Australian Government

Land & Water Australia

Improving the NRM knowledge system for regions

Knowledge for managing Australian landscapes

November 2006

By the Knowledge for Regional NRM Team

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List of abbreviations and acronyms

AANRO	Australian Agriculture and Natural Resources Online
ASDD	Australian Spatial Data Directory
BRS	Bureau of Rural Sciences
CMA	Catchment Management Authority
CRC	Cooperative Research Centre
CRI	collaborative regional investment
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DST	decision support tool
ERIN	Environmental Resources Information Network
FSKS	First-stop Knowledge Shop
GB	gigabytes
IM	information management
IT	information technology
K&A	Knowledge & Adoption
KM	knowledge management
LWA	Land & Water Australia
M&E	monitoring and evaluation
MLLE	multiple levels and lines of evidence
NHT	Natural Heritage Trust
NRM	natural resource management
PRISM	Practical Index of Salinity Models Database
R&D	research and development
RDC	Research Development Corporations
RSS	Really Simple Syndication

Contents

Executive summary

There has never been greater public investment in natural resource management (NRM) in Australia or in research that provides the information and knowledge to improve it. There are compelling reasons for investment in knowledge generation, sharing and management. These include to inform better management decisions; to support innovation in the development of more sustainable and profitable systems, practices and technologies; and to facilitate better use of existing knowledge and lesson sharing, so that the whole system learns as it develops.

A challenge exists in ensuring that investment in NRM know-how flows through to, and from, on-ground change. The 56 regional NRM bodies around Australia are key users of this knowledge, and function as critical pathways in the flow of knowledge. Without these pathways working effectively there is a risk that investments in NRM will not be based on the best available information.

The overarching objective of the Knowledge for Regional NRM Program is to facilitate better linkages between regional NRM bodies and knowledge providers, and to assist regional NRM bodies to better manage their knowledge. Phase one of the Knowledge for Regional NRM Program, which commenced in February 2005 and was funded by the Natural Heritage Trust (NHT), investigated and tested ways to improve the adoption and sharing of knowledge by regional NRM bodies and looked for ways to improve knowledge connections between regional NRM bodies and research and information providers. The Program took a broad view of the NRM sector, looking beyond Land & Water Australia's accepted areas of interest.

This paper presents the findings of phase one and also outlines a comprehensive approach to improving the NRM knowledge system, especially as it supports regional bodies. The proposed options endeavour to:

- make better use of existing knowledge and information
- improve access to knowledge and information
- build capacity of NRM professionals to use knowledge in management decisions
- increase sharing of experiential knowledge and lessons between regions
- improve two-way knowledge sharing between knowledge providers and regional NRM bodies.
- make regional knowledge needs more accessible to research providers

- facilitate more effective processes for the management of knowledge and information
- stimulate a culture that values knowledge and information.

The approach proposed here for delivering this improved regional NRM knowledge system was designed using contributions from regional NRM bodies, knowledge providers, and successful initiatives from outside both the NRM sector and Australia. It consists of three overarching packages which are comprised of a number of services grounded in the real needs of regional bodies and have been verified by them. The proposed packages of services are:

1 Better practice in knowledge management

'Better practice in knowledge management' will provide NRM regions and practitioners with the skills and practices to better search, retrieve, manage and evaluate information. It will also assist them to identify the gaps in their knowledge base and is proposed to include:

- *Knowledge Management Guidelines for the NRM Sector* to enable regional NRM bodies to develop knowledge strategies appropriate to their circumstances
- a **knowledge management training and support** program to further develop the information seeking practices of regional NRM bodies and improve their management of knowledge and information
- *Better Knowledge Practice Awards* to acknowledge those regional NRM bodies and research and development organisations that are achieving better practice in knowledge management.

2 NRM Toolbar

The NRM Toolbar is a knowledge system for NRM professionals and will be delivered through an internet based toolbar. The system will facilitate the sharing of knowledge between regional NRM bodies and provide mechanisms for two-way flow of knowledge between regions and information providers. Services include:

- an **NRM search engine** to connect Australia's largest knowledge repositories with the capability to search a range of NRM websites

- *My Library* will support the sharing of references by individuals, groups and organisations through *Lists* that are searchable by the NRM search engine

- an *Ask a Librarian* service

- *This Worked Here!* to allow people who implement NRM practices to document and share what worked and what didn't

- searchable databases including a *Knowledge Needs Database*, an *R&D Directory* and an *NRM Funding and Events Calendar*

- **decision support tool reviews** to outline the tools available for a given purpose and provide information that will help regions decide which one is right for them

- **knowledge alerts** that are individually customised

- an *NRM Knowledge Market Report* to provide real-time reporting of knowledge market activity associated with the NRM Toolbar.

3 Supporting knowledge brokering in the NRM sector

The 'supporting knowledge brokering in the NRM sector' package aims to provide a range of services to regional NRM bodies to support them to broker knowledge. It includes:

- **brokering existing knowledge and information** to enable regional NRM bodies to get a better grasp on what knowledge and information is available and how it meets their knowledge needs

- initiating **collaborative and multiregional investments** in new research and information to address regional knowledge needs

- **supporting regional innovators** to share their innovative NRM management practices and processes with other regions

- producing a series of audio and video *NRM Stories* for sharing good news stories and lessons within the NRM community

- *Sister Regions* to trial and support mentoring partnerships between regional NRM bodies.

Land & Water Australia has successfully secured funds to commence implementation of some of the proposed services. There are several other opportunities, both outlined in the paper and more broadly, for organisations within the NRM sector to work with Land & Water Australia or collaboratively with each other to improve the NRM knowledge system.

Broader implications of the Knowledge for Regional NRM Program

In addition to identifying specific barriers and options to address them, Land & Water Australia has identified a number of broader policy implications. These are discussed in Chapter 4 of the paper and relate to:

- the purposefulness, cohesion and performance in the NRM knowledge system

- the need for stable support arrangements for knowledge management services

- roles and responsibilities in the NRM knowledge system

- the NRM knowledge market

- the use of standards for evidence in regional decision making

- incentives for researchers to place their work into the bigger NRM picture

- review of the roles and responsibilities of the NRM Facilitator Network.

In conclusion

Regions are at the point where knowledge management is of critical importance for them to move forward in their day to day business of managing natural resources. There is a risk that regional responses to this urgent need will create a suite of different information and knowledge management systems and processes across the country, none of which will speak to the other. It is critical that a consistent approach is developed now.

This paper outlines an approach, including proposing packages of specific services, to enable this to happen in a coordinated and considered manner. It is intended that it will stimulate dialogue on how to improve the NRM knowledge system, create a robust investment model to ensure its long-term stability, and catalyse strategic action and investment across the NRM sector towards this end.

1 Introduction

Since 2001 the 56 regional natural resource management (NRM) bodies across Australia have had responsibility for planning, implementing and evaluating activities that lead to the improvement, maintenance and conservation of natural resources in their regions. The context in which this takes place is highly complex: there are numerous stakeholders involved; the issues are multifaceted and interconnected; solutions are not always clear or take a long time to take effect; there are three levels of government each with potentially different policy and program agendas; and finally, there are hundreds of organisations engaged in researching and generating information appropriate to the NRM context.

The success of regional NRM processes is contingent on access to best available information, however, despite considerable public investment in both the regional NRM process and NRM research there remains a risk that investments through regional arrangements may not be based on the best available knowledge due to the complexity and fragmentation of the NRM knowledge system.

The overarching objective of the Knowledge for Regional NRM Program is to facilitate better linkages between regional NRM bodies and knowledge providers, and to assist regional NRM bodies to better manage their knowledge.

Phase one of the Knowledge for Regional NRM Program, which commenced in February 2005 and was funded by the Natural Heritage Trust (NHT), investigated and tested ways to improve the adoption and sharing of knowledge by regional NRM bodies and looked for ways to improve knowledge connections between regional bodies and information providers. The Program took a broad view of the NRM sector, looking beyond Land & Water Australia's (LWA) accepted areas of interest.

Rather than being simply an information gathering exercise, phase one of the Program also endeavoured to embody the action learning approach, providing opportunities for regional NRM representatives and LWA staff to increase their understanding of and experience with knowledge management. Appendix A and B provide information on the consultation processes undertaken during phase one of the Knowledge for Regional NRM Program.

This paper outlines a comprehensive approach to improving the NRM knowledge system, especially as it supports regional bodies. The proposed options endeavour to:

- make better use of existing knowledge and information
- improve access to knowledge and information
- build capacity of NRM professionals to use knowledge in management decisions
- increase sharing of experiential knowledge and lessons between regions
- improve two-way knowledge sharing between knowledge providers and regional NRM bodies.
- make regional knowledge needs more accessible to research providers
- facilitate more effective processes for the management of knowledge and information
- stimulate a culture that values knowledge and information.

The approach proposed to deliver this improved regional NRM knowledge system consists of three overarching packages:

- Better practice in knowledge management (Section 3.2)
- the NRM Toolbar (Section 3.3)
- Supporting knowledge brokering in the NRM sector (Section 3.4).

Each of these packages is comprised of a number of services which are grounded in the real needs of regional bodies and have been verified by them. The proposed services provide a clear way for members of the NRM sector to add significant value to their investment in NRM research, and will assist them in implementing the regional framework. A coherent and systematic approach to managing information and knowledge, at all scales, is necessary to address natural resource degradation and vital to the achievement of NHT objectives.

LWA has successfully secured NHT funds to commence implementation of some of the proposed services. In deciding which services to direct these funds towards, LWA prioritised those that contribute to the development of a strong foundation upon which to build a more robust NRM knowledge system. An important further consideration was to what extent a particular

service addressed a need identified as urgent by the regional NRM representatives who participated in phase one of the Program.

There are several opportunities, both outlined in the paper and more broadly, for other organisations within the NRM sector to work with LWA or collaboratively with each other to improve the NRM knowledge system.

Regions are at the point where knowledge management is of critical importance for them to move forward in their day to day business of managing our natural resources. There is a risk that regional responses to this urgent need will create a suite of different information and knowledge management systems and processes across the country, none of which will speak to the other. It is critical that a consistent approach is developed now.

This paper outlines an approach, including proposing packages of specific services, to enable this to happen in a coordinated and considered manner. It is intended that it will stimulate dialogue on how to: improve the NRM knowledge system; create a robust investment model to ensure its long-term stability; and catalyse strategic action and investment across the NRM sector towards this end.

FIGURE 1 Natural Resource Management Regions
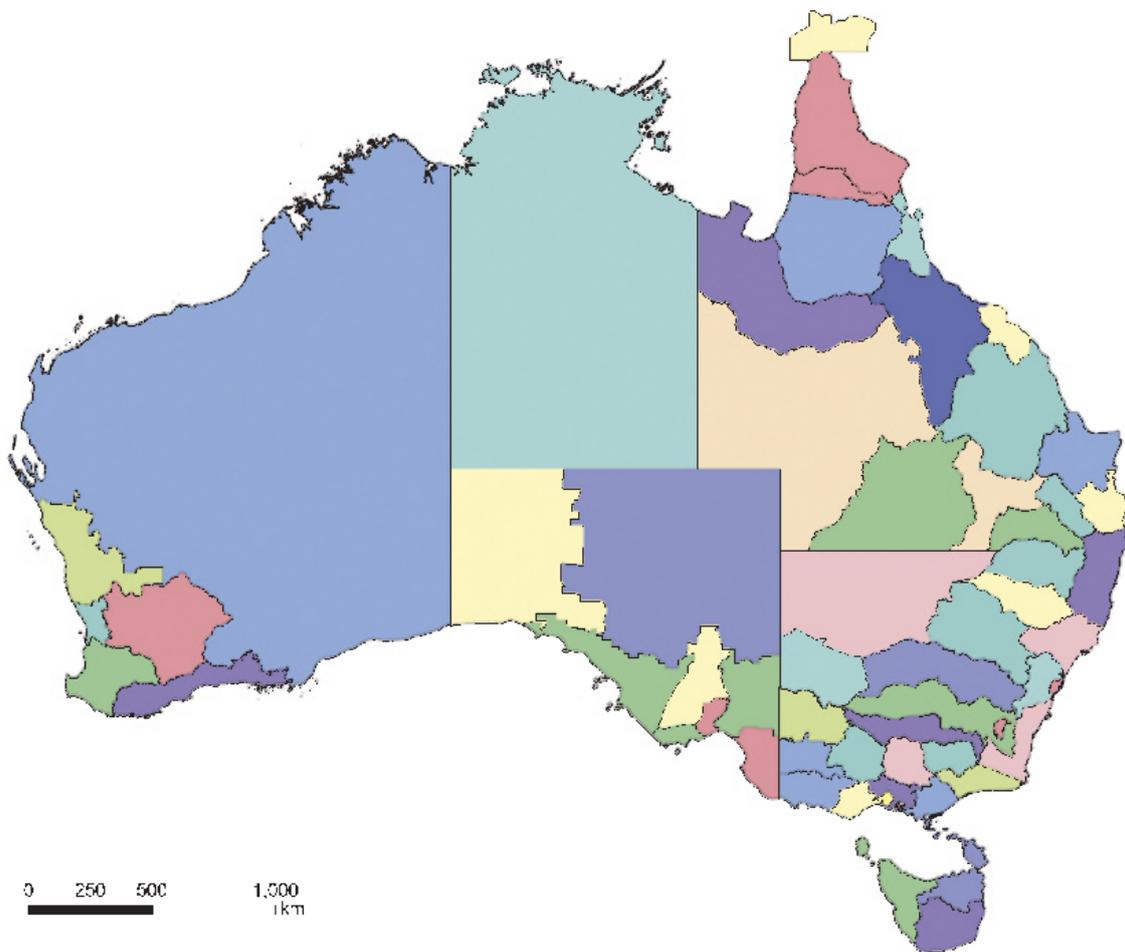
2 Barriers to knowledge exchange

The issues identified in this chapter are the result of analysing the output from the various activities undertaken during phase one, as described in Appendix A—'How the paper was developed'. The following issue statements translate the barriers identified in the initial *Scoping Report* into single statements that have provided guidance to the development of the various packages detailed in this paper. This chapter gives a brief description of each issue statement, with relevant examples taken directly from the data sources (see Appendix A for information on data sources).

