



MODULE 1: Information Management and the Sustainable Development of Natural Resources - An Introduction to Informa- tion Management Systems

**Building capacity to implement natural
resources information management sys-
tems.**

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MODULE 1

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Guide for managers

Context

One of the prerequisites for natural resources management (NRM) involves the establishment and maintenance of a database of relevant information in digital format. Access to reliable and up-to-date information reduces the uncertainty in planning and management by helping identify, model and analyse situations and issues. Strategies to overcome them may then be prepared and implemented, with the impacts monitored as part of an overall system. The value of the information and the effectiveness of the decision-making and planning processes are very closely related to the quality and completeness of the information and the manner in which it is made available. In this respect data access, management, integration, analysis and communication are key components.

In recent times best practices have evolved to assist data-related tasks in NRM projects. Successful projects have generally adopted an integrated information management solution; combining leadership, people, technology, applications and data into a framework that ensures tools and procedures are in place to maintain and transform data into useful information products that support core business operations and the decision-making process.

Under current arrangements, funding for NRM projects is increasingly being channelled from government agencies to regional groups (e.g. catchment management authorities and resource information centres). This often involves gaining access to, developing new, and processing existing data. It is important these data become part of the national resource base, and following completion of the initial project, are subsequently made available to the broader community.

The **Natural Resources Information Management Toolkit** (the Toolkit) is being implemented under the joint sponsorship of the National Land & Water Resources Audit (the Audit) and ANZLIC – the Spatial Information Council (ANZLIC), as part of a strategy aimed at **building capacity to implement natural resources information management solutions**. The Toolkit will assist project managers, staff and participating parties at national, state/territory and regional levels to obtain full value from the investment in collection, management and use of data to fulfil project requirements.

The aim of the Toolkit is to compile a resource that:

- assists in building capacity at regional and local levels to manage, utilise and share natural resources data and information more effectively
- increases the awareness, understanding and skills of individuals responsible for data and information management in NRM programs

- facilitates the development and adoption of internationally accepted standards and guidelines for information management and thereby promotes best practices in information management
- gives participants in NRM projects access to practical information management tools to reduce set-up costs and duplication of effort
- supports the development of community networks through open and efficient sharing of information resources and knowledge, and assists the establishment of information loops between regional, state/territory and national levels
- ensures the sustainable management of data used or created in projects
- allows others to fully exploit the information generated from natural resource management projects.

It is acknowledged that each state and territory has its own initiatives related to data and information management, including governance guidelines and protocols. The intent of this guideline is to provide background information on natural resources management programs, emphasising the recent shift in focus of funding programs to a regional level, and to provide an introduction to information management.

Actions

Managers should concentrate on developing integrated management solutions in which the acquisition, processing and dissemination of data and information is carried out within a collaborative framework. This can be achieved through the establishment of a spatial data infrastructure, involving the creation of guidelines, standards and procedures within a framework that is supported by a scientifically based and technically competent distributed group of data custodians and related agencies.

The Australian, state and territory governments are all currently involved in the development of the Australian Spatial Data Infrastructure (ASDI). Managers of regional projects should facilitate the development and implementation of data policies at a local level, which are based on best practice principles, such as those outlined in the *ANZLIC Policy Statement on Spatial Data Management*. For example:

- creation of an easily accessible, distributed data network to manage and disseminate data collected as part of project and other activities in support of corporate objectives
- development of core datasets as standard or base-line products, and a range of other products and services as needed, to support economic, ecological and social development
- provision of best practice quality assurance mechanisms and procedures to create validated, well-documented datasets to meet priority information needs

- establishment of partnerships with industry, government and others (e.g. educational institutions) to develop skills and maximise use
- where possible avoidance of duplication in data capture, and expenditure on system development
- archiving of data to ensure availability for multiple use and safeguard for future generations.

Achievement of the above principles requires adoption of best practice in data and information management for data collectors, owners, custodians and groups or agencies that generate information.

This guideline is designed to provide a brief overview to assist regional groups in developing strategies that address data and information issues and thereby assist in sustainable NRM. Additional and more detailed information related to program development and data management is presented in other chapters of the Toolkit.

Acknowledgments

This module sources material produced by the Audit; the Australian Government Department of the Environment, Water, Heritage and the Arts; Bureau of Rural Sciences; Geoscience Australia; ANZLIC; and Spatial Knowledge Engineering, Incorporated. These sources are duly acknowledged.

Guide to symbols

The following symbols are used throughout the Toolkit as a guide to users, and draw attention to important issues and information.



Information which readers should take particular note of



Best practice information



Tips for readers—based on experience and aimed at saving time and resources



Caution—readers are advised that particular care should be taken or that the subject issue may be complex



Additional information



Capability raising—used to show a signpost to a higher capability level

Bold Text

Used to highlight a particular issue

Boxed Text

Highlighting of issues specifically related to ANZLIC or the Audit

1.1 Overview of NRM programs

1.1.1 The new NRM framework

The contemporary view of sustainable management of natural resources is that it is best achieved by adopting a regional approach involving the development of strong cooperative partnerships between government bodies, the community, on-ground land managers and educational institutions, to develop plans that address regional needs.

