agricultural Systems, 103, pp. 562–568.*

2.2 Defining and measuring adaptive capacity

2.2.1 Background

The development of techniques for MER of Target 13 gains insight from an international literature exploring theories of the adoption of sustainable farming practices (Rogers 2003) and adaptive capacity to global change (Adger 2006). However, it goes well beyond this theoretical literature to build on practical applications of these ideas in Australian agriculture (Nelson et al. 2005, 2006 & 2007). Most of the international global change literature is dichotomised between deductively defining adaptive capacity (theory driven approach), and inductively measuring it at a national level using secondary data sources (data driven approach). In perhaps the most comprehensive review, Nelson et al. (2007) define adaptive capacity as the preconditions necessary to enable adaptation, including social and physical elements, and the ability to mobilise these elements. There have been very few attempts to measure the adaptive capacity of rural communities consistently across multiple regions. Most attempts to measure adaptive capacity use secondary data from national accounts to compare nations, overlooking important regional differences and local drivers of adaptive capacity (Adger & Vincent 2005; Brooks et al. 2005; Erikson & Kelly 2007; Vincent 2007). There are fewer examples where national level data and local case studies are combined (eg. O'Brien et al. 2004). Most attempts to measure adaptive capacity either omit a conceptual understanding of adaptive capacity altogether, or lose sight of the concept as data limitations redirect the original objectives of the research.

There are only a few studies of participatory rural appraisal techniques used to enable community based NRM groups to self assess their adaptive capacity (Berkes & Jolly 2001; Fraser et al. 2006; Mendis-Millard & Reed 2007). These 'bottom-up' approaches provide insight for reflection and action within the communities to which they are applicable, but do not enable broader policy application because they are not readily transferable to a regional scale.

2.2.2 Approach

In Australia, Nelson et al. (2006) have shown how the Rural Livelihoods Analysis framework (Figure 6) of Ellis (2000) could be applied using farm survey data collected consistently across regions to analyse the capacity of farmers to adopt sustainable farming practices. Nelson et al. (2005, 2007 & 2010ab) report the initial results of applying the Rural Livelihoods Analysis with the same data to analyse the overall adaptive capacity of Australian rural communities to global change. In both types of application, the combination of a strong conceptual framework and consistent data provided regionally consistent measures of adaptive capacity.

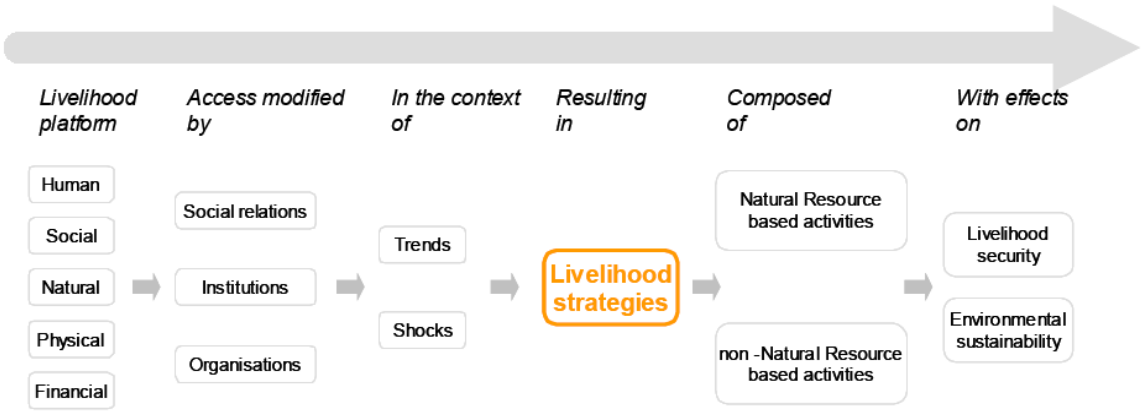


Figure 6: The Rural Livelihoods Analysis framework (adapted from Nelson et al. 2007)

Rural livelihood strategies comprise sets of activities that are continuously invented, adapted and adopted in response to changing access to resources. The resources drawn upon to create rural livelihood strategies can be characterised as five broadly defined types of capital: human, social, natural, physical, and financial (Table 4). The balance between the five capitals for NR managers is as important as the amount of any one type of capital, because the five capitals can complement and act as substitutes for one another in the process of generating livelihoods (Ellis 2000). An important strategy for enhancing current and future livelihood options is to transform one type of capital into another. For example, households and communities can transform natural capital into physical and financial capital through economic activity. Similarly, financial, social and physical capital can be transformed into human capital through investments in education. Substitution between forms of capital is at the heart of economic definitions of sustainable development (Pearce & Warford 1993). It is also central to ecological perspectives that recognise that natural capital cannot easily be recreated once transformed (Norton 1995).

Table 4: Description of the five capitals used in the livelihoods analysis framework of Ellis (2000)

Capital	Description
Human	The skills, health and education of individuals that contribute to the productivity of labour and capacity to manage land
Social	Reciprocal claims on others by virtue of social relationships, the close social bonds that facilitate cooperative action and the social bridging, and linking via which ideas and resources are accessed
Natural	The productivity of land, and actions to sustain productivity, as well as the water and biological resources from which rural livelihoods are derived
Physical	Capital items produced by economic activity from other types of capital that can include infrastructure, equipment and improvements in genetic resources (crops, livestock)
Financial	The level, variability and diversity of income sources, and access to other financial resources (credit and savings) that together contribute to wealth.

The Rural Livelihoods Analysis has been used to analyse the adaptive capacity of rural communities in both developing (Ellis & Freeman 2004) and developed nations, including Australia (Nelson et al. 2005; Meinke et al. 2006). The applications of the Rural Livelihoods Analysis to understand the adaptive capacity of Australian rural communities is currently being expanded using data collected by the ABS (Nelson et al. 2007). These national applications of the Rural Livelihoods Analysis are a useful policy tool for prioritising more detailed regional investigation to develop practical strategies for building adaptive capacity. National indicators of adaptive capacity, however, lack the local relevance and community ownership necessary to guide contextually relevant strategies that trigger local action to adopt a change in management practices or mix of livelihood activities. Nelson et al. (2006) showed how the Rural Livelihoods Analysis could be used to broaden traditional diffusion of innovation approaches (Rogers 2003) in understanding the adoption of sustainable farming practices by Australian land managers. The adaptive capacity and aspirations of NR managers contribute strongly to the assessment, adaptation and adoption of sustainable management practices.

2.2.3 Workshop process

Outlined in this section is the application of a workshop process for MER at state and catchment levels for the NSW Government's NRM Target 13 of increasing the capacity of NR managers. Results from pilot trials of the process conducted in the Central West and Hunter–Central Rivers regions will be used to illustrate the types of information and reporting products that can be produced. The detailed reports from the trials are presented in Appendix A and B.

Scoping workshops were held with each CMA to identify the significant NR managers in each catchment; however, the timeframe and level of resources restricted the number that could be engaged for this assessment process to 3–4 high priority groups. The initial focus of Target 13 on agricultural land managers in these catchments built on a set of national adaptive capacity indices generated using data provided by farmers to ABARE. This secondary data was not available for other types of NR manager (eg mining, local government) and was a significant limitation in some CMAs. For other types of NR managers, the adaptive capacity method developed for land managers was used to communicate the approach to create context specific indicators.

The basic steps involved in the capacity assessment workshop are described below:

1. Form an oversight group for Target 13 of CMA staff responsible for MER. This group was designed to oversee the process to ensure that it meets the CMA's reporting commitments.
2. With the oversight group, priorities were set for working with different types of NR managers across the catchment by trading regional priorities off against the resources available for reporting.
3. Draw on existing networks of NR managers to establish focus groups representing each type of NR manager across the agro-ecological zones of the catchment. The participants should, ideally:
    - include a CMA staff member for reporting, alignment and moderation purposes
    - be interested, willing to participate and able to understand the process
    - be well-informed and able to make judgments about the capacity of the NR managers that they represent

- be long-term members of the community, with a reasonable likelihood of being available to update the exercise in three to five years.

A workshop was required for each type of NR manager. Multiple agro-ecological zones for each type of manager were handled by separate breakout groups during the workshop. The preliminary design of the workshop included:

1. presentation of adaptive capacity using the Rural Livelihoods Analysis, and its regional application using ABARE farm survey data.
2. workshop sessions for:
   - agricultural land managers covered by the ABARE farm survey data – to modify or replace national with locally relevant indicators, creating a common set for each type of NR manager across the CMA
   - other NR managers that were household/farm based – to create an appropriate set of indicators under the five capitals.
3. Breakout sessions for the representatives of each group of NR managers for each agro-ecological zone to:
   - discuss and develop a clear statement of the rationale for choosing the particular indicators within each capital
   - self-assess by assigning a numerical value to the current adaptive capacity of the group they represent in the zone they represent
   - discuss and consider the reasons for the value assigned within each region and the important differences between regions.
4. Final workshop session to:
   - moderate the rating of adaptive capacity across the catchment
   - identify common priorities for building adaptive capacity, and practical strategies for collective action between the CMA, the wider community, industry and governments to achieve this
   - evaluate the approach.

This workshop format was modified for NR manager groups that were not household/farm based (eg local government). The process for those groups is described in Section 2.2.6.

2.2.4 The Rural Livelihoods Analysis and adaptive capacity

Each assessment workshop began by communicating how the Rural Livelihoods Analysis can be used to monitor the adaptive capacity of NR managers. A PowerPoint presentation was used to demonstrate the concepts of adaptive capacity and how it can be measured, and what the different components of the measure are. A discussion followed about vulnerability and impacts and their relationship to adaptive capacity. Discussion focused strongly on the rural livelihoods approach using the five capitals presented in Table 4.

As proof of concept at a larger scale, the presentation reviewed the use of ABARE farm survey data to create a nationally consistent adaptive capacity index for land managers (Nelson et al. 2005). There was a description of what the indicators and capitals mean, and where the data came from. Maps for each indicator, capital and overall adaptive capacity were shown (Figure 7). A spider web

diagram was used to illustrate how the adaptive capacity of different communities or industries could be contrasted, and to illustrate the ability to compare the relative scores of different types of capitals (Figure 8).

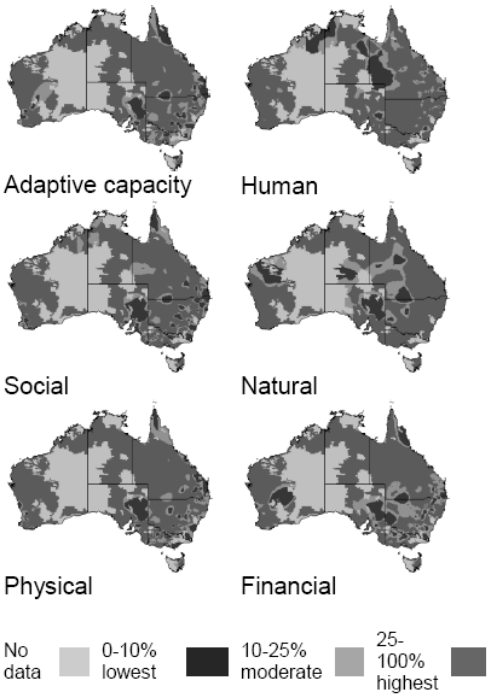


Figure 7: Example of the national level data (Nelson et al. 2005), showing the levels of adaptive capacity and of the five capitals of the Australian rural community

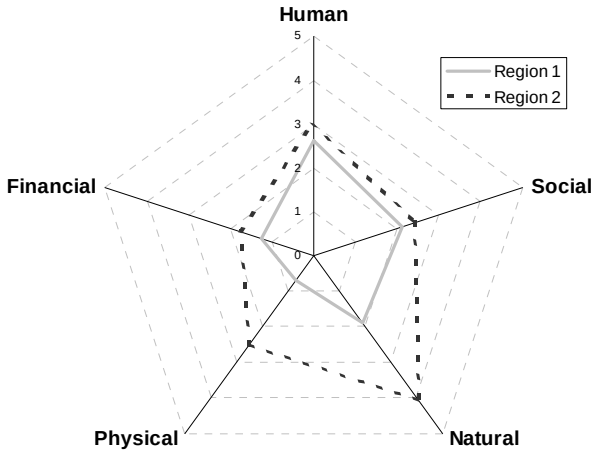


Figure 8: Typical spider web diagram useful in comparing across capitals and also for comparing different communities, regions or industries

2.2.5 Self-assessment of adaptive capacity

Once the workshop participants had a good understanding of the secondary data at national and regional CMA scales, the workshops explored how the NR managers and community might evaluate their own adaptive capacity using a similar framework and approach. The first step in this process was for the regional NR managers to agree on a common set of indicators for each of the five capitals. Indicators were confined to 3–5 per capital to avoid correlation and the consequent redundancy between indices, and the choices evaluated against the conceptual understanding of adaptive capacity provided by the Rural Livelihoods Analysis. The indicators chosen need to be locally relevant with reference to local NRM issues (Table 5). The common set of indicators can then be populated for each agro-ecological zone using data collected locally, or via expert judgment of the focus group members (Table 6 and Figure 9).

Table 5: Example of locally derived indicators for NR management decisions for catchments compared to the indicators from the ABARE Farm Survey

Capital	ABARE Farm Survey	Locally derived relevant/specific indicators
Human	Education of operator	Enthusiasm and optimism
	Education of spouse	Awareness of NRM issue
	Health	Openness and ability to learn
		Age and physical capacity
Social	Landcare membership	Young people in NRM
	Partners	Sense of community
	Internet	Volunteerism
		NRM group participation
Natural	Mean PGI	Biodiversity and remnant vegetation
	Dams	Soil health
	Vegetation potential	Pasture management
		Salinity of waterways
Physical	Plant and machinery index	Low input farming
	Structures index	Fencing
	Livestock index	Groundwork maintenance
		NRM farm equipment
Financial	Capital	Off-farm investment
	Mean total cash income	Off-farm employment
	Access to Finance	Availability of cash to do NRM
		Farm management deposits

Table 6: Indicators and scores for a hypothetical catchment

Relative score / 5		Region			
		1	2	3	Average
Human	Enthusiasm and optimism	1	3	4	2.7
	Ageing farm managers	1	2	2	1.7
	Willingness to take risks and chan	1	3	2	2
	Resilience and mental health	0.1	1	2	1
	NRM education in schools	0.1	1	1	0.7
	Average Human	**0.6**	**2**	**2.2**	**1.6**
Social	Volunteering – participation	1	2	2	1.7
	Volunteering – lead & represent	1	1	1	1
	Young people in NRM	0.1	0.1	0.1	0.1
	Fear of policy	0.1	3	3	2
	Average Social	**0.5**	**1.5**	**1.5**	**1.2**
Natural	Pasture growth	4	3	2	3
	Water security	2	1	0.1	1
	Biodiversity	3	2	4	3
	Soil health	3	2	4	3
	Average Natural	**3**	**2**	**2.5**	**2.5**
Physical	Conservation farming equipment	3	2	2	2.3
	Efficient paddock	4	2	2	2.7
	Low input farming	4	3	1	2.7
	Average Physical	**3.7**	**2.3**	**1.7**	**2.6**
Financial	Off farm investment	3	3	3	3
	Off farm employment	1	4	5	3.3
	Availability of cash to do NRM	1	1	1	1
	Average Financial	**1.7**	**2.7**	**3**	**2.4**

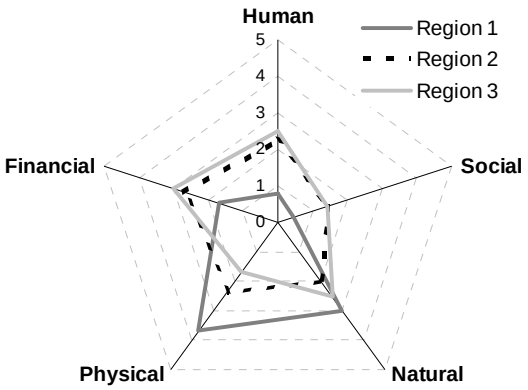


Figure 9: NRM capacity in hypothetical regions

The representatives from each agro-ecological zone were asked to work together as a group to derive a collective analysis of an adaptive capacity index for the type of NR manager that they represented. Each indicator was scored on the basis of its ability to support NRM, and subsequently, what level of action was required (Figure 10). A score of 5 did not imply an abundance or high level of a particular component of adaptive capacity, but rather that it was effectively supporting NRM. Conversely, a score of 0 did not imply a complete absence of a component, but rather that the indicator was currently constraining NRM and was therefore a high priority for action. It was important to ensure participants understood the rating system so that

they could score the indicators accordingly. Participants were also asked to identify common priorities for building adaptive capacity in order to identify priorities for collective action between the CMA, the wider community, industry and governments.

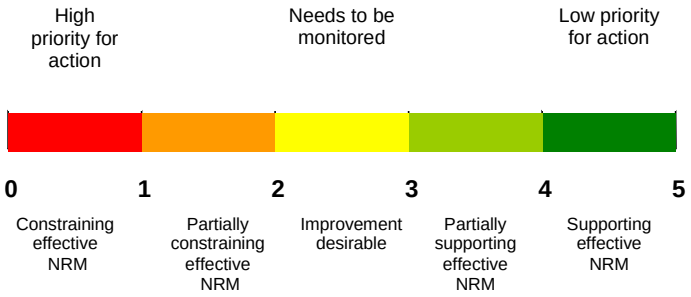


Figure 10: NRM capacity scoring scale

The groups representing each agro-ecological zone then reassembled as a single group to moderate the ranking of adaptive capacity across the catchment, and explore common priorities for building adaptive capacity.

2.2.6 Non-farm/household based NR managers

While the participatory approach to assessment of NR manager capacity described in the preceding sections proved useful in discussions with agricultural land managers, not unexpectedly, scoping workshops with CMA staff (Appendix A and Appendix B) identified a number of other types of NR managers for which the approach needed some modification. In particular, the diversity of impacts on NR that occurs in coastal catchments required a capacity assessment process to incorporate information from groups such as local government, the development community and the mining industry.

In these cases, it was important to focus on the institutional and organisational values/assets that these types of managers use to influence the condition of NR because, unlike traditional farm businesses, NRM takes place outside of the context of a rural household. This approach is consistent with the Ellis (2000) framework for rural livelihoods, where the access modifiers that influence NRM can be examined.

In workshops with non-farm NR managers, three questions were posed:

1. How do non-farm NR managers influence NRM?
2. What is the capacity of non-farm NR managers to influence improved NRM?
3. What opportunities exist to improve NRM capacity for these non-farm NR managers?

The information gained from these workshop discussions was used to provide rich context over and above that provided by managers such as farmers.