Insufficient time is a universal barrier to the effective management of knowledge and information. The following issues sit within this context.

A **There is a need for more opportunities for regions to share their knowledge and experience**
- **~ with each other**
- **~ with research and development (R&D) organisations**
- **~ with policy makers.**

Regional staff report that they have limited opportunities to share experiences with each other. This includes an inability to find out what other regions are currently working on or 'who is about to do what'. The sharing of experience and knowledge would allow regions to form collaborations, or at least reduce the duplication of research and information products. A regional officer summarised it well, 'A process is required to capture the knowledge generated and to allow for sharing across regions'.

There is also limited opportunity for regions to share information with R&D and policy organisations. For instance an NRM body representative noted, 'The region is always producing good news stories and media releases but is unsure where to send them'.

B **There is a need for policy and R&D organisations to more effectively communicate their activities and outputs**
- **~ with each other**
- **~ with regions.**

Regional staff and facilitators suggest that there is room for improving communication about what is happening in R&D organisations. One regional officer commented that 'R&Ds are protective of information until it gets published and then it's too late', and 'There is only information about the past, not what is currently happening on the ground'. Added to this situation is the lack of a 'clear access portal for regional bodies to become aware of what national data providers exist and what relevant data they might have available'. Reference was also made to the significant material generated by R&D organisations that is published in journals, which are not generally accessible to a broad audience.

It was also observed that the 'Australian Government is poor at advertising what they actually do' and improvements in this communication would enhance regional body understanding of government policy. Similarly, improved communication of policy to the NRM Facilitator Network could lead to improved consistency between organisations regarding policy direction. Reference was also made to the loss of corporate knowledge in the Australian Government due to high staff turnover. Turnover leads to information networks and personal contacts breaking down and creates an impediment to continuing knowledge exchange.

C **Regions need to be able to effectively define and communicate their knowledge needs to result in a R&D agenda more relevant to their circumstances.**

Regional officers feel that their knowledge and knowledge needs are not valued at the national level and that national organisations are not informed of regional needs. In some cases this is related to the limited capacity of regional bodies to identify and define their needs, with regional staff indicating the need for improved support for this activity. More direct pathways to report regional research needs to national bodies are also needed.

D Regions need support to further develop their information-seeking practices.

Individual regional officers have varying levels of capacity to effectively seek information from the vast array of NRM information available. The following statement sums up the issue, 'Where is it and how do we get it?'

While regional staff reported a lack of time and resources to 'trawl around the web' looking for information, in some cases this may be because of a lack of familiarity in how to best use the online information-searching environment.

E Regions need improved support to manage their information and knowledge.

Generally, there is no broad, systematic approach to managing information and knowledge within regions. Most regions have a website, but there are few that have sophisticated and rigorous systems with standardised classification systems, metadata standards, and internal databases.

Staff turnover, and the associated loss of knowledge and established contacts, is a further issue for regions. The problem, often due to information being 'held in people's heads', adds to the need to establish and maintain effective systems to manage the large amounts of NRM information and knowledge held within regional bodies.

F There is a need to reduce fragmentation of information sources.

In many cases regional staff are not aware that there is information that would meet their requirements because they are overwhelmed by 'too many websites to go to' and they are unsure of which R&D organisation to approach. The essence of this issue is demonstrated in the following statement from a regional officer, 'There are so many organisations that it is confusing to know where to access information and who runs what programs'.

G There is a need to develop ways of taking into account the diversity of circumstances and user preferences with regard to accessing information.

People have a diverse range of preferences in relation to accessing information, including face-to-face contact, email alerts, online discussion forums, publications or telephone conversations. One size does not fit all.

Technological limitations such as lack of access to broadband infrastructure can also impact on the capacity of regional staff to access certain types of information. The type of language used also affects the capacity for uptake of knowledge. Research and information providers need to consider this diversity in relation to communicating effectively with regional NRM bodies.

H More information needs to be available at a scale relevant to regional decision-making.

The use of the term 'relevant' in this issue statement relates to both the scale and format in which information and data is communicated. In order for information to become relevant and valued as regional knowledge, it needs to be interpreted within the temporal, cultural and political context that is relevant to a particular region. Currently, information generated by national providers is often perceived as useful in terms of general principles, but it is not always apparent how that information can be utilised at the regional level.

I There is a need to develop ways of overcoming cost as a barrier to regions obtaining information.

Regional staff reported that funding is not always available for them to commission research and the cost of certain data types, such as satellite images, is considered prohibitive. Additionally, in cases where duplication of cost occurs, such as when different regional bodies commission consultants to do the same type of research, low-cost tools are needed by regions to help them minimise such duplication.

J Regions, knowledge brokers and facilitators need support and training to ensure they are effective in their role of improving knowledge management, exchange and adoption.

Effective mechanisms or strategies to support facilitators and knowledge brokers in their roles will assist in information sharing. Training is one solution; while opportunities to share experience through communities of practice is another.

Information literacy is another barrier raised by a number of officers. Regional bodies and facilitators reported sentiments such as, 'It is difficult for an individual to identify what is important, from among the deluge'. There is a perception that information providers do not currently filter or synthesise enough material before it is disseminated. Users of information need support, either through training or other mechanisms, to improve their capacity to evaluate information and determine what is of most relevance to them.

Other issues

There are also a range of other barriers to knowledge exchange created through issues such as funding arrangements, governance and the relationships between various departments and agencies. The arrangements for the collection, sharing and management of 'data' relevant to regions were also unclear. Such issues were outside the scope of this project so solutions and mechanisms were not developed to tackle them. Some of these issues are dealt with more thoroughly in Chapter 4, Policy Implications.

3   A range of options

3.1 Options overview

The options presented in this paper seek to catalyse knowledge brokering and exchange activities that will promote increased access to, and use of, relevant information for NRM decisions. The packages described in subsequent sections are comprised of services that focus on: improving access to knowledge; making better use of existing knowledge; increasing the sharing of experiential knowledge; generating more targeted new knowledge; and building the capacity of NRM professionals to deploy knowledge in management decisions. They are grouped into the following packages:

- Better practice in knowledge management (Section 3.2)

- NRM Toolbar (Section 3.3)

- Supporting knowledge brokering in the NRM sector (Section 3.4).

The options presented are relevant to a broad range of stakeholders within the NRM sector. Figure 1 shows the relationship of the proposed services to the stakeholders involved and where in the system those services provide an improvement. How each of the services addresses the issues statements in Chapter 2 is presented in Table 1.

The remaining sections in this Chapter outline the purpose of the individual services, the benefits associated with them and provide a description. Boxes which include case studies and relevant explanatory information are provided where possible to improve clarity.

There are no suggestions put forward in this paper for improving linkages with policy makers, as this was outside the project's scope, but many of the services could be adapted for this purpose.

FIGURE 2   Where the proposed options target the NRM knowledge system*

BUILDING CAPACITY TO MANAGE KNOWLEDGE WITHIN REGIONS

Example options:
- Knowledge management guide
- Knowledge management training
- Knowledge management tools within the NRM Toolbar

REGION TO REGION SHARING OF KNOWLEDGE

Example options:
- Sharing of regional knowledge via forums and the NRM Toolbar
- Supporting regional collaboration to procure research
- Region to region mentoring
- Sharing of anecdotal evidence through *This Worked Here!*

Regional NRM Bodies

KNOWLEDGE FLOW BETWEEN R&D ORGANISATIONS AND REGIONS

Example options:
- Feeding regional knowledge needs into the National R&D agenda
- Brokering of best available information
- Initiating multiregional research investments

Landholders & Indigenous Landowners

Research & Development Organisations

*   This diagram does not represent the entire NRM knowledge system, nor does it show all proposed options

TABLE 1   Issues statements related to packages

ISSUE / OPTION	Better Practice in Knowledge Management			NRM Toolbar										Knowledge Brokering support for Regions				
	Knowledge Management Guidelines for the NRM Sector	Knowledge management training and support	Better Knowledge Practice Awards	My Library	This Worked Here!	NRM Funding and Events Calendar	Knowledge Needs Database	NRM search engine	Knowledge alerts	Ask a Librarian	Decision support tool reviews	R&D Directory	NRM Knowledge Market Report	Brokering of existing knowledge and information	Initiating collaborative and multiregional investments	Supporting regional NRM practitioners to share innovations	NRM Stories	Regional mentoring (Sister Regions)
A There is a need for more opportunities for regions to share their knowledge and experience	x	x		x	x	x			x		x			x		x	x	x
B There is need for policy and R&D organisations to more effectively communicate their activities and outputs			x	x		x		x	x		x	x	x	x				
C Regions need to be able to effectively define and communicate their knowledge needs to result in a R&D agenda more relevant to their circumstance.	x	x					x					x						
D Regions need support to further develop their information seeking practices.		x								x								
E Regions need improved support to manage their information and knowledge.	x	x	x	x	x		x		x			x						
F There is a need to reduce fragmentation of information sources.				x	x	x	x				x	x		x	x			
G There is a need to develop ways of taking into account the diversity of circumstances and user preferences with regard to accessing information.	x	x	x		x			x	x		x	x	x	x	x		x	
H More information needs to be available at a scale relevant to regional decision making.					x		x	x					x			x	x	x
I There is a need to develop ways of overcoming cost as a barrier to regions obtaining information.							x			x				x	x	x		
J Regions, knowledge brokers and facilitators need support and training to ensure they are effective in their role of improving knowledge management, exchange and adoption.		x		x			x	x		x	x	x						

3.2 Better practice in knowledge management

This package encourages better practice in knowledge management in regional NRM. The initial two services are designed to improve knowledge management skills among regional NRM bodies, NRM practitioners and facilitators. The final service encourages a culture of valuing information by recognising organisations that achieve better practice in knowledge management. The services are:

■ *Knowledge Management Guidelines for the NRM Sector*

■ knowledge management training and support

■ *Better Knowledge Practice Awards*.

3.2.1 Knowledge Management Guidelines for the NRM Sector

Purpose

To develop *Knowledge Management Guidelines* to assist regions and NRM practitioners to better manage knowledge and information. The Guidelines will include information to enable regional NRM bodies to develop knowledge strategies that are tailored to their circumstances. The Guidelines will provide a basis for the knowledge management training and support service (Section 3.2.2).

Potential benefits

■ Promotion of a culture of actively managing and valuing knowledge and information

■ Improved use of existing knowledge in decision making

■ Increased transparency and accountability of decision making by recording evidence used

■ Increased ability of regional staff to indicate their knowledge needs

■ Increased likelihood of interaction with NRM researchers

■ Opportunities created to share the cost of research with other regions.

Description of service

The *Knowledge Management Guidelines* will assist regional NRM bodies to develop knowledge management systems that will ensure they are effective in managing, exchanging, adopting and evaluating knowledge. The Guidelines will be developed with participation from regional NRM bodies, facilitators and knowledge brokers. Sources to be used to inform the development of the Guidelines are: regional case studies; pilot studies; materials developed by LWA; information from the NRM sector; and advice from other sectors. The Guidelines will link closely with the knowledge management training and support service.

Knowledge strategy pilot studies have been initiated with Northern and Yorke NRM Board in South Australia and NRM North in Tasmania. The lessons from these pilot studies, as well as those from the case studies described in the boxes at the end of this section, will contribute to the development of the Guidelines. The Knowledge & Adoption Team within LWA has developed a forward-thinking approach to improving the adoption of research through its *Knowledge & Adoption Strategy— Managing information and knowledge for adoption outcomes* (LWA, 2005). This work will also help to inform the *Knowledge Management Guidelines*.

Regional Research and Development Prospectus

The Burnett Mary Regional Group (www.burnettmarynrm.org.au) is developing a Research and Development Prospectus to communicate its research needs to the science and R&D community. The Prospectus will outline the high-priority R&D needs in the Burnett Mary region that need to be met by the regional investment strategy. The Prospectus will be utilised to:

- articulate R&D needs to the scientific and R&D community

- commission specific projects or call for proposals

- seek additional resources from prospective project partners.