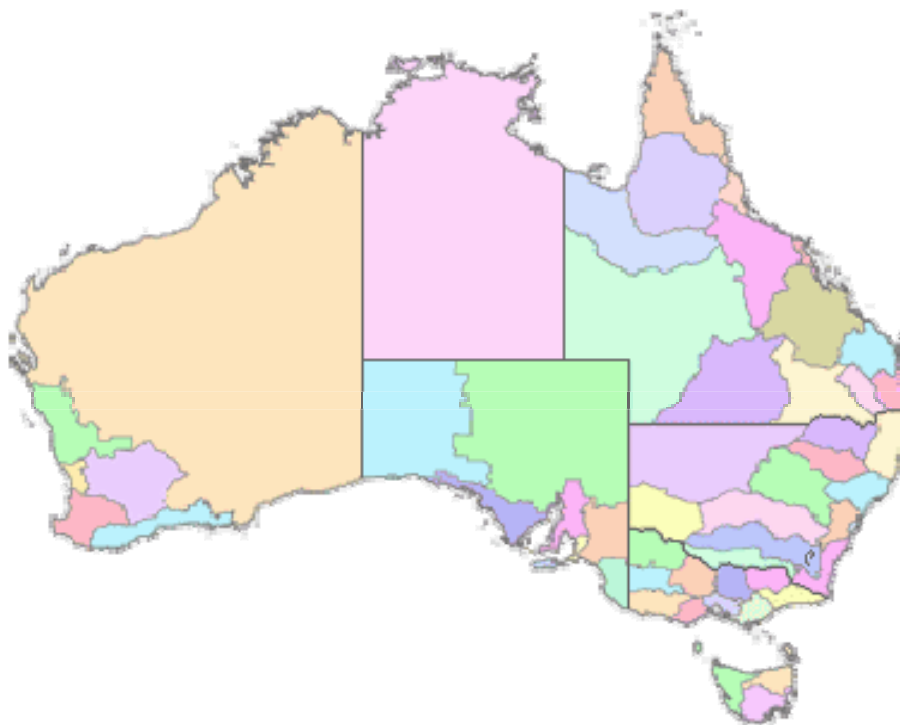
The shift to a regional approach in Australia was demonstrated in the nation-wide implementation of natural resource management programs. The success of these initiatives is dependent on regional communities being able to develop, own and implement plans for NRM.

Development of regional boundaries

The Australian, state and territory governments have developed a system of regional boundaries for the purpose of identifying NRM priorities. A total of 56 NRM regions have now been identified to facilitate the integrated delivery of NRM priority issues, in association with state and territory governments (see Figure 1–1, and <http://www.nrm.gov.au/index.html>).

Figure 1–1 The 56 NRM regions across Australia

(Source: <http://www.nrm.gov.au/index.html>)



Establishment of regional bodies

Though actual implementation procedures vary between state and territory jurisdictions, each region will have at least one regional body established to undertake the tasks for managing and protecting the region's natural resources.

Development of regional NRM plans and improved efficiencies

A major task to be undertaken by regional bodies under the framework outlined above, involves the development of a single NRM plan for the region. These plans form the basis for investment from the natural resource management programs and thereby streamline operations by removing the need for individual project plans to access different types of government funding.

Regional plans outline the means for identifying and achieving the region's NRM targets, and involve an agreement between government and the community with respect to an investment strategy for implementing the plan, and the definition of goals and contributions that all parties will undertake.

In principle, regional plans detail catchment-wide activities and address a range of NRM issues including land and water management, biodiversity, and agricultural practices.

Such an approach has potential to leverage increased efficiencies and effectiveness in overall program delivery.

Accreditation of regional plans

The Australian and state and territory governments invest in community-based regional plans once they have passed an accreditation process based on criteria agreed by the various governments through the Natural Resource Management Ministerial Council (NRMMC).

Key elements of the accreditation criteria by which plans are assessed, require regional bodies to demonstrate that their plans:

- are based on a whole-of-region approach
- cover the full range of NRM issues and incorporate environmental, social and economic aspects
- are underpinned by scientific analysis of natural resources conditions, problems and priorities
- have effective involvement of all key stakeholders in the development and implementation of the plan
- focus on addressing the underlying causes rather than symptoms or problems

- include strategies to implement agreed NRM policies to protect the natural resources base
- demonstrate consistency with other planning processes and legislative requirements applicable to the region
- establish targets at the regional scale which are consistent with the national framework for NRM standards and targets
- identify strategic, prioritised actions to address the range of NRM issues and achievements of regional targets within an established timeframe
- provide for the continuous development, monitoring and review of improvement in the plan.

Funding arrangements

Following accreditation of a region's NRM plan, the regional body is responsible for developing investment strategies or business plans that are aimed at attracting investment in the regional plan. Such a strategy should detail specific actions, costs and time frames required to implement the regional plan and achieve regional targets and returns on investment as detailed in the plan.

All Australian, state and territory government and regional joint investment decisions for NRM programs are based on a region's investment strategy, and it is considered an essential milestone prior to the final agreement being signed by the relevant regional group and the Australian and relevant state/territory governments to formally release investment funds.

Bilateral agreements

Bilateral agreements are developed in a joint process of consultation and negotiation between the Australian government and the states and territories, and include the state or territory government's undertakings on land and water reforms. They also identify regional bodies responsible for the development and delivery of NRM plans, and some of the administrative and accountability arrangements.



A major strength of the current NRM programs lies in the opportunity for enhanced capacity building and improved monitoring and evaluation procedures undertaken at a regional level.

Additional information on NRM regions, regional NRM plans and bilateral agreements is available from the following website:

<http://www.nrm.gov.au/index.html>

Specific information on state and territory regions is also available at:

<http://www.nrm.gov.au/nrm/region.html>

1.2 Role of the Toolkit

The range of issues, capacity and characteristics of regional NRM groups throughout Australia is extremely varied. This variety relates to various factors including size, location, population, complexity and funding, etc. The Toolkit aims to provide information that will be of value to all NRM groups. Each group is increasingly becoming more involved in managing data and information to improve the management of resources. The challenge is how to best use and manage data and information to support core business processes.

