

Catchment Knowledge Exchange

Working draft version 1

Knowledge Brokering Operational Plan

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Key Knowledge Brokering Terms

Catchment Management	Catchment management involves the sustainable use and management of land and water resources at a catchment level.
Data	Data can exist in any form, usable or not. Data has no meaning of itself, without relation to other things. ¹
Information	Data that are processed in relation to other things to be useful; answering "who", "what", "where", and "when" questions. ²
Knowledge	Application of data and information. In this plan the term "knowledge" will be used to refer to data, information and knowledge.
Knowledge brokering	Knowledge brokering is the human force behind knowledge exchange, transfer, synthesis, and the forming of collaborations, networks, and partnerships. This role provides a robust connection between policy, research, extension, and catchment management.
Knowledge chain	The broader system in which a knowledge brokering service operates. It includes many or all of the functions that a knowledge brokering service may undertake or influence.
Knowledge management	Knowledge management has foundations in the management of explicit knowledge including information, documents and records as well as the management of tacit knowledge including networks, skills transfer and learning. Its strength lies in its power to combine the organisational elements of people, process, technology and content into a coherent approach to address gaps in organizational capability ³ .
Natural resource management	The management of natural resources (land, water, biodiversity) in an integrated fashion, recognising the values of both conservation and productive use of natural resources and striving to achieve sustainability in all resource use ⁴ .
Research and development	Creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications (OECD).
Theme	Also known as a field. At the broadest level themes in catchment management may include water, land, biodiversity, coasts and marine, and people. However a 'theme' may be defined geographically or within a scientific discipline.
Victoria's Catchment Management Framework	Victoria's Catchment Management Framework largely involves the VCMC, ten CMAs, DPI, DSE, and other relevant government agencies and bodies and the processes through which they operate together.

¹ Russell Ackoff (1989), in Campbell 2006, *The Australian Natural Resource Management System*.

² *ibid*

³ Standards Australia, 2005, *Australian Standard for Knowledge Management*.

⁴ Williams J, 2005, *Native Vegetation and Regional Management: A guide to research and resources*. Greening Australia Ltd, Yarralumla ACT.

Abbreviations

CKE	Catchment Knowledge Exchange
CMA	Catchment Management Authority
CMF	Catchment Management Framework (Victorian)
DPI	Department of Primary Industries
DSE	Department of Sustainability and Environment
KBS	Knowledge Brokering Service
NRM	Natural Resource Management
PMG	Project Management Group (of the Catchment Knowledge Exchange project)
SNA	Social Network Analysis
R&D	Research and Development
VCMC	Victorian Catchment Management Council

Part 1: Introduction

Purpose of this document

The following document outlines a process for implementing a generic knowledge brokering service within the Catchment Management Framework. In addition, the document is intended to be a resource to the broader community of existing knowledge brokers in natural resource management. Therefore this document is intended to be a resource applicable at a statewide level, across regions, or within a region.

We recognise a range of knowledge brokering options and seek to actively collaborate with other individuals and institutions to ensure that knowledge is accessible, shared, and applied to achieve sustainable and healthy catchments. This document is intended to build the basis for such an ongoing collaboration.

Why knowledge brokering?

Victoria needs to demonstrate that it is leveraging the highest value from investments in data, information and knowledge. Despite quality research and development occurring, there are still gaps in knowledge that require long term and at times transdisciplinary research projects to address. Changes in the way investment occurs has resulted in a diversification and multiplication of NRM advisors and research providers, therefore knowledge is increasingly fragmented and not easily accessible. Despite long term public investment into the catchment and natural resource management area, the full value of investments in knowledge is rarely gained. There are significant gains to be made through greater access and use of existing knowledge (local knowledge and experience, research, datasets, information systems etc.), rather than continually focusing on the generation of new knowledge. Knowledge brokering is not the only answer to these issues; however it is hoped it will go some way to meeting the need for improved accountability, access to knowledge, reduced fragmentation, and the delivery of greater return on investment.

What do we mean by “knowledge brokering”?

Within the Catchment Knowledge Exchange (CKE) project, knowledge brokering is defined as “the human force behind knowledge exchange, transfer, adoption, and in some cases priority setting and generation.” This is quite different to the customary definition of the broker, ‘being one who buys or sells property for another’. However there is no standard definition of a knowledge broker. The role and function of a knowledge broker is best defined within the context of the actual need.

A knowledge broker may be an individual or a team of people. The term ‘knowledge brokering service’ (KBS) is used to refer to instances which involves more than the individual knowledge broker, either a team of knowledge brokers, or a knowledge broker and other individuals or services such as web support, research input etc.

The Victorian Catchment Management Framework

Victoria’s Catchment Management Framework (VCMF) largely involves the VCMC, ten CMAs, DPI, DSE, and other relevant government agencies and bodies, however not exclusively as there are research bodies, private sector groups, and community and non government groups who will also benefit from the knowledge brokering services and products. This project sets out to help achieve the VCMC’s vision that:

Victoria will have healthy rivers flowing through ecologically sustainable and productive catchments.