Monitoring marine water quality by Damon Shearer (left) and Jan Arens (right) for Tanuum Boyne Coastcare.
Photo provided by Burnett Mary Regional Group

Development of an Integrated Regional Research program

The South Australian Murray Darling Basin NRM Board is currently reviewing its information needs and research priorities. The first stage of this process has involved a review of research undertaken in the region between 1995 and 2005. The review has identified nearly 800 publications, which have been compiled into a database that is available online at: http://www.dwlbc.sa.gov. au/subs/research/search.php. This review will be an important tool for identifying research already undertaken, research gaps and active research in the region.

The second stage of the process is the development of an integrated program of research that:

- addresses the key regional and State strategic objectives

- provides an overview of regional R&D, research gaps, and future R&D priorities

- identifies opportunities for co-investment and partnerships.
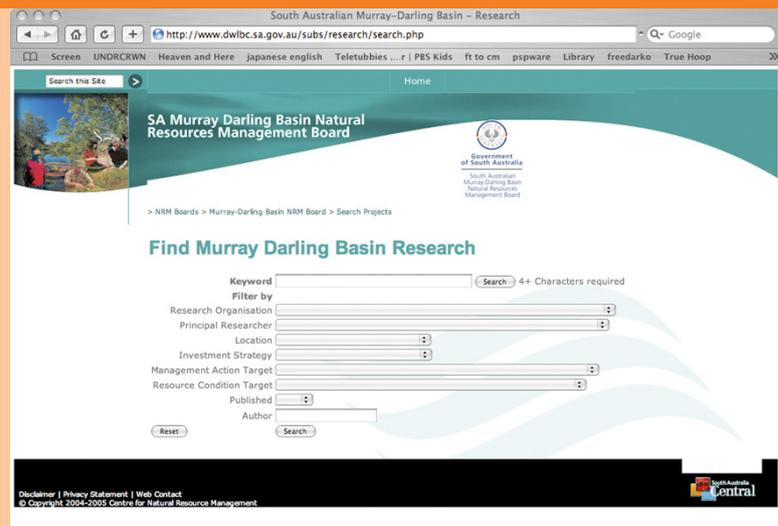
South Australian Murray Darling Basin NRM Board Research Database

3.2.2 Knowledge management training and support

Purpose

To develop and provide training and advice in knowledge management to regional NRM bodies and NRM practitioners.

Potential benefits

- Begins to establish a culture of valuing and managing knowledge and information

- Increases the capability of regional NRM bodies to adopt processes for improving knowledge management and exchange within their organisation and across the regional NRM knowledge system

- Avoids costs associated with duplication of research effort

- More regional decisions being made with best available knowledge.

Description of service

Regional NRM bodies have requested support to achieve improvements in their information seeking and knowledge management practices. In general, the Knowledge for Regional NRM Team has found that knowledge brokers, facilitators and regional NRM bodies need further assistance and training to evaluate information and be effective in improving knowledge exchange and adoption. This service aims to address these barriers by providing training and support in knowledge management and is anticipated to increase implementation of the *Knowledge Management Guidelines for the NRM sector*.

Aspects of the service will aim to improve general information literacy skills. These include searching, retrieving, evaluating and managing information and personal knowledge. Formal training on how to interpret the quality of research papers will be considered. The service might include training in multiple levels and lines of evidence (MLLE) for building knowledge on an issue for which there is limited direct evidence. MLLE approaches were pioneered to evaluate the effect of smoking tobacco on human health—a situation where it was not possible to do a definitive study to prove the case.

The proposed training package will include:

- how to use the *Knowledge Management Guidelines for the NRM sector*

- how regions can get their knowledge management process started

- how to catalogue existing knowledge and information sources

- how to improve information search and retrieval skills

- what knowledge is already available and how the region can maintain awareness of it

- evaluating information (e.g. multiple levels and lines of evidence)

- how to develop research priorities, write research questions and engage scientists

- use of the NRM Toolbar.

Whilst training in knowledge management will be a large aspect of this service, regional NRM bodies will be supported in cataloguing their existing internal information sources through technology provided in the *My Library* tool (Section 3.3.1) on the NRM Toolbar. Cataloguing information sources is a crucial first step for regional NRM bodies to effectively manage their knowledge. Case studies (see box below) detailing the experiences of regions proficient in cataloguing their information sources will be incorporated in the training.

Corangamite Catchment Management Authority Knowledge Base

The Corangamite Catchment Management Authority (CCMA) has built a database that allows users to search by topic and locality from an extensive collection of research project descriptions, research publications and technical reports. The information covers all aspects of the catchment including: atmosphere; climate; biodiversity and ecology; land and landscapes; social, cultural and economic information; and water and aquatic systems. There are currently over 2000 entries in the database and more are added daily. The Knowledge Base is available online at www.aanro.net/ccma/page/search.htm.

The database comes from the Improving Catchment Knowledge Project—a collaboration between Corangamite and Glenelg–Hopkins Catchment Management Authorities and LWA. The project is an exemplar of the way regional NRM bodies can manage their information sources and will be used as a case study in the proposed training and to inform the development of the *Knowledge Management Guidelines for the NRM Sector*.
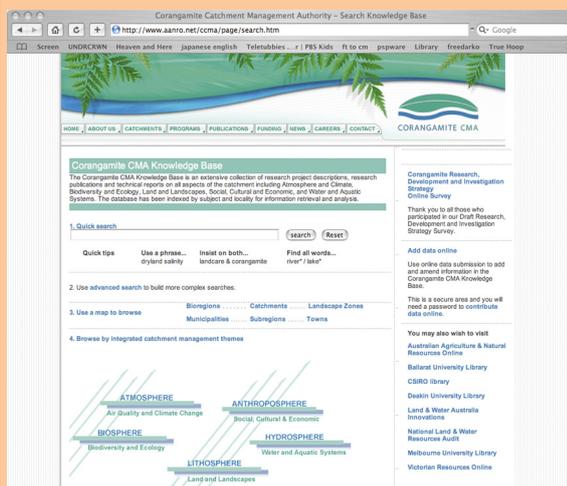
Corangamite Catchment Management Authority Knowledge Base

3.2.3 Better Knowledge Practice Awards

Purpose

To acknowledge those regional NRM bodies and R&D organisations that are achieving better practice in knowledge management.

Potential benefits

- Encourages a culture of valuing knowledge and information
- Raises awareness of knowledge management as an issue
- Rewards and recognises organisations that are achieving better practice in knowledge management.

Description of service

The Knowledge for Regional NRM Team has found that creating better informed NRM planning and implementation in regions will require a change of knowledge management practices within R&D and regional NRM bodies. The Awards scheme will increase awareness of knowledge management as an issue for research and NRM organisations and recognise those organisations achieving better practice.

Possible Awards are:

The Regional NRM Award for Evidence-based Decision Making

The transparent use of evidence by regional NRM bodies to allocate public NRM investment should be encouraged. This Award would increase recognition of this issue for regional NRM bodies.

The NRM R&D Award for Knowledge Adoption Practice

This Award would recognise those R&D organisations that are explicitly planning and delivering research with the end user in mind. Innovative ways to increase the adoption of research should be encouraged.

3.3 NRM Toolbar

This Section provides a description of the NRM Toolbar (for further information on the development of the Toolbar refer to Appendix B). The following sections each provide a description of the proposed services that comprise the NRM Toolbar. The proposed services of the NRM Toolbar are:

- *My Library*

- *This Worked Here!*

- *NRM Funding and Events Calendar*

- *Knowledge Needs Database*

- an NRM search engine

- knowledge alerts

- *Ask a Librarian*

- decision support tool reviews

- *R&D Directory*

- the *NRM Knowledge Market Report*

- a user interface, user profile and help systems.

NHT funds for a basic NRM Toolbar comprising some services have already been secured by LWA. The services included in the basic NRM Toolbar are:

- *My Library*

- *This Worked Here!*

- *NRM Funding and Events Calendar*

- *Knowledge Needs Database*

- a basic user interface, user profile and help systems.

Efforts to secure funding for unfunded services considered important to creating a foundation for the NRM Toolbar are currently being undertaken. Organisations able to benefit from the NRM Toolbar are encouraged to consider opportunities for collaboration with LWA to realise its full potential.

The final Section (3.3.12) outlines operational issues that need to be considered to enable the successful implementation of the NRM Toolbar.

Figure 2 (on page 16) presents an overview of the services that make up the NRM Toolbar.

3.3.1 My Library

Purpose

My Library will provide users with a tool to catalogue and organise information sources that are relevant to them, for example, evidence used to support a specific decision or publications of interest on a given topic. Once an information source is catalogued in any user's library, it can then be found by all NRM Toolbar users as the libraries are searchable. In this way the users of the NRM Toolbar will support a community of practice as they catalogue useful material.

Potential benefits

- Provides a system for cataloguing an organisation's internal information sources, reducing time taken to find appropriate information

- Improved accountability for decision making processes because of the ability to track information used and decision making processes undertaken

- Information sources and corporate knowledge can be shared, retained and transferred, reducing staff turnover issues, and expediting staff induction.

Description of service

The linking of large existing reference libraries can only expose a limited quantity of existing NRM-related information. *My Library* is a free referencing tool to assist in 'uncovering' a wider range of NRM information sources. It will do this by providing the user with a standard referencing form that will facilitate future searching of user-added references. Included on the form will be a tool to 'geo-code' the reference to show where it is most relevant in the landscape.

The Knowledge for Regional NRM Team has learnt that the preferred approach for the *My Library* concept involves individuals having their own knowledge libraries so that only information sources relevant to them are presented. This does not mean that a user's efforts to catalogue information

sources of relevance to their own organisation will be wasted. On the reference form the user can opt to tag the item as 'relevant to me' and/or 'relevant to others in my organisation'. If this second tag is selected, the item will be ranked high in future searches by staff within their organisation.

An important feature of the *My Library* tool is the 'List', which is a set of information sources that relate to a particular use or topic. For example, all the journal articles that were used as evidence to decide on a resource condition target could be included in one List, and all a user's references

relating to salinity in their area could be included in a separate List.

Users will be able to share and have group maintenance of Lists. In this way they will become artefacts of communities of practice (see box on page 28). Another use of Lists is for annotated bibliographies.

FIGURE 3   Overview of the services making up the NRM Toolbar
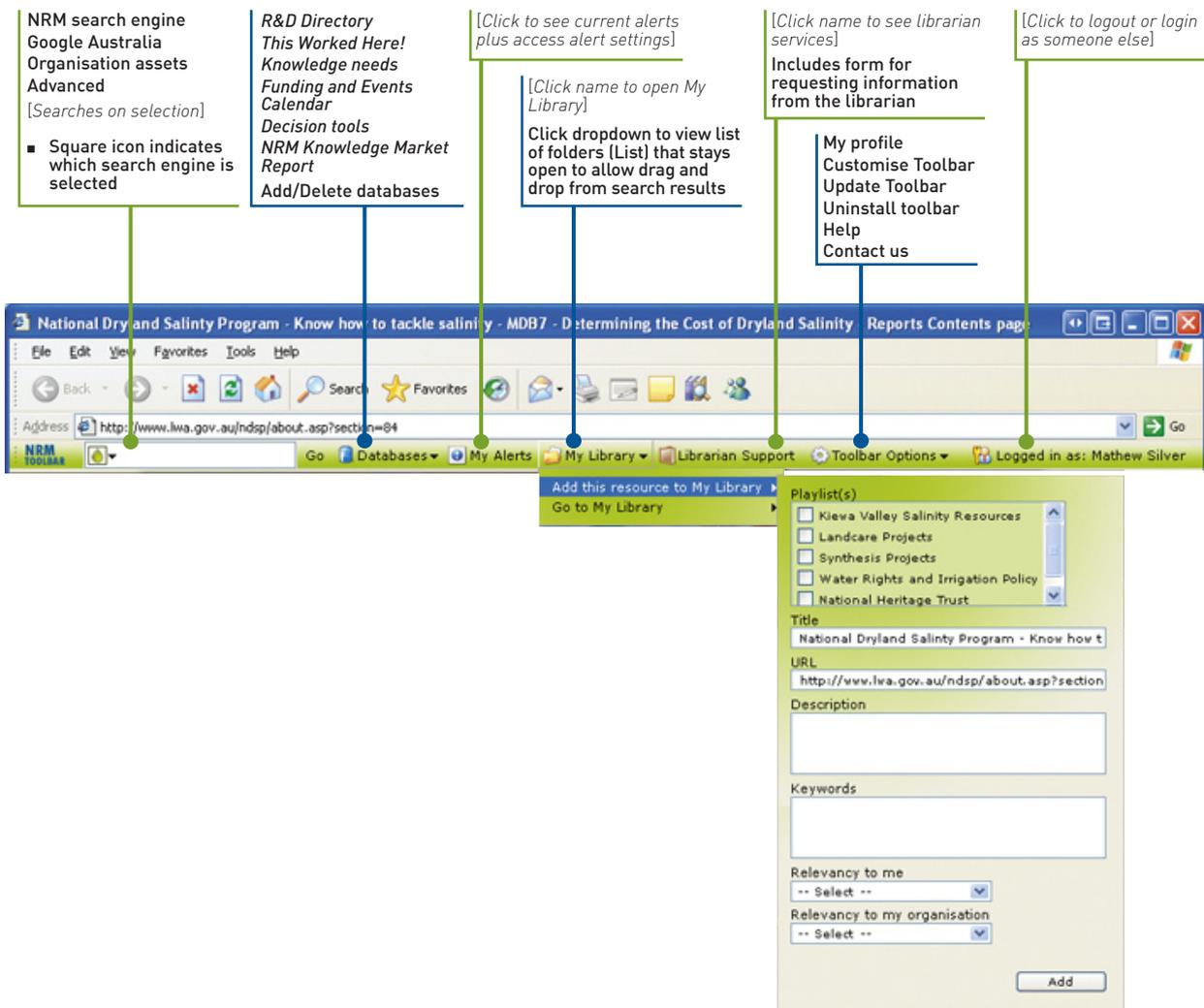
3.3.2 This Worked Here!