The Toolkit has been designed to provide universal principles of best practice for data and information management. In doing so, it is pitched at a strategic level thereby ensuring commonality between various NRM bodies while using specific examples from a range of sources to illustrate particular issues.



The aim of the Toolkit is to compile a resource that:

- assists in building capacity at regional and local levels to manage, utilise and share natural resources data and information more effectively
- increases the awareness, understanding and skills of individuals responsible for data and information management in NRM programs
- facilitates the development and adoption of internationally accepted standards and guidelines for information management and thereby promotes best practices
- gives participants in NRM projects access to practical information management tools to reduce set-up costs and duplication of effort
- supports the development of community networks through open and efficient sharing of information resources and knowledge, and assists the establishment of information loops between regional, state/territory and national levels
- ensures the sustainable management of data used or created in projects
- allows others to fully exploit the information generated from NRM projects.

1.3 Capacity building road map

There is a wide variety of data and information management capacity across various NRM groups throughout Australia which relates to their size, complexity, location, funding, individual and organisational capacity, and time in existence.

Within the context of the need for ongoing improvements in the capacity of NRM regional bodies for managing data and information, it is important to consider a spectrum of information management capabilities. This can be viewed as part of a road map scenario giving consideration to where each

NRM group is currently positioned and where they would like to be in the short, medium, and longer term.

The concept of capability spectrums is well established in the information technology industry and within quality management and allied disciplines across all industry sectors.

It is useful to consider the application of the capability-raising concepts to regional NRM groups as the methodologies do not consider current capability as a problem, but merely a starting point for improvement.

The following capability model (Table 1–1)—based on a simple five-stage maturity model as commonly used by the information technology industry—is presented for consideration. The model allows all NRM groups, regardless of their current capabilities, to consider what is needed to improve their capacity, and subsequently develop an action plan to move forward on the capability spectrum.

Table 1–1 An indicative capability framework for spatial information management within NRM regional bodies

Level	Name	Description
1	Individual capabilities	Individual staff members within NRM regional body are developing one or two projects or a business process.
2	Managed individual capability	The projects of individuals are recognised by the NRM regional group and are being managed, with standards in place. A linkage exists with some business processes and procedures. Training resources are allocated, responsibilities have been assigned and evaluations are taking place regularly.
3	Organisational capability	All NRM group business processes and projects are defined and managed using formal program management procedures. Linkage of all business processes to defined user needs exists. Internal benchmarking is occurring and compares data and information management with other business activities.
4	Quantitatively managed organisation capability	Quantified measures of process efficiency across the NRM region are occurring. Data and information management process, standards, training and support are measured quantitatively.
5	Optimising	There is continuous improvement of processes based on quantified measures of efficiency and range of management strategies to constantly improve measured performance.

It is a useful exercise to consider where your NRM regional group is placed on this capability spectrum and where you intend to go (and how). Specifically, Modules 1 to 11 of this Toolkit are designed to support you on that journey. For some regional groups, raising capability by one or two levels may be sufficient. For others, a strategic plan for level improvement progressing towards Level 5 may be more appropriate. Regardless, the focus should be on moving forward; either through the development of shared spatial information system (SIS) services with other NRM regions/organisations, or through your own SIS implementation. A module-by-module road map for increasing capability is included at Table 1–2.

Table 1–2 A capability-raising road map for spatial information management in NRM regional bodies

#	Module	Level 1 › 2	Level 2 › 3	Level 3 › 4	Level 4 › 5
1	Information management and the sustainable development of natural resources – an introduction to information management systems	Develop spatial information management plan including resource needs (people, funds and equipment), business drivers and governance	Comprehensive organisation-wide information management plan linked to business process analysis and underpinned by internal benchmarking	Development of formal measures demonstrating contribution of spatial information to business process efficiency including external benchmarking	Internal and external benchmarking drives continuous improvement process, including appropriate governance models to rapidly enact process improvements
2	Data management principles	Individual people or units have documented data management processes, policies and procedures	Organisation-wide data management processes, policies and procedures in place	Business process review for ensuring compliance with data management processes, policies and procedures	Development of metrics for data management compliance, including continuous external benchmarking
3	Interpretation and visualisation of data – an introduction to spatial information systems	Understanding of spatial information systems by key staff members	Organisational understanding of spatial information systems	Cost benefit of spatial information systems analysed and recognised	Regular reviews of understanding, implementation and use of spatial information systems
4	Spatial data priorities, standards and compliance	Individual people or departments have documented spatial data management standards, processes, policies and procedures	Organisation-wide spatial data management standards, processes, policies and procedures	Business process review for ensuring compliance with spatial data management standards, processes, policies and procedures	Development of metrics for spatial data management standards and compliance, including continuous external benchmarking
5	Spatial data discovery and access	Individual understanding of spatial data clearing houses and peer support networks	Formal spatial data access and use arrangements within and between regional bodies and other organisations;	Development of feedback mechanisms to ensure spatial data quality and access align with business drivers	Continuous effort for improving discovery and access of spatial data by all sections of NRM