This Knowledge Brokering Operational Plan must be considered within the Victorian Catchment Management Framework institutional setting, while also considering their contribution to natural resource and catchment management. The Catchment Management Framework exists to deliver

improved natural resource management outcomes. Knowledge brokers will actively contribute to a number of the functions and processes of natural resource management, such as:

- identifying assets based on government priorities, scientific information and community knowledge and preferences, as a part of the asset/threat/risk framework
- detailed NRM plans, including effective and practical target setting
- effective participation of stakeholders
- access to information- generally interpreted at an appropriate scale
- effective monitoring, evaluation and reporting

The Catchment Knowledge Exchange project

The higher level outcome of the Catchment Knowledge Exchange is:

- Readily available evidence to support decision making for improved natural resource management outcomes

The objectives of a knowledge brokering service are to:

- Generate measurable improvements in the generation, dissemination, and utilisation of knowledge in the NRM theme.
- Provide timely and relevant information and knowledge to support those making natural resource management decisions.

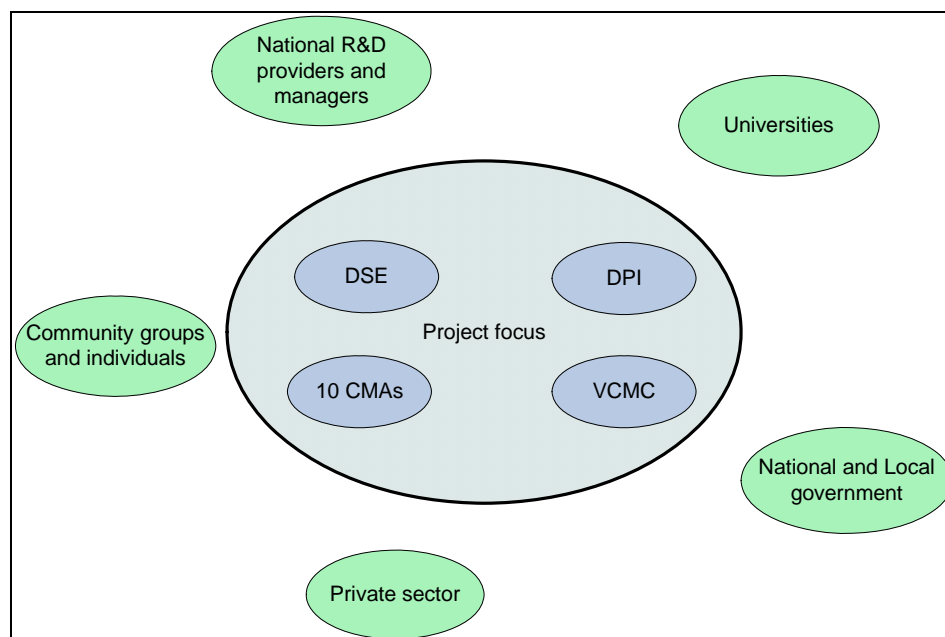


Figure 1 Institutional focus of the Knowledge Exchange project, and the knowledge brokering operational plan

Although the CKE is founded on the institutions that form the Victorian Catchment Management Framework a broader partnership has been established. The partnerships are formalised through memorandums of understanding. The Catchment Knowledge Exchange has the following partners:

(To be inserted when formalised).

Principles

The Knowledge Brokering Service (the Service) will be a collaborative, independent initiative based on the following principles:

- A. **Collaboration**, by internally and externally fostering good communications, open decision-making and teamwork.
- B. Striving for **relevance** by promoting the assessment of interventions, the outcomes of which matter to people making choices in catchment management.
- C. Enabling **wide participation** in the work of the Service by reducing barriers to contributing and by encouraging diversity.
- D. Promoting **access**, by wide dissemination of the outputs of the Service by taking advantage of strategic alliances, and by promoting appropriate cost sharing, content and media to meet the needs of users.
- E. Ensuring **quality**, by being open and **responsive** to feedback, applying advances in methodology, and developing systems for quality improvement.
- F. Keeping **up to date**, by a commitment to ensure that best management practices are maintained through identification and incorporation of new evidence.
- G. **Minimising bias**, through a variety of approaches such as scientific rigor, ensuring broad participation, and avoiding conflicts of interest.
- H. **Continuity**, by ensuring that responsibility for the knowledge brokering service and key functions is reviewed, maintained and renewed.
- I. **Avoiding duplication**, by good management and co-ordination to maximise economy of effort.

The implementation of these principles through the operational plan and protocols and procedures are expected to achieve behavioural change, as described in [Appendix 3](#). These changes in behaviour are the most aspirational measures of success of the knowledge brokering service.

What sort of activities can a Knowledge Broker do?

Activities

The knowledge brokering service will implement quality assured processes that enable the tailored sharing of information and experience, and the ongoing maintenance of an inventory of knowledge assets, including datasets, reports, and information systems. The knowledge brokering service will establish and maintain a collaborative community of people and institutions through independent and transparent protocols and a commitment to evidence based advice.