Purpose

This service will support the sharing of information on which management practices have and have not worked. It is aimed at the sharing of local knowledge as opposed to scientific knowledge.

Potential benefits

- A tool for NRM professionals to document local knowledge that can be used in the selection of management practices
- A potential outlet for insights gained through NHT funded projects and included in reports to government
- A low-cost solution to improve the sharing of lessons from on-ground projects.

Description of service

This Worked Here! will provide regional NRM bodies with a tool to support the capture, sharing and presentation of local experiences with specific management practices. A range of techniques and formats could be employed to present the information including text, images, audio and video. An example of the use of video in successfully capturing information on NRM management practices is detailed in the box adjacent.

Regional NRM bodies can work with local landowners to capture their experiences in managing the landscape to benefit others. This may be through access to a website and recording of audio or video files. The box at the end of this section describes the value of narrative techniques as an approach to capturing and sharing information associated with complex issues.

CASE STUDY

Traditional Knowledge Recording Project

An initiative by the Traditional Knowledge Recording Project has used video to document landscape management knowledge held by Aboriginal Elders in Cape York. The project seeks to lead by example in building successful networking and partnerships towards this methodology to encourage collaborative outcomes for cultural and natural resource management. Further detail on this project can be found at the TKRP website: www.tkrp.com.au.

Linking with this initiative could be applied by other regional NRM bodies.

Traditional Knowledge Recording Project - Recording Plant Knowledge.
Photo provided by Victor Steffensen.

Narrative techniques are an approach to capturing and sharing information associated with complex issues. Standards Australia International (2004:18), defines narrative as:

'.... the capture, interpretation, distribution and stimulation of knowledge through story. It includes the capture of anecdotal material in the field through a broad range of techniques including those drawn from anthropology as well as story circles, virtual story telling and many others. Narrative databases hold knowledge in its original form, often without formal interpretation, allowing users to encounter stories in the system as they would encounter stories through casual questioning. Narrative techniques also focus on interpreting and representing culture in the formal communication of knowledge through story telling.'

Storytelling is one component of the practice of narrative and can be a useful tool for capturing and disseminating knowledge in organisations and contributing to organisational learning (SAI, 2004:21).

Narrative techniques provide the opportunity to understand complexity through the collection of anecdotes or shared stories of personal experiences. The collected stories reveal what is really happening and the values people have.

References for additional information on narrative techniques can be found in Further Reading (page 38) at the end of the paper.

3.3.3 NRM Funding and Events Calendar

Purpose

The *NRM Funding and Events Calendar* will publish information on funding and events available to regional NRM bodies. Priority will be given to events that provide NRM professionals with learning opportunities such as conferences and forums. Regional bodies will also be able to publicise learning events occurring in their region.

Potential benefits

- Ability to view learning opportunities provided by multiple organisations from a single point

- Increased awareness of the range of professional development opportunities offered by R&D organisations in regional areas

- Better use of available professional development funds

- Increased user awareness of research funding opportunities

- Potential for increased number of applications for research funds, leading to improved quality of investments in research.

Description of service

The *NRM Funding and Events Calendar* will publish information about events being offered by information providers to regional NRM bodies. The content of the Calendar will be delivered through a central coordinator, but the tool will allow R&D organisations and regional NRM bodies to remotely draft event information for approval by the central coordinator. Alerts of events and funding opportunities will occur through the NRM Toolbar.

3.3.4 Knowledge Needs Database

Purpose

The *Knowledge Needs Database* will assist regional NRM bodies to communicate their needs to research and information providers. It will also assist with the identification of cases where multiple regions require the same knowledge and can potentially cost share to obtain it.

Potential benefits

- R&D strategic plans and collaborative investments can be developed based on knowledge needs identified in the Database

- Can capture strategic (>2 yrs) and tactical (<4 wks) knowledge needs

- Reduces duplication of R&D expenditure by creating opportunities for collaboration

- Facilitates interaction between research providers and NRM regions thereby increasing relevance of the research undertaken

- May expedite research to address knowledge needs.

Description of service

When regions cannot find knowledge they need, they can register a 'knowledge need' on the Database. It is expected that information providers who consider regional NRM bodies a client, will consult this database to assist in their formulation of strategic direction at the organisation, program and project level.

The Knowledge for Regional NRM Team extracted and collated regional knowledge needs identified in regional NRM bodies' planning and strategy documents. These lists of knowledge needs are currently being reviewed by the relevant regional NRM bodies before being entered in the Database and published on-line. The *Knowledge Needs Database* will be available by the end of the 2006/07 financial year.

FUNDING

The *Knowledge Needs Database* is funded by the NHT and will be undertaken by LWA during the 2006/07 financial year.

3.3.5 NRM search engine

Purpose

The NRM search engine will enable users to search across multiple publication repositories from a single search point and will provide more relevant search results for NRM decision-makers by focusing on high-quality sources and those identified as relevant by other NRM practitioners.

Potential benefits

- Ability to search many separate online resources from a single search point

- Increased relevance of search results due to prioritisation of relevant, high quality materials

- Ability to easily add useful information sources to a user's personal *My Library*.

Description of service

The preferred process to achieve the NRM search engine is to develop a customised search engine that will conduct a federated search of large existing repositories. This will potentially include repositories such as AANRO, collections in the National Library of Australia, Libraries Australia and the Livestock e-library.

In addition to these large repositories, the search engine will also conduct a search of the personal *My Libraries* that are supported by the NRM Toolbar. In this way, when a NRM practitioner catalogues a new information source, other users will be able to find it and easily add it to their own *My Library*.

Table 2 describes a suggested ranking of search results by the NRM search engine. This ordering is intended to significantly improve the relevance of search results for NRM professionals. The approach is based on the reasoning that any evaluation of information relevant to the user is very important. Of least value are the website crawl results, as they only pick up keywords that may or may not relate to individual information sources.

FUNDING

Further investigations into open source search engines will determine what level of functionality can be achieved for the NRM search engine in the 2006/07 financial year without further investment.

TABLE 2   Ranking of search results in the NRM search engine

Ranked	Description	Why is it ranked this way?
First	Information that has been assessed as useful by another person within the user's organisation and added to *My Library*.	Multiplies the value of one individual's efforts to identify information of interest.
Second	Information sources that comply with the AANRO standard.	Standard references can be easily added to the user's personal *My Library* saving time by not having to rewrite the reference.
Third	References on other users' *My Libraries* that are not complete (i.e. not all fields are complete and hence it is a lower-quality reference).	Although referenced using the standard format, these references may be of lower quality than others.
Fourth	Results of a web page crawl of specific NRM websites.	These results will be links to keywords within web pages. There will be no existing *My Library* entry for these results and therefore they will require the user to catalogue them in their personal *My Library* if they are useful.

3.3.6 Knowledge alerts

Purpose

This service is proposed to develop software to create customised alerts of information sources that have recently been published and are relevant to individual users.

Potential benefits

- Users will receive alerts of relevant new information sources
- Users will not have to search for new information sources as the service will be automated
- The user controls alerts so they do not get flooded with material.

Description of service

The Knowledge for Regional NRM Team has learnt that a specific alerts section of the NRM Toolbar that will allow the user to specify what they wish to receive alerts on would be a useful tool. The user will have the choice of:

- What types of information sources they want to be alerted to
- What topics they are interested in
- How often they wish to be alerted
- Whether they wish to be alerted via email or as web alerts.

The conceptual design of the system would also support automated selection of information sources to include alerts based on what is already in a user's *My Library*. This tool is closely related to the NRM search engine and should be developed in tandem with it.

FUNDING

3.3.7 Ask a Librarian

Purpose

To provide search assistance and access to information and knowledge for regional users of the NRM Toolbar.

Potential benefits

- Provides journal articles and abstracts to address regional knowledge needs

- Provides a referral service to link regional staff with knowledge brokering organisations

- Provides support for the NRM Toolbar

- Offers support to staff of regional NRM bodies in searching and information retrieval skills when using the NRM Toolbar

- Offers alternative access to those who are unable to use the internet.

Description of service

The Knowledge for Regional NRM Team has found that regional NRM bodies will sometimes need assistance with searching and accessing relevant information. In addition, the Team found that regions have limited or no access to full text journal articles and that they would highly value this access.

Ask a Librarian will address this issue by providing a free 1800 phone service for regional staff to use to obtain support in the use of the NRM Toolbar; access to full text journal articles; and referrals to relevant knowledge brokering organisations. Alternatively, regional staff can fill in a simple form accessed from the NRM Toolbar to send details of their search requirements to the librarian. The librarian will search for available information and then send a reply in the form of a List to the requestors online *My Library* or in hard copy when necessary. The requestor will be alerted by email once information has either been added to the List or posted. Responses delivered as a List in *My Library* can then be shared with others.

The proposed *Ask a Librarian* service will include the following services to regional NRM bodies:

- preparation of bibliographies of references and information

- identification and provision of publicly available reports and papers

- access to journal articles that are not publicly available

- advice on how to undertake searches via the NRM Toolbar

- provide links to existing knowledge brokering groups and organisations, such as Greening Australia or the NRM Facilitator Network.

3.3.8 Decision support tool reviews

Purpose

To provide a mechanism for information about decision support tools (DSTs) to be shared via independent reviews in order to assist practitioners select the right tool.

Potential benefits

- Improved awareness of available DSTs
- Improved selection of relevant DSTs and hence better NRM investments
- Provision of peer review and user feedback on DSTs
- Encourage contact between tool developers and end users.

Description of service

Regional NRM bodies and other NRM decision-making bodies invest large amounts of money in DSTs. The proposed service will build a register of independent DST reviews to assist regional NRM bodies in selecting the right tool. The Knowledge for Regional NRM Team has learnt that the reviews will need to be written by specialists in the relevant field and will need to have a user-friendly format, similar to that of consumer reports.

Information proposed to be included in the reviews is: the software platform required to drive the model, the skill level required of the operator, value for money and comparisons with other models that perform a similar function.

FUNDING

The register of independent reviews of DSTs is not currently funded, however, options to fund this service are being investigated by LWA.

CASE STUDY

Practical Index of Salinity Models

The Practical Index of Salinity Models (PRISM) was developed in 2002 as a user guide to salinity models.

PRISM is currently accessible on the LWA website, www.lwa.gov.au/ndsp/prism/. Efforts will be made to build upon this existing database.
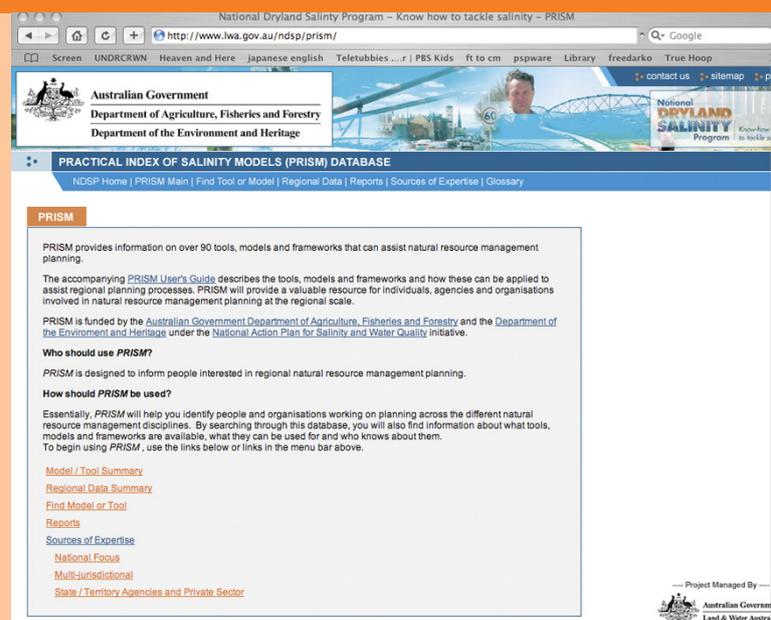
Practical Index of Salinity Models

3.3.9 R&D Directory

Purpose

The *R&D Directory* will assist users to identify current and recently completed research of relevance.