#	Module	Level 1 › 2	Level 2 › 3	Level 3 › 4	Level 4 › 5
			organisation mandate for peer support	across regional bodies	regional bodies
6	Project management and justification – lessons learnt, pitfalls and best practice procedures	Implement standardised project management, including individual or departmental level business cases	Implement program level organisation-wide project management, including systematic business cases	Analysis of project and program performance in project planning, management and post-project review, including cost benefit analysis of business cases	Comparative benchmarking of project performance between NRM bodies and allied organisations/ sectors
7	Guidelines for selecting spatial information system software and hardware	System procurement driven by individual or departmental business needs; funded, endorsed plan for system procurement and implementation; selection check lists and criteria followed	System procurement fully integrated with business needs and procurement decisions undertaken on an organisation-wide basis	System audits, user reviews and business alignment assessment; user groups providing quantified feedback on systems	Quantified internal feedback on system usage and performance regularly compared with other organisations
8	Enhancing capability for using spatial information	The projects of individuals are recognised by the organisation or NRM regional body and are being managed; standards are in place and linkage exists to some business processes and procedures; training resources are allocated, responsibilities assigned and evaluations are taking place	All processes are defined and managed through program management of all projects; linkage of all business processes to defined customer needs exists; internal benchmarking is occurring and compares spatial information management with other business activities	Quantified measures of process efficiency across the organisation or NRM regional body; spatial information management process, standards, training and support are measured quantitatively	Continuous improvement based on quantified measures of process efficiency and range of management strategies to constantly improve measured performance
9	Map production	Unit or departmental documented map production	Organisation-wide documented map production	Comparative analysis and alignment of regional map	Formal processes in place to ensure continuous improvement and

#	Module	Level 1 › 2	Level 2 › 3	Level 3 › 4	Level 4 › 5
	guidelines	guideline(s)	guideline(s)	production guideline(s)	change management of map production guideline(s) generated by quantified regional analysis and user feedback
10	Introduction to GPS and best practice guidelines	Low understanding of GPS principles; GPS procurement driven by individual needs	Understanding of GPS principles; GPS procurement integrated with needs and procurement based on endorsed plan	Good understanding of GPS principles; formal methods for GPS survey and processing; procurement integrated with needs and procurement based on endorsed plan	Benchmarking of performance, with continuous effort for improving
11	Partnerships and working together – the potential for collaboration	Individuals or departments service the spatial information requirements of others	Organisational mandate for collaboration across all functional areas of an NRM group and formalised agreements for working together with other organisations	Performance measures established for internal and external service agreements	Benchmarking of performance measures for service agreements; combined agreements for collaborative spatial information usage

Signposts are included in each module to guide managers in raising their NRM region's capability.

1.4 Information management



Increasingly, international reviews are revealing that the successful implementation of regional NRM plans is underpinned by the adoption and utilisation of appropriate information technology to improve efficiency in project activities. **To be effective, the use of information technology must be supported by policies and practices that view data and information as a long-term asset, requiring dedicated management and coordination, to produce increased efficiency and effectiveness in business operations.** This means being able to deliver the right information, in the correct format, in a timely fashion to decision makers.

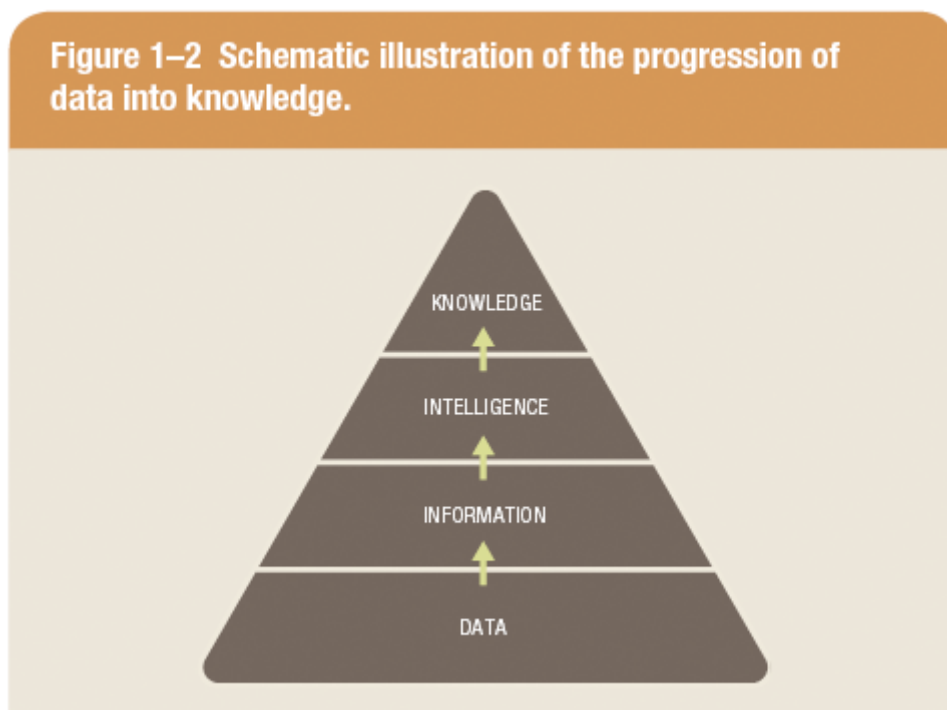
Unfortunately, in many situations there is a barrier between what management and staff need, and what they actually have—they need easy access to relevant information; tools that support the use of the data; understanding of the data through standards and metadata; clear direction for priorities;

and training in the use of the technologies. What they most often encounter is data that are highly dispersed, not easily accessible, and not conforming to a standard, which when coupled with complicated technologies and bureaucratic management and support components, do not make the job any easier. As a consequence:

- time, effort and money are wasted in duplicating effort in data collection, management and analysis
- results are not transferable or easily shared
- decisions are difficult to communicate which often culminates in management having difficulty assigning priorities and resources.