The term “Knowledge Brokering” is open to interpretation. It is often interpreted to mean any or all of the following:

1. Connecting someone who is seeking knowledge with a written documentation or specialist in that area who can provide an answer.
2. Bringing together people who have a need for a particular piece of information with others who could undertake some targeted research to better answer the question.
3. Collating and synthesising the information around a particular knowledge need.
4. Finding new ways of disseminating and integrating useful results of research projects or programs.
5. Promoting research outcomes as the basis for subsequent funding applications.
6. Organising the accessibility of data sets and information.
7. Identifying knowledge gaps.
8. Interpreting the needs of “knowledge generators” to “knowledge users” and vice versa.
9. Targeting research findings to different groups of users.
10. Establishing and facilitating a multi disciplinary team.
11. Connecting people within the Catchment Management Framework who have not previously met to help resolve particular issues or to answer a question.
12. Facilitating the complete knowledge chain (rather than just one part).
13. Managing the research base so that obsolete information and documents are removed or archived.
14. Providing tools to reduce knowledge loss that occurs through generational and institutional change.
15. Developing and using mechanisms to mobilise implicit and experiential knowledge.

Determining which of these activities as well as others are undertaken, depends on the objectives of the knowledge brokering service and the nature of the thematic area of operation.

The principle of independence raises a number of questions in the way knowledge brokers can operate within and across institutions. Once a knowledge broker is embedded in a particular organisation they will take on affinities with that particular body or team. This should not threaten in the independence of the knowledge broker, so long as they have the ability to operate without bias, and maintain open and accountable processes.

What doesn't the knowledge broker do?

There are some activities that the knowledge broker does not undertake. These are the responsibility of the broader knowledge management system. Some of these activities are listed below:

- developing and enforcing data management standards and protocols
- the knowledge broker generally does not undertake research generation, although they may support or facilitate new research projects, i.e. keeps the channels open, but does not provide the water to fill them.

Part 2: The Knowledge Chain

What is the knowledge chain?

The knowledge chain is adapted from the Campbell and Cochrane Collaborations⁵ and describes the different functions or elements that the knowledge broker may undertake within the entire knowledge management system.

The elements of the knowledge chain are not necessarily sequential but they do represent a broader understanding of the entire knowledge management system that the broker operates within.

Table 1 The Knowledge Chain

	Elements	Example
1	Identification of business need	Such as policy (a request from the NRM ministerial council), or management (needs arising from the increased interest in raised bed cropping)
2	Quality assurance	Peer review
3	Knowledge synthesis	State of knowledge report on the science behind biological farming. Synthesis of special editions of a journal Tracking journal papers
4	Consolidations of datasets and specialist knowledge	Victorian Water Resources Data Warehouse
5	Reporting and dissemination	Web products GRDC seminars Newsletters
6a	Practice Change through evidence to practice- management, paddock level	DPI Extension services Birchip Cropping Group Pivot agronomists Dairy industry extension
6b	Practice Change through evidence to practice- policy	Adaptive Management Modelling and mapping to support priority setting
7	Learning and evaluation	LWA Research return on investment
8	Identification of knowledge gaps	Victorian Water Trust Assessment of Knowledge Gaps
9	Development of knowledge collaborations	Land Technology Alliance Water Research Cluster (The University of Adelaide)
10	Knowledge generation, through R&D, monitoring and evaluation, and contributions from practitioners	Our Rural Landscapes LWA Healthy Soils Initiative Tertiary Sector
11	Knowledge Chain Facilitation	Oversight of the functioning of the overall chain and the interactions between the elements.

⁵ The Cochrane Collaboration is an international organisation that aims to help people make well-informed decisions about healthcare by preparing, maintaining and promoting the accessibility of systematic reviews of the effects of healthcare interventions. The international Campbell Collaboration (C2) is a non-profit organization that aims to help people make well-informed decisions about the effects of interventions in the social, behavioural and educational arenas. These Collaborations focus on generating “reviews” of the best available evidence on a particular topic. They also include rigorous documented processes for managing quality assurance, collation of datasets and knowledge, and for forming review teams.

Part 3: Stages in a knowledge brokering service

Introduction

The knowledge broker and their support group needs to determine where and how they can add best value to their theme area. Figure 2 illustrates the two main stages of development of a knowledge brokering service, mapping, and implementation. The timelines are approximate but serve a purpose in providing an indicative timeframe for planning. Evaluating and learning is an ongoing process that commences with the project comprising frequent review and annual reporting. It is important to start focusing on the lasting legacy of the knowledge broker service from day one.

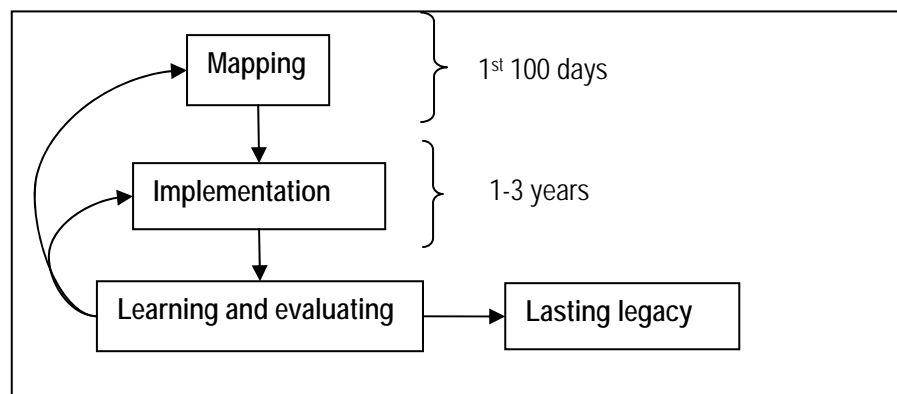


Figure 2 Overview of the stages in a knowledge brokering service

Part 4: Foundation stage for a new knowledge brokering service - knowledge mapping