Potential benefits

- The ability to browse information on R&D organisations, programs and projects and identify the relationships between these entities

- Increased awareness of R&D programs

- Value-adding to investment in the AANRO service

- Encourage collaboration between R&D organisations and cut down on research duplication.

Description of service

Project and organisational descriptions already maintained through AANRO will be added to research program information collected by a central coordinator in the Knowledge for Regional NRM Team to create an *R&D Directory*. This will increase the value of existing AANRO content by making it possible to browse by topic.

FUNDING

The *R&D Directory* is not currently funded, however, funding is actively being sought by LWA.

3.3.10 NRM Knowledge Market Report

Purpose

To provide a real-time snapshot of the status of knowledge needs and usage of information sources by users of the NRM Toolbar.

Potential benefits

- Facilitate more effective strategic planning and tactical activities in response to knowledge needs

- Enable tracking of the effectiveness of information sources in the market, to inform the development of more appropriate and accessible information sources in order to achieve increased adoption.

Description of service

The *NRM Knowledge Market Report* will utilise data on user interaction with the NRM Toolbar to generate a dynamically updated report on knowledge market activity. This will include data on both knowledge needs hot topics and the most popular information sources being added to users' personal *My Libraries*.

FUNDING

Development of the *NRM Knowledge Market Report* is not currently funded, however, options to fund it are being investigated by LWA.

3.3.11 User interface, user profile and help systems

Purpose

The user interface, user profile and help systems are required to support the functioning of the NRM Toolbar. While very important to the success of any NRM Toolbar, they are standard steps in the development of any system and are therefore summarised together below.

Brief description

USER INTERFACE

The user interface will combine all the individual elements into a simple framework for users. Due to the number of elements included in the NRM Toolbar, a web toolbar is viewed as the most logical and attractive option for the interface. It allows access to the NRM Toolbar from any website. A mock-up of the NRM Toolbar interface is provided in Figure 3 (page 16).

USER PROFILE

The user profile will handle all user information required for the NRM Toolbar. This information, such as which organisation the user works for, customises the content being displayed.

HELP SYSTEMS

While the NRM Toolbar has been designed to be as intuitive as possible, there will still be the need for an online and phone contact helpdesk for users.

FUNDING

While an interface will be developed for those parts of the NRM Toolbar in development this year, further funding is actively being sought by LWA to enable full interface development to occur during the 2006/07 financial year.

3.3.12 Implementation issues for the NRM Toolbar

There are a number of operational issues to be considered in the implementation of the NRM Toolbar.

A   Who has access to the NRM Toolbar?

Many of the services that make up the NRM Toolbar have value to users outside regional NRM bodies. In fact, the success of a system that is to stimulate interaction between information providers and users will depend on a broad range of NRM professionals using it. The range of potential user groups for the NRM Toolbar includes:

- regional NRM bodies
- the NRM Facilitator Network
- NRM consultants (including agri-consultants)
- Landcare and Rivercare coordinators
- Local landholders and Indigenous landowners
- state government agencies
- non-government NRM organisations
- national R&D agencies
- university researchers.

Where appropriate, investors in and administrators of the NRM Toolbar should consider making services available to a broad range of potential users. In cases where the system offers a labour-intensive service, such as the *Ask a Librarian* service, access can be restricted to regional NRM bodies.

Access should be limited to a community of NRM professionals since the value of sharing knowledge via the *My Library* tool will be reduced if irrelevant material is included. There are practical IT methods available to restrict the user base to NRM professionals.

B   Longevity of support and delivery

The design of the NRM Toolbar relies on a number of organisations accessing and utilising the tool. One of the biggest factors influencing whether regional bodies and other organisations will use the NRM Toolbar is the stability of support arrangements.

There are a number of potential models for the operation and funding of the NRM Toolbar to ensure its longevity. Selection of the preferred

model should include consideration of which model will provide the most incentive for organisations and individuals to use the tool. For example, regional NRM bodies will not catalogue all their internal information sources in the tool unless they are confident the delivery and support of it will be ongoing.

C Roles involved in maintaining the NRM Toolbar

The proposed NRM Toolbar is not simply an IT system. It includes a number of labour-intensive knowledge services that will lead to improved knowledge adoption by user groups and a more efficient NRM knowledge system. This includes functions such as: identifying opportunities for collaboration in research across regional NRM bodies; matching knowledge needs to existing information sources; and manually collating some types of information sources. The following roles are indicative of the roles needed in a support team for the NRM Toolbar:

PRODUCT DEVELOPMENT MANAGER
A system like the NRM Toolbar will undergo constant improvement in response to feedback and suggestions from users. An experienced person will be required to direct the development of the product to cater for its various audiences and users. This will involve negotiation of content access with information providers and identifying new opportunities to deliver content that will meet users' needs through the NRM Toolbar. It will also involve management of the IT functionality provided by the NRM Toolbar.

KNOWLEDGE BROKER
One of the major benefits of the NRM Toolbar is that it allows a knowledge broker to match user needs with existing information sources. The knowledge broker would perform this role as well as identifying and encouraging collaborative research funding arrangements between users with common needs. This position is critical to achieving return on investment in the NRM Toolbar.

HELPDESK
While the NRM Toolbar should be as simple as possible for users to operate, there will always be a proportion of the user base that will require support to use it. A person should always be available to respond to user requests for assistance. This role may be handled by a number of staff as opposed to a single person.

PROMOTION
The NRM Toolbar will require ongoing promotion to ensure its success. This may not need to be a full-time position, but dedicated resources will be required to perform this role.

CONTENT OFFICER
Some elements of the NRM Toolbar require manual collation of content from a number of sources. There are also cases where the central team will manage generation of content such as reviews or evaluations. The Content Officer will manage these content generation processes. Maintaining the quality of content is critical to the success of the NRM Toolbar.

D Maintaining a competitive service environment

A risk of building a single system is that regional NRM bodies will get locked into approaching a single provider for additional services. Every effort will be made to maintain a competitive environment for the provision of knowledge management services to regional NRM bodies and other potential user groups. This includes looking at open source or open standard software to run the NRM Toolbar.

3.4 Supporting knowledge brokering in the NRM sector

The proposed 'supporting knowledge brokering in the NRM sector' package provides a range of services to support regional NRM bodies to broker knowledge. These services include:

- Brokering existing knowledge and information

- Initiating collaborative and multiregional investments

- Supporting regional NRM practitioners to share innovations

- *NRM Stories*

- Regional mentoring (*Sister Regions*).

3.4.1 Brokering existing knowledge and information

Purpose

To better utilise existing knowledge and information to address regional NRM knowledge needs and management issues.

Potential benefits

- Identifies knowledge needs of regional NRM bodies that can be met by existing information and provides this in an appropriate format

- Links R&D providers with regional NRM bodies to meet their knowledge needs

- Supports region-to-region sharing of knowledge and experience.

Description of service

Regional NRM bodies have expressed the desire to get a better grasp on what knowledge and information is available and how it meets their knowledge needs. The Knowledge for Regional NRM Team has learnt that in many cases regions are unaware of existing knowledge and information that could meet their needs or, in some cases, are overwhelmed by the amount of information.

The Team has also learnt that regions are unaware of what other regions are doing with regard to developing information to fill their knowledge gaps. In addition, regional NRM bodies and R&D providers derive considerable value from opportunities to meet and share experiences and information. The substantial cost associated with such meetings restricts how often they can occur and often limits exploration to a small number of priority issues.

This service to regions will comprise two components:

- *Responding to knowledge needs*, which will:
  - Examine and evaluate the knowledge needs of regional NRM bodies in order to gauge the extent to which the needs can be met with existing knowledge

  - Develop summary information on relevant R&D programs and projects

  - Identify and alert regional NRM bodies to others that share an interest in an issue

  - Coordinate or link collaboratively with other knowledge brokering groups and organisations to provide responses to the regional knowledge needs identified.

- *Management practice synthesis*, which will:
  - Investigate development of synthesis materials to respond to knowledge needs, which could range from fact sheets through to forums and events.

The Knowledge for Regional NRM Team has already collated a considerable body of information on current knowledge needs expressed by NRM bodies from across Australia. This will be captured in the *Knowledge Needs Database* (Section 3.3.4) of the NRM Toolbar.

The first case study, below, describes how synthesis documents, such as the development of better management practice guidelines, may be further explored and applied to the NRM context. The second case study provides an example of how problem solving workshops and theme based workshops have been used to address specific knowledge needs.

The Knowledge for Regional NRM Team has identified the potential to use communities of practice in the development of synthesis documents or in problem definition or solving. A substantial amount of information on the existence and functioning of communities of practice is readily available. The 'Communities of practice' box, at the end of this section, documents the exploration of the communities of practice concept undertaken by the Knowledge for Regional NRM Team and outlines ways in which the Program can support their development to assist in the sharing of information.

CASE STUDY

Synthesis outside natural resource management

Medical and education practitioners now rely heavily on synthesis of clinical trials and other research to inform selection of interventions or management guidelines. These include world wide initiatives such as the Cochrane Collaboration for medicine and the What Works Clearinghouse for education.

The selection of management practices for NRM is as complex, if not more so, than the selection of interventions in education and medicine. There are no significant synthesis initiatives available for NRM practitioners. There is, however, no reason why similar synthesis frameworks cannot be applied in NRM.

Synthesis of research findings often falls into no-mans-land between researchers and practitioners. Practitioners want synthesis that considers research from all R&D providers, not just a single organisation; hence there is no incentive for individual R&D agencies to undertake this work. At the same time, it is not practical or efficient for individual practitioner organisations to synthesise all available research.

In its scoping year, the Knowledge for Regional NRM Team found significant interest in the concept of synthesis of management practice knowledge and research. While the necessary investment in such a synthesis effort would not be small, it is not significant compared with the total amount spent on NRM research and would provide considerable benefits to practitioners.

CASE STUDY

The Riparian workshops for 2005/2006

LWA's National Riparian R&D Program has undertaken eleven years of research into how riparian areas function, how they can be better managed, and how to engage local communities in protecting, maintaining and rehabilitating them. The research has focused on science to improve the understanding of key riparian management issues.

Between November 2005 and March 2006 the National Riparian Lands R&D Program was 'on the road', running regional workshops in each State and Territory, plus tailor made ones for organisations like Greening Australia. Researchers translated their findings into practical management outcomes. Each workshop had between 25-35 participants, drawn from government NRM departments, non-government organisations and regional NRM bodies. Some 220 people attended the workshops overall.

The mix of science and practice proved popular with participants, who found the workshops useful and highly valued the opportunity to talk directly to the researchers. Taking researchers out to the regions was found to be a good approach as people felt they could access the science as it was placed within their local context.

Macroinvertebrate sampling on the Snowy River by Robyn Bevitt (left) and Teresa Rose (right) of the Department of Natural Resources. Photo by Robyn Diamond

A community of practice is a network of people who share a common interest in a specific area of knowledge or competence and are willing to work and learn together over a period of time to develop and share that knowledge.

Over the past 18 months, the Knowledge for Regional NRM Team identified the need to support communities of practice to address various issues that face regional NRM bodies. Communities of practice may evolve of their own accord to meet a particular need. However, the Team found that when endeavouring to initiate communities of practice through workshops and meetings, the lack of a champion hindered their establishment.

There are many benefits associated with communities of practice, as they:

- provide a valuable vehicle for developing and sharing specialist knowledge
- provide a non-threatening forum to explore and test ideas or validate courses of action
- have access to broader networks and expert help and seek help in addressing challenges
- enable rapid problem solving to occur
- generate new knowledge in response to problems and opportunities
- can be more flexible than traditional arrangements
- cut across organisational boundaries and formal communication lines
- provide early warning of potential opportunities and threats
- can be a vehicle for cultural change (creating a knowledge sharing culture)
- are largely self-organising
- allow for professional skills to be honed through sharing of ideas and discussion.

The NRM Toolbar has a number of components that can support communities of practice. For example, *My Library* stores and shares information sources and the NRM search engine offers communities of practice a way to share and search for information sources related to their area of interest. In addition, knowledge alerts will assist in keeping the community of practice up to date in their field of interest.

3.4.2 Initiating collaborative and multiregional investments

Purpose

To initiate collaborations and multiregional investment in new research and information to address regional knowledge needs.

Potential benefits

- Reduced duplication of information generation processes
- Provides better return on investment because research would be undertaken by multiple regions to address priority and common regional knowledge needs.

Description of service

The Knowledge for Regional NRM Team has found that many regions have common needs for new information and research. These needs have often led to multiple investments into similar issues or even the same issue. In addition, regions have often described cost as a barrier to obtaining new information and research; this could be partially overcome through more collaborative investment. The information gained through this collaborative effort would also be at a scale appropriate for use by the regions involved.