Similarly, international and Australian experience demonstrates that a large number of organisations and regional bodies are both information providers and clients, and that there has often been a sizeable investment in data collection activities. This investment has not always resulted in increased efficiency and the transfer of data to information and knowledge.

It has been argued that it is the transformation of data to decision making which ultimately brings a level of knowledge, and an ability to make informed interventions to improve the management of natural resources. A schema for this concept is illustrated at Figure 1–2.



The goal of information systems is to convert data into information. Data are considered to be the input to a process where information is created. For example, daily rainfall recorded over long periods can be used to produce a monthly mean average for a particular location.

Issues



While the benefits of having access to and being able to use data and information may be well understood and accepted, the reality for many is:

- the technology is not accessible to most people because it is too complicated to use and is too expensive to acquire
- data are incomplete and not easily accessible
- data are not up-to-date and often lack any documentation on their accuracy and reliability
- only a few elite 'technology gurus' have the know-how and tools to analyse and synthesise information.

Today's spatial information and web technologies can enable sophisticated analysis, sharing, publishing and access, however as mentioned, in many cases, a lot of money and time are spent with few results.

There are many reasons why these implementations might fail:

- lack of leadership or senior management support
- failure to identify the full implementation costs—focusing on hardware and software costs while data, training, and applications development costs are missed or underestimated
- insufficient or inappropriate expertise and experience on the implementation team
- reliance on experts and technology to dictate the business processes, instead of facilitating and supporting the organisation's information needs.

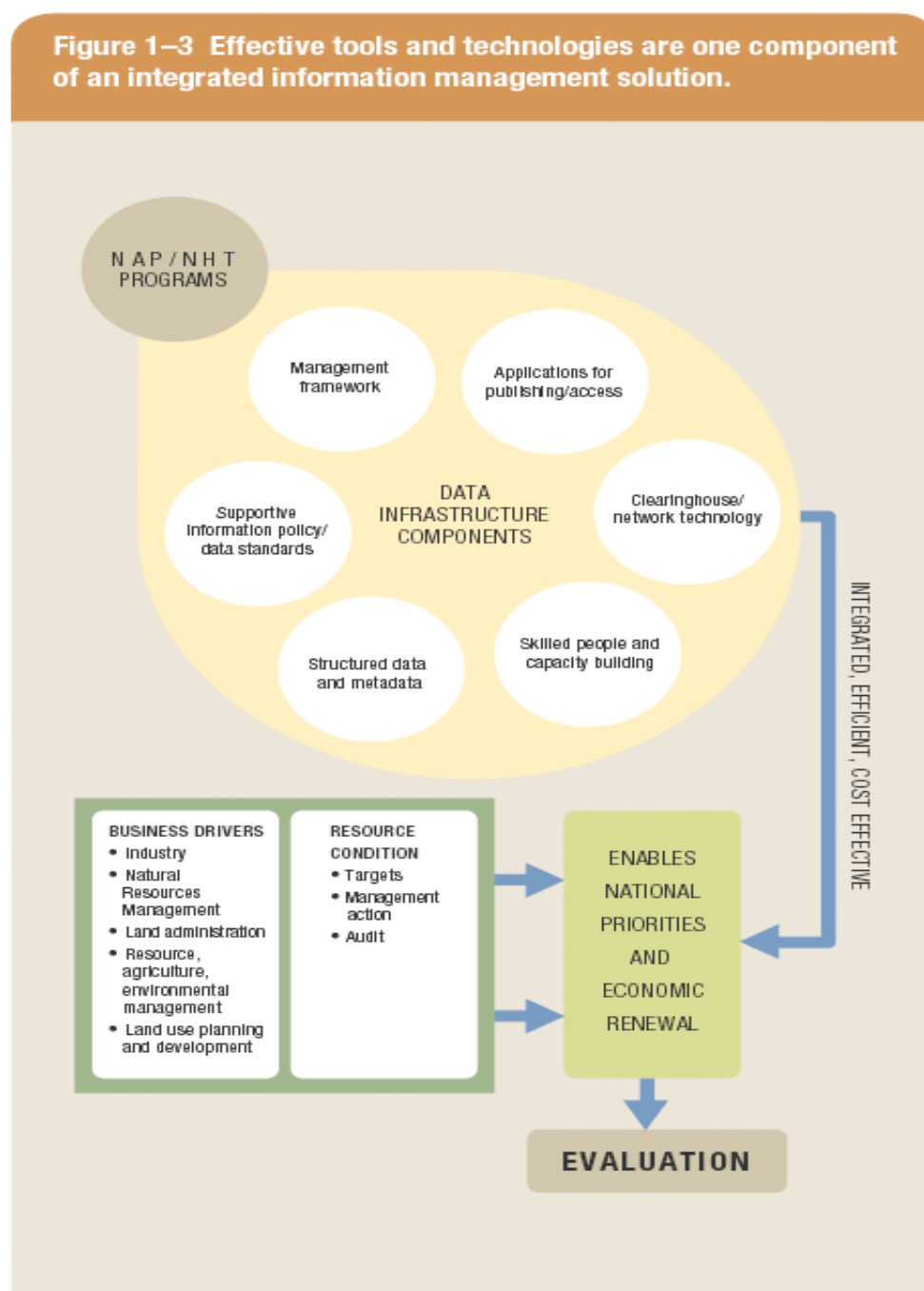
The following table illustrates some of the issues associated with information and an inability to access and integrate the data.