Introduction

The mapping or foundation stage will generally occur over the first 100 days. This is a very approximate measure and will vary with size and depth of the theme area. This is the stage where the systems and processes for managing the knowledge brokering service will be established.

Defining the theme

There are various ways of defining themes, based on scientific disciplines, organisational structures, or practical applications. The purpose of defining themes is to set realistic boundaries and focus the operational activities of the knowledge brokering service.

Other themes may be based upon scientific fields or process related issues. Examples of theme areas are listed below. However the theme is best defined by the business need.

1. water quality
2. terrestrial biodiversity
3. market based instruments.
4. monitoring, evaluation and reporting
5. salinity
6. ecosystem services
7. social science

Define and refine the theme area using the following criteria:

1. Define the desired outcomes of the knowledge brokering service.
2. Geographic focus- e.g. CMA area, bioregion, or basin

3. Technical focus- research, policy, management, investment, extension
4. Institutional scope- e.g. State Government R&D agencies, local government etc. Located within one institution, strategically embedded in a partner organization, or working across a number of institutions.
5. Identification of the best areas to contribute through the mapping of the current activities in the knowledge chain

Who are the stakeholders and what are the existing activities?

Invariably there will be existing activities underway in the theme area. It is important to scope these areas to determine how the knowledge brokering service can best add value, without duplicating existing efforts.

In order for the knowledge broker service to meet stakeholder needs it is essential to determine what it is their stakeholders require. An example of a map of the existing activities underway in the soil health theme area is in [Appendix 2](#).

It is possible to map expertise; the links between people within an organization, and across organisations; and identify the knowledge gaps. By making organisational knowledge visible, a knowledge map can support improvements and changes to the way knowledge is used, shared and transferred.⁶ This involves gaining a complete picture of current and previous projects, programs, research capability, organizations, and stakeholders in the chosen field.

It is important to be aware of existing human networks and to work cooperatively where ever possible rather than establishing new groups. One technique for understanding the interaction of individuals or groups of people is social network analysis (SNA). Knowledge brokers can use SNA to visualize and measure the flows between people, networks, communities and other knowledge sources such as websites and information systems⁷. SNA is a useful tool when identifying inter and intra organizational knowledge flows. One of the critical questions is understanding who people talk to when they want to find something out. Social network analysis particularly will help to surface the hidden or 'shadow' knowledge flows within or across organisations. These flows will often run counter to those shown in organisational charts where knowledge and communication is usually depicted as flowing in a top-down direction⁸. This can help in identifying champions, authorities and therefore opportunities to improve the flow of knowledge.

Part 5: Building on the foundation- implementation

Introduction

Some of the elements of the knowledge chain will occur on an annual basis, such as seminars and reporting. Other elements of the knowledge chain are processes that occur in an ongoing manner, such as quality assurance, and evaluation and learning. The first year may also involve pilots so that different approaches can be tested and evaluated. This may involve a scaling up of activities that were piloted in the early stages of the KBS operation. The following section provides an introduction to many of the elements of the knowledge chain. In reality an individual knowledge broker may focus on anywhere up to five of these elements, or even concentrate on the facilitation of the overall knowledge chain.

⁶ *ibid*

⁷ Standards Australia 2005, *Knowledge Management- A Guide*, AS5037-2005

⁸ *ibid*

Knowledge chain activities

Knowledge synthesis

[Knowledge synthesis](#) involves bringing multiple pieces of knowledge together and drawing out commonalities or findings. For example scientific papers may be collated, or research findings may be synthesized in a form that is relevant for inclusion in a Regional Strategy or Action Plan. Another form of synthesis report are thematic reports which provide a snap shop of current and past programs, research capabilities, and significant advances in knowledge. The knowledge broker may undertake this or work with discipline experts. This may be triggered through an identified knowledge gap or questions from stakeholders.

Consolidations of datasets and specialist knowledge

Technology such as web applications and databases can support the knowledge broker to varying degrees depending on the intent of the knowledge brokering service, as both for an inventory or index, and also as a method for communication. This need not always be a sophisticated web application, as a simple spreadsheet will often work as a registry of information. The essential requirements are making sure that data and information are gathered, maintained and stored in a consistent and compatible manner. Web applications can help to manage and facilitate communication to a certain extent, through functionality such as discussion boards, lodging of enquiries, and events.

Reporting and dissemination

There are a number of ways to enable the reporting and dissemination of information to occur. Communication can occur through [workshops, seminars, conferences](#), on line forums, newsletters, posting of reports, and one on one discussions. Reporting may also involve accounting the impacts or implications of research, or associated knowledge brokering activities to investors.