2.3 Reporting products from the workshops

The necessity of condensing the panoply of qualitative and quantitative data generated from MER of 13 NRM targets into succinct reporting products for 13 catchment management regions means that some of the nuanced findings of the Target 13 assessments will be lost. Recognising the

difficulty of inserting qualitative findings into what was essentially a state-wide biophysical monitoring program, a number of reporting products tailored to different audiences was developed. The most comprehensive of these reports, specifically for CMAs, captured the detailed contextual information generated in the capacity assessment workshops. The detailed reports included:

- an understanding of the regionally relevant components of adaptive capacity and how these were evaluated for each prioritised group of NR managers across the catchment
- self-assessed adaptive capacity for each group of NR managers (quantitative assessment for agricultural land managers and qualitative assessment for other types of NR managers) for each agro-ecological zone (where they were delineated) across the catchment
- an agreed set of practical and achievable priorities for collective action to build adaptive capacity by the CMA, the wider community, industry and government.

Such reports could be used by CMAs for strategic planning purposes for example, to assist in directing investment in NRM, formulate CAP priorities, and provide context for SOC reporting as a complement to other community engagement activities by CMAs.

The quantitative, detailed reports for agricultural land managers were then summarised into 2–3 page report cards. Prototypes of the report cards are included in Appendix A and Appendix B. The prototypes consist of a description of the number, type and spatial representation of the participants and a spider plot displaying the quantitative assessment of the capitals making up capacity. The spider plot provides a useful point of entry into a tabulation of the regional indicators of capacity, their rating ('condition') and trend over time, and a brief description of their importance to workshop participants (analogous to 'pressure' reported in biophysical targets). Where an indicator is rated as constraining NRM (scores less than 2.5), a second table summarises the collective actions to build capacity as identified by the workshop participants. A Management Activities section is proposed for inclusion to emphasise investment in capacity building activities by government and CMAs.

In addition to reporting at catchment scale, it was envisioned that the information generated through the assessment process would contribute to state-level reporting, for example through NSW SOE reporting. Following the pilot trials, the assessment process was extended state-wide to include a further nine workshops with land managers covering seven catchments. Owing to the complexity of governance issues in managing the broader NSW MER strategy, these workshops took place between late August and early December 2008; a challenging timeframe for a state-wide consultation process. Pooling the information gathered from all of the Target 13 workshops conducted throughout NSW allowed identification of the common underlying drivers and constraints to NRM on private land and actions that may require intervention at state or national levels.

3. Towards operational capacity assessment

3.1 Introduction

Much of Australia's NR base is in decline, but NR managers in many areas are still maintaining their livelihoods. The approach used here explores the issues central to improving sustainable use of NR and encourages people to think about what can be done among different organisations and institutions (from governments to communities and families) to improve their capacity. The approach also links livelihood strategies and environments, recognising that sustainable NRM on private land requires viable livelihoods. For capacity assessment to become an input to the formulation of NR policy it needs to be incorporated into CMA business processes, as engagement with regional communities is a core function of CMAs. Issues of the complementarity of the assessment process with existing CMA community engagement activities, the scale of assessment and its representativeness and repeatability within the context of a continuing monitoring program, also need consideration.

3.2 Complementarity

The Target 13-style capacity assessment is not intended as a substitute for a comprehensive community engagement strategy. On the contrary, the Target 13 process is greatly enhanced where linkages to community groups are already established. CMA reference groups (such as the Central West NRM group and local government reference groups) provide a ready-made sample of willing, NRM-knowledgeable members of selected community sectors. Often members of these groups represent broader constituencies, such as local Landcare coordinators or Australian government NRM facilitators, which enhances the legitimacy of the process and its findings.

In addition, some CMAs have conducted broad social benchmarking surveys of their communities. Field et al. (2002) define these types of studies as drawing on the conceptual orientation and analytical focus of environmental sociology, which seeks to measure environmental concern, and to identify correlations between environmentalism and a range of attitudes, values, beliefs, and socio-demographic characteristics. In contrast, NR sociology traditionally focuses on the ways in which resource development and use patterns affect patterns of social change and social well-being in rural communities and rural regions, and the application of social science knowledge to solving resource and environmental management problems. In particular, Field et al. (2002) define NR sociology as often encompassing the development and evaluation of public involvement processes based on principles of community-based collaboration and co-management strategies, as well as analyses of the nature and implications of community-based participation in resource management issues and concerns. With its emphasis on community participation and NRM problem solving, the Target 13 process is embedded within the principles and practice of NR sociology.

While social benchmarking surveys are often essentially intelligence gathering exercises and do not constitute effective community engagement, spatial and demographic analysis of the information generated in such surveys can reveal community sectors or geographical areas where NRM outcomes could be enhanced through deeper assessment of capacity and the collective actions to build capacity that the Target 13 process identifies.

3.3 Scale

Field et al. (2002) state that there are significant challenges in working across highly divergent analytic scales with very different units of analysis in order to provide a more comprehensive understanding of how localised resource use and management patterns are often manifestations of broader social, economic, and political processes. Challenges also exist when determining how those linkages in turn affect the patterns of change and levels of well-being experienced by specific communities and resource users.

Use of a consistent conceptual framework allows nesting of indicators and facilitates capacity assessment to cross the social organisational hierarchies fundamental to NRM (Ewart et al. 2006). In the Target 13 process we make use of the framework of capitals (human, social, natural, physical and financial) also used by Nelson et al. (2010 a, b) to measure the adaptive capacity of broadacre agriculture managers under the National NRM monitoring and evaluation framework. At higher organisational levels (eg national and state levels) the capital framework is populated by indicators selected from secondary data, which provide broad policy-relevant insights into the constraints and options for building adaptive capacity in rural communities (Figure 11). However, at these coarser scales, the unit of analysis is no longer a specific community in a well defined context (Nelson 2010a). To effectively monitor Target 13 at finer organisational levels (catchment, household and individual) more appropriate to intervention by CMAs, the framework was populated with primary data gathered through a participatory process with regional NR managers, to create contextually relevant measures of capacity that trigger capacity building actions.

In the Target 13 process, the geographical scale of capacity assessment is very much dependent on the spatial representation of the participants. In the Central West region, the CMA had in place an established group of NR managers selected specifically to represent the community of regional land managers. This allowed a catchment-wide assessment of the capacity of private land managers. In contrast, the socio-economically diverse nature of Hunter–Central Rivers region called for a number of geographically discrete assessments to be carried out; these included large-scale agriculture managers in the upper catchment, small-scale land managers on the peri-urban fringe of Singleton, coal mine environment managers principally located on the valley floor and members of the development community operating largely along the coastal strip. The Target 13 process was sufficiently robust to accommodate these changes in scale.

3.4 Representativeness

To undertake thorough evaluation, NR manager capacity requires greater participation and representation than occurred in the pilot trials with CMAs. In all of the capacity assessment workshops, particular attention was paid to exploring who the participants represented and where in the catchment they came from. However, the use of information based on engagement with limited types of NR managers (albeit those identified as significant by the CMA) to provide a holistic assessment of the catchment, particularly in highly diverse coastal catchments, is unlikely to be representative of other NR managers. Rather the data derived from this process provide indicative and partial representation of key issues that affect capacity. The coherence of themes identified across workshops supports the contention that the process provides a useful method for rapid appraisal of capacity at a regional level. Yet at a local level, no given assessment can be taken as comprehensively representing that locality.

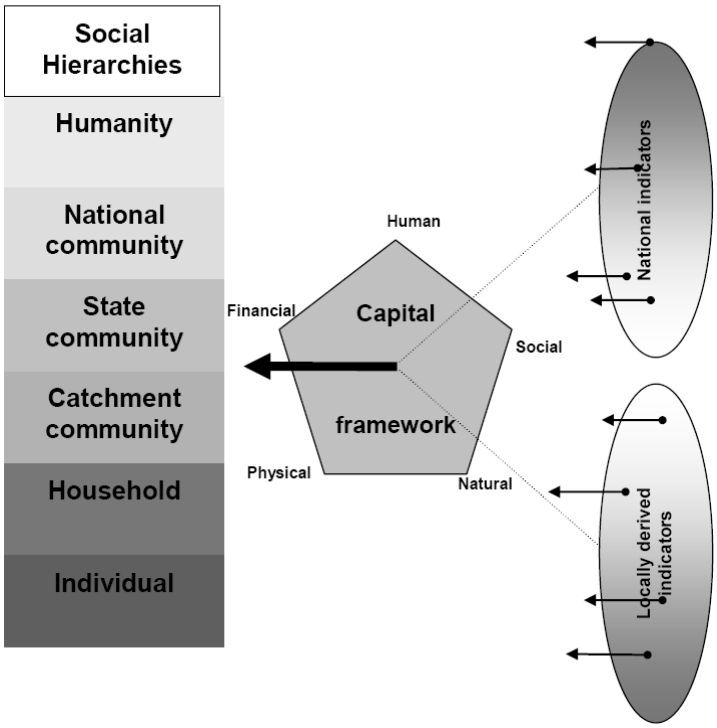


Figure 11: Indicators of capacity (horizontal arrows) nested within a capital framework to inform capacity assessment at a range of social organisational hierarchies. For coarse scale, assessment indicators can be drawn from secondary data. At fine scale, locally derived indicators are needed to trigger capacity building.

Timing of the workshops was made as flexible as possible to ensure a broad spectrum of participants. However, the potential representativeness of the participants is strongly related to the resources and time available for community consultation. Workshops were frequently conducted around a social event, particularly in more remote rural locations, such as an evening barbeque. This often allowed husbands and wives involved in traditional farming families to participate and contribute their perspectives on NRM stemming from their different roles in management of the farm business and links to the local community (Roberts 1995).

Due to the state-wide extension of Target 13 occurring in a period of less than four months, scheduling of workshops in some locations was demanding and left little room to accommodate changes. For example, in southern NSW where workshops coincided with time of harvest for grain growers their participation was limited. Graziers, however, appeared less constrained by the agriculture calendar and were more frequent participants in Target 13 workshops.

3.5 Repeatability

The framework of capitals used to describe capacity is intended to provide consistency across scales and to allow comparison from workshop to workshop. The indicators of each capital identified from the workshops are expected to differ between locations within any single episode of data collection and provide regional relevance. It is anticipated that if the workshop process were repeated for another round of catchment reporting, for example in two years' time, some of the current indicators would no longer be important (for example, as a result of capacity building

activities and changed weather or socio-economic conditions). Other indicators may emerge as new constraints/enablers of NRM in response to prevailing socio-economic and biophysical conditions. The inclusion of a Management Activities section in catchment reporting is important to identify where investment in the community can be linked to changes in regional indicators and improved capacity for NRM. In this sense, the process enables understanding of faster and slower variables that influence capacity, especially at a regional scale, which in turn is crucial to understanding social-ecological systems, and in intervening to make them more sustainable (Berkes & Folke 1998).

For subsequent rounds of data collection, it would be possible to return to the same areas with some of the same participants prior to the production of the next report. Recent audits conducted by the NRC of CMA community engagement activities (NRC 2009) suggest there is room in CMA business processes for a Target 13-style of assessment.

A better approach would be to operationalise capacity assessment as part of comprehensive community engagement. Whenever a CMA establishes a reference group with a community sector or a best practice farmer group an assessment of capacity could be conducted to formally define who the group represents (socially and spatially) and what their capacity is for NRM. In effect this is already done in CMAs where engagement structures have been formalised, such as official CMA reference groups. However, a process to properly capture the information in a consistent way would facilitate monitoring, evaluation and reporting of capacity. For a small investment of time a rich mosaic could be constructed of drivers, impediments and potential collective actions for NRM throughout the catchment. This approach would not require a specific round of data collection for catchment reporting; instead, the information would be readily available and trends would emerge that could be easily tracked over time. The potential to incorporate this type of socio-economic information into biophysical MER structures to assist in strategic NRM investment is an emerging field of research (Field et al. 2003).

In addition, consideration should be given to incorporating information from capacity assessments conducted by other community-based NRM groups, such as Landcare groups. Provided a consistent approach to assessment was adopted throughout the catchment, community-based NRM groups could extend the coverage and enhance the depth of capacity assessments for a CMA at little additional cost.

3.6 Acceptance of qualitative findings

Participatory research, such as the capacity assessment process described in this report, is a qualitative (descriptive) research method that relies on transcripts and/or observations as raw data, rather than the quantitative (mathematical) measurements that are relied on in conventional research. It is commonly asserted that participatory methods involve only subjective observations that findings are 'informal' and 'qualitative', implying poorer quality or second-rate work, and that rigour and accuracy are assumed to be in contradiction with participatory methods.

As a consequence of this prejudice, and unlike investigators in the quantitative studies, investigators relying on participatory methods are asked to prove the usefulness of their approach. Conventional researchers use four criteria to persuade their audiences that the findings of an inquiry can be trusted (Pretty & Vodouhê 1997):

- How can we be confident about the 'truth' of the findings (internal validity)?

- Can we apply these findings to other contexts or with other groups of people (external validity)?
- Would the findings be repeated if the inquiry were replicated with the same or similar subjects in the same or similar context (reliability)?
- How can we be certain that the findings have been determined by the subjects and context of the inquiry, rather than by the biases, motivations, and perspectives of the investigators (objectivity)?

To account for the differences between qualitative and quantitative research methods, a set of twelve criteria for establishing trustworthiness of participatory findings have been identified (Pretty 1994). Overall these criteria call for:

- trust and rapport between participants and investigators
- a full understanding of context by investigators
- triangulation of sources, methods, and investigators
- participant checking of the findings
- peer review
- an increased awareness and appreciation of their circumstances by the participants and by participants of other people
- reports that are rich descriptions of complex reality and that capture people's personal perspectives and experiences, and that provide a prompt for action.

The Target 13 process can be demonstrated to meet these criteria for trustworthiness. However, it remains for potential users of the information collected through the process to be receptive to 'feedback from local voices' (Wallington & Lawrence 2009). For this to occur, NRM policy practitioners must accept that stakeholders are intelligent, responsible agents who are willing to act in the collective interest when institutional arrangements foster learning, allow co-design of institutional conditions and value reciprocity (Collins & Ison 2009b).

3.7 Conclusions

Community capacity assessment is still in the early phases of development. The modified Rural Livelihoods Analysis applied in Target 13 proved to be an innovative, rapid, robust and potentially repeatable method. However, successful implementation of continuing, state-wide capacity assessment will depend on more than a successful demonstration of its potential. McLain et al. (2008) examined the lessons learned from a series of multi-scale socio-economic assessments of large ecosystems. Their conclusions, reproduced below, are highly relevant to MER of the community targets embodied in the NSW State Plan:

1. Social scientists have the methods needed to gather relevant socio-economic data, including community level data. However, applying these methods over large geographic areas is costly and time consuming.

2. Progress has been made in developing the theoretical constructs needed to measure relevant community characteristics, processes, structures, and change. However, disagreements still exist over many of these constructs, and theories regarding the links between these variables and resource management policy need considerably more work. If adequately funded, large-scale assessments—which have the potential to integrate large-scale and in-depth social analyses in ways conducive to theory development and refinement—could themselves play an important role in reducing these disagreements.
3. Building in processes that explicitly engage a wide range of stakeholders, including community members, land managers, policymakers, and key interest groups, in designing and conducting social assessments improves the quality, relevance, and use of the findings. Doing so however requires acknowledgment of, and appreciation for, participatory and adaptive management processes. It is not clear whether today's resource management agencies are willing to make such commitments, or are able to provide the resources needed to support deeper engagement of numerous stakeholders.

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Appendix A: The Central West Catchment Pilot[2]

A1. Report on a scoping workshop with Central West CMA

Background

The purpose of this workshop was to:

1. provide CMA staff with an overview of the framework being developed to monitor adaptive capacity for national and state MER reporting
2. present a participatory approach that is being developed to monitor capacity to manage NRs at a catchment scale
3. invite CMA staff to participate and co-design this process, beginning by prioritising groups of NR managers to pilot the approach with.

There were a series of presentations from the project team:

1. Introduction to project team, progress with Target 13 to date and suggested approach
2. Background and theory to adaptive capacity
3. Participatory approach to self-assessment of adaptive capacity
4. Secondary socio-economic data available to CMAs
5. Discussions with CMA staff.

Selection of NRM managers

Participants in the workshop, held at CMA offices in Dubbo, comprised eight senior members of CMA staff. The highest priority outcomes for the team were for CMA staff to enthusiastically identify with and agree to participate in the project, and to prioritise groups of NR managers with whom to pilot the approach. The workshop concluded with an open discussion about the diverse types of NR managers across the catchment, and the criteria for prioritising groups to approach for involvement in pilot study. The conversation focused on land managers as a convenient group of NR managers to pilot this approach with, although the importance of other resource managers in future expansion of this approach was acknowledged.

The key criteria emerging from the conversation included:

1. the spatial and social representative of the land type being managed in terms of all land across the catchment. The three regions were identified:

- Tablelands
- Slopes
- Plains

[2] Note: The reports included in this appendix are prototypes and are reproduced with permission of Central West CMA. Their inclusion does not imply acceptance of State of Catchment reporting by Central West CMA.

2. the ease of access through existing networks and organisations. It rapidly became apparent that the Central West CMA has a network of reference groups that represent important groups of land managers across the catchment, and that this project could most efficiently proceed via these networks. Three types of reference groups have been established with representatives across the catchment:

- Aboriginal
- Central West NRM
- local government.

3. the identification of CMA staff through which to select and make contact with key informants to represent these groups.