Without an integrated solution ...	This results in ...
Data are dispersed within and among organisations	<ul style="list-style-type: none"> ■ difficulty accessing the data
Data are collected and stored according to different standards	<ul style="list-style-type: none"> ■ incompatibility among datasets of similar themes and subject matter within and among organisations ■ large databases with limited usefulness ■ difficulties integrating data from other locations or with other themes ■ data not being useable with some computer technology
Data are collected for a single purpose	<ul style="list-style-type: none"> ■ a fragmented database ■ gaps in coverage or overlapping coverage ■ increased costs ■ lost opportunity and lost investment
Data are poorly documented and publicised	<ul style="list-style-type: none"> ■ limited or no availability to potential users ■ data collection duplication where data already exists
Management cannot set up information policies for access and use of data	<ul style="list-style-type: none"> ■ multiple 'owners' and a 'silo' mentality that is not conducive to sharing or partnership ■ difficulty in setting priorities for data management and systems development ■ information is not treated as a corporate resource (like financial resources and human resources)
Focus on 'high-end' solutions for specialists	<ul style="list-style-type: none"> ■ most management and staff not having the simple tools they require to access and use the information ■ focus on advanced analysis, not on information presentation for decision making, monitoring or evaluation ■ the readily available, up-to-date data from various sources, such as space-borne imaging is not usable by most

It is against this background that the Audit and ANZLIC are promoting an integrated information management solution, and in particular the development of a **Natural Resources Information Management Toolkit** aimed at an integrated set of practical guidelines suitable for immediate use in implementing best practices in information management in NRM projects.

1.4.1 Need for Integrated information management and a data Infrastructure

An integrated information management solution successfully combines leadership, people, computer hardware and software, applications, and data into a framework or infrastructure that ensures the appropriate tools and rules are in place to maintain data and turn them into useful information products to support operations and decision making (Figure 1–3).



An integrated information management solution is needed for two key reasons:

1. management capability
2. value and cost.

Management capability

Public and private sector policy, planning, decision making and action all rely on good data and supporting systems. If the data and systems are not in place, management capability and economic growth do not meet their maximum potential.



An integrated solution ensures that good data are accessible and that the appropriate applications are in the hands of the people who need them. An integrated solution also provides opportunities to do new things, and to improve the way current activities are done, in ways currently not foreseen or possible.

Value and cost

Data—particularly geographic data—can be expensive to collect, manage and maintain. The integrated system's framework and mechanisms enable and promote the sharing and distribution of data, thus reducing costs and increasing their value. An integrated system also promotes the development and acceptance of standards through the use of common data systems and a participatory information management structure. This also reduces costs and increases the value of the data.



1 ► 2

Develop spatial information management plan including resource needs: human resources, budget allocations and required technologies. The plan should be closely tied to business drivers and be developed with ongoing governance in mind.

1.5 Components of an integrated management solution and spatial data infrastructure

As mentioned previously, a number of elements are involved in the development of an integrated information management solution and the development of a spatial data infrastructure (SDI) to assist NRM. It should be noted that each jurisdiction normally has its own specific guidelines, policies and protocols.



The latest information on the development of the Australian Spatial Data Infrastructure (ASDI) is available on the ANZLIC web site:

<http://www.anzlic.org.au/infrastructure.html>

A copy of the ANZLIC Action Plan for implementing the Australian Spatial data infrastructure is available for download from the ANZLIC web site:

<http://www.anzlic.org.au/publications.html>

Additional information is presented in Section 1.4 of this module.

The following information is a guide to assist regional groups.

1.5.1 Management and organisation framework

Leadership

Examination of successful NRM initiatives at a regional level reveals that all have a senior management authority and/or leadership present at some stage during the development and implementation of the project. Leadership is required to ensure that activities in the development of a data infrastructure remain coordinated and focused. An overarching vision or goal to which all partners subscribe is important. The designation of a lead agency among the partners, with dedicated resources able to provide coordinating mechanisms, is a key ingredient to expediting development. An additional leadership role is to maintain enthusiasm and continuously promote the vision and goals. In this sense leaders often act as 'champions' to ensure success.



Leadership is especially important in the initial stages of implementing an integrated management solution at regional locations.

Sample organisational models/responses

Several organisational models are possible for implementing an integrated management solution, however often one is more suitable than another based on specific circumstances, mandates or drivers, namely:

Partnership

- typically business driven
- supportive policy environment for data access and sharing

Data utility

- given authority by government to create and maintain framework data
- services and profit stem from this model

Committee

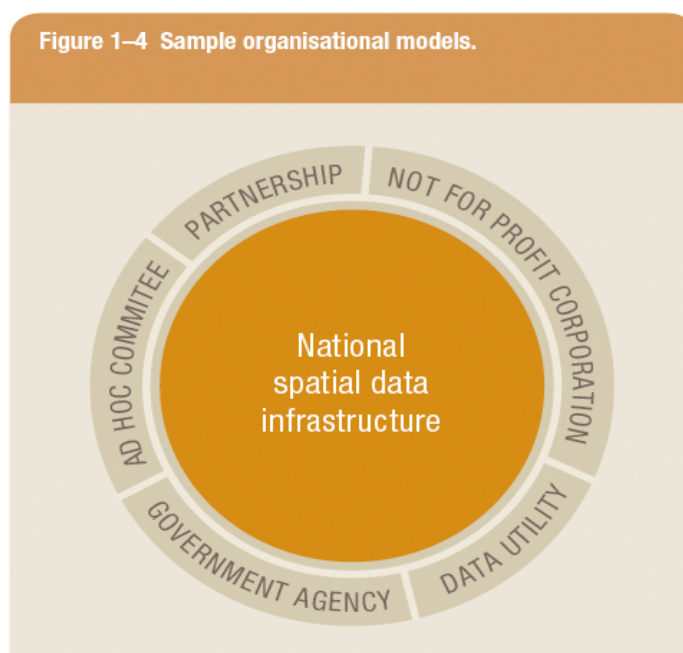
- multi-department/organisational membership with staff undertaking specific roles of implementation

Non-profit corporation or bodies

- separate from government with broad participation by board of directors
- frequently has some form of enacting legislation

Government agency

- responsibilities given to lead government agencies to enact



Steering committee/board of directors

The adoption of an integrated management solution and establishment of a data infrastructure often involves the creation of organisational responses such as a data utility and policy/standards group. To be effective some formal arrangement is required (in the form of a steering committee or board) to oversee implementation and provide vision, direction and approval of resources. In general, such a committee has overall direction authority, and is the key body in ensuring that products and services reflect the expectations and needs of the organisations and user groups they serve.