Another important function is document management which involves creation, version control, publication, and retrieval. Some documents or products may have inbuilt sunset and review dates.

Practice Change through evidence to practice- management, paddock level

Traditionally the transfer of research to practice has occurred through extension services. There are now many mechanisms that allow this to occur such as agribusiness, government extension programs, Landcare, training programs, and many others. There may be some situations where the KBS has a role in facilitating this process. The knowledge broker may have a role in documenting and communicating knowledge needs to policy makers and investors.

Practice Change through evidence to practice- policy

Policy development and implementation relies on a sound and contemporary knowledge base. There will be some situations where the KBS has a role in facilitating this process. The knowledge broker also may have a role in documenting and communicating knowledge needs to policy makers and investors. Another important function for knowledge brokers may be to demonstrate how information assists in making investment decisions.

Evaluation and learning-measuring progress and impact

Monitoring, evaluation and learning involves the development of a plan early in the implementation of the knowledge brokering service. One of the most commonly cited difficulties experienced by knowledge brokers is the ability to demonstrate and measure the impacts of their efforts. Therefore a particular focus has been on developing measures and indicators for knowledge brokers to use. A set of [measures and indicators](#) has been developed that the knowledge broker can use to suit their particular role (Table 2 and 3).

Identification of knowledge gaps

The documentation and prioritisation of knowledge gaps in the theme area is an important process in working towards meeting these gaps. Some gaps may require new knowledge generation, others may require providing access or synthesizing existing knowledge. Part of this role is to help formulate the right questions to which answers can be found that assist in making management decisions.

Development of knowledge collaborations

Knowledge brokers may form collaborative partnerships to generate, disseminate, or collate knowledge. This could involve research communities, policy groups, local communities, other types of individuals, depending on the purpose of the collaboration. Currently the most common form of collaboration are those for research, often to achieve multidisciplinary outcomes. The broker may be the catalyst or in some cases have an active role in the partnership.

Facilitation of the whole knowledge chain

The knowledge brokering service can provide a leadership and facilitation role of all the elements in the knowledge chain. It is not however possible for the KBS to have a direct management role or responsibility for all these elements.

Part 6: Leaving a lasting legacy

What will the knowledge broker pass on? This is important for ensuring the implementation of the principle, "Continuity, by ensuring that responsibility for the knowledge brokering service and key functions is reviewed, maintained and renewed". The tendency towards short term contracts and short term employment has left many examples of lost knowledge, data and information when a project commences or members of staff leave. Actions in the knowledge chain need to be ongoing not a single event. To leave a lasting legacy it is necessary to embed knowledge management and brokering activities within existing procedures and processes. Champions within the organisations of the CMF will also be necessary to ensure that the legacy is left after the initiative.

Closing a Knowledge Broker service down

The products and datasets used by the KBS need to be made accessible to the custodian upon closing. The roles and responsibilities of the custodian need to be clear and transparent.

Part 7: Protocols and procedures⁹

Where and why are they necessary?

There are situations where procedures provide benefits in ensuring that the process used is rigorous, consistent, unbiased, systematic, and to assist in integration across knowledge broker themes. Protocols and procedures must be implemented in a manner that contributes to the objectives of the CKE. Figure 3 provides an overview of the protocols and procedures within the Knowledge Brokering Operational Plan.

In this situation the standards and protocols take different forms, such as:

1. data and information management
2. methods and guidelines, such as those for undertaking a synthesis report or a knowledge gap analysis

In many situations the procedures and protocols implemented may not be new, it may simply involve an improvement of an existing process through documentation and checklists. However in some cases the procedures and protocols will be new. There is a balancing act between providing rigorous processes and allowing the necessary level of flexibility to drive creativity and innovation.

⁹ In the Knowledge Brokering Operational Plan protocols and procedures will be considered analogous with business processes

Quality control

Quality control is not considered as a separate process. Rather the protocols and procedures are designed in such a way that quality control measures are embedded. It is essential that quality control is considered in database design and implementation, and in other processes such as producing a synthesis report.