This service would address these issues by looking for opportunities for collaboration across regions with common research and information needs. The service would:

- identify regional NRM bodies with common needs
- initiate collaboration between regions to address knowledge needs
- facilitate knowledge needs workshops with key research providers
- assist regional NRM bodies in identifying funding opportunities
- develop an annual knowledge needs report, from the *Knowledge Needs Database*, that identifies priority knowledge needs across regional NRM bodies and provide it to both research providers and regional bodies.

The Knowledge for Regional NRM Team has also identified that there need to be more incentives for researchers to provide advice to regions. A case study describing incentives to encourage scientists to prepare articles for publication in journals is given below. This problem is also further discussed in Chapter 4, Policy Implications.

CASE STUDY

eWater CRC: Incentives for scientists

Funding available to research scientists has traditionally been delivered as three year research grants. Factors, such as the variable scales at which catchment and ecological processes occur, can result in the researcher having difficulty in implementing their research program or project—the vagaries of nature can mean that the full three years of a research grant is devoted to collecting sufficient information from which to answer research questions. The researcher then has to find the time (and sometimes resources) to prepare manuscripts and have them published whilst managing other competing activities and pressures. This can result in significant delays in preparing manuscripts, having them peer reviewed and published in scientific journals, and then being made available to NRM staff and others who may wish to apply the material they contain.

In order to overcome such problems, the previous CRC for Freshwater Ecology and more recently, the eWater CRC provided both time and resources for research staff to prepare manuscripts and have them ready for publication within three months of conclusion of major research programs. Support for 'writing-up' periods was greatly appreciated by research staff and meant that research findings were published in a timely manner. Staff were required to report on publication completion as a formal CRC milestone task.

The 'initiating collaboration and multiregional investments service' would also gauge demand for more formalised investment in collaborative regional projects. The box at right describes how this could be achieved.

Possible Future Investment: Collaborative Regional Investment Program

There is currently minimal coordination of regional NRM investment. Coordination would help to attract the best researchers and overcome issues associated with cost. To attract the best available researchers, we need to find ways to overcome the perception that 'providing research to regional NRM bodies is consulting and is not acknowledged or rewarded in universities.'

A Collaborative Regional Investment (CRI) Program could overcome this barrier by providing research grants and supporting scientists to publish amongst the research community. In addition, embedded in the CRI Program could be the broader knowledge and adoption principle; to support scholars to undertake their research with regions in a participatory way. The CRI Program could therefore act as a broker of research for regional NRM bodies where collaborative projects are identified. In addition, the CRI Program could assist with other issues including duplication of research, fragmentation of information sources, dealing with information that is not at a relevant scale and the cost of obtaining information.

Potential benefits of the CRI Program include:

- research would be guided through genuine partnerships with regional NRM bodies who in turn would have direct participation in the research

- through partnerships with regional NRM bodies a more direct pathway for adoption would be built into the research projects

- results would be more accessible for translation into management guidelines for regional NRM

- there would be a greater chance of attracting the best available researchers from universities to undertake research for regional NRM bodies because it would be regarded as 'research' rather than a 'consultancy'

- there would be better return on investment by undertaking research that met the priority needs common to multiple regions.

Over the next two years the Knowledge for Regional NRM Team will determine demand for the CRI Program as well as provide input into its design and governance.

3.4.3 Supporting regional NRM practitioners to share innovations

Purpose

To support regional NRM bodies in sharing their innovations with other regions.

Potential benefits

- Supports regional innovators to share their experience and knowledge across regions
- Encourages innovation
- Reduces the duplication of resources and research investment
- Encourages better practice in regions.

Description of service

The 'supporting regional NRM practitioners to share innovations' service helps address the barriers associated with regions sharing their knowledge and experience of innovative NRM practices with each other, R&D providers and policy agencies. When individuals exhibit strong knowledge or skills in a particular NRM topic or take an innovative approach to a management practice, they are overloaded with requests for information. This service looks to support NRM innovators to share their knowledge and experience with other regional NRM bodies and NRM practitioners.

It is proposed that the service would provide:
- ongoing funding to enable innovators to present at conferences and workshops, within Australia, that other NRM regions attend
- annual funding to support the development and delivery of training packages of innovative tools, practices and techniques.

FUNDING

The 'supporting regional NRM practitioners to share innovations' service is not currently funded, however, options to fund it are being investigated by LWA.

3.4.4 NRM Stories

Purpose

Provide learning from applied NRM knowledge through video and other formats, for gathering and sharing good news stories and lessons within the NRM community.

Potential benefits

- Experience and lessons would be captured and made available to a broad audience
- Stories would become a resource for future planning and program or project development
- Providing information and lessons in a variety of formats increases the likelihood that lessons that could otherwise be ignored would be listened to and used
- Captures the history and thinking behind a practice.

Description of service

NRM Stories will provide an alternative avenue for regional NRM bodies to provide their good news stories or lessons learnt. The Knowledge for Regional NRM Team has learnt that regions want avenues to share their stories and that current avenues may not be providing the variety of formats that best meet this need.

This service proposes that a series of *NRM Stories* (which relate particular aspects of applied knowledge) be produced that can be accessed via the NRM Toolbar. Each story could also be catalogued in a user's personal *My Library*. This service could possibly be developed in partnership with the NRM Facilitator Network and run through the Mosaic Map project developed by the Australian Government NRM Team.

FUNDING

NRM Stories is not currently funded, however, options to fund it are being investigated by LWA.

3.4.5 Regional mentoring (Sister Regions)

Purpose

To trial and support regional NRM bodies in mentoring partnerships.

Potential benefits

■ Facilitates the sharing of experience, knowledge and processes across regions

■ Reduces the duplication of resources and subsequent investment

■ Enables mechanisms for sharing tacit knowledge between regions.

Description of service

The Knowledge for Regional NRM Team is supporting regional NRM bodies interested in region-to-region mentoring via the *Sister Regions* program. A pilot is being run which is designed to create more opportunities for regions to share their knowledge and experience with each other.

The idea of mentoring is widely recognised as a mutually beneficial relationship. Through such partnerships, individuals or organisations share in the growth and personal development of one another.

Some regions currently undertake partnerships, but they are primarily with neighbouring regions and nearly always in the same state. This service would endeavour to support regions with similar issues across state boundaries to increase the sphere within which learning and sharing of lessons takes place.

Four regions have expressed interest in being involved in two *Sister Regions* pilots, as described in the boxes at the end of this section. Each region may decide to run the process differently, however, it is likely that the regions will visit one another to share knowledge and experiences and look at each other's projects.

In the longer term the Knowledge for Regional NRM Team will support the mentoring approach by:

■ Developing guideline material for other regions to establish their own regional mentoring arrangements

■ Coordinating a national regional mentoring service based on criteria such as geographical location, stage of planning processes, issues in the region and staffing levels.

FUNDING

The two *Sister Region* pilots described below and on page 32 are funded by the NHT and will be overseen by LWA.

Northern Gulf Resource Management Group and Rangelands Western Australia Sister Region pilot

As a first step, both regions will map their activities, projects and key people to work out areas where they can share experiences and knowledge. Both of these regions work with similar land types so there will be on-ground benefits in sharing skills, tools and pathways. In particular, Northern Gulf and Rangelands will share how they work with graziers and their perspectives and techniques for involving Indigenous communities.

RANGELANDS WESTERN AUSTRALIA

NORTHERN GULF

Far North Queensland NRM Ltd and the Corangamite Catchment Management Authority Sister Region pilot

Far North Queensland NRM Ltd and the Corangamite Catchment Management Authority will meet with each other and share their experience in the area of knowledge management. The Corangamite Catchment Management Authority has recently developed an approach to managing its information sources, communicating its knowledge needs and engaging researchers and consultants (see box on page 14) that Far North Queensland NRM Ltd is keen to learn from. Far North Queensland NRM Ltd has been engaging scientists to provide advice through ongoing partnerships. The Corangamite Catchment Management Authority will be able to explore different ways of engaging scientists in its activities.

FAR NORTH QUEENSLAND

CORANGAMITE

3.4.6 Implementation of a knowledge brokering network

Potential investment in a network of regional knowledge brokers to strengthen links between information providers and regional NRM bodies has been discussed extensively in consultations during the scoping phase of the Knowledge for Regional NRM Program. Explanatory information on knowledge brokering is provided in the boxes that follow on page 33 and 34.

While it is important to acknowledge and understand the benefits of establishing a large distributed network of knowledge brokers to service regional NRM bodies, the Knowledge for Regional NRM Team would not currently suggest investment in such a network. Several organisations, such as R&D providers, state government agencies and private consultants, are already investing in either knowledge brokers or specialists that undertake knowledge brokering activities for regional NRM bodies. It is the view of LWA that, at this stage, the limited funds available would achieve a better outcome if they were invested in providing support to individuals and organisations currently undertaking knowledge brokering activities. The options proposed in this paper are designed to provide that support and thereby add value to regional NRM bodies. According to Campbell:

'I don't believe that we need necessarily to be spending more money or employing more people. But we do need a clearer national framework for this total investment, and one that pays greater attention to some of the underlying knowledge system issues. As things stand currently, extension activity is being funded, but investment in extension infrastructure is limited and has probably declined (2006:27).'

The packages and services discussed previously provide some of the practical elements of this infrastructure.

WHAT IS KNOWLEDGE BROKERING?

The Knowledge for Regional NRM Program defined 'knowledge brokering' as part of the various people-based actions of knowledge exchange and adoption. It involves bringing people together, helping to build links, identifying gaps and needs and sharing ideas. It searches for opportunities to have the right information used to solve problems and for better ways of doing things. It also includes assisting groups to communicate and understand each other's abilities and needs, and assists in guiding people to sources of relevant information.

Knowledge brokering can involve summarising and synthesising research and policy into easily understood formats for use by NRM professionals, and for transforming knowledge needs and issues into research questions. Knowledge brokering encourages the use of research outcomes in planning and implementation and uses evaluation to identify successes or improvements. Some of these activities and roles overlap with facilitation, though this term is sometimes also used to describe a broader suite of activities. Both facilitation and knowledge brokering fit within the broader context of extension and capacity building. Campbell (2006:16) put forward the following mud map (Figure 4) to show the relationship between these terms.

Furthermore, there are specific skills associated with knowledge brokering.

Skills and attributes required for knowledge brokering

Knowledge brokering can be a whole role or activities undertaken by a person as part of their role. Knowledge brokering draws upon a broad array of attributes and skills. Some of the specific attributes and skills that are required for knowledge brokering include:

- **strong technical literacy**—essential to a knowledge broker's credibility and crucial to their understanding, and ability to search and cross-examine information sources

- **strong communication skills**—key to a knowledge broker's ability to quickly understand a situation, build rapport and trust with others, actively listen and translate complex concepts into easily understandable formats

- **strong problem-solving skills**—important for a knowledge broker to make sense of the various types of existing knowledge and experience, to be able to think strategically and keep an open mind when defining and addressing problems for end users

- **excellent people skills**—a must for a knowledge broker so they are able to maintain their interest and desire to understand people and their problems, identify and resolve conflict and maintain networks.

FIGURE 4   Conceptual mud map of extension models
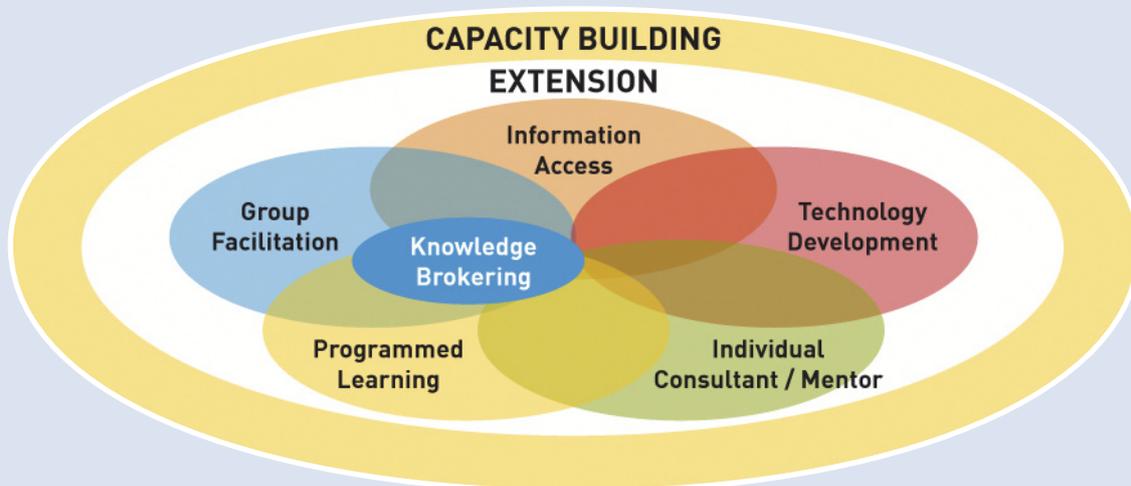
Source: Campbell 2006:16

KNOWLEDGE BROKERING APPROACHES

The various models for a knowledge-brokering network and options currently employed in the NRM system are described below.