Typical roles for such a committee or board involve the following:

Partnership development and policy framework

The steering committee or board is responsible for driving the development of data sharing and co-maintenance policies/directions and its membership should reflect any partnerships in the implementation.

Communication/participation

Steering committee members should be responsible for 'championing' the adoption and use of the system components within and beyond their organisation or group. They should also ensure their organisation or agency participates in the development of communication materials in support of the integrated management solution.

Data standards

The steering committee should be responsible for approving authority for data standards used by the system/partnership, and ratifying any data standards processes.

System requirement priorities

As well as setting priorities for new system requirements, the steering committee should also be responsible for determining any new requirements.

Data collection and maintenance priorities

The steering committee should assist in ratifying new business processes that maintain the framework databases, e.g. sharing and incorporation of information gathered by agencies to support their ongoing work. It should also be responsible for setting priorities related to data capture, cleaning and maintenance. The steering committee should also be aware of and adhere to over-arching policies as part of wider initiatives at the Australian, state or territory government levels.

Training

The steering committee should participate in the determination of training needs to build capacity within the various partners to more fully benefit from the overall implementation of the system.

1.5.2 Training and expertise

Training and development

The development of an integrated management solution and data infrastructure needs to be accompanied by a training strategy to build and sustain capacity.



One of the key lessons learnt from past initiatives is that not enough attention has been given to capacity building and the development of corporate knowledge bases (and use of simple viewing tools) that enable data and information to be readily available for all partners and stakeholders via a range of publishing media, e.g. the internet.

The following key elements should be considered:

- identification of skills and training needs required to implement an integrated management solution
- specific capacity in SIS concepts and software training may be required along with training in application development, system and network administration, database development and maintenance, and program management
- development of a suite of standard and custom products and services often improves efficiency and effectiveness.

Further information on training and recruitment for acquiring skills in spatial information management is provided in *Module 8: Enhancing capability for using spatial information*

Inventory of skills

The establishment of an inventory of skills amongst key partners involved in the development of regional plans for NRM is one method of determining training or educational priorities. In this regard the use of a questionnaire may assist to rapidly obtain information from each partner. (Refer Module 8 for additional information on training)

Spatial information systems expertise

Obtaining high quality professional SIS expertise is often difficult and relatively expensive—a fact that is common to both city and regional locations. In many situations it is not appropriate to have access to full-time SIS professionals within an organisation. There are examples where the establishment of 'collaborative' resource information centres has proven to be very effective in developing databases and providing products and services to a range of partners or clients, as it reduces the requirement that all agencies have expertise within their organisation.

The introduction of standards (e.g. file naming conventions, metadata and protocols for data sharing) and simple visualisation tools are assisting to make it much easier for people to obtain access to, and use, spatial information. As a result, casual users familiar with basic desktop computer programs can now undertake tasks such as displaying spatial information and making a map.

Focal Points

A key part to the successful implementation of an integrated management solution involves having a local focal point for the development and implementation of a number of component activities, including the following roles:

- communication—providing and disseminating information among government agencies, key stakeholder groups and partners, as well as other clients such as local business, individuals and the media

- technology support, planning and implementation
- support to management and steering committee/board of directors; identification of issues, facilitation etc.
- development of information products and services, such as standard maps, data distribution CDs and web-based mapping applications
- training and capacity building
- mediation and independent advice.

1.5.3 Information policy

Information access policy considerations

Access to accurate and up-to-date data in a timely fashion is critical to the successful management of natural resources. Many people involved in the development of SIS and database activities have experience of being refused access to data. In many cases this is a result of an absence of policy relating to the provision of data to other users, or an explicit restriction on providing the dataset.



Develop formal measures to demonstrate the contribution of spatial information to business process efficiency including external benchmarking.

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A number of key information policy issues need to be addressed:

Cost

Consideration needs to be given to the cost of providing data versus the cost of providing access to data. In many cases some users only want access to view data as opposed to actually obtaining a copy of the dataset in a format that can be used and manipulated within SIS or database programs.

Cost can be both a barrier for the user to acquire certain datasets, as well as for the provider to supply data in the format or extent requested. In many situations a case exists for low or no cost to acquire data that has been captured using public funding. However this needs to be considered in relation to some situations where the absence of a homogenous policy around cost recovery by public agencies can inhibit the flow of data and information even more. Higher prices for data are likely to limit distribution and access.

Format

Format issues are of particular concern, including that in which the data are stored (e.g. a satellite image may be stored in a number of different image file formats), and the media on which the dataset is stored (e.g. CD-ROM or DVD). It should also be noted that technology is making many formats obsolete in a very short time (e.g. the 5" disk was very common a number of years ago but is hardly used at all today).

System design

System design issues must consider how they provide access, especially where certain records contain elements of information that need to have restricted distribution.