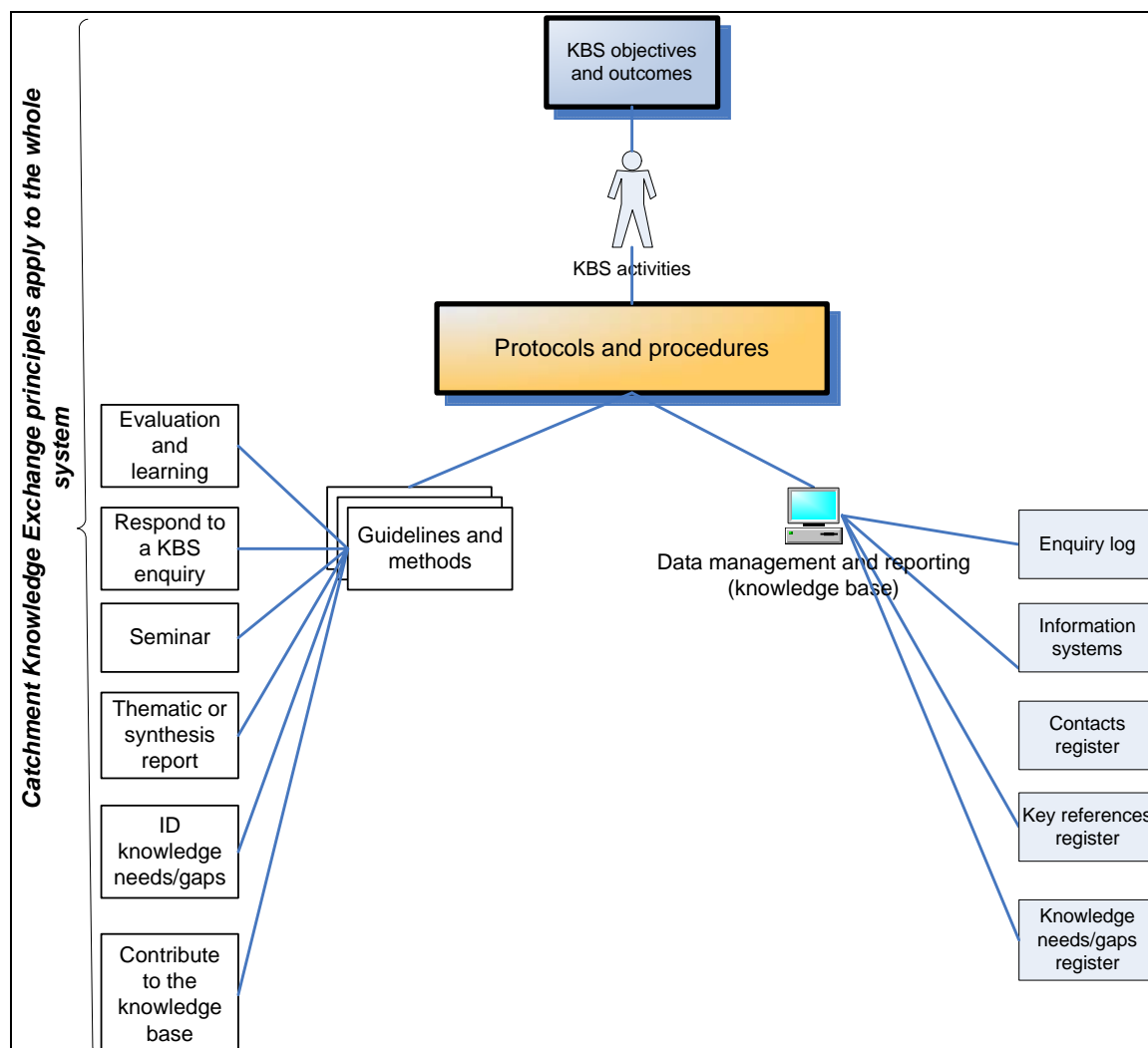


Figure 3 Overview of the procedures and protocols contained in the Knowledge Brokering operational plan

Procedures and protocols are intended to provide the following benefits to the Catchment Knowledge Exchange:

1. To assist the KBS in delivering products and services by providing
 - a. a checklist for delivering specific activities
 - b. templates and forms
 - c. a “rolling” reference set of “best practices”
 - d. a set of processes that maximize the time spent on core knowledge brokering activities while simultaneously generating required information for accountability and reporting.
2. To ensure that the Catchment Knowledge Exchange Principles are realised in operational practice.
3. To ensure that all “partners” of the CKE have equal access to information and opportunity to participate in activities of the Exchange.

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4. To ensure that activities delivered by the CKE are undertaken to an agreed standard.
5. To ensure that all of the individual activities undertaken by the CKE contribute to the overall objectives of the CKE.
6. To ensure that unnecessary duplication of information collection and storage is minimised.
7. To ensure that "continuity of service" and "accessibility of information" is maintained beyond any individual.
8. To ensure that the products and services of the CKE are of ongoing relevance to users.
9. To clarify roles and responsibilities.
10. To assist the integration of CKE outputs across themes.
11. To integrate business and financial management of the CKE with the core brokering work of the KBS

Procedures provide a guide for "how" activities are to be delivered with the CKE. They do not:

1. Determine the balance of effort across the products and services
2. Replace the need for the KBS to build and use effective professional networks
3. Lessen the need for the KBS to be innovative in delivery

Appendix 1: Resources for Knowledge Brokers

Protocols

1. That the CKE works for the achievement of public policy outcomes.
2. That the CKE Board (PMG at present) will be drawn from the CKE partnership and represent the diversity of the CKE.
3. That within the objectives of the CKE, the KBS implements the CKE in such a way as to recognise and support the independence and objectives of partners of the CKE.
4. That the KBS will implement a range of procedures and protocols that give effect to the principles of the CKE.
5. That KBS will regularly complete a declaration of interests.
6. That the KBS will implement procedures that ensure that all CKE partners are provided with equivalent notification, involvement, and access to information on activities and decisions.
7. The CKE will work to meet the knowledge needs of those decision makers based across Victoria through working with institutions and individuals from Victoria, Australia and internationally.
8. The CKE will only store the information which is not better stored and delivered from elsewhere.
9. That the CKE will not undertake work better done by others in the public or private sectors. This will be determined through the application of criteria, with final decision by the CKE Board.