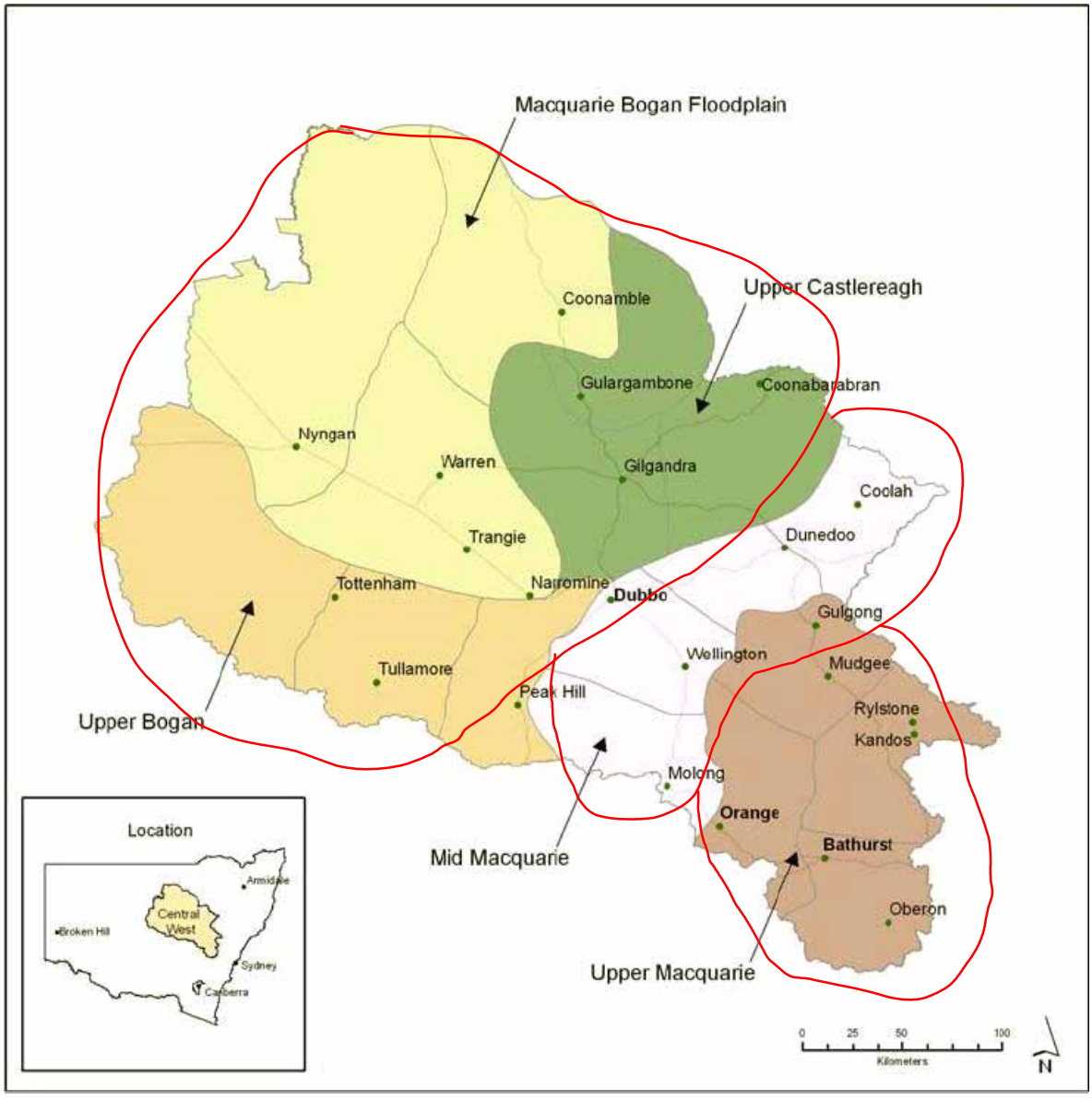


Figure A1.1: Rough division of the Central West CMA into three broad agro-ecological regions

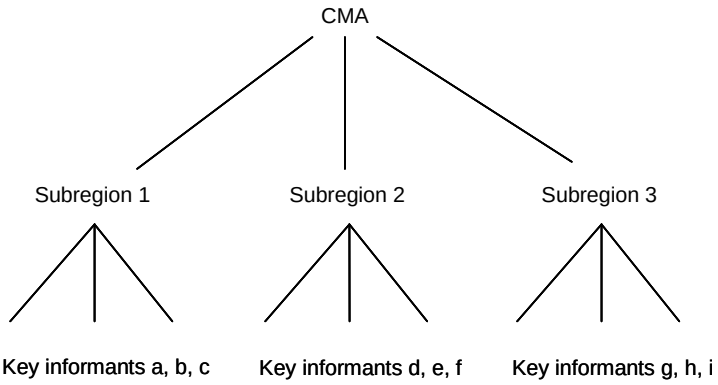


Figure A1.2: Relationship between the CMA, key NR managers in the three subregions and the key informants in each subregion

The goal of this project was to design a participatory approach to monitoring the adaptive capacity of NR managers across each catchment. This requires a sampling frame of key informants to select and populate local indicators of adaptive capacity within the Rural Livelihoods Analysis framework (Figure A1.2). The discussion suggested two tiers of consultation across the Central West CMA:

1. Small groups of resource managers from each reference groups across the spatial zones (subregions) of the catchment to create and populate the indicators
2. A small group of knowledgeable, long-term participants (key informants) selected from each reference group and led by a CMA staff member to play a role in moderating the selection and population of indicators.

Plan of action

The key action is to formulate a program of fieldwork to pilot the approach with the CMAs reference groups in each region. A starting outline would be:

1. with CMA staff, identify leading representatives to form a steering group for each reference group across each region (ie key members from each region)
2. introduce the project to these key members, and meet with them in person if possible or by phone to organise focus groups with 3–5 selected representatives in their regions
3. meet with the key members to moderate the selection of indicators and results across the region
4. develop report and submit to participants and CMA team for comment and approval.

A2. The Central West NRM reference group workshop

Summary

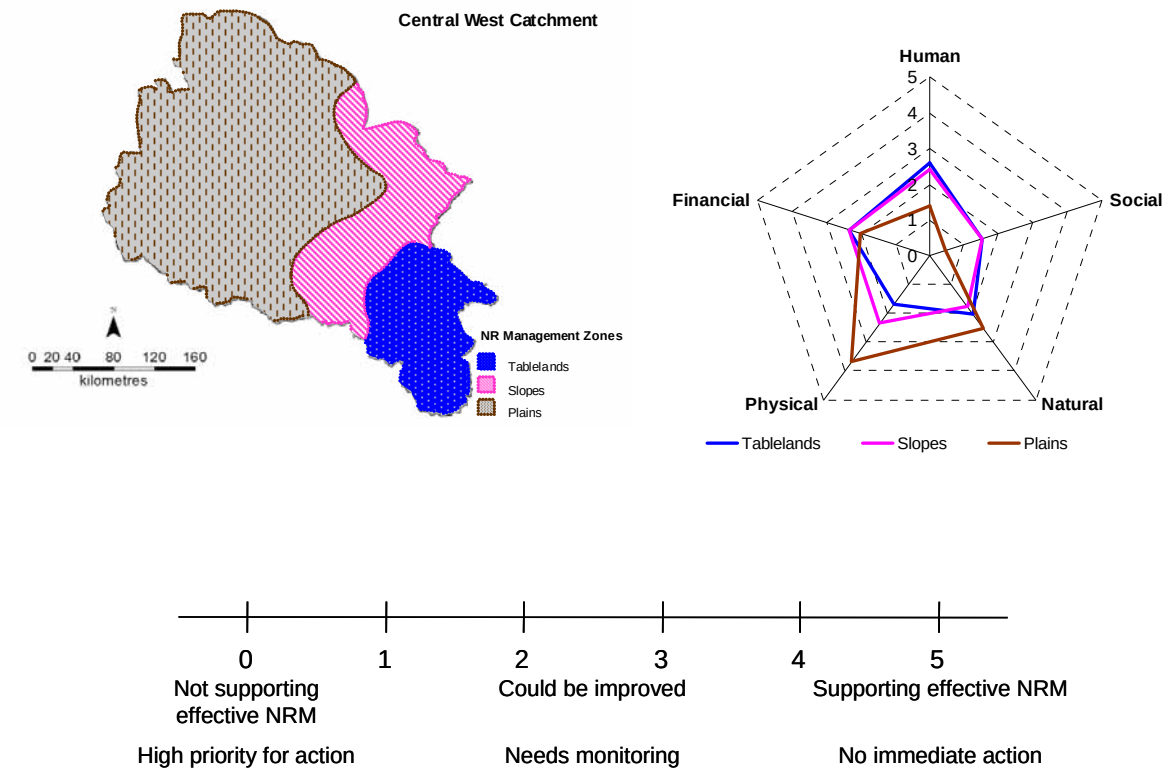


Figure A2.1: Self-assessed adaptive capacity of land managers across three regions of the Central West by the NRM reference group of the Central West CMA (April 2008)

NR managers manage land across the Central West CMA (Figure A2.1). Managers in the upper part of the catchment generally have smaller areas of land and live in close proximity to rural towns and have access to various services, but the land managers in the Plains have larger areas of land and are more remote to towns and services. This influences the type and level of NRM that occurs across the catchment.

Adaptive capacity

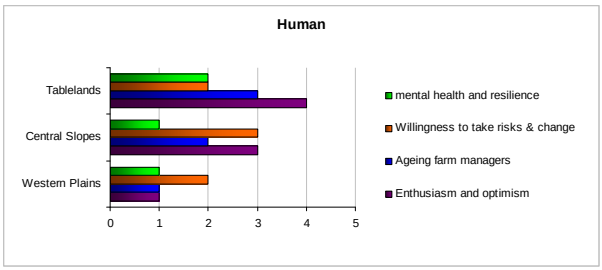
NR managers identified themselves as having low to moderate levels of adaptive capacity which was below the level necessary to support effective NRM.

The Slopes and Tablelands regions of the Central West catchment were similar in overall assessments for human, social, natural, physical and financial capitals. The Western Plains region had markedly lower human, social and financial capitals but much higher levels of natural and physical capitals compared to the Slopes and Tablelands regions.

Priorities for collective action

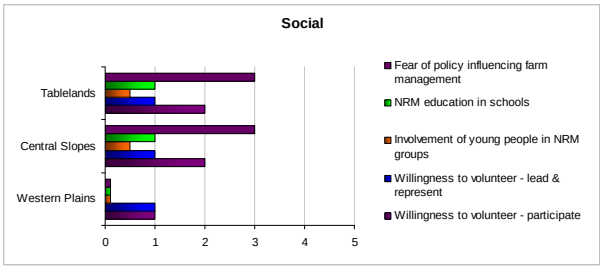
Priorities for collective action between land managers, CMAs and governments to enhance the adaptive capacity for NRM for NR managers in the Central West CMA include the following:

- Enhance enthusiasm and optimism necessary to support participation in NRM by better supporting volunteerism
- Enhance resilience and mental health in remote farming communities through support for local events
- Improve availability of mental health services particularly in the more remote western regions
- Improve regional services, infrastructure, education and employment to improve living standards and attract younger professionals
- Enhance willingness to volunteer for leadership of NRM activities through increased recognition and practical support for volunteer leaders, and enhance willingness to participate in NRM activities by investing in regional NRM coordinators
- Support regional NRM teachers and facilitators to resource NRM education and the recruitment of young people
- Raise awareness on how water security throughout the catchment is affected by actions taken in the upper regions
- Support education through schools and extra-curricular organisations to encourage appreciation of biodiversity
- Focus on reducing soil erosion and increasing soil health in the Central Slopes and Tablelands regions
- Raise awareness of groundcover conservation measures to increase soil moisture
- Increase uptake of conservation farming equipment by providing education and subsidy support to enable appropriate use of conservation equipment
- Raise awareness of optimal paddock sizes to increase farm income and promote NRM
- Increase awareness about the increasing costs and NR impacts associated with high input farming
- Increase education opportunities and social support to highlight the importance of diversifying farm businesses and investing off-farm
- Increase support for farm business flexibility
- Improvements to funding are vital – current funding for NRM is oversubscribed throughout the catchment. Identified as important to maintain enthusiasm and appreciate value of NRM.



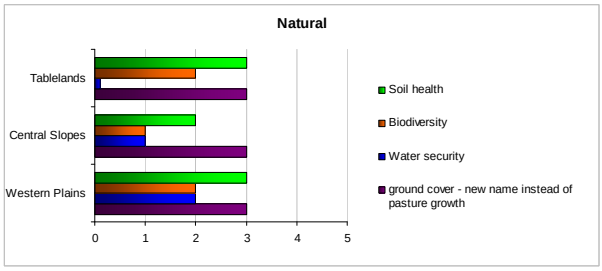
Human – overall self-assessment was low to moderate: low to moderate in Slopes and Tablelands and low in Plains.

- Moderate to high levels in Tablelands were due to access to education, employment and health services. Non-farm employment increased NRM resources.
- In Plains, there is declining profitability, depopulation and reduced social/recreational opportunities with low enthusiasm, willingness to change and ability to recruit young people into farming. Poor mental health services.



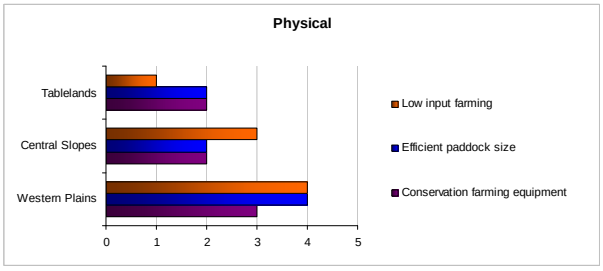
Social – overall self-assessment was low: low in Slopes and Tablelands and very low in Plains.

- Greater population density and non-farm employment in Slopes and Tablelands increases participation in NRM activities. Restrictions on clearing of native vegetation have undermined trust in governments.
- Recruitment and education of young people a high priority.



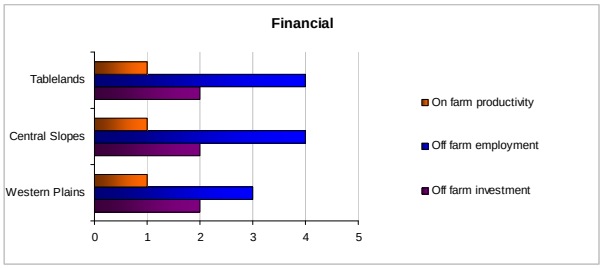
Natural – overall self-assessment was low to moderate across all regions.

- Priorities include management of water resources in the Slopes and Tablelands to improve water security throughout the catchment, improving biodiversity in the Slopes because of land clearing, and soil health in the Slopes and maintaining groundcover.



Physical – overall self-assessment was low in the Tablelands, moderate in the Slopes and high in the Plains.

- Priorities include conservation farming equipment in the Tablelands and Slopes, efficient paddock size in the Tablelands and Slopes and low input farming in the Tablelands.



Financial – overall self-assessment was low to high across the catchment.

- Highest priorities were for on-farm profitability and off-farm investment for all regions. Off-farm employment was high near towns but there were fewer opportunities in the Plains.

Table A2.1: Human capital

Indicator	Why was this indicator chosen?	Trend
Enthusiasm and optimism Enthusiasm and optimism increase capacity of land managers to manage NR	This indicator was chosen because enthusiasm and optimism contribute significantly to the awareness and management of NRM issues, and the willingness, cooperation and volunteerism necessary to support collective action to improve NRM (see social capital).	↓
Ageing farm managers An ageing (younger) farm population reduces (increases) the capacity of land managers to manage NRs	This indicator was chosen because younger people recruited to the region, including both farmers and professionals, can be more willing to innovate, change and take considered risks. Planned succession is necessary to ensure that younger farmers recruited to the region have the necessary skills and experience to manage NR.	↓
Willingness to take risks and change A willingness to change, innovate and take considered risks increases the capacity of land managers to manage NRs	This indicator was chosen because a willingness to change, innovate and take considered risks were considered essential elements of an aptitude for agriculture that builds on, but transcends, formal agricultural training.	↑
Resilience and mental health Improvements in mental health increase the capacity of land managers to manage NRs	This indicator was chosen because mental health affects the ability of land managers to recover from stresses such as drought.	↑
NRM training & education NRM training and education increase the capacity of land managers to manage NRs	This indicator was chosen because levels of NRM training and education are fragmented and uncertain, and generally diminishes for land managers in remote areas of the western plains. It was referred to CMA staff for assessment because of their knowledge of recent NRM training activities in the region. Consequently, it is not yet included in the graph of human capital.	↑

Differences between regions

Overall, human capital across the Central West catchment was assessed to be below the level necessary to support effective NRM, and therefore a high priority for collective action between land managers, CMAs and governments. Human capital was assessed at low to moderate levels in the upper regions (Slopes, Tablelands) of the catchment, falling to low levels across the more remote Plains. An exception was the willingness to change, innovate and take considered risks which is high in the larger wheat/sheep farming communities of the Slopes.

The high levels of human capital in the upper part of the catchment around Orange and Bathurst generally are partly due to greater access to education and employment opportunities, and because greater population density supports better services such as health. The availability of non-farm employment in this region also increases the number of farmers with the time and resources necessary to participate in NRM groups and activities.

In the more remote areas of the Western Plains, declining profitability and consequent farm amalgamations have led to depopulation and reduced social and recreational (especially sporting) opportunities. This has had a long-term detrimental impact on enthusiasm, willingness to change and the ability to recruit young people into farming. In addition to these long-term social and economic pressures, persistent drought and extended periods of low income have contributed to low resilience and mental health. Low mental health has been exacerbated by poor access to mental health services.

Priorities for collective action

Priorities for collective action between land managers, CMAs and governments to enhance human capital for NRM across the Central West catchment include:

- enhancing the enthusiasm and optimism necessary to support participation in NRM by better recognising and supporting volunteerism (discussed further under social capital below).
- enhancing the resilience and mental health particularly of remote farming communities through support for positive local events such festivals that generate positive sentiments and provide events to look forward to.
- the ability to cope with acute mental health issues could be improved by making mental health services more readily available, particularly in the more remote western regions.
- the ageing farm population can be addressed by improvements in regional services, infrastructure, education and employment necessary to improve living standards and attract younger professionals.

Table A2.2: Social capital

Indicator	Why was this indicator chosen?	Trend
Willingness to volunteer - participate Willingness to participate in volunteer activities increases the capacity of land managers to manage NRs	This indicator was chosen because participation in volunteerism underpins collective action to improve NRM.	↔
Willingness to volunteer – lead and represent Willingness to lead volunteer activities increases the capacity of land managers to manage NRs	This indicator was chosen because of the crucial role that leaders play in facilitating and coordinating collective action to improve NRM.	↓
Involvement of young people in NRM groups The involvement of young people in NRM groups increases the capacity of land managers to manage NRs	This indicator was chosen because of the vital role that young people play in succession planning, and the vibrancy, new ideas and willingness to learn and take risks that they bring to NRM.	↔
NRM education in schools NRM education in schools increases the capacity of land managers to manage NRs	This indicator was chosen because of the crucial role that education in schools plays in promoting awareness, focusing activity as well as instilling the skills necessary to manage NR.	↔
Fear of policy influencing farm management Fear of policy influencing farm management reduces the capacity of land managers to manage NRs	This indicator was chosen because of fear that policy intervention can reduce commitment to NRM.	↑

Differences between regions

Overall, social capital across the Central West was assessed to be below levels necessary to support effective NRM, and therefore a high priority for collective action between land managers, CMAs and governments. Social capital was assessed at low levels in the upper part of the catchment (Slopes, Tablelands), and very low levels across the more remote Plains.