Regional-hosted knowledge brokers

Regional bodies are becoming increasingly aware of the potential value of in-house knowledge brokers. The Central West CMA in NSW and a group of CMAs in Victoria have already seen the need to employ knowledge brokers. Always acting in the best interests of the host organisation, the broker can select the best available knowledge from all sources and tailor it for regional use.

R&D hosted knowledge brokers

Increasingly, R&D organisations are employing knowledge brokers to assist with the adoption of research findings from their programs. It is often difficult for NRM professionals to identify and access the most appropriate researcher(s) or consultant(s) for a given knowledge need. The Knowledge for Regional NRM Team has learnt that regional knowledge brokers, the NRM Facilitator Network and regional officers could be better supported by having a first point of call within R&D organisations to enable easier access to researchers.

The NRM Facilitator Network as knowledge brokers

The NRM Facilitator Network has a number of roles including communicating Australian Government policy and its implications at the state level and also communicating feedback to the Australian Government with regard to policies and programs. A further role for the NRM Facilitator Network could be that of knowledge broker. The Knowledge for Regional NRM Team undertook a survey of 25 facilitators from the Network to scope their understanding of knowledge brokering and also asked what support was needed for this activity.

Results from the survey show that facilitators identified that they regularly engage in knowledge brokering activities. They are also involved with supporting networks or communities of practice, and encouraging the use of research and collected information in regional NRM planning, implementation and evaluation. Facilitators felt that knowledge brokering activities were a key and successful part of their role. However, the term 'knowledge brokering' was not extensively used by the group.

The role of consultants as knowledge brokers

For regional bodies, consultants currently play a vital role in brokering knowledge. Often with large specialist networks at their disposal, consultants can efficiently supply knowledge for a specific purpose. The main disadvantage is that individual regions may be duplicating procurement of the same knowledge.

4 Policy Implications

The Knowledge for Regional NRM Team has identified a number of policy implications with regard to how knowledge is managed across the NRM sector. These implications are discussed in greater detail below.

A Improving purposefulness, cohesion and performance in the NRM knowledge system

Measures for improving the purposefulness, cohesion and performance of the NRM knowledge system have been considered by LWA's Executive Director, Andrew Campbell, in his occasional paper, *The Australian Natural Resource Management Knowledge System* (2006). The paper suggests making the system more **purposeful** by:

- Developing an overall NRM knowledge strategy

- Developing core elements of a common reporting framework, and

- Establishing a high level of capacity amongst NRM professionals to set priorities and review progress.

In addition, the paper recommends complementary measures to make the system more **cohesive** by making information and knowledge more accessible, funding the 'arrows'—mechanisms that connect information and knowledge across the system—and rewarding collaborative behaviour. Finally, the paper also identifies ways to improve system **function**, including tapping into people with rich experience and knowledge and helping to share their insights and innovation with others. The principles of purposefulness, cohesion and function have guided the packages of services described in Chapter 3.

B Stable support arrangements for knowledge management services

Many of the packages and services discussed in this paper rely on organisations implementing them as part of their internal business processes. There has been a very positive response from regional NRM bodies regarding the proposed services and their potential to improve knowledge management in their organisations. However, collaboration with regional NRM bodies to implement the proposed packages and the expected resulting improvements is unlikely to occur if there are questions about how long these services will last and how they will be supported. This is particularly the case with the NRM Toolbar, which regional NRM bodies have stressed would need to be made available and supported for a minimum of five years for them to hard-wire it into their business processes.

Such a step would, over time, make a huge difference in the overall functioning of the NRM knowledge system in Australia.

C Economies of scale

Regional NRM bodies understand the importance of knowledge management for the attainment of NRM outcomes. As a result, many bodies are beginning to invest in individual systems to support better use of knowledge. As stated in Campbell (2006:29),

> '...we run the risk of allowing the development of dozens of different rail gauges...'.

Not only is there a risk of different gauges, but there is also a risk of large and unnecessary duplication in public expenditure. In addition, some regions simply cannot afford the development and implementation of the infrastructure required. The establishment of shared standards and infrastructure to manage knowledge will provide economies of scale to deal with knowledge management issues across all regional NRM bodies.

D Roles and responsibilities in the NRM knowledge system

There is still a great deal of confusion amongst practitioners and researchers about where different organisations fit within the NRM knowledge system. This is particularly true with regard to data management and monitoring and evaluation. Questions like, 'Who is setting the data standards?' and 'Who is collecting, storing and managing data?' are commonplace. Determining which scale and organisation is most appropriate for undertaking these responsibilities is still required, and crucial. Factors that need to be taken into account when considering these responsibilities are: stability of arrangements for continuity; levels of resourcing and skills or capacity.

The Australian Government has recently established a community of practice for data and information management and access to support NRM. It is hoped that this group will assist with clarifying roles and responsibilities in the NRM system.

E Understanding the NRM knowledge market

Further investigation into the NRM knowledge market will clarify the issues and drivers associated with regional research and the need for a Collaborative Regional Investment Program (see box on page 29). The Knowledge for Regional NRM Team has identified a number of challenges and conflicting problems faced by stakeholders and participants. For example:

- What is the role for private knowledge providers?

- Can a knowledge market provide efficiencies or could it result in major inequities regarding access to good information?

- Researchers may avoid undertaking research for regions because this is regarded as consulting, and consultancies are not acknowledged or rewarded in universities.

- Consultants believe they are competing with research organisations, which can often offer lower rates that are offset by the various government top-ups they receive.

- Regions believe they are paying universities for the science at consultancy rates that are higher than research rates.

F Standards for evidence based regional decision-making

When dealing with regional NRM bodies from New South Wales, the Knowledge for Regional NRM Team noticed the positive impact of the Natural Resources Commission (NRC) *Standard for Quality Natural Resource Management* (NRC, 2005). The Standard requires regional NRM bodies to show their use of best available knowledge and has created the need for NSW regional NRM bodies to investigate knowledge management solutions. The full impact of the Standard in NSW and the potential of this framework to be a driver for the wider introduction of knowledge management solutions warrants further investigation.

G Role and responsibility of the NRM Facilitator Network

It has been suggested to the Knowledge for Regional NRM Team that members of the NRM Facilitator Network could potentially be knowledge brokers, as much (but not all) of their role already involves knowledge brokering activities. This is discussed further in Section 3.4.6. In summary, it is recommended that the other aspects of their roles would need to be well considered and preserved when looking at this possibility. If their other functions are not properly evaluated, one gap may be patched in the science—region—policy connection arena to create another. A systematic review of their role and responsibilities in NRM, along with an exploration and recommendation of desirable skill sets to fill these functions would help to resolve the question about their role as knowledge brokers.

H Incentives for researchers to place their work into the bigger NRM picture

The Knowledge for Regional NRM Team has identified that research is often done in isolation from regions and the research outcomes are not put back into the bigger context. Science by its very nature has to reduce certain aspects of the environment in order to understand it. There are few requirements of researchers to place this research back into a broader context so that it can inform the system as a whole. Researchers have an important role in showing how their work fits into the bigger NRM picture to inform regional NRM decision-making. Incentives for researchers

are required to encourage them to inform regional decision making and to show how their work fits into a bigger NRM picture. The Knowledge for Regional NRM Team has identified the following:

- Decisions made by regional NRM bodies can be better informed when researchers are involved to help them define and solve problems and define knowledge and research needs

- Researchers usually have 100 per cent of their time allocated to their research. Any outside activity—such as a problem definition and solving workshop for regions—would add to an already full-time commitment

- The culture and rewards of research mean that once a research question is answered the researcher often moves on to other projects, having little interest in the broader implications of their work.

A greater understanding of the incentives and drivers that might encourage researchers to work with regions is required.

One such initiative may be to invest 10 to 20 per cent of a researcher's time for broader activities, such as problem-solving workshops with regions. This model was successfully used to attract researchers to problem definition and solving workshops as part of the Cooperative Research Centre for Freshwater Ecology (see case study on page 29). Another initiative may be to invest in PhD scholarships and post doctorates at the regional level, thus introducing young researchers to specific regions. Regional NRM bodies could provide incentives to researchers such as offering funding, physical support, access to equipment and accommodation.

Further reading

Knowledge and Adoption

Land & Water Australia, 2005, *Knowledge and Adoption Strategy—Managing information and knowledge for adoption outcomes*, Land & Water Australia, Canberra, ACT.

Knowledge Brokering

Australian Biosecurity Cooperative Research Centre, 2006, *Technology Transfer: Knowledge Exchange*, http://www1.abcrc.org.au/pages/ TechTransfer.aspx, last accessed 5.30pm, 21 September 2006.

Canadian Health Service Research Foundation, 2006, *Keys: Knowledge Exchange Yields Success, Glossary of knowledge exchange terms as used by the foundation.* http://www.chsrf.ca/keys/glossary_ e.php, last accessed 5.30pm 21September 2006.

Knowledge Management

actKM Forum, www.actkm.org, last accessed 11.30am 23 October 2006. The actKM Forum is a not-for-profit learning community dedicated to building and sharing knowledge about public sector knowledge management.

Australian Government Information Management Office, 2006, *Australian Government Information Interoperability Framework: sharing information across boundaries*, AGIMO, Canberra, ACT.

Standards Australia International, 2004, *Knowledge Management Terminology and Reading List—An Australian Guide,* HB 189—2004, Sydney, NSW.

Standards Australia International, 2005, *Knowledge management: a guide*, AS 5037-2005, Sydney, NSW.

Monitoring and Evaluation

National Monitoring and Evaluation Symposium Steering Committee, 2005, *National Monitoring and Evaluation Symposium Hobart 2005 'Challenges and opportunities in achieving better NRM through M&E' Proceedings*, http://www.lwa.gov.au/downloads/ publications_pdf/PR051005.pdf, last accessed 8.40pm 4 November 2006.

Narrative Techniques

Knowledge Board, www.knowledgeboard.com, last accessed 11.30am 23 October 2006. A self-moderating global community thinking and collaborating on subjects around (but not limited to) Knowledge Management and Innovation in the worlds of business and academia.

NRM Knowledge System

Australian Government, NRM Facilitator Network, http://www.nrm.gov.au/publications/ facilitator-factsheet.html last accessed 4.50pm 13 October 2006.

Campbell, A., 2006, *The Australian Natural Resource Management Knowledge System*, Land & Water Australia, Canberra, ACT.

LWA, 2006, *Knowledge for Regional NRM: Connecting researchers and practitioners*, Canberra, ACT.

LWA,2005, *Knowledge for Regional NRM: Scoping Report*, Canberra, ACT.

LWA,2005, *Knowledge for Regional NRM: Facilitators as knowledge brokers*, Canberra, ACT.

Natural Resources Commission, 2005, *Standard for Quality Natural Resource Management*, Natural Resources Commission, Sydney, NSW, www.nrc.nsw.gov.au, last accessed 2.10pm 13 October 2006.

Appendix A

How the paper was developed

This Appendix provides information on the activities undertaken to generate the knowledge base that informs this paper. Major activities undertaken during phase one of the Program included:

- A Scoping Report
- Development of issue statements
- A technical feasibility report of the First-stop Knowledge Shop (Appendix B)
- Connecting with information providers
- Program Working Group meetings
- Technical Advisory Group meetings
- Facilitator Discussion Group
- Workshops and forums.

Further detail on these activities is presented below.

Scoping Report

The *Scoping Report* reviewed the concept of regional knowledge management, including knowledge brokering and its role in facilitating information and knowledge sharing between national and regional stakeholders in the NRM context.

Included in the *Scoping Report* is an initial review of knowledge exchange processes in NRM and identification of current problems and barriers faced by stakeholders (regional NRM bodies, regional facilitators and national organisations) in relation to these processes. In addition, the report began to identify options for improving information exchange along with proposed knowledge brokering approaches and tools.

The report provides:

- A review of the literature examining the use of information in the regional NRM context
- A review of existing knowledge brokering and exchange approaches
- A survey of 16 regional bodies (including CEOs)
- A summary of discussions, in various forums, with the NRM Facilitator Network and the Landcare facilitators' network
- A summary of discussions with national research organisations.

The survey and workshop outcomes were supported by the findings in the literature. Key learnings contained in the *Scoping Report* showed that the major concerns for regional stakeholders included:

- Fragmentation of information and sources
- Managing the large volume of information
- Relevance of that information to context, including scale
- Accessibility and availability of information
- Information sharing on multiple levels
- The need for a two-way flow of information.

The report also began to propose a range of knowledge brokering approaches and tools. The Knowledge for Regional NRM Team has explored these further and they have contributed to the development of the issue statements and subsequently to the development of the three packages outlined in this paper.

Approach to defining issues and packages for the paper

The identification of issues and the packages to address them was undertaken through two stages:

- **Stage 1**: Development of issues statements
- **Stage 2**: Development of knowledge exchange packages and supporting services.

A description of the steps included in each stage follows.