Procedures

Decide to run a Theme Seminar

Decide to write/update a report (synthesis or thematic)

Decide to answer an enquiry

Decide to incorporate data and information into the knowledge base (data management and reporting)

Existing knowledge brokers in the Catchment Framework

List of contacts

to be completed with knowledge broker's permission

Further reading

Campbell A, 2006, *The Australian Natural Resource Management Knowledge System*, Land and Water Australia, Australian Government.

Standards Australia, 2005, *Australian Standard for Knowledge Management*.

to be completed

Performance Measures

Standards Australia (2005) describes four different types of indicators for knowledge management:

1. Artefact-centred indicators – can indicate success by the increased creation, capture and use of documents, video/sound files, images and web pages.
2. Activity-centred indicators – can indicate improvements in consulting, coaching, mentoring, facilitating and training.
3. Cultural or behavioural change-centred indicators – can indicate results from implementing the knowledge initiative and/or its accompanying change interventions.
4. Intellectual capital or intellectual property-centred indicators – can indicate improvements in performance by comparing key performance indicators or the shift in value of knowledge based assets.

Table 2 provides a number of performance measures that may be used by a knowledge broker. These are a combination of the four types of indicators listed above. These would be further refined and selected to suit the particular role. Table 3 aligns the knowledge chain elements with the performance measures that apply for further targeting.

Table 2 Performance measures and methods for information collection

Evaluation Focus Area	Critical success factors	Measures and indicators	Methods
<i>What is going to be evaluated?</i>	<i>What must be achieved for the KBS to be successful?</i>	<i>What measures will be used to indicate success?</i>	<i>What methods can we use to collect the evidence required to measure performance?</i>
Knowledge needs	Access to research, people, information and databases	Improved ability to access research information Documented knowledge needs in theme area Quality, frequency and coverage of advice to research generators on knowledge gaps Researchers and investors are seeking and valuing advice on knowledge needs	Interviews and questionnaire
Measuring effectiveness, magnitude (user and investor satisfaction)	Development and acceptance of measures for assessing the integrity, access and relevance of the evidence base Collaboration with relevant "beneficiary" groups Collaboration with relevant knowledge generation groups User and investor confidence	Improvement in user and investor confidence in the use generation and access to knowledge Improved benefit cost ratio of R&D projects	Interviews and questionnaire Cost benefit analysis

Evaluation Focus Area	Critical success factors	Measures and indicators	Methods
<i>What is going to be evaluated?</i>	<i>What must be achieved for the KBS to be successful?</i>	<i>What measures will be used to indicate success?</i>	<i>What methods can we use to collect the evidence required to measure performance?</i>
Understanding the impacts of the knowledge brokering	Improved knowledge base of NRM science Improved cost effectiveness of R&D investments through knowledge brokering activities Measurable value of brokering activities	Consistent or increased use of the web application (visit numbers, length of stay, number of enquiries) Continued use of the knowledge broker Number of queries answered or referred successfully Critical mass attendance for seminars reached 7.5/10 average satisfaction rating for seminars Increase in the number of collaborative projects Establishment of multi institutional or discipline groups Better than 1:2 return on investment for brokering activities Improvement in the strength of social network in the theme Number and impact (cost savings) of identified opportunities for data mining and re-use	Number of website hits Number of enquiries of the knowledge broker Seminar attendance and feedback Strength of social networks in the theme Levels of collaboration with knowledge generators and users Evidence log Return on investment for brokering activities Social network analysis index

Table 3 Alignment of the performance measures with the knowledge chain elements

PERFORMANCE MEASURES AND INDICATORS	KNOWLEDGE CHAIN ELEMENTS											
	ID of business need	Quality assurance	Knowledge synthesis	Consolidations of datasets and specialist knowledge	Reporting and dissemination	Practice Change through evidence to practice-mgt, paddock level	Practice Change through evidence to practice-policy	Evaluation and learning	ID of knowledge gaps	Development of knowledge collaborations	Knowledge generation	Knowledge Chain Facilitation
Improved ability to access research information												
Documented knowledge needs in theme area												
Quality, frequency and coverage of advice to research generators on knowledge gaps												
Improvement in user and investor confidence in the use generation and access to knowledge												
Improved benefit cost ratio of R&D projects												
Consistent or increased use of the web application (visit numbers, length of stay, number of enquiries)												
Continued use of the												

PERFORMANCE MEASURES AND INDICATORS	KNOWLEDGE CHAIN ELEMENTS											
	ID of business need	Quality assurance	Knowledge synthesis	Consolidations of datasets and specialist knowledge	Reporting and dissemination	Practice Change through evidence to practice-mgt, paddock level	Practice Change through evidence to practice-policy	Evaluation and learning	ID of knowledge gaps	Development of knowledge collaborations	Knowledge generation	Knowledge Chain Facilitation
knowledge broker												
Number of queries answered or referred successfully												
Critical mass attendance for seminars reached												
7.5/10 average satisfaction rating for seminars												
Increase in the number of collaborative projects												
Establishment of multi institutional or discipline groups												
Better than 1:2 return on investment for brokering activities												
Improvement in the strength of social network in the theme												
Number and impact (cost savings) of identified opportunities for data mining and re-												