Participation in voluntary activities was assessed separately to the willingness to lead them. Greater population density, smaller farms and access to non-farm employment in the upper part of the catchment means that there are more farmers with the time and resources necessary to participate in NRM groups in the two eastern areas of the catchment. Lower willingness to participate in the western part of the catchment is partly due to lower population, larger farms and fewer non-farm

livelihood options. However, controls on clearing native vegetation have significantly undermined trust in governments generally, and this has affected commitment to government NRM initiatives.

The recruitment and education of young people was considered a priority to ensure succession, the injection of new ideas, energy and an ability to learn into NRM across the region. A high turnover of teaching staff contributes to low capacity for NRM education in more remote western areas. This affects more than the skills necessary to manage NR, because schools often form a focal point for community NRM activities.

Priorities for collective action

Priorities for collective action between land managers, CMAs and governments to enhance social capital for NRM in the region include:

- enhancing willingness to volunteer for leadership of NRM activities through increased recognition and practical support for volunteer leaders, including financial support for travel and administration, assistance filling out funding approvals, as well as access to high speed internet and IT support
- enhancing willingness to participate in NRM activities by investing in regional NRM coordinators that raise awareness, coordinate events and assist volunteers with essential bureaucratic processes such as funding applications
- supporting regional NRM teachers and/or facilitators to resource NRM education and the recruitment of young people into NRM activities across the region.

Table A2.3: Natural capital

Indicator	Why was this indicator chosen?	Trend
Water security Ongoing access to water is necessary for land managers to farm and to manage NRs	This indicator was chosen because water security is a high priority for land managers and a necessary precursor to NRM.	↓
Biodiversity Biodiversity increases the capacity of land managers across the region to manage NRs	This indicator was chosen because regions in which biodiversity levels are low are regions where agriculture is intense and are regions of priority for NRM. 'Biodiversity' as an indicator of natural capital ranges across many scales, from soil biota to fauna.	↓
Soil health An ability to repair and maintain soil health increases the capacity of land managers across the region to manage NRs	This indicator was chosen because differences in soil health are useful indicators of where NRM efforts should be focused. 'Soil health' as an indicator of natural capital includes soil stability, soil structure, and soil migration.	↑

Groundcover An ability to manage plant growth and land cover increases the capacity of land managers across the region to manage NRs	This indicator was chosen because the ability to grow plants (crops or pasture), especially in difficult years, demonstrates an ability to respond well to the dynamic natural system and indicates an ability to manage NR well. This indicator is affected by seasonal variability, stocking rates, and differences in management.	↑

Differences between regions

The natural capital underpinning the capacity of land managers to manage NR across the Central West catchment is moderate at best, and requires continual monitoring.

The greatest priority for improvements in the management of water resources lies in the upper parts of the catchment (Slopes, Tablelands) where rainfall has historically been high, relative to the drier western region. Improvements in upstream regions will increase water security throughout the whole catchment.

Improving biodiversity is a high priority throughout the catchment. Of the three regions, the Slopes region is the highest priority for action due to the high rate of land clearance, and associated losses in biodiversity.

Soil health throughout the Central West catchment is low; however, there are buffers in the Tablelands and Plains regions. In the Tablelands rainfall is relatively high and in the Plains region land managers already work to improve soil health in order to survive on lower rainfall. Absence of buffers in the Slopes region means this is the highest priority for action, although action on soil health throughout the whole catchment is important.

Experience with past episodes of overgrazing has meant that land managers across the Plains have developed an acute awareness of the carrying capacity of their land, and the value of maintaining live groundcover to retain soil moisture. In the upper areas of the catchment, historically higher rainfall can reduce the priority given to pasture management and this may lead in times of drought, exacerbated by a low capacity to relocate stock, to increased vulnerability and reduced ability to manage NR.

Priorities for collective action

Priorities for collective action between land managers, CMAs, and governments to enhance natural capital for NRM within the CMA include:

- improving water resources throughout the catchment, especially in the upper regions (Tablelands, Slopes) and increasing community awareness of how water security throughout the whole catchment is affected by actions taken in the upper regions
- providing support education through schools and extra-curricular organisations to encourage younger people to appreciate and value biodiversity
- focusing on reducing soil erosion and increasing soil health especially in the Slopes and Tablelands regions, where local changes will result in widespread improvements to soil health and reductions in soil erosion throughout the whole catchment
- increasing education and uptake throughout the catchment of groundcover conservation measures, especially those which contribute to increased soil moisture.

Table A2.4: Physical capital

Indicator	Why was this indicator chosen?	Trend
Conservation farming equipment Access to conservation farming equipment increases the capacity of land managers across the region to manage NRs	This indicator was chosen because best management practices increase land managers' capacity to practise effective NRM. Specialised conservation farming equipment enables best farm management practices.	↑
Efficient paddock size Appropriately-sized paddocks increase the capacity of land managers to manage NRs	This indicator was chosen because appropriately-sized, well managed, paddocks enhance pasture management and the protection of water courses. The scale at which paddocks should optimally be sized varies between regions.	↑
Low input farming More efficient use of smaller quantities of inputs increases the capacity of land managers to manage NRs	This indicator was chosen because the adoption of low input farming indicates recognition of the impact of farming inputs on the wider environment.	↑

Differences between regions

Physical capital is sufficient to support effective NRM in the farming systems of the Western Plains where land managers are better adapted to a riskier environment, but falls to below sufficient to support NRM in the eastern areas of the catchment.

Conservation farming has been taken up extensively in the Western Plains region where farm sizes are better suited to the available equipment, and the need for conservation farming is greater; and to a lesser extent in the Slopes region where subsidies for equipment implementation have been available. In the upper catchment (Slopes, Tablelands) smaller paddock sizes make conservation farming equipment more expensive per hectare to implement and subsidies have been harder to obtain.

There has been a focus in the Plains region on creating efficient paddocks optimally sized to improve both crop and NRM efficiencies, partly in response to uptake of conservation farming equipment. In the upper catchment there has been less emphasis on optimising paddock size.

Awareness of low input farming is high in the Plains region, where conditions are more marginal and farm businesses are more sensitive to the higher (environmental and financial) costs of high input farming. Also, excess inputs on farms in the upper catchment have flow-on effects which may affect the whole catchment, whereas excess inputs in the western region have less far reaching consequences.

Priorities for collective action

Priorities for collective action between land managers, CMAs, and governments to enhance physical capital for NRM within the CMA include:

- increasing the uptake of conservation farming equipment in the Slopes and Tablelands regions, by providing support (such as education and subsidies) to enable conservation equipment appropriate to the relative paddock sizes to be adopted
- focusing both on education to ascertain optimal paddock sizes; and on support (such as government subsidies) to create well sized paddocks to increase farm income and promote NRM. The priority is for action in the Slopes and Tablelands regions
- increasing awareness with land managers and community groups about the increasing costs and NR impacts associated with high input farming. Most action is needed in the Tablelands region because the effects of surplus inputs from this region are felt across the catchment.

Table A2.5: Financial capital

Indicator	Why was this indicator chosen?	Trend
Off-farm investment Off-farm investment is an indicator of the productivity and resilience of a farm, and of its land managers, and their capacity to manage NRs	This indicator was chosen because off-farm investment is a useful indicator of the resilience and self-awareness of land managers as business owners, not just as farmers. Land managers with greater financial resilience are likely to have more viable farms and to be better positioned to manage NR. Off-farm investment and off-farm employment are both indicators of land managers' financial resilience and the viability of their farm businesses, and should be used together as indicators of land managers' ability to manage NR.	not assessed
Off-farm employment Off-farm employment is an indicator of the productivity and resilience of a farm, and of its land managers' capacity to manage NRs	This indicator was chosen because off-farm employment indicates ability to diversify income sources and recognise and adapt to difficult conditions. Off-farm employment and off-farm investment are both indicators of land managers' financial resilience and the viability of their farm businesses and should be used together as indicators of land managers' ability to manage NR.	↑
On-farm profitability The availability of cash is critical to land managers investing in managing NRs	This indicator was chosen because funding, along with time and land, is necessary for effective NRM. Land managers need external funding to help them contribute effectively to managing NR.	↓

Differences between regions

Financial capital is moderate throughout the catchment and requires monitoring to ensure NRM remains effective.

Off-farm investment is low throughout the catchment. Generally farmers have low financial resilience and many are struggling to keep their farm businesses viable, a necessary precursor to having the capability to manage NR.

Off-farm employment generally occurs for two reasons: out of choice (eg age, financial, or social motives) or of necessity (due to reduced on-farm income). Off-farm employment can be volatile and weather dependent in the longer term. Off-farm employment is high near country towns, especially those in the upper catchment (Slopes, Tablelands) with mining operations. There are fewer off-farm employment opportunities in the Plains region.

Incentive funding is necessary for NRM. Land managers can generally offer time and land but may lack available cash to complement these contributions; effective NRM usually requires all three. External (ie off farm) funding for NRM projects is very low throughout the whole catchment.

Priorities for collective action

Priorities for collective action between land managers, CMAs, and governments to enhance financial capital for NRM within the CMA include:

- increasing education opportunities and social supports in order to highlight to land managers the importance of diversifying farm businesses and investing off-farm (when possible, not necessarily during a drought). This action is a priority throughout the catchment, as financial resilience is universally low
- increasing support for farm business flexibility (ie providing opportunities to retrain, encouraging a greater social acceptance of 'non-traditional job' alternative sand increasing knowledge of income stream diversification), are useful for those who are in a position to consider off-farm employment. These actions are more likely to be useful in the upper regions of the catchment where more opportunities for off-farm employment exist
- improvements to funding are vital – current funding for NRM is oversubscribed throughout the catchment. As well, indications from land managers about their enthusiasm for, and appreciation of the value of, NRM will highlight to CMA and governments the urgency with which the community seeks funding increases.

NB: it was the feeling of the meeting that the Upper Castlereagh region is really part of the Slopes, not the Plains subregion.

A3. The local government workshop

Coonabarabran, Friday 9 May 2008

Summary

1. Influence of local government on NRM:

- Local governments are direct NR managers, and influence NRM by others throughout the Central West catchment.
- Direct influence occurs through council services such as managing roadside verges, urban parks and undeveloped land, bushfire related hazards, water management and riparian zones.
- Indirect influence occurs through planning and approvals services, and NRM related education and awareness-raising.

2. Capacity of local government to influence improved NRM:

- There is potential to improve or influence the complementarity between NRM and related councils activities.
- There is an opportunity for greater regional coordination and resource sharing between councils.
- The extent to which NRM is explicitly recognised in council budgets, and the mechanisms used to allocate funding to councils by state governments.
- The awareness and capacity of councillors to address NRM issues is highly variable, reflecting similar diversity within the community itself.

3. Opportunities to improve the NRM capacity of local government:

- NRM facilitators and community champions have been particularly effective in generating community action.
- A team approach to providing these services across the Central West catchment is suggested.
- NRM needs to be appropriately recognised and prioritised within council budgets, and funding provided to councils by state governments.
- Raise the awareness and capacity of councillors to address NRM issues.

4. Recommendations for monitoring and evaluation:

- The recognition of NRM issues in funding and planning mechanisms of local governments.
- The profile of local governments in delivering and supporting NR outcomes.

Introduction

The important role that local governments play in managing NR has been recognised by the Central West CMA through the establishment of a facilitated reference group for Council Environment and NRM officers. This facilitates coordinated action and information sharing between local governments and the broader agricultural, rural and conservation activities that form the focus of the CMA. This report summarises the outcomes of a workshop held with the Local Government Reference Group in Coonabarabran in May 2008 to better understand:

1. the direct and indirect ways in which the local governments influence NRM
2. the opportunities and constraints affecting the capacity of local governments to influence improved NRM
3. priorities for collective action between local governments, the CMA, other government agencies and other stakeholders to improve NRM.

The workshop

To facilitate this discussion, the workshop began by reviewing the capability provided by the Rural Livelihoods Analysis to assess the capacity of land managers. This set the scene for a discussion of the role of local governments in NRM, and influences on their capacity to contribute to improved NRM outcomes.

The workshop was held at the Acacia Hotel in Coonabarabran in the afternoon of Friday 9 May 2008. This was part of a regular meeting of the Central West CMA Local Government Reference Group and coordinated by a CMA officer. There were nine participants during the workshop plus members of the Target 13 project team from NSW DECCW and CSIRO Sustainable Ecosystems.

Main discussion points

The influence of local government on NRM

In the past, NRM was not seen as a core activity of local government councils, despite the significant work done by councils on NRM. This role was often not explicitly recognised, and considered to be more of a state government issue. The issue of direct and explicit responsibility for NRM is therefore new to many local councils and as such, it has to compete with other council priorities (eg road maintenance, garbage collection). This naturally depends on the interests and priorities of councillors and their constituents. There are, however, a range of activities that local councils are involved in that affect NRM:

- Council services:
    - Councils endeavour to manage NR appropriately through the management of roadside verges, urban areas, and bushfire related hazards.
    - Councils face a diverse range of water management issues including groundwater management, water quality, treatment plant upgrades, storm water harvesting, rainwater tanks in urban areas, water sensitive urban design, sediment management, management of septic tanks and issues relating to runoff and pollution, grey-water use and effects on groundwater (eg farmers growing lucerne).
    - Managing creeks and riparian zones, including adding habitat complexity in water bodies to allow slow percolation.
- Councils are required to evaluate and approve buildings and construction, and control the use of land through local environmental plans (LEPs):
    - Local governments influence construction and building in urban areas and focus on the sustainable use of resources (energy consumption, heating, lighting, water etc) through building codes (eg 'BASIX' to achieve a 40 per cent reduction from baseline).
    - Development applications have to go through local council and there can be reviews of the LEP.

- Local councils have a role to play in NRM related education, and often through an environmental officer who can facilitate on-ground NRM activities:
    - Management of remnant vegetation, weed control, enhancement of biodiversity, minimisation of human impact and riparian vegetation management
    - Management of pests and weeds through a weed officers (for the management of noxious weeds), but also some pest management of birds in urban areas, and larger vertebrates in reserves
    - Education role to raise awareness of salinity problems and minimise its effects in urban areas
    - Community tree planting days. For example, in Orange, there is a community environment liaison officer and facilitator with links to park management and Landcare, while in Coonamble there are tree planting and green power programs aimed at carbon neutrality.

Capacity of local government to influence improved NRM

The capacity of local governments to improve or influence NRM was considered reasonably good in most shires. There were, however, some general and NRM specific constraints on the ability of local councils to manage NR.

- Funding ultimately constrains all local government activities, although there are some issues specific to NRM:
    - The role of local councils in managing NR is not yet recognised fully in the formula used by state governments to allocate funding to local governments.
    - Contention surrounds the idea of raising rates to pay for NRM, and the potential acceptance by communities varies widely.
- The level of interest and priority given to NRM by communities and within local governments is important for generating activity and achieving outcomes:
    - Councils face a range of competing pressures, and NRM can not necessarily be a high priority for all councils at all times. At times, community perceptions can unhelpfully transfer most or all of the responsibility for NRM to councils.
    - NRM can be in tension with economic development. For example, the scaling back of resource based industries such as sawmills can create negative reactions to environmental issues.
    - Some communities show strong interest in NRM, and people often want to contribute. For example, there is a strong environmental group in Orange (ECO) that is leading NRM activities. Another example is a fishing club that removed willows and restocked a river with fish by raising money through raffles and CMA support
    - The interest of local communities and governments need to be aligned to in order to achieve optimal NR outcomes. Governments can encourage or discourage local action, and not only through funding.

- Council issues:
    - The capacity of councils to manage NR depends critically on the awareness and priority given to this issue by councillors, and their knowledge and skills to address it.
    - Access to skills – it can be difficult to get qualified staff to relocate to small towns and remote rural areas, particularly for short-term contracts.
    - The success of NRM can depend on alignment between local and state government priorities.

Opportunities to improve the NRM capacity of local government

Discussion of the role that local governments play in NRM flowed into discussion of opportunities to enhance this role. NRM facilitators and community champions have been particularly effective in generating community action. They provide a focus for activities, awareness raising and education on how to address NRM challenges, including through schools. They also provide direct support to small communities, coordinate activities, and build the capacity of local communities to manage NR.

- NRM needs to be appropriately recognised and prioritised within council budgets, and the funding formulas used by state governments to allocate funds to councils.
- A team approach to providing these services across the CMA is suggested as a way of sharing resources and expertise. Regional staff have already provided relevant expertise across the CMA as needed. This could be enhanced by improving mechanisms for sharing skilled staff employed by individual councils with other councils.
- This can enable appropriate funding of NRM facilitators, community champions and environmental officers in line with council and state government priorities.
- Councillors have diverse interests and backgrounds. Briefing on NRM issues and opportunities to address them could aid their appropriate recognition and prioritisation.

Recommendations for monitoring and evaluation

The workshop identified several priorities for monitoring and evaluation:

- The recognition of NRM issues in funding allocation and priority and planning mechanisms of local governments:
    - Explore opportunities for investment into better NRM outcomes (eg better management of roads and environments and water resources), through joint funding applications with other councils, and through support of NRM facilitators
    - Explore approaches to share resources and expertise of NRM staff across councils and throughout the catchment
- Raise or maintain the profile of the role that local government plays in delivering and supporting NR outcomes.

A4. NRM capacity in the Central West region, 2008

Target: There is an increase in the capacity of NR managers to contribute to regionally relevant NRM.

Overall condition: 

Trend: ↔

Confidence: L–M

A workshop was held in the Central West region to assess the capacity of land managers to contribute to regionally relevant NRM (Figure A4.1). Participants identified several indicators of *human, social, natural, physical* and *financial* capital that enable or constrain NRM in the region, which they divided into three subregions. Participants rated each indicator on a scale of 0 to 5 according to the degree to which the indicator supports NRM action (Table A4.1). The averages of the indicators for each type of capital are plotted on a spider chart (Figure A4.2) and the average for each capital and each sub-region was used to assess overall condition. Participants also self-assessed the trend in condition for each indicator.

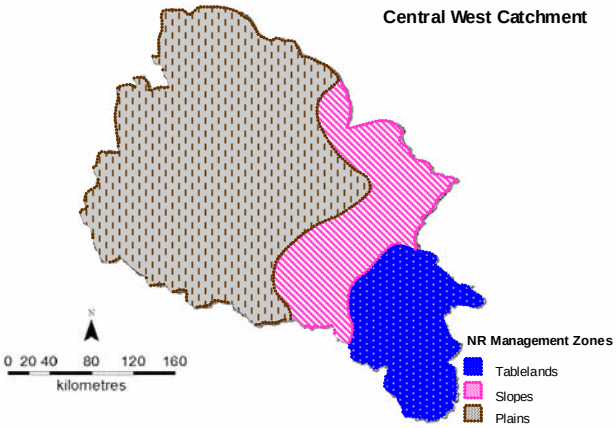


Figure A4.1: Map of the Central West region and the area represented by workshop group

Twelve participants attended a workshop in Dubbo. Participants were members of the CMA's NRM reference group and represented the entire region. The group included farmers, CMA staff, the Rural Lands Protection Board, Landcare and farming groups. To assess NRM capacity, participants selected a single set of indicators for the region as a whole but, when rating the indicators, chose to consider the region as three subregions based on topography: Tablelands, Slopes and Plains.