Stage 1 Development of issues statements

A Identification of barriers to information seeking

A range of surveys and informal discussions provided insight into the specific barriers to information seeking confronted by regional NRM officers and the NRM Facilitator Network. This included inputs from:

REGIONAL SURVEYS

Sixteen regional bodies were surveyed using a semi-randomised approach, which aimed to maximise variation across the geographical area represented by NRM regions. The semi-structured interviews sought input about the barriers, needs and preferences of regional NRM officers in relation to knowledge exchange.

FACILITATOR SURVEYS

Twenty-five facilitators (seven Australian Government facilitators and 18 regional NRM facilitators) were interviewed by telephone about their understanding of their roles in relation to knowledge brokering and knowledge exchange (see box on page 34).

FINDINGS OF PHASES ONE AND TWO OF THE NRM TOOLBAR FEASIBILITY STUDY

Phases 1 and 2 of the NRM Toolbar feasibility study involved a survey of regional bodies and interviews with regional NRM staff to further characterise key issues to be dealt with by the NRM Toolbar.

OUTCOMES FROM TWO COMMUNITY FORUMS

Members of the Knowledge for Regional NRM Team attended two community forums, one in Darwin in April 2005 and the other in Sydney in April 2006. The Team obtained input from Chairs from 38 regional NRM bodies about their needs and preferences for knowledge sharing processes and arrangements.

BARRIERS IDENTIFIED AND DISCUSSED IN LITERATURE

A literature review was undertaken to investigate the major findings with regard to knowledge management and knowledge brokering both within and outside Australia. Findings from other sectors were also investigated in this process.

B   Evidence from team learning

As part of an action learning approach, individual Knowledge for Regional NRM Team members were continually learning about the complexities associated with the regional NRM knowledge system. This included information about barriers, potential packages for improving knowledge exchange and an understanding of information-seeking processes.

These lessons came about through trials of various processes (see boxes below), discussions at formal meetings, reading, and informal conversations with stakeholders in regions. All team lessons were recorded to further inform the packages proposed in Chapter 3.

NATIONAL MONITORING AND EVALUATION SYMPOSIUM

The National Monitoring and Evaluation Symposium, held in September 2005, was a national first in bringing together regional NRM body representatives and key monitoring and evaluation (M&E) practitioners from state/territory and national agencies. One hundred and forty-five delegates, including representatives from 49 regions, shared experiences to develop a collective understanding of how M&E can help achieve better NRM outcomes. The event itself sparked many linkages and new partnerships and made steps towards a more cooperative environment for M&E in NRM. The report of the Symposium is available from www.lwa.gov.au

SOCIAL AND ECONOMIC INFORMATION FOR REGIONAL NRM WORKSHOP

The Social and Economic Information for Regional NRM Workshop was a two day workshop, held in July 2006, that brought together 50 representatives from regional NRM bodies and key social and economic research and information providers, universities and private industry. The workshop allowed practitioners and researchers to share their knowledge. The knowledge sharing led to regional NRM bodies being better informed about the information that is available and improved understanding amongst research providers of how they can better service regional activities. The workshop will feed into the First National Workshop for Regional NRM in November 2006 and may lead to a national forum on social and economic information for regional NRM within the next 12-18 months.

Demand for this workshop was very high. Participants greatly valued the opportunity to share their knowledge including what has worked well and what has not. They were also able to define regional socio-economic information needs, challenges and opportunities.

Developing issues statements

The Knowledge for Regional NRM Team entered individual barrier statements from all the information sources (as described above) into a spreadsheet (Figure A). These statements were also linked to the data sources from which they were derived to assist analysis. Specific quotations clearly encapsulating the meaning of the identified barriers were included in this spreadsheet in order to capture the 'voice' of participants. An intensive, iterative process of clarifying content, exploring meaning and cross-checking data sources resulted in the final series of 10 issues statements, presented in Chapter 2. These statements capture the intent of all the barrier statements identified throughout the data collection process.

FIGURE A   Development of issues statements

Issue Statements (A-J) Team process 10 issue statements encapsulate all barriers				Data fragment	Data source (hyperlinked)
A	B			We need more opportunities for professionals to share experiences	Facilitator Q23
A	C	B		Often researchers don't always have time or resources to become involved in events and activities outside their particular project – but input would be highly valued	GA
A	C	E		Regional bodes are being pulled in multiple directions for information. Don't have staff resources to report	Q16
A	D	E	B	Not knowing 'who is about to do what' and the ability to search for this information. This is as important as what has been done as there is often a time lag between a project starting and information being available. It is also important that those undertaking new research can collaborate with projects already underway	Community forum
A	D	E		Level of awareness about information and not knowing how to apply it is a key issue	Q8
A	D	F	B	Key issue relevant to Statistics appears to be knowing who is doing what. In many cases people are not aware that there is relevant information that would meet their requirements	FSKS questionnaire
A	E	B		Duplication is a huge issue - "research is conducted but not registered". Once a person leaves an organisation no-one is aware of that information and it is duplicated.	Q13
A	E	B		Personalities/organisational cultures and structures that prohibit integration and interaction	CSIRO - CSE
A	E			"There is definitely information being used but it's in peoples' heads"	Q12

Stage 2 Development of packages and supporting services

During Stage 2, the Knowledge for Regional NRM Team examined options to address user requirements and overcome the barriers to finding, exchanging or sharing knowledge. Potential solutions were gathered from the many sources described below. As ideas and solutions were identified, an assessment was made about their viability. The Program Working Group provided feedback on the development of the solutions. Solutions assessed as viable were developed into the three packages presented in Chapter 3.

Stakeholder surveys

Information obtained through the regional and facilitator surveys described in Stage 1 above was used to develop the packages and supporting services.

Suggestions from Program Working Group, Technical Advisory Group and NRM Facilitator Discussion Group

The Knowledge for Regional NRM Team had the opportunity to meet with and discuss various solutions with the Program Working Group, the Technical Advisory Group and the NRM Facilitator Discussion Group. Input was also gained from numerous sessions at forums, workshops and conferences with all suggestions and feedback being considered during the development of the three packages and services.

Suggestions from the project team and broader Knowledge & Adoption Team at LWA

The Knowledge for Regional NRM Team learnings, described throughout Chapter 3, were also used to inform the development of viable information management and knowledge sharing packages. In addition, the project team held a workshop with the LWA Knowledge & Adoption Team. All outputs from this workshop were recorded; they included the development of the proposed packages.

Case studies

The Knowledge for Regional NRM Team assessed existing knowledge exchange processes individually for their potential application to NRM. These are documented in the numerous case study boxes included throughout Chapter 3.

Consultancies

Reports from the NRM Toolbar feasibility study (Appendix B) included some initial suggestions for knowledge exchange processes. These were also utilised in the development of proposed packages.

Once the three packages were conceptualised they were each assessed for their feasibility. The practicalities of the packages and services for regional NRM bodies were reviewed independently. The final output of Stage 2 is the proposed packages and services included in Chapter 3.

Appendix B

NRM Toolbar Feasibility Study

The NRM Toolbar Feasibility Study examined the feasibility of a potential First-stop Knowledge Shop (FSKS). The objective of the study was to investigate possible options for a FSKS for NRM. The FSKS is now referred to as the NRM Toolbar.

Study approach

The services of the Toolbar were developed by assessing the requirements of key stakeholders, identifying the breadth of knowledge to be dealt with by the system and investigating successful knowledge exchange systems from NRM and other sectors. This was undertaken via four phases:

- **Phase 1**—Developed an understanding of existing sources of relevant information and access arrangements. The results of this phase are included in Report 1—User requirements and review of knowledge provided by national R&D organisations.

- **Phase 2**—Reviewed existing knowledge management and knowledge exchange systems used by multiple organisations and sectors across Australia and overseas. The findings of this phase are reported in Report 2—Review of knowledge exchange systems.

- **Phase 3**—Developed the package of feasible services presented in Section 3.3 of this paper.

- **Evaluation**—A series of evaluation workshops were conducted with regional NRM bodies and facilitators.

Technical Advisory Group

A Technical Advisory Group, comprising representatives from national R&D organisations, was consulted during the feasibility study. The group provided valuable feedback and direction to the study.

Scope of the NRM Toolbar

The objective of the NRM Toolbar is to provide increased coordination, cooperation and interconnection between information providers and regional NRM bodies. The NRM Toolbar was to build upon existing data libraries, atlases and data delivery systems to link information for use by regional NRM bodies and NRM facilitators. It aimed to help people find the information or contact they needed when they need it. It was also to assist people in finding and sorting out the most relevant information from the massive array of potential information sources.

Given the number of stakeholders and complexities in the regional NRM system, the Feasibility Study focused on how a NRM Toolbar would benefit the primary target user groups: regional NRM bodies and the NRM Facilitator Network.

Glossary

Adoption—acceptance and use by the target audience of a new concept, tool or practice (LWA, 2005:16).

Communities of practice—groups of people who develop competence and good practice in a defined area. Also known as enabling or knowledge networks, they bring together and attract people who do not normally work together to share their knowledge and create better working practices... They act as mechanisms for increasing tacit knowledge and also for transforming tacit knowledge into explicit knowledge (SAI, 2004:4).

Evidence-based practice—practice that is informed by empirical research and critical appraisal of validated knowledge... Evidence-based decision making is now being fostered in government, education, and other sectors to ensure that decisions and working practices are based on relevant, current and comprehensive knowledge (SAI, 2004:8).

Information—data that has been analysed and interpreted to tell a story about a situation, eg. water levels are rising in region X (LWA, 2005:16).

Knowledge—the synthesis of facts, information, opinion, learnings and interpretation according to one's own experiences (LWA, 2005:16).

Knowledge base—the body of knowledge available to an organisation. It is comprised of organisational competences, the knowledge within teams and individuals, and is supported by organisation collections of information and data. An organisation may build specific knowledge bases to collate information on key topics or processes (SAI, 2004:13).

Knowledge brokering—focuses on connecting people interested in an issue, it helps build relationships and networks for sharing existing research and ideas and for stimulating new work. Knowledge brokers provide links between different entities or individuals that otherwise would not have any relationship. It is a dynamic activity and is not simply focused on moving information from a source to a recipient (LWA, 2005:16).

Knowledge management—a multi-disciplined approach to achieving organisational objectives by making best use of knowledge. It involves the design, review and implementation of both social and technological processes to improve the creation and application of knowledge, in the collective interest of stakeholders (SAI, 2004:15).

Knowledge management systems—a systems approach to knowledge management involves an holistic and integrated use of people, processes and technology to automate or support various types of activities. While knowledge management is much more than a technical issue, most knowledge management systems will inevitably involve some aspect of information and communications technologies (SAI, 2004:16).

Knowledge management strategy—the plans, processes and actions by which an organisation achieves its desired objectives for knowledge management. A knowledge management strategy is the critical link between organisational strategy and knowledge management initiatives, articulating how an organisation can support business achievement by utilising its knowledge-based resources. (SAI, 2004:17).

Knowledge market—the knowledge market it comprised of those organisations or individuals that produce information and undertake research and those that use or buy it.

Metadata—structured information that describes and/or enables finding, managing, controlling, understanding or preserving other information over time (SAI, 2004:18).

Narrative—the capture, interpretation, distribution and stimulation of knowledge through story. It includes the capture of anecdotal material in the field through a broad range of techniques including those drawn from anthropology as well as story circles, virtual story telling and many others. Narrative databases hold knowledge in its original form, often without formal interpretation, allowing users to encounter stories in the system as they would encounter stories through casual questioning. Narrative techniques also focus on interpreting and representing culture in the formal communication of knowledge through story telling (SAI, 2004:18).

NRM Facilitator Network—an extensive Network that helps link organisations with an interest in NRM, including all governments, regional bodies, Indigenous communities, non-government organisations, industry, volunteers and the community. The Network is jointly funded by the Australian Government through the Natural Heritage Trust, State/ Territory Governments and host organisations/regional bodies and consists of: Australian Government Facilitators; Regional Facilitators; Indigenous Land Management Facilitators; Local Government Facilitators; and Local-level Facilitators/Coordinators (Australian Government, 2006).

Open source/open standard software—computer software whose source code is available under a copyright license that permits users to study, change, and improve the software, and to redistribute it in modified or unmodified form (en.wikipedia.org)

Regional NRM bodies—the Australian Government, in association with State and Territory Governments, identified 56 regions across Australia to facilitate integrated delivery of NRM priority issues. A regional NRM body has been established in each region. Refer to www.nrm.gov.au for more information on the regions (Australian Government, 2006).

Storytelling—can provide a useful tool for capturing and disseminating knowledge in organisations and contributing to organisational learning. Storytelling is one component of the practice of narrative (SAI, 2004:21).

Tacit knowledge—personal knowledge resident within the mind, understanding, perception and know-how of individuals. It is typically communicated through the processes of discussion, stories and person-to-person interactions often using techniques such as metaphors, analogies and the development of a shared language… It includes skills, experiences, insight, intuition and judgement (SAI, 2004:22).