	KNOWLEDGE CHAIN ELEMENTS											
PERFORMANCE MEASURES AND INDICATORS	ID of business need	Quality assurance	Knowledge synthesis	Consolidations of datasets and specialist knowledge	Reporting and dissemination	Practice Change through evidence to practice-mgt, paddock level	Practice Change through evidence to practice-policy	Evaluation and learning	ID of knowledge gaps	Development of knowledge collaborations	Knowledge generation	Knowledge Chain Facilitation
use												

Appendix 2 Example of a map of existing activities underway in the soil health theme in Victoria

Table 4 Example of a map of existing activities underway in the soil health theme in Victoria

	Knowledge Value Chain	How this function is currently contributed to by the Knowledge Brokering Service through the funded project (EWR)?	How this function is currently explicitly met through the actions of other stakeholders in the field?	Current gaps ¹⁰
1	Identification of business need			Different views on business need exist with different stakeholders. Business need is often poorly documented.
2	Quality assurance	Through a documented, rigorous process for knowledge brokering and synthesis (EWR)	QA processes exist for research papers within formal Knowledge generation institutions.	QA for knowledge synthesis or integration are less universally known or documented. QA for informal knowledge capture not used. Evidence base for policy use and management decisions are often not well documented.
3	Consolidation data sets and specialist knowledge	Soil health knowledge inventory (EWR)	Victorian Resources Online (DPI)	
4	Knowledge synthesis	Soil health thematic report (EWR)	Victorian Resources Online (DPI)	This needs to be driven by a particular need or question
5	Reporting and dissemination	Soil health seminar (2006)	Partnership with NC CMA	
6a	Practice Change through evidence to Practice-management, paddock level		DPI Soil Extension Services. Private sector agronomists This may occur on a project basis	There is a gap in the opportunity for “end users” to provide feedback on the usefulness of information and on their experience (knowledge) in the application of the information to their need.
6b	Practice Change through evidence to Practice-policy		This may occur on a project basis	
7	Evaluation and learning	Monitoring, Evaluation and Learning Plan and implementation		
8	Identification of knowledge gaps	Report on future soil health research priorities (EWR)		

¹⁰ Based on informal discussions with stakeholders in the soil health field, questionnaires and interviews

	Knowledge Value Chain	How this function is currently contributed to by the Knowledge Brokering Service through the funded project (EWR)?	How this function is currently explicitly met through the actions of other stakeholders in the field?	Current gaps ¹⁰
9	Development of Knowledge Collaborations	Social Network Analysis is capturing and making explicit the stakeholders in the Soil Health Field, but this is only part of the function.		Specific formation of formal knowledge generation collaborations would be better driven by a particular need.
10	Knowledge generation, through R&D, monitoring and evaluation, and contributions from practitioners		Formal knowledge generation is undertaken by various research providers and government agencies.	There is a gap in the harvesting and sharing of practitioner experience and knowledge. There is a gap in accessing the formal and informal indigenous knowledge.
	Facilitation of the above steps			

Appendix 3 Principles and the key behaviours expected through the implementation of the operational plan, and procedures and protocols

The Knowledge Brokering Service will be a collaborative, independent initiative based on the following principles:

1. **Collaboration**, by internally and externally fostering good communications, open decision-making and teamwork.
Key behaviours- open minded, inclusive, enjoys working with a whole range of people types, good at allocating, delegating and encouraging
2. Striving for **relevance** by promoting the assessment of interventions, the outcomes of which matter to people making choices in catchment management.
Key behaviours- understanding the needs of users, interested in the perspectives, ideas and logic of others
3. Enabling **wide participation** in the work of the Service by reducing barriers to contributing and by encouraging diversity.
Key behaviours- encourages wide and diverse participation, ability to analyse new ways of doing things and to challenging accepted norms
4. Promoting **access**, by wide dissemination of the outputs of the Service by taking advantage of strategic alliances, and by promoting appropriate cost sharing, content and media to meet the needs of users.
Key behaviours- promoting access to information, cost sharing and alliances
5. Ensuring **quality**, by being open and **responsive** to feedback, applying advances in methodology, and developing systems for quality improvement.
Key behaviours- good understanding of risk and consequence, seeking and accepting of constructive appraisal (and criticism)
6. Keeping **up to date**, by a commitment to ensure that best management practices are maintained through identification and incorporation of new evidence.
Key behaviours- use of best quality and current evidence, ability to build and maintain networks
7. **Minimising bias**, through a variety of approaches such as scientific rigor, ensuring broad participation, and avoiding conflicts of interest.
Key behaviours- unbiased, rigorous and broad participation
8. **Continuity**, by ensuring that responsibility for the knowledge brokering service and key functions is reviewed, maintained and renewed.
Key behaviours- commitment to ensure that the service leaves a lasting legacy
9. **Avoiding duplication**, by good management and co-ordination to maximise economy of effort.
Key behaviours- coordination, cooperation, and efficiency