The results for each capital were similar for the Tablelands and Slopes. However, the scores given for some indicators of natural capital varied markedly. Soil health and biodiversity were seen as supporting effective NRM on the Tablelands, but not on the Slopes. Water security was rated low in all subregions. For the Plains, social, human and financial capitals were rated lower than for the Tablelands and Slopes, but physical and natural capitals were higher. Physical capital was rated significantly higher in the Plains subregion because infrastructure requirements are lower. Conversely, social and human capitals were weaker for the Plains, with most indicators rated very low. Extended drought and isolation has had a major impact on Plains land managers, affecting their level of confidence and their ability to access quality education and health services and develop supportive social networks.

Of the financial capital indicators, all subregions rated declining farm profitability as a high priority for action. The availability of off-farm employment was seen as supporting NRM in the Tablelands and Slopes; however, the lack of similar opportunities on the Plains resulted in a lower rating in that subregion.

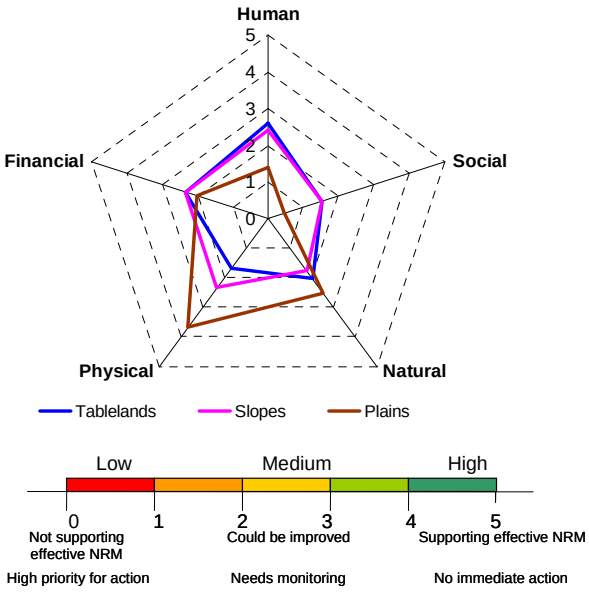


Figure A4.2: Self-assessed capacity to manage NRs in the Central West catchment

Table A4.1: Examples of the capitals

Capital	Examples
Human	skills, health and education
Social	family, community and other social networks and services
Natural	productivity of land, water and biological resources
Physical	infrastructure, equipment and breeding resources
Financial	access to income, savings and credit

Table A4.2: Condition indicators in the Central West region

Condition					
Indicator	Tablelands	Slopes	Plains	Trend	Importance of indicator
Human capital (the skills, health and education that contribute to the capacity to manage NRs)					
Resilience and mental health				↔	Affects the ability of land managers to recover from stresses such as drought.
Willingness to take risks and change				↑	Essential elements of an aptitude for agriculture that builds on, but transcends formal agricultural training.
Ageing farm managers				↓	Regional recruitment of younger people including both farmers and professionals enhances willingness to innovate and take considered risks.
Enthusiasm and optimism				↔	Contribute to awareness and management of NR issues and the willingness, cooperation and volunteerism necessary for collective action.
Social capital (the family and community support available, and networks through which ideas and opportunities are accessed)					
Fear of policy				↓	Policy intervention can reduce commitment to NRM.
NRM education in schools				↔	Education in schools is crucial in promoting awareness focusing activity as well as instilling the skills necessary to manage NRs.
Young people in NRM				↑	Involvement of young people vital for succession planning and bring to NRM vibrancy, new ideas and willingness to learn and take risks.
Volunteering – lead and represent				↔	Leaders crucial in facilitating and coordinating collective action to improve NRM.
Volunteering – participation				↓	Participation in volunteerism underpins collective action to improve NRM.
Natural capital (the productivity of land, water and biological resources from which rural livelihoods are derived)					
Soil health				↑	Differences in soil health are useful indicators of where NRM efforts should be focused.

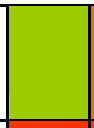
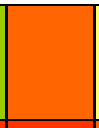
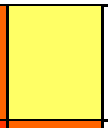
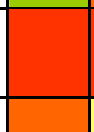
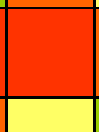
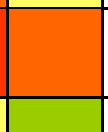
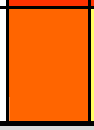
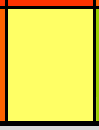
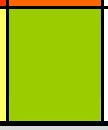
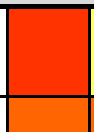
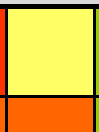
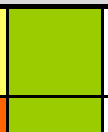
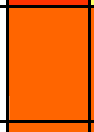
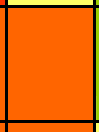
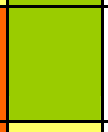
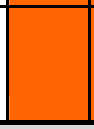
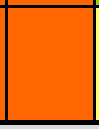
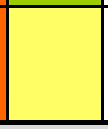
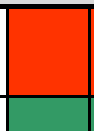
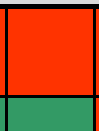
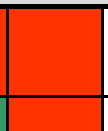
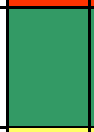
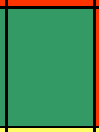
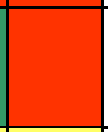
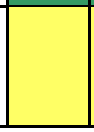
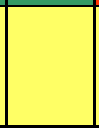
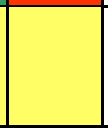
Biodiversity				↑	Regions low in biodiversity are a priority for NRM, as well as regions where agriculture is practiced at a relatively high intensity.
Water security				↔	A high priority for land managers and a necessary precursor to NRM.
Groundcover				?	Management demonstrates ability to respond to the dynamic natural system and demonstrates a likely ability to manage NRs well.
Physical capital (the infrastructure, equipment and breeding improvements to crops and livestock that contribute to rural livelihoods)					
Low input farming				↓	Adoption of low input farming indicates recognition of the impact of farming inputs on the wider environment.
Efficient paddock size				↔	Well managed, appropriately-sized paddocks enhance pasture management and the protection of water courses.
Conservation farming equipment				↑	Access to specialised equipment is often necessary to efficiently integrate improved NRM into farming businesses.
Financial capital (the level and variability of the different sources of income, savings and credit available to support rural livelihoods)					
Farm profitability				↔	Determines financial resources available for investment in NRM.
Off-farm employment				↓	Off-farm investment is a useful indicator of the long-term success of land management. It indicates an ability to diversify the asset base.
Off-farm investment				↑	Employment off-farm indicates ability to diversify income sources and recognise and adapt to difficult conditions.

Table A4.3: Collection action priorities for the Central West region

Indicator	Collective action priorities
Human capital (the skills, health and education that contribute to the capacity to manage NRs)	
Resilience and mental health	Make mental health services more readily available, particularly in the more remote western regions.
Willingness to take risks and change	Improve native vegetation policy.
Ageing farm managers	See 'Young people in NRM' below.
Enthusiasm and optimism	Support festivals and other events that that generate positive sentiments and provide events to look forward to.
Social capital (the family and community support available, and networks through which ideas and opportunities are accessed)	
Fear of policy	A focus of concern is invasive native scrub policies.
NRM education in schools	See 'Biodiversity' below. Focus on local issues, not just global issues such as climate change. Modernise the agriculture curriculum.
Young people in NRM	Farmers cannot afford to hire people. Improve regional services, infrastructure, education and employment necessary to improve living standards and attract younger professionals. Support regional NRM teachers and/or facilitators to resource NRM education and the recruitment of young people into NRM activities across the region.
Volunteering – lead and represent and Volunteering and participation	Pay coordinators appropriately and provide security of employment. Increase the recognition and practical support for volunteer leaders, including financial support for travel and administration, assistance filling out funding approvals, as well as access to high speed Internet and IT support. Recognise and support volunteerism. Invest in regional NRM coordinators that raise awareness, coordinate events and assist volunteers with essential bureaucratic processes such as funding applications.
Natural capital (the productivity of land, water and biological resources from which rural livelihoods are derived)	
Soil health	Focus on reducing soil erosion and increasing soil health, especially in the central Slopes and Plains subregions, and in the Tablelands region, where local changes will result in widespread improvements to soil health and reductions in soil erosion throughout the whole catchment.
Biodiversity	Support education through schools and extra curricular organisations to encourage younger people to appreciate and value biodiversity, especially in the west.
Water security	Increase community awareness, especially in the upper regions of the catchment, of how water security throughout the whole catchment is affected by actions taken in the upper regions.

Groundcover	Increase education and uptake throughout the region of groundcover conservation measures, especially those which contribute to increased soil moisture.
Physical capital (the infrastructure, equipment and breeding improvements to crops and livestock that contribute to rural livelihoods)	
Low input farming	Increase awareness with land managers and community groups about the increasing costs and NRM impacts of high input farming. Most action is needed in the Tablelands because the effects of surplus inputs from this region are felt across the catchment.
Efficient paddock size	Education and support (such as government subsidies) to create well-sized paddocks to increase farm income and promote NRM.
Conservation farming equipment	Increasing the uptake of conservation farming equipment by providing support (such as education and subsidies) to enable conservation equipment appropriate to the relative paddock sizes to be adopted.
Financial capital (the level and variability of the different sources of income, savings and credit available to support rural livelihoods)	
Farm profitability	Various suggestions relating to incentive payments. Current funding for NRM is oversubscribed throughout the region and should be increased. Ecosystem service payments will help.
Off-farm employment	Increasing support for farm business flexibility (ie providing opportunities to retrain, encouraging a greater social acceptance of 'non-traditional' job alternatives and increasing knowledge of income stream diversification) are useful for those who are in a position to consider off-farm employment. These actions are more likely to be useful in the upper regions of the catchment where more opportunities for off-farm employment exist.
Off-farm investment	Increase education opportunities and social support to highlight the importance of diversifying farm businesses and investing off-farm (when possible, not necessarily during a drought). Financial resilience is universally low.

Appendix B: The Hunter–Central Rivers Catchment Pilot[3]

B1. Report on a scoping workshop with Hunter–Central Rivers CMA

Background

The purpose of this workshop was to:

- provide CMA staff with an overview of the framework being developed to monitor adaptive capacity for national and state MER reporting
- present a participatory approach that is being developed to monitor capacity to manage NR at a catchment scale
- invite CMA staff to participate and co-design this process, beginning by prioritising groups of NR managers to pilot the approach with.
- There were a series of presentations from the Target 13 project team:
- Introduction to project team, progress with Target 13 to date and suggested approach
- Background and theory to adaptive capacity
- Participatory approach to self assessment of adaptive capacity
- Secondary socio-economic data for CMAs
- Discussions with CMA staff.

Selection of NRM managers

The workshop, held at the CMA's offices in Patterson included members of the CMA board and senior members of CMA staff (10 participants in total). The highest priority outcomes for the team were for CMA staff to enthusiastically identify with and agree to participate in the project, and to prioritise groups of NR managers with whom to pilot the approach. The workshop concluded with an open discussion about the diverse types of NR managers across the catchment, and the criteria for prioritising groups to approach for involvement in pilot study. The conversation focused on land managers as a convenient group of NR managers to pilot this approach with, although the importance of other resource managers in future expansion of this approach was acknowledged.

The key criteria emerging from the conversation included:

1. The spatial and social representative of the land type being managed across the catchment:
    a) Small-scale holdings (ad hoc Glendonbrook Group)
    b) Large-scale holdings (ad hoc Merriwa Group)
    c) Coal (Hunter Coal Environmental Group – formal group)
    d) Development community (ad hoc group from members of the Association of Urban Developers)

3 Note: The reports included in this appendix are prototypes and are reproduced with permission of Hunter-Central Rivers CMA. Their inclusion does not imply acceptance of State of Catchment reporting by Hunter–Central Rivers CMA.

2. The ease of access through existing networks and local CMA staff. It rapidly became apparent that the Hunter–Central Rivers catchment has a number of formal and ad hoc interest groups that represent important groups of land managers across the catchment, and that this project could most efficiently proceed via local CMA staff with knowledge of these groups
3. The identification of CMA staff through which to select and make contact with key informants to represent these groups.

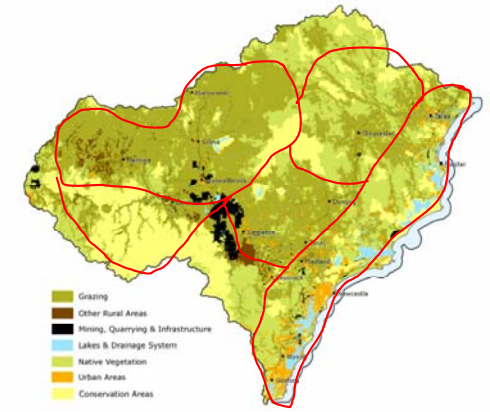


Figure B1.1: Rough division of Hunter – Central Rivers CMA into broad agro-ecological regions

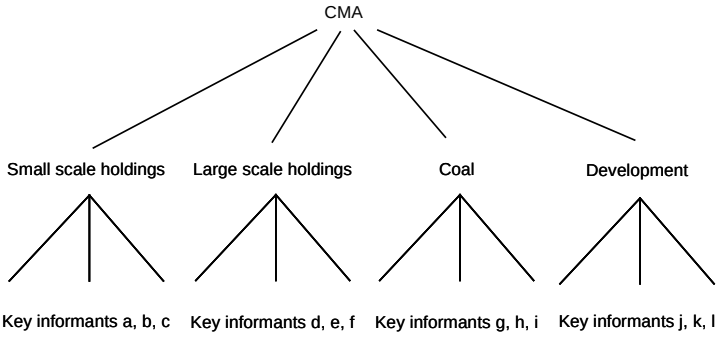


Figure B1.2: Relationship between the CMA, key NR managers in sub regions and the key informants in each subregion

The goal of this project is to design a participatory approach to monitoring the adaptive capacity of NR managers across each catchment. This requires a sampling frame of key informants to select and populate local indicators of adaptive capacity within the Rural Livelihoods Analysis framework (B1. 2). The discussion suggested two tiers of consultation across the Hunter–Central Rivers CMA:

1. Small groups of resource managers from each reference group across the spatial zones (subregion/land type) of the catchment to create and populate the indicators
2. A small group of knowledgeable, long-term participants (key informants) selected from each reference group and led by a CMA staff member to play a role in moderating the selection and population of indicators.

Plan of action

The key action is to formulate a program of fieldwork to pilot the approach with the four NR manager groups. A starting outline would be:

1. with CMA staff, identify leading representatives to form a steering group for each NRM group across each region (ie key members from each region)
2. introducing the project to these key members, and meet with them in person if possible or by phone to organise focus groups with 3–5 selected representatives in their regions
3. meeting with the key members to moderate the selection of indicators and results across the region
4. developing a report and submitting it to participants and CMA for comment and approval.

B2. The large-scale landholders workshop

Summary

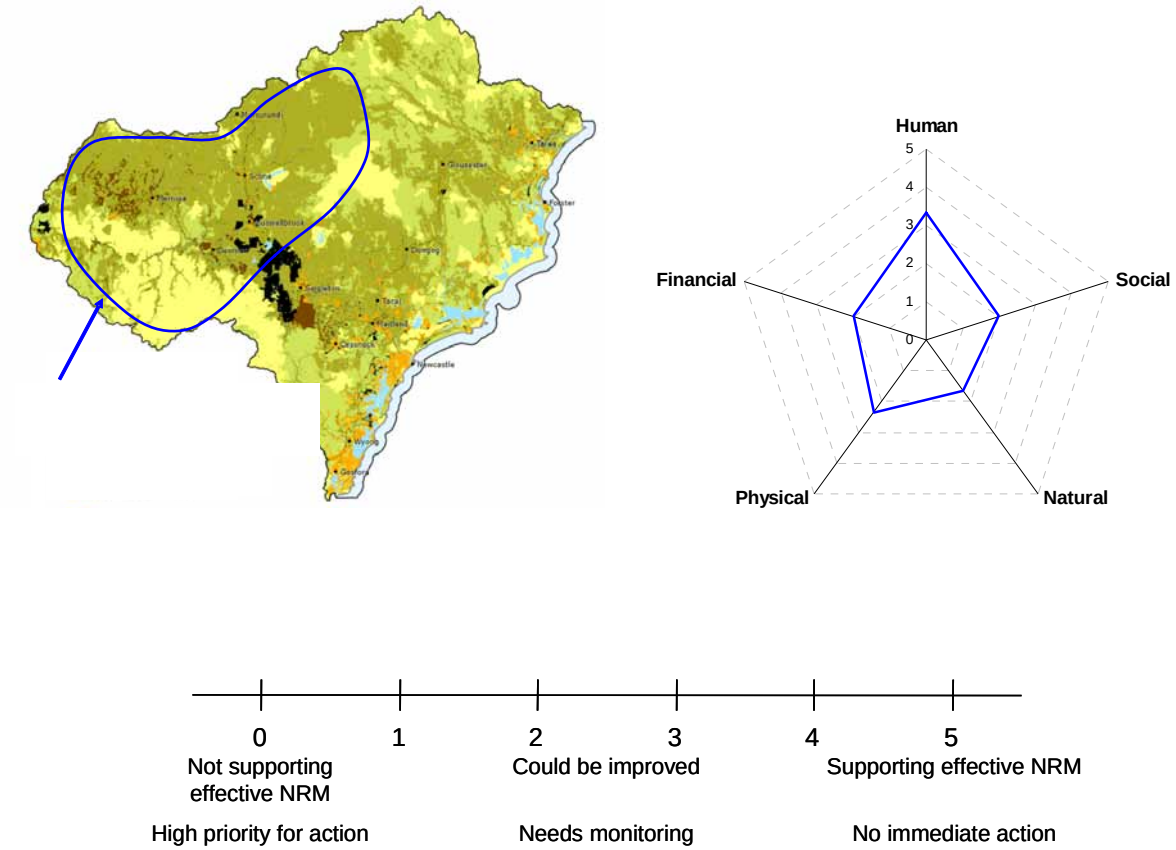


Figure B2.1: Self-assessed adaptive capacity of large-scale land managers, Hunter-Central Rivers CMA, May 2008

Large-scale landholders are land managers in the upper part of the Hunter–Central Rivers CMA that own and manage relatively large areas of land. Most land managers have cropping and/or cattle grazing enterprises.

Adaptive capacity

Large-scale landholders identified themselves as having low levels of adaptive capacity that were not currently supporting effective NRM.

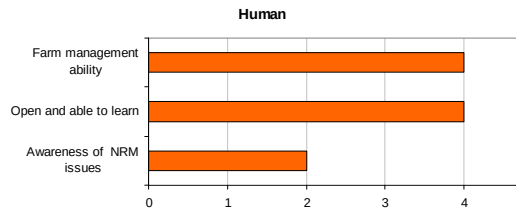
Human capital was assessed at moderate levels and required monitoring in the future. High levels of farm management ability and openness to learning offset low levels of awareness of NRM issues.

Social, natural, physical and financial capitals were all assessed as low and were below the level necessary to support effective NRM. Indicators with low scores include trust of government, sense of community, soil erosion, groundwater management, fencing, strategic watering points, farm profitability and high cost of NRM equipment. Collective action is required to improve these elements of NRM capacity.

Priorities for collective action

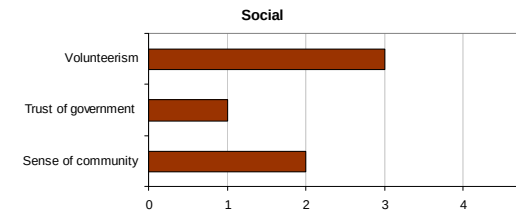
Priorities for collective action between land managers, CMAs and governments to enhance the adaptive capacity for NRM for large-scale land managers in the Hunter–Central Rivers CMA include:

- increasing the awareness of NRM issues, particularly amongst the growing population of absentee landholders in the region
- maintaining a strong sense of community through activities that promote community identity and social interaction
- creating processes that enable farmers to have participatory and local input into NRM policy
- engaging absentee landholders to improve their awareness and ability to manage and participate in community based NRM
- community education to manage soil erosion
- monitoring and researching of groundwater resources
- enhancing groundcover and educating the community about the issue
- raising the awareness, knowledge and funding opportunities for fencing and for location of strategic watering points to manage soil erosion and stock access to streams
- monitoring and maintaining soil banks across the CMA area
- improving the community attitude of farming – efforts should be made to increase farm profitability through extension and funding opportunities
- resolving the funding and management issues for availability of tillage equipment
- continuing the Farm Management Deposits (FMDs) scheme .



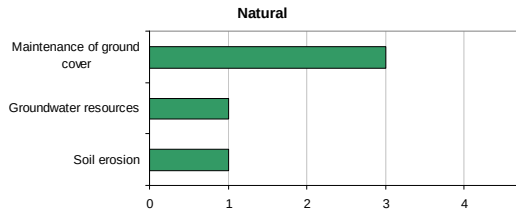
Human [self-assessment was moderate]

- A generally high level of farm management ability and openness to learning currently offset relatively low levels of awareness of NRM issues. Awareness increasing over time.
- Requires increase in awareness of NRM issues.



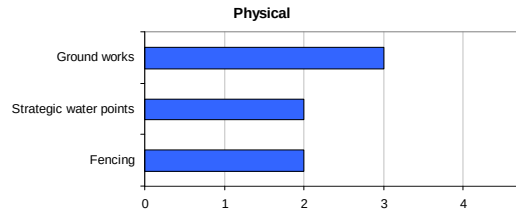
Social [self-assessment was low to moderate]

- Rural decline and low volunteering has reduced the sense of community to collectively manage NR. There is a disconnection between farmers and government NRM initiatives.
- Need to raise sense of community and awareness of NRM, and involve farmers in NRM policy.



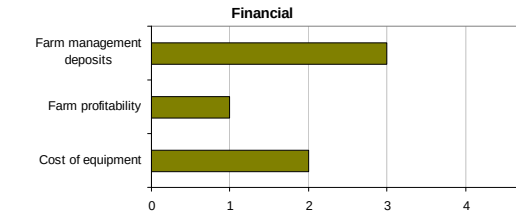
Natural [self-assessment was low]

- Soil erosion, groundwater management and vegetation management affect crop production and stocking rates.
- Education and monitoring of soil erosion, groundwater and groundcover is required.



Physical [self-assessment was low to moderate]

- Fencing and strategic watering points allow for effective grazing management, reduction in soil erosion and minimal creek damage. Ground works reduce soil erosion during flooding events.
- Awareness, knowledge, monitoring and funding is required.



Financial [self-assessment was low to moderate]

- Low farm profitability and high cost of equipment for NRM are constraints for undertaking NRM activities. FMDs allow appropriate NRM to occur during hard times.
- Community attitude of farming and farm profitability need to be increased, funding needs to be available for NRM equipment and FMDs should be continued.

Table B2.1: Human capital

Indicator	Why was this indicator chosen?
Awareness of NRM issues Awareness of NRM issues increases the capacity of land managers to manage NRs	This indicator was chosen because it is necessary for land managers to recognise NRM issues before they can manage them effectively.
Open and able to learn Being open and able to learn increases the capacity of land managers to manage NRs	This indicator was chosen because effectively responding to NRM issues requires land managers to change and adopt new practices.

Farm management ability Farm management ability increases the capacity of land managers to manage NRs	This indicator was chosen because the ability to manage a farm, mostly acquired through experience rather than formal education, helps farmers to make the right management decisions at the right times.

Assessment

Overall, human capital for smallholder farmers in this region was assessed to be at moderate levels, requiring monitoring into the future. A generally high level of farm management ability and openness to learning currently offset relatively low levels of awareness of NRM issues. However, awareness of NRM issues has been increasing steadily over the past 10 years. Awareness of NRM is important in this region due to the fragility of the environment, particularly in regards to erosion and pasture degradation. Climate change is also making awareness of NRM issues even more critical. A changing climate has also increased the importance of openness to learning and the adoption of new management practices. A growing awareness of NRM issues is part of a general trend toward improved farm management ability over the last 30 years, with the adoption of modern farming practices contributing significantly to the resilience and financial of farms during a string of recent poor seasons.

Priorities for collective action

Priorities for collective action between land managers, CMAs and governments to enhance human capital for NRM for large-scale land managers in the Hunter–Central Rivers CMA include:

- increasing the awareness of NRM issues, particularly amongst the growing population of absentee landholders in the region.

Table B2.2: Social capital

Indicator	Why was this indicator chosen?
Sense of community A sense of community increases the capacity of land managers to manage NRs	This indicator was chosen because a sense of community is essential to support collective action to manage NR.
Trust of government Trust of government increases the capacity of land managers to manage NRs	This indicator was chosen because leadership by governments is essential for enabling collective action to manage NR.
Volunteerism Volunteerism increases the capacity of land managers to manage NRs	This indicator was chosen because volunteerism is an indicator of the community health and viability necessary to support NRM.

Assessment

Overall, social capital for large landholders in this part of the Hunter Valley was assessed to be below the level necessary to support effective NRM, and therefore a high priority for collective action between land managers, CMAs and governments. Rural decline in the form of declining populations, local government amalgamations, and centralisation of community services in larger urban centres has been steadily reducing the sense of community necessary to collectively manage NR over many years. Declining rural populations and an increase in absentee land

ownership has also reduced the number of volunteers available to maintain community activities including those associated with NRM, increasing the responsibility and workloads of those that remain.

There is a general disconnect between governments and farmers that impacts on the capacity to manage NR. Regulation associated with land clearing, urban development and mining has reduced confidence and trust in government NRM initiatives. Centralised forms of regulation have not always led to the desired local NRM outcomes, and the complexity of regulation can impose significant costs on land managers.

Priorities for collective action

Priorities for collective action between land managers, CMAs and governments to enhance social capital for NRM for large-scale land managers in the Hunter–Central Rivers CMA include:

- maintaining a strong sense of community through activities that promote community identity and social interaction – schools are often a focal point of community participation, and maintaining local schools may be part of a broader set of strategies for enhancing community based NRM
- creating processes that enable farmers to have more direct and local input into NRM policy, and moving from a top down process to a more participatory process of developing and implementing policy
- engaging absentee landholders to improve their awareness and ability to manage NR, and participate in community based NRM.

Table B2.3: Natural capital

Indicator	Why was this indicator chosen?
Soil erosion Soil erosion reduces the capacity of land managers to manage NRs	This indicator was chosen because soil is affected by erosion and is influenced by the location of the farm in the valley and affects crop production, surface water quality, drainage networks and pasture for livestock.
Management of groundwater Access to groundwater resources can increase the capacity of land managers to manage NRs	This indicator was chosen because secure access to and good management of groundwater resources can increase stocking rates for grazing enterprises, but can be affected by mining operations.
Maintenance of groundcover Good vegetation cover increases the capacity of land managers to manage NRs	This indicator was chosen because good vegetation cover moderates the impact of soil erosion and groundwater resources.

Assessment

Overall natural capital for large-scale land managers was assessed to be below the level necessary to support effective NRM, and therefore a high priority for collective action between land managers, CMAs and governments.

Soil erosion and management of groundwater resources were identified as very low and therefore high priorities for action. Soil loss reduces crop production and reduces surface water quality and

effects both cropping and grazing enterprises. The demand for groundwater has been increasing and supplies are decreasing with severe water shortages anticipated in some areas of the catchment. In some areas bores have been drying up and deeper bores are required. There was a belief that the mines in the area are altering the water table through the mining operations and through the use of the groundwater.

The maintenance of groundcover was identified as moderate and therefore it is necessary to continue some action and to continue monitoring condition. A diversity of species was seen as important in achieving good groundcover and there appeared to be a trade-off between introduced and native grasses (which can take a long time to establish). Revegetation is required in some areas.

Priorities for collective action

Priorities for collective action between land managers, CMAs and governments to enhance natural capital for NRM for large-scale land managers in the Hunter–Central Rivers CMA include:

- community education to manage soil erosion – Department of Primary Industries–Agriculture runs ProGraze courses, monitoring of groundcover and teaching people how to do it and long-term funding commitment is required to deal with the issue and planting grasses and trees will reduce soil erosion
- monitoring of groundwater resources – research is required on groundwater connectivity, recharge rates, extent of body, and of the effect of mining on the groundwater resource
- introducing native trees and groundcover in areas with poor vegetation cover – there is a need to educate the community to manage this issue and the CMA could assist with proactive vegetation management.

Table B2.4: Physical capital

Indicator	Why was this indicator chosen?
Fencing Fences increase the capacity of land managers to manage NRs	This indicator was chosen because fences allow land managers to effectively manage grazing impacts and reduce soil erosion.
Strategic water points Strategic watering points increase the capacity of land managers to manage NRs	This indicator was chosen because locating watering points in strategic locations can reduce soil and stream impacts from grazing pressure and improve crop production.
Ground works (construction and maintenance of graded banks) Ground works increases the capacity of land managers to manage NRs	This indicator was chosen because the constructing and maintenance of graded banks reduces soil erosion particularly during heavy rainfall events.

Assessment

Overall physical capital for large-scale land managers was assessed to be low to moderate and was not considered sufficient for effective NRM. Collective action is required between land managers, CMAs and governments.

Fencing and strategic watering points were identified as high priorities for action. Fencing allows for effective grazing management, but many fences are in poor condition. They are often the last thing to get replaced when money is tight and labour is not always available to maintain them. Well maintained fences increase the value of properties and ensure neighbouring property owners are happy. Watering points need to be strategically located to minimise soil erosion problems and to keep stock out of water courses; however, knowledge is required to do this effectively.

Ground works were identified as moderate priority for action. Well designed graded banks have proven to be a cost-effective and reliable strategy for soil erosion management. Many banks are old and deteriorated and need continual monitoring and management.

Priorities for collective action

Priorities for collective action between land managers, CMAs and governments to enhance physical capital for NRM for large-scale land managers in the Hunter–Central Rivers CMA include:

- raising the awareness, knowledge and funding opportunities for the importance of fencing to manage soil erosion
- raising the awareness, knowledge and funding opportunities for the importance of location of strategic watering points to manage soil erosion and stock access to streams – funding for development of water infrastructure is crucial
- maintaining soil banks across the CMA area should be maintained and monitoring of soil banks need to be done on regular basis.

Table B2.5: Financial capital

Indicator	Why was this indicator chosen?
Cost of equipment The high cost of equipment decreases the capacity of land managers to manage NRs	This indicator was chosen because the high cost of tillage equipment necessary for effective NRM is out of reach for many individual farmers.
Farm profitability Poor farm profitability decreases the capacity of land managers to manage NRs	This indicator was chosen because poor farm profitability reduces the capacity of farmers to implement important NRM strategies on their farms.
Farm Management Deposits (FMDs) FMDs increase the capacity of land managers to manage NRs	This indicator was chosen because FMDs allow farmers to manage their enterprises through good and bad times so that they preserve their natural resources (eg de-stock at the right time).

Assessment

Overall financial capital for large-scale land managers was assessed to be low to moderate and in general was not supporting effective NRM. Collective action is required between land managers, CMAs and governments.

Farm profitability was identified as a very high priority for action. Lack of money is a constraint – farmers cannot afford to pay for labour so is hard to get things done. There was a perception that

off-farm income was necessary in order to support farming and NRM activities and that if farmers had more money, they would implement important management strategies on their farms.

Cost of equipment was identified as a high priority for action. Much of the equipment is too expensive. Some tillage equipment can be hired on a seasonal basis, but there are problems with availability at the right time. There are lots of old machinery and little turnover and labour is required which is not always available.

FMDs were identified as a moderate priority for action. FMDs reduce fluctuations in farmers' incomes and provide sufficient funds for undertaking production and NRM activities. It was considered important to be able to put money aside during the hard times.

Priorities for collective action

Priorities for collective action between land managers, CMAs and governments to enhance financial capital for NRM for large-scale land managers in the Hunter–Central Rivers CMA include:

- changing community attitude – importance of valuing the land and how it is managed. Need to have a higher value placed on the importance of production of food, and the resource (grain for oil vs. grain for food). Efforts should be made to increase farm profitability through extension and funding opportunities
- resolving funding and management issues for availability of tillage equipment
- continuing the FMDs scheme.

B3. The small-scale landholders workshop

Summary

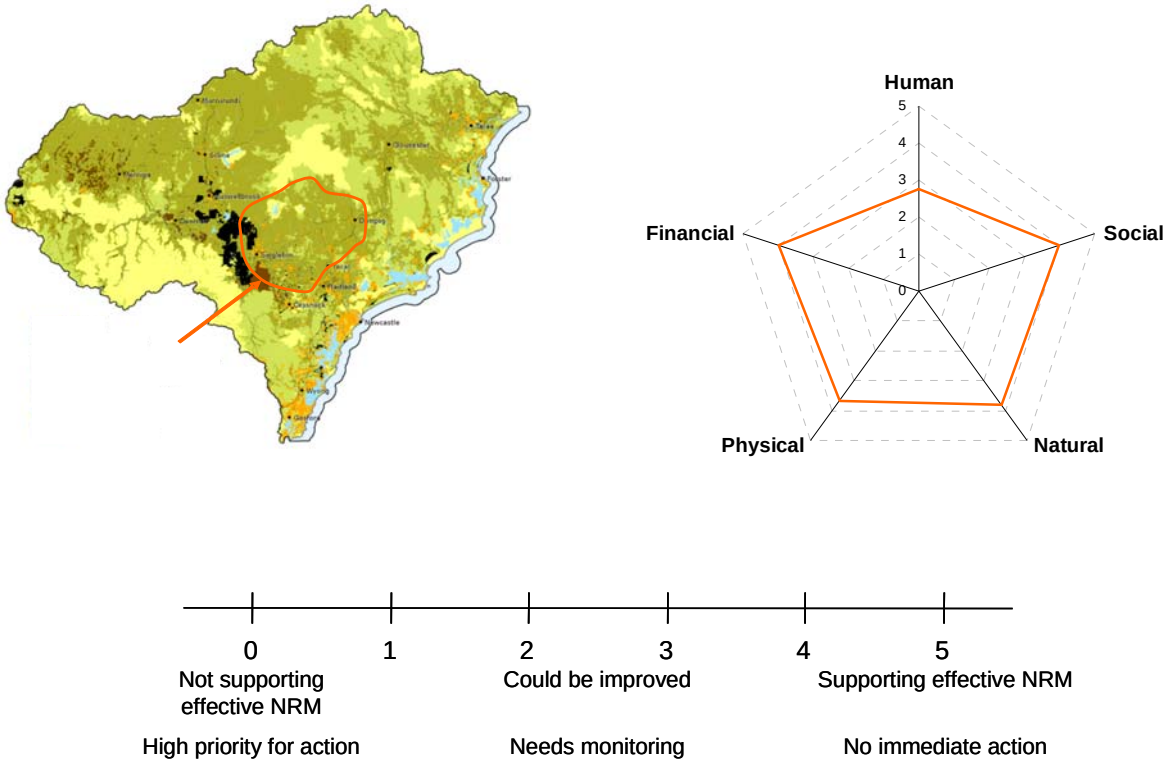


Figure B3.1: Self-assessed adaptive capacity of small-scale land managers, Hunter–Central Rivers CMA, May 2008

Small-scale landholders are land managers in the central part of the Hunter–Central Rivers CMA that own and manage relatively small areas of land. Most land managers have off-farm income and diverse farming enterprises.

Adaptive capacity

Small-scale landholders identified themselves as having moderate to high levels of adaptive capacity that are currently supporting effective NRM.

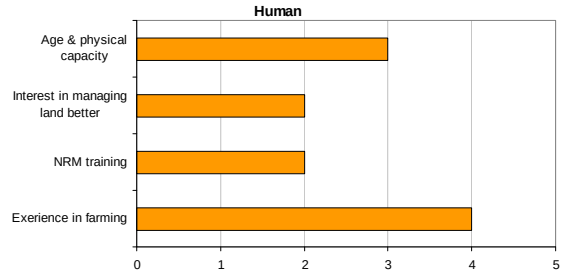
Human capital was assessed as the lowest of the capitals and was below the level necessary to support effective NRM. Key issues identified include poor attendance and availability of NRM training (eg field days, NRM short courses, TAFE courses) and a low interest in managing land better. These are high priorities for collective action.

Social, natural, physical and financial capitals were all rated moderate to high and were effectively supporting NRM. Indicators with low scores include participation in NRM and production groups, weeds in riparian zones, soil quality and fencing for riparian zones. Collective action is required to improve these elements of NRM capacity.

Priorities for collective action

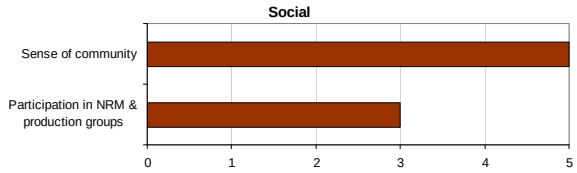
Priorities for collective action between land managers, CMAs and governments to enhance the adaptive capacity for NRM for small-scale land managers in the Hunter–Central Rivers CMA include:

- recruiting younger families in the region into NRM groups to offset the ageing trend in NRM participants
- raising awareness and redesigning NRM training opportunities to increase adoption
- maintaining a strong sense of community and high participation in NRM groups
- increasing awareness and management of acid and saline soils
- improving seasonal management of weeds along waterways
- raising awareness of fencing for riparian zones
- raising awareness of funding available for NRM through the CMA
- increasing the aspirations of landholders for improved NRM outcomes.



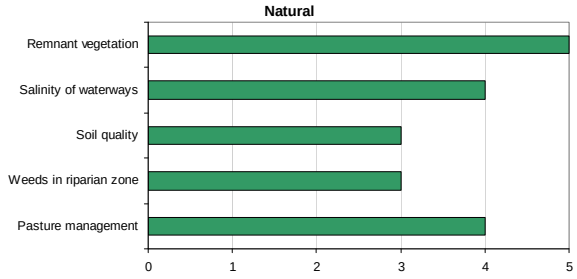
Human

- Self-assessment included low and high indicators, requires monitoring and some action in the future
- Experienced farmers support effective NRM, but this ageing population poses a future risk to NRM as age reduces physical ability
- Collective action is required to recruit younger families into the region and raise awareness and redesign training opportunities to be more flexible.



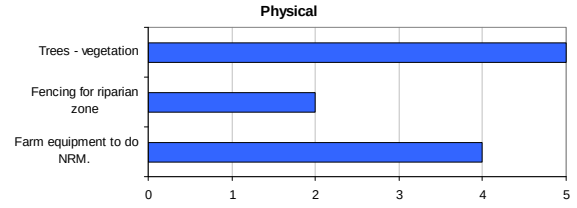
Social

- Self-assessment was high
- A strong sense of community flows through to relatively high participation in NRM activities
- Maintaining a strong sense of community and high participation in NRM groups is required.



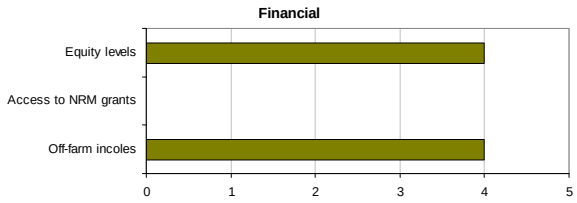
Natural

- Self-assessment was moderate to high
- These indicators affect stocking rates, water and soil quality
- Collective action is required to increased awareness of weeds in riparian zones and for improved soil quality.



Physical

- Self-assessment was moderate, but low for fencing riparian zones
- Farm equipment and trees/vegetation were assessed as high and adequately supports NRM
- Increased awareness is required for fencing of riparian zones.



Financial

- Self-assessment was high
- Off-farm incomes and equity levels were considered high and allows for investment in NRM. Young families need support and encouragement
- Awareness of funding opportunities and to increase aspirations is required.

Table B3.1: Human capital

Indicator	Why was this indicator chosen?
Experience of farming Experience of farming increases the capacity of land managers to manage NRs	This indicator was chosen because experience of farming can assist farmers to select the easiest and most locally appropriate management response to changing circumstances, and to cope with extreme events like floods and droughts.
NRM training – field days and short courses NRM training increases the capacity of land managers to manage NRs	This indicator was chosen because NRM training provides the awareness, knowledge and skills to appropriately manage NRM issues on farm, and do so in a way that contributes effectively to NRM across the region.

Interest in NRM *Interest in NRM increases the capacity of land managers to manage NRs*	This indicator was chosen because action to effectively manage NRs depends on awareness of NRM and personal commitment to doing something about it.
Age and physical capacity *Increasing age and reduced physical capacity can reduce the capacity of land managers to manage NRs*	This indicator was chosen because the population in the region is ageing, and an anticipated decline in the ability of older farmers to do physical work on farm could diminish future capacity to manage NRs across the region.

Assessment

Overall, human capital for small-scale land managers in this region was assessed to be moderate levels, requiring monitoring into the future. NRM in the region is currently supported by the presence of experienced farmers, often retiring to smaller properties in the region after a lifetime farming in agricultural regions further west. This ageing population of farmers also poses a future risk to NRM in the region that needs monitoring and early intervention, as age reduces physical capacity to manage NR. If addressed, relatively low uptake of NRM training opportunities was flagged as an opportunity to enhance the future NRM capacity of smallholder farmers in this region.

Priorities for collective action

Priorities for collective action between land managers, CMAs and governments to enhance human capital for NRM for small-scale land managers in the Hunter–Central Rivers CMA include:

- recruiting younger families in the region into NRM groups to offset the ageing trend in NRM participants through increased awareness family friendly events and opportunities for involvement that suit busy people working off-farm
- raising awareness and redesign NRM training opportunities to increase adoption by groups currently underrepresented in participation, particularly younger families and busy people working off-farm – this could include building and promoting socialising features of these events.

Table B3.2: Social capital

Indicator	**Why was this indicator chosen?**
Participation in NRM groups *Participation in NRM groups increases the capacity of land managers to manage NRs*	This indicator was chosen because participation in NRM groups provides confidence and motivation to do NRM activities, while also building and social and support networks.
Sense of community *A sense of community increases the capacity of land managers to manage NRs*	This indicator was chosen because a sense of community forms the basis for collaboration to manage NR, provides pathways for the flow of ideas through the community, and supports the networks through which CMA staff interact with the community.

Assessment

Overall, social capital for small-scale land managers was assessed to be high and effectively supporting NRM in this part of the Hunter Valley. A strong sense of community is supported by lots

of community activities such as dances, market days, car-boot sales and cultural events, often organised around the presence of a community hall. This strong sense of community flows through to relatively high participation in NRM activities relative to other events.

Priorities for collective action

Priorities for collective action between land managers, CMAs and governments to enhance social capital for NRM for small-scale land managers in the Hunter–Central Rivers CMA include:

- maintaining a strong sense of community and high participation in NRM groups.

Table B3.3: Natural capital

Indicator	Why was this indicator chosen?
Pasture management *Sustainable pasture management increases capacity of land managers to manage NRs*	This indicator was chosen because land managers need to effectively manage stocking rates to avoid degradation of land resources.
Weeds in riparian zone *Weeds in riparian zone decrease the capacity of land managers to manage NRs*	This indicator was chosen because riparian weeds overgrow creeks, reduce stock access to water and can affect livestock health.
Soil quality *Acid and sodic soils decrease the capacity of land managers to manage NRs*	This indicator was chosen because soil quality (particularly acidic and saline soils) is poor in some parts of the catchment which affects carrying capacity.
Salinity of waterways *Salinity reduces water quality and decreases capacity of land managers to manage NRs*	This indicator was chosen because saline water reduces stocking rates and land productivity.
Remnant vegetation *Remnant vegetation increases capacity of land managers to manage NRs*	This indicator was chosen because remnant vegetation controls erosion, provides shade for livestock and absorbs carbon.

Assessment

Overall natural capital for small-scale land managers was assessed to be moderate to high and in general was supporting effective NRM. However, there were some areas where collective action was required between land managers, CMAs and governments.

Weeds in the riparian zone and soil quality (acid and saline soils) were identified as moderate priorities for action. Weeds were identified as a seasonal problem exacerbated by flooding events. If not actively managed they can spread into other production areas. Soil quality is poor in some areas of the catchment and effort is required to increase knowledge and awareness of the problem and to improve soil quality to increase stocking rates.

Pasture management and salinity of waterways were identified as moderate to high and require monitoring. Remnant vegetation was considered high and is supporting effective NRM. No immediate action is required.

Priorities for collective action

Priorities for collective action between land managers, CMAs and governments to enhance natural capital for NRM for small-scale land managers in the Hunter–Central Rivers CMA include:

- increasing awareness and management of acid and saline soils
- seasonal management of weeds along waterways.

Table B3.4: Physical capital

Indicator	Why was this indicator chosen?
Farm equipment to do NRM *Appropriate farm equipment increases capacity of land managers to manage NRs*	This indicator was chosen because access and availability of farm equipment is essential to do NRM activities.
Fencing for riparian zone *Protecting riparian zones increases capacity of land managers to manage NRs*	This indicator was chosen because fencing is important to control grazing impacts around riparian zones.
Trees – vegetation *Vegetation increases capacity of land managers to manage*	This indicator was chosen because trees and vegetation improve biodiversity.

Assessment

Overall physical capital for small-scale land managers was assessed to be moderate and in general was supporting effective NRM. However, there were some areas where collective action is required between land managers, CMAs and governments.

Fencing of riparian zone was assessed as low and is therefore identified as a priority for action. Fencing needs improvement to control grazing impacts and was considered hard work. More fences are required in some areas and monitoring of fence condition is important.

Farm equipment to do NRM and trees/vegetation were assessed as high to very high and in general were adequately supporting NRM for small-scale landholders but require monitoring.

Priorities for collective action

Priorities for collective action between land managers, CMAs and governments to enhance physical capital for NRM for small-scale land managers in the Hunter–Central Rivers CMA include:

- the need to raise awareness of fencing for riparian zones. Financial assistance is available. It was important to emphasise that cattle do not have to be excluded forever. Education is required to raise levels of knowledge. There was no 'big stick' or penalty available to encourage exclusion.

Table B3.5: Financial capital

Indicator	Why was this indicator chosen?
Off-farm income *Diversity of income sources increases capacity of land managers to manage NRs*	This indicator was chosen because off-farm incomes are high in this area because of mines and allows landholders to spend money on NRM issues.
Access to NRM grants *Availability of NRM funds increases capacity of land managers to manage NRs*	This indicator was chosen because funding is available through the CMA and other sources to undertake activities to improve NRM outcomes.
Equity levels *The availability of household cash increases capacity of land managers to manage NRs*	This indicator was chosen because people (households) in the region are generally well-off (high equity) and are more likely to invest in NRM improvements.

Assessment

Overall financial capital for small-scale land managers was assessed to be high and is supporting effective NRM. However, there were some areas where collective action is required between land managers, CMAs and governments.

Off-farm incomes and equity levels for small-scale land managers in this region are high and this allows for investment in NRM outcomes. Small-scale land managers have a strong interest in the land and are likely to improve their NRs. It was identified that young families still need encouragement because they are time or cash limited for NRM investment. NRM funds are available through the CMA and other sources (eg Landcare), but there was some apathy which was linked to low aspirations.

Priorities for collective action

Priorities for collective action between land managers, CMAs and governments to enhance financial capital for NRM for small-scale land managers in the Hunter–Central Rivers CMA include:

- raising awareness of funding available for NRM through the CMA
- increasing the aspirations of landholders for improved NRM outcomes.

B4. The development community workshop

Summary

1. Influence of developers on NRM:

- Developers transform relatively undeveloped or natural landscapes into urban landscapes.
- They contribute to decisions that influence the balance between development and conservation across broader regional landscapes.
- They work to minimise the ecological footprint of development with a complex legislative framework.

2. Capacity of developers to influence improved NRM:

- Developers work within a complex legislative environment in which the goals of development are highly contested, and alternative forms of regulation often cause tension.
- Step wise resolution of this complexity tends to lead to suboptimal development and NRM outcomes, because there is no mechanism for achieving consensus between multiple competing interests.

3. Opportunities to improve the NRM capacity of developers:

- Establish informal deliberative, participatory and adaptive facilitation processes that enable the multiple stakeholders to come together to holistically design optimal development and NRM outcomes.
- Emphasise a whole-of-landscape perspective in planning processes rather than on a site-by-site basis.
- Invest in developing science based metrics that inform holistic trade-off decisions to improve multiple development and NRM outcomes across regional landscapes, and embed the use of these in the participatory governance mechanisms.

4. Recommendations for monitoring and evaluation:

- The evolution and effectiveness of (a) deliberative, participatory and adaptive facilitation processes, (b) whole-of-landscape planning processes and (c) science based methods and metrics could be monitored over time.

Introduction

Urban land developers have been identified by the Hunter–Central Rivers CMA as contributing significantly to the management of NRs in the region. The links between urban development and the agricultural, rural and conservation activities that form the focus of CMA activities remain relatively unexplored. This report summarises the outcomes of a workshop held with developers in Newcastle in May 2008 to better understand:

1. the direct and indirect ways in which developers influence NRM
2. the opportunities and constraints affecting the capacity of developers to influence improved NRM

3. priorities for collective action between developers, the CMA, government agencies and other stakeholders to improve NRM.

The workshop

The purpose of the workshop was to better understand the ways in which urban developers influence NRM in the Hunter region, and to identify priorities for collective action between developers, the CMA, governments and other stakeholders to improve NRM. The capability provided by rural livelihoods analysis to assess the capacity of land managers was presented as an example of how capacity can be assessed in rural contexts. This set the scene for a discussion of the role of developers in NRM, and influences on their capacity to contribute to improved NRM outcomes.

The workshop was held at DECCW office in Newcastle in the afternoon of Wednesday 7 May 2008. Participants included two senior development managers with urban development companies, two members of the consulting industry that provides technical support to urban development companies, a CMA Program Manager and members of the Target 13 project team (NSW DECCW and CSIRO).

Main discussion points

Urban developers transform land and other NRs from relatively undeveloped states to more developed states that support human habitation and add to economic development and social well-being. This is analogous to transforming relatively undeveloped forms of natural capital into managed forms of physical and financial capital. This process can have either positive or negative implications for NRM, depending on the pre-existing condition of NRs and the immediate and ongoing impacts of development.

The influence of developers on NRM

Developers have important direct and indirect impacts on NRM. Firstly and perhaps most obviously, developers influence NRM directly by driving development processes that transform relatively undeveloped or natural landscapes into more urban landscapes. Urban land development includes decisions on where to locate development across the landscape, and on the nature and intensity of development at specific sites.

Secondly and perhaps less obviously, developers influence the balance of development and conservation across broader regional landscapes. Through land-use planning decisions they contribute to decisions over which areas are managed for NR outcomes, which areas are conserved or protected. Developers have a strong and increasing awareness of the ecological footprints of development, and their business success is increasingly influenced by their ability to minimise these impacts. Although yet to be operationalised, there is growing interest in offset or biobanking schemes with potential to balance development and conservation across the broader landscape. More efficient and intensive development in areas of low NR value can reduce demand to develop areas of high natural value.

Capacity of developers to influence improved NRM

The capacity of developers to influence improved NRM is itself influenced by the policy environment in which land-use planning decisions are made. In turn, developers contribute to the creation of institutional arrangements that affect the future management of NRs by others.

Developers are influenced by a multitude of legislation and regulation affecting the management of native vegetation, protection of buffer zones along water courses, the management of vegetation to reduce bushfire hazard and many more. The process of development approval currently involves a linear, consecutive resolution of individual issues with separate agencies. No single agency has responsibility for achieving an integrated overall balance of development and NRM outcomes, undermining the perceived credibility of approval processes. The result can be a prescriptive implementation of fragmented regulation which leads to both suboptimal development and NRM outcomes. For example, development restrictions in areas with low conservation value can exacerbate demand for development in areas of higher conservation value. Development near existing services, public transport, and infrastructure has a lower ecological footprint and can lead to improved socio-economic outcomes in terms of affordable housing and quality of life. More efficient use of land will lead to less pressure being put on areas of habitat that should be preserved.

The current institutional context in which developers operate does little to promote the basic principles of adaptive management and governance. Urban development frequently results in natural areas managed under community title. Developers have a significant influence on establishing the conditions under which these areas are managed into the future. Once established, however, it is usually impractical to seek agreement to adapt these management prescriptions to changing environmental, social or economic conditions across the many joint holders of a community title. The result can be suboptimal NRM outcomes in the longer term.

Opportunities to improve the NRM capacity of developers

Participants at the workshop identified several opportunities for developers, the CMA, government agencies and other stakeholders to work collectively to improve NRM outcomes:

1. Establish informal deliberative, participatory and adaptive facilitation processes that enable the multiple stakeholders with interests in urban development to come together to holistically design optimal development and NRM outcomes. This is required on a local and regional level, rather than a site-by-site basis)
2. Emphasise a whole-of-landscape perspective in planning processes to enable development trade-offs to be made across regional landscapes rather than on a site-by-site basis
3. Develop holistic and participatory land development approval processes that enable the multiple development and NRM outcomes to be negotiated across regional landscapes by:
    a) investing in the development of science based methods and metrics that can inform development/conservation trade-off decisions across regional landscapes
    b) embed the use of these metrics in deliberative, participatory and adaptive resource governance mechanisms that facilitate the resolution of competing interests between multiple stakeholders to achieve holistically optimal development and NRM outcomes.

It was recognised that while CMAs could potentially make an important contribution to improving the capacity of developers to enhance NRM outcomes, urban development is not their primary role. CMAs can and do contribute to the informal facilitation of deliberative, participatory and adaptive processes for resolving competing interests in NRM.

Recommendations for monitoring and evaluation

The opportunities to enhance the capacity of developers to influence improved NRM outcomes identified during the workshop also suggest obvious opportunities to monitor changes in this capacity over time. These include the following:

1. Developers currently report that informal deliberative, participatory and adaptive facilitation processes that could enable the multiple stakeholders to holistically design optimal development and NRM outcomes are largely absent. The evolution and effectiveness of these processes could be monitored over time.
2. Developers currently report a linear and fragmented approach to development approval. The evolution and effectiveness of whole-of-landscape planning processes could be monitored over time.
3. Developers currently report a lack of science based methods and metrics capable of informing development/conservation trade-off decisions across regional landscapes. The evolution of science based methods and metrics could be monitored over time, along with the evolution of deliberative, participatory and adaptive resource governance processes necessary to effectively implement them.

B5. The coal mining representatives' workshop

Hunter–Central Rivers Catchment, Singleton, Wednesday 14 May 2008

Introduction

The mining industry was identified by the Hunter–Central Rivers CMA as contributing significantly to the management of NRs in the region. The links between the mining industry and the agricultural, rural and conservation activities that form the focus of CMA activities have been explored to a fair degree, but further examination is required. This report summarises the outcomes of a workshop held with the mining industry in Singleton in May 2008 to better understand:

- the direct and indirect ways in which the mining industry influence NRM
- the opportunities and constraints affecting the capacity of the mining industry to influence improved NRM
- priorities for collective action between the mining industry, the CMA, government agencies and other stakeholders to improve NRM.

The workshop

The purpose of the workshop was to better understand the ways in which the mining industry influences NRM in the Hunter–Central Rivers region, and to identify priorities for collective action between developers, the CMA, governments and other stakeholders to improve NRM. The capability provided by the Rural Livelihoods Analysis to assess the capacity of land managers was presented as an example of how capacity can be assessed in rural contexts. This set the scene for a discussion of the role of the mining industry in NRM, and influences on their capacity to contribute to improved NRM outcomes.

The workshop was held at the Singleton Library in the morning of Wednesday 14 May 2008. Participants included representatives of four of the major coal mining companies in the Hunter Valley with responsibility for environmental management or community coordination, a manager from a company providing environmental management services to several other Hunter Valley coal mining companies, a catchment coordinator from the CMA and members of the Theme Team (NSW DECCW and CSIRO).

Main discussion points

The mining industry affects NRM through three types of land-uses (open-cut mining and underground mining):

1. Areas currently being mined
2. Potential areas for mining in the future
3. Periphery around other areas (no potential for coal; buffer areas).

These land-uses vary from extraction of resources at one end of the scale to protection and enhancement of NRs at the other extreme. There are a range of positive and negative affects for NRM through the process of mining, depending on the potential of mineral resources that the mining industry wish to extract and the buffer areas and post-mining regeneration of areas.

The influence of mining industry on NRM

The mining industry has important affects on NRM through direct and indirect links with the CMA. Such links include working with 'GreenCorps' for weed control, tree planting, erosion control, and involving neighbouring landholders, and rehabilitation work along shared riparian areas. In general, the aim of the mining industry is to have mutual positive impacts for NRM and involve the community at various scales.

There are various kinds of impacts of mining on NRs and other landholders. For underground mining there are subsidence issues, but the mining companies generally own the land where these affects occur (although some landholders may be affected). Most impacts are minimal. There is a lot of monitoring conducted to assess the current status, and much work towards repairing dams, fences, and putting in additional contour banks for erosion control. The mining industry is keen to do what is necessary for land managers to continue. Plans of management are established with neighbouring land managers, and are managed on a site-by-site basis. For open-cut mining, there are impacts on air pollution, dust, noise etc. Neighbouring owners are given an option for purchase of land if there are significant potential impacts.

There are often significant social impacts as a result of the mining operations. For example, land deemed suitable for mining have been owned by successive generations of farming families, so there are often strong ties to the land. In some cases though, some landowners lease back land after the mining to continue to work the land. However, the mining industry will not encourage mining to go ahead if landowners don't want to be involved.

In buffer areas, the mining industry encourages the continuation of agricultural production to maintain links to the land, but there is an opportunity to integrate benefits to biodiversity and to use offsets. This comes from screen planting and aesthetics near mining areas, which also provide some ecosystem services (noise reduction, dust capture etc). The mining industry is keen to ensure the land is managed appropriately, with a good balance between production and conservation.

After mining has ceased in an area, the mining industry reclaims the land. There are often tensions between biodiversity and production values, and there is consultation with the community about final landforms and land-uses. This is aspirational rather than regulatory, and the mining industry does not have to accept what has been recommended.

For leaseholders on agricultural land, the mining companies cannot tell them what to do; there is a licence that describes management practices. Examples of management include no grazing of river banks without the consent from the mining company. However, there can be some crash grazing to remove plant rubbish. No major earth works (dams) can be conducted without consent and pest and weed control must be put in place. The vision for these leases is to ensure leaseholders use current best practice. Licences are generally for two years, but can be for up to five years. The problem is that there is no incentive for good management. Some companies have their own pastoral companies running and managing stock (so there are good controls on management), but other mining companies do not.

There are some important behavioural issues with farmers who may not be using current best practices for management. For example, some farmers are not willing to allow planting of trees along riparian areas or rehabilitate areas after flooding.

In general, the mining companies are well aware of NRM issues and are trying to raise the profile and importance of NRM. The CMA is also involved through raising standards. There are some good examples where there are direct partnership projects with mining companies on non-mining land, and achieving NRM outcomes on agricultural land. Important outcomes include native vegetation, soil salinity, river red gum rehabilitation and monitoring and research and a biodiversity strategy.

Capacity of mining industry to influence improved NRM

There are some limitations on mining in areas because of threatened ecosystems, such as endangered river red gum communities. However, there is a good opportunity to take marginal pasture land out of production and put it into conservation land.

Biobanking is a methodological approach currently being explored to help target specific areas with the aim of having a net positive impact on biodiversity outcomes. The mining industry has to manage this land on a case-by-case basis. They encourage research to be conducted on these areas. It is an approach to put a value on large areas of undeveloped land and sell to mining companies as offset areas. This can create an open market and could include a market system for carbon credits.

There are good interactions between the mining industry and the CMA, although it is not a requirement to involve the CMA. There is a dedicated contact within the CMA. The CMA provides direction for where investment should occur, linked with appropriate technical experience and provides financial assistance for landholders. The CMA CAP is used as a basis for planning and development within the CMA, to align consistency of action, and provides background for policy statements.

There is now good overlap of interest between the mining industry and the CMA, for example in areas affected by salinity and for the management of river red gums. The CMA has good links to local communities and the mining industry have a strong interest in working with local communities and with cooperation with the CMA. The CMA helps form partnerships and it easy to set up agreements with the CMA.

Opportunities to improve the NRM capacity of mining industry

There were a range of opportunities discussed, to improve NRM capacity of the mining industry. These include the following:

- Closer relationships would be maintained between different government agencies – there was a perception that there were too many government agencies and for each different management issue there was a range of departments that had to be liaised with.
- Water management issues were seen as important, especially for the farming and agriculture perspective (eg lucerne farmers, dairy farmers).
- The future is uncertain, especially with reduced allocations in the future –water rights are kept as part of the lease and water is used and reused for mining operations.

- CMAs provide advice and assistance to the mining industry, but they are not a regulator. They can, however, provide a link between regulators and the mining companies. The CMAs make comments on mining plans and ensure consistency with CAP and native vegetation act to maintain environmental outcomes. The main focus is off-mine and buffer areas. Land management planning includes soil and salinity management, pasture management, riparian zone management and revegetation protection and enhancement (on steep, highly erodible areas).
- The CMA can play an important role in the implementation of broader outcomes –there is a need to revitalise the Department of Mineral Resource's 20-year plans (now run by Department of Primary Industries – Agriculture) including revisions on landscape plans across mine sites, connections between different holdings, biobanking and offset programs (location of areas to facilitate corridors), and links to Greening Australia.
- The big picture issues often tend to get lost when regulators closely examine single resource management issues and there are only finite resources to manage these.
- The profile of communication, research and awards for environmental excellence needs to be increased – the Hunter Coal and Environment Group (plus the Minerals Council Group) provides a forum for the mining industry and includes many environmental consultants and the CMA.
- There is much research conducted through the Australian Coal and Agriculture Research Project (ACARP) in different topic areas and assessed by a panel – this was seen as a way to engage with the CMA and to identify and fill knowledge gaps, with funding coming from levies.
- There need to ensure the research work undertaken though the mining companies gets well communicated is important.
- The profile of environmental excellence needs to be increased through the Champion of Excellence Awards through Landcare.
- The mining industry needs to maintain communication and links with local communities and indigenous communities.
- The coal industry actively gives indigenous owners an active voice in the salvage and management of archaeological sites and influences the NRM implications for how an area is managed. There are good links with local cultural heritage groups and there is an Aboriginal Trust. The industry must follow the laws.
- The mining industry is strongly involved in liaison with local community groups and there must be focused discussion on the immediate impacts of mining as well as current best management practices.

B6. NRM capacity in the Hunter–Central Rivers region

Target: There is an increase in the capacity of NR managers to contribute to regionally relevant NR management.

Overall condition:  Trend: ? Confidence: L–M

Two workshops were held in the Hunter–Central Rivers region to assess the capacity of land managers to contribute to regionally-relevant NRM (Fig. B6.1). At each workshop, participants identified several indicators of *human*, *social*, *natural*, *physical* and *financial* capital that enable or constrain NRM in their local area (Table B6.2). Participants rated each indicator on a scale of 0 to 5. The averages of the indicators for each type of capital are plotted on a spider chart (Figure B6.2) and the average for each capital and each subregion was used to assess the overall condition. Participants also self-assessed the trend in condition for each indicator.

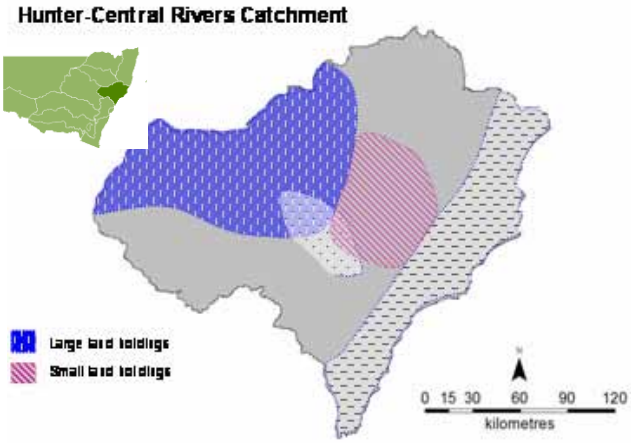


Figure B6.1: Map of the Hunter–Central Rivers region and the areas represented by the small- and large-scale landholder workshop groups

Nine large-scale mixed farmers attended a workshop at Cassilis and described themselves as being representative of the large landholders concentrated largely in the upper parts of the catchment. Cattle production and cropping are the main enterprises for these landholders. Five small-scale landholders attended a workshop in Singleton; they were primarily life-style landholders with off-farm income and diverse farming enterprises (Figure B6.1).

The large-scale group had relatively low levels of social, natural, physical and financial capitals that limited their capacity for NRM. Human capital was relatively high. The small-scale landholders had relatively high levels of all capitals, except human capital, which was moderate.

For large-scale landholders, the primary constraints to NRM were the low profitability of farming, aspects of groundwater management (particularly in relation to the impacts of mining on aquifers) and concerns about the level of engagement with landholders by government in NRM decision-making.

For small-scale landholders, key constraints to NRM action related to a lack of enthusiasm, interest and engagement in NRM by their community. Off-farm income, largely through employment in the mining sector, was seen as strongly supporting NRM on small holdings.

Both landholder groups believed that, within their communities, the experience and ability in farm management of many landholders effectively supported NRM.

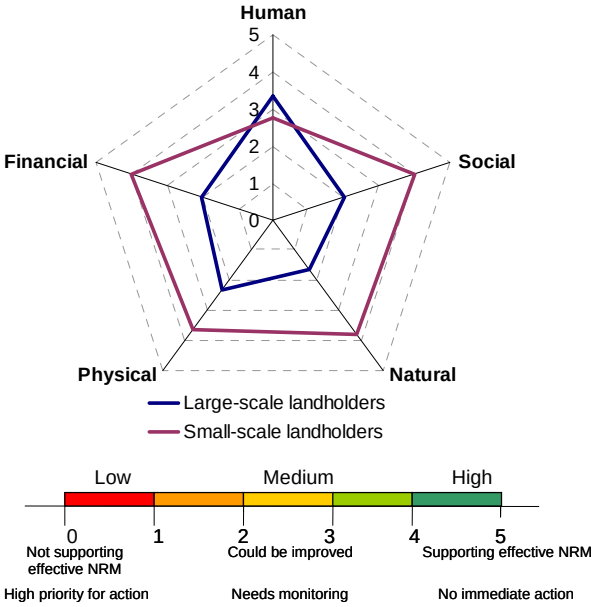


Figure B6.2: Self-assessed capacity to manage NRs in the Hunter–Central Rivers region

Table B6.1: Examples of the capitals

Capital	Examples
Human	skills, health and education
Social	family, community and other social networks and services
Natural	productivity of land, water and biological resources
Physical	infrastructure, equipment and breeding resources
Financial	access to income, savings and credit

Table B6.2: Indicators of capacity for large-scale land managers

Indicator	Condition	Trend	Pressures/importance of indicator
Human capital (the skills, health and education that contribute to the capacity to manage NRs)			
Awareness of NRM issues		?	Necessary for land managers to recognise NRM issues before they can manage them effectively.
Openness and ability to learn		?	Responding to NRM issues requires change and adoption of new practices.
Farm management ability		?	Acquired through experience rather than formal education. Helps farmers make timely management decisions.
Social capital (the family and community support available, and networks through which ideas and opportunities are accessed)			
Sense of community		?	Essential to support collective action to manage NRs.
Volunteerism		?	Indicates the community's health and viability necessary to support NRM.
Trust of government		?	Leadership by governments essential to enable collective action for NRM.
Natural capital (the productivity of land, water and biological resources from which rural livelihoods are derived)			
Soil erosion		?	Influenced by location of the farm in the valley and affects crop production.
Groundwater management		?	Secure access/good management can increase stocking rates.
Groundcover maintenance		?	Moderates the impact of soil erosion and groundwater resources.
Physical capital (the infrastructure, equipment and breeding improvements to crops and livestock that contribute to rural livelihoods)			
Fencing		?	Allows land managers to effectively manage grazing impacts and reduce soil erosion.
Strategic water points		?	Strategic watering points can reduce soil and stream impacts from grazing pressure and improve crop production.
Groundwork maintenance		?	Construction/maintenance of graded banks reduces soil erosion in heavy rainfall events.
Financial capital (the level and variability of the different sources of income, savings and credit available to support rural livelihoods)			
Cost of equipment		?	High cost of tillage equipment for effective NRM out of reach for many farmers.
Farm profitability		?	Poor profitability reduces capacity of farmers to implement NRM on farms.
Farm management deposits.		?	Allows enterprises management to preserve natural resources (eg timely de-stocking).

Table B6.3: Collective actions for large-scale land managers

Indicator	Collective action priorities
Human capital (the skills, health and education that contribute to the capacity to manage NRs)	
Awareness of NRM issues	Initiatives to improve awareness with absentee landowners. Initiatives that reach them via lifestyle goals, weekend activities.
Social capital (the family and community support available, and networks through which ideas and opportunities are accessed)	
Sense of community	Involve schools in NRM awareness campaigns as they are often a focal point of the community
Trust of government	Provide opportunities for agricultural land managers to have more input into future NRM policies. Community based rather than top-down approaches (eg Landcare and before that the Hunter Trust in 1950s), provide opportunities for meaningful engagement on NRM issues.
Natural capital (the productivity of land, water and biological resources from which rural livelihoods are derived)	
Groundwater management	Improved monitoring of groundwater resources, connectivity across bores needed to assess impact of mining on resources. Research needed on groundwater connectivity, recharge rates and extent of aquifers.
Groundcover maintenance	Continue support for ProGraze courses (NSW Department of Primary Industries – Agriculture) to improve skills in monitoring and management of groundcover.
Physical capital (the infrastructure, equipment and breeding improvements to crops and livestock that contribute to rural livelihoods)	
Fencing	Improved awareness, knowledge and availability of funding required to ensure the adoption of appropriate fencing for NRM.
Strategic water points	Improved awareness, knowledge and availability of funding required to ensure the adoption of appropriate on farm water infrastructure for NRM.
Groundwork maintenance	Encourage regular maintenance of existing structures (eg graded banks) to ensure their continued effectiveness.
Financial capital (the level and variability of the different sources of income, savings and credit available to support rural livelihoods)	
Cost of equipment	Provide increased incentive funding for NRM equipment.
Farm profitability	Recognise the capital value of well-managed land so that the investment in NRM is reflected in the price of land.
Farm Management Deposits	Retention of the FMDs scheme is critical to ensuring the viability and resilience of farmers.

Table B6.4: Indicators of capacity for small-scale land managers

Indicator	Condition	Trend	Pressures/importance of indicator
Human capital (the skills, health and education that contribute to the capacity to manage NRs)			
Farming experience			Assists in selecting appropriate management response to changing circumstances and to cope with extremes of climate.
Age and physical capacity			Population is ageing and future physical capacity for NRM could diminish.
Interest in NRM			Effective NRM depends on awareness of issues and personal commitment to doing something about it.
NRM training – field days and short courses			Provides awareness, knowledge and skills for NRM in a way that contributes effectively to NRM across the region.
Social capital (the family and community support available, and networks through which ideas and opportunities are accessed)			
Sense of community			Basis of collaboration, allows flow of ideas through community, supports networks for CMA interaction.
NRM group participation			Provides confidence/motivation for NRM, builds social/support networks.
Natural capital (the productivity of land, water and biological resources from which rural livelihoods are derived)			
Pasture management			Need to effectively manage stocking rates to avoid land degradation.
Weeds in riparian zone			Overgrow creeks, reduce stock access to water, affect livestock health.
Soil quality			Poor in some regions (acidity and salinity) affects carrying capacity.
Salinity of waterways			Reduces stocking rates and land productivity.
Remnant vegetation			Controls erosion, provides shade for livestock and absorbs carbon.

Physical capital (the infrastructure, equipment and breeding improvements to crops and livestock that contribute to rural livelihoods)			
NRM farm equipment			Access and availability essential for NRM activities.
Fencing for riparian zone			Important to control grazing impacts around riparian zones.
Trees – vegetation			Trees and vegetation improve biodiversity.
Financial capital (the level and variability of the different sources of income, savings and credit available to support rural livelihoods)			
Off-farm income			High in this area because of mines. Allows landholder expenditure on NRM.
Access to NRM grants			From CMA and other sources to undertake activities to improve NRM.
Equity levels			High in the region. High levels generate investment in NRM improvements.

Table B6.5: Collective actions for small-scale land managers

Indicator	Collective action priorities
Human capital (the skills, health and education that contribute to the capacity to manage NRs)	
Age and physical capacity	Recruit younger families in the region into NRM groups to offset the ageing trend in NRM participants by increasing profile of NRM at family friendly events and opportunities for involvement that suit busy people working off-farm.
Interest in NRM	Raise awareness and redesign NRM training opportunities to increase adoption by groups currently underrepresented in participation.
NRM training – field days and short courses	Redesign NRM training opportunities to be more flexible, particularly for younger families and people working off-farm by building and promoting the socialising features of these events.
Social capital (the family and community support available, and networks through which ideas and opportunities are accessed)	
Sense of community	Maintain a strong sense of community to ensure high participation in NRM groups.
NRM group participation	
Natural capital (the productivity of land, water and biological resources from which rural livelihoods are derived)	
Weeds in riparian zone	Increase awareness of weeds and the importance of controlling weeds in riparian zones.

Soil quality	Increase awareness and management of acid and saline soils.
Physical capital (the infrastructure, equipment and breeding improvements to crops and livestock that contribute to rural livelihoods)	
Fencing for riparian zone	Increase awareness of need for fencing in riparian zones and of the availability of incentive funding.
Financial capital (the level and variability of the different sources of income, savings and credit available to support rural livelihoods)	
Access to NRM grants	Increase awareness of funding opportunities for NRM, increase aspirations of small scale landholders for improved NRM outcomes leading to on-farm expenditure on NRM.

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