Copyright



Copyright and intellectual property rights need to be addressed as part of an information access policy. Note: Policies for copyright and intellectual property rights can be complex to develop, however useful models and templates are available (refer to web links provided at Section 1.6 of this module).

Privacy

When collecting data it is important to clarify what is private and what is to be made available in the public domain. In some cases specific data such as the age structure, species and production figures for a forest compartment may not be available to the public, however, a map (or SIS layer) of the forest concession boundaries may be freely available.

Privacy legislation normally requires that personal information be made available to the person, and that it be protected from others. Clear parameters are needed for personal information. The following is a guide for the collection of new data as they relate to privacy:

- justify the need for the personal information to be collected
- provide notification of any secondary use of such information
- maintain an index of all databases containing personal information
- provide individuals with the opportunity to verify the accuracy of the information—including a means by which the individual can have inaccuracies dealt with.



ANZLIC's Guideline for Privacy is available online from the ANZLIC website at <http://www.anzlic.org.au/policies.html>

Liability

Liability involves how protected an organisation is from legal recourse. This is very important in the area of data and information management especially where damage is caused to an individual or organisation as a result of misuse or inaccuracies in the data. Liability is often dealt with using end-user agreements and licences. As a guide, accuracy should always be reflected in the metadata. This is one reason why metadata are very important when data are made more widely available.

Summary of current ANZLIC information management policies



ANZLIC and the Audit believe that the nation is best served by data management policies that encourage and facilitate the use and integration of data and that price should not be an impediment to the transfer of data. Where possible, prices should be established at the lowest level (i.e. free or the cost of transfer) to encourage efficient and effective use, avoid duplication and overlap in data collection and maintenance, and promote data integration.

The ANZLIC website has a number of guidelines suitable for use as templates in the development of policies and protocols at a regional level.

To date ANZLIC has developed:

- Guidelines for Custodianship (of spatial data)
- Policy Statement on Spatial Data Management
- Metadata protocol and standard metadata profile
- Guiding Principles for Spatial Data Access and Pricing Policy
- Privacy guidelines for spatial information
- Access to Sensitive Spatial Data, and is currently developing liability guidelines.



More information about ANZLIC's policies and guidelines is available online on the ANZLIC website at: <http://www.anzlic.org.au/policies.html>

1.5.4 Partnerships

The development of an integrated management solution and data infrastructure presents many opportunities for partnerships. Information access enables groups and partners to do things in new ways, provide new services and information products, and reduce the reliance on traditional approaches.

A single agency or organisation is unlikely to have all the resources, skills and knowledge required to undertake the development of all aspects of a data infrastructure and implementation of an integrated management solution. Having organisations and partners working together from the outset is vital to ensure activities occur in a way that supports all the partners in their use of data. It also means that a greater amount and wider range of resources are incorporated in the development process. In this respect the involvement of both public and private partners, as well as

academic/educational groups and individual experts, in a consortium approach often yields the best results.

There is a range of mechanisms for the development of partnerships, as outlined in *Module 6: Project management and justification – lessons learnt, pitfalls and best practice procedures*. Importantly, Module 6 outlines the benefits found internationally for working with all levels of government on shared spatial information issues and problems.

Module 11: Partnerships and working together – the potential for collaboration outlines the potential approaches to developing partnerships with other local governments and/or private partners on spatial information management.

1.6 Additional support

Considerable resource material related to NRM programs, the development of spatial data infrastructures and the establishment of resource information centres is available on the web. Following are some selected examples.

1.6.1 Material on Australian Government investment programs

Caring for Our Country: <http://www.nrm.gov.au/>

National Action Plan for Salinity and Water Quality:

<http://www.napswq.gov.au/napswq/index.html>

Natural Heritage Trust: <http://www.nht.gov.au/>

1.6.2 Material on spatial data infrastructures and policies

General resource material

'Snapshot of SDI Development in Australia':

http://www.geom.unimelb.edu.au/research/publications/IPW/024_Warnest%20REF.pdf

ANZLIC policies: <http://www.anzlic.org.au/policies.html>

Australian Spatial Data Infrastructure (ASDI): <http://www.ga.gov.au/nmd/asdi>

Global Spatial Data Infrastructure (GSDI): <http://www.gsdi.org>

US Federal Geographic Data Committee (FGDC): <http://www.fgdc.gov>

Survey of national and regional spatial data infrastructure activities around the globe:

<http://www.spatial.maine.edu/~onsrud/GSDI.htm>

GSDI Cookbook: <http://gsdi.org/gsdicookbookindex.asp>

State and territory spatial data infrastructure activities

Queensland: <http://www.qsiis.qld.gov.au> and <http://www.nrw.qld.gov.au/about/index.html>

Western Australia: <http://www.walis.wa.gov.au> and the Shared Land Information Platform (SLIP) <http://spatial.agric.wa.gov.au/slip/>

New South Wales: <http://www.canri.nsw.gov.au/policies> plus the natural resources information management strategy <http://nrims.nsw.gov.au/>

Tasmania: <http://www.dpiwe.tas.gov.au> and <http://www.thelist.tas.gov.au/>

Australian Capital Territory: http://www.actpla.act.gov.au/tools_resources/maps_land_survey

Victoria: <http://www.land.vic.gov.au/land/lnlc2.nsf/FID/-869AEC581C5361B84A256C390082E029?OpenDocument#VSDD> and Victoria's Resources Online <http://www.dpi.vic.gov.au/dpi/vro/vrosite.nsf/pages/naturalresources-home>

Northern Territory: <http://www.ntlis.nt.gov.au>

South Australia: <http://www.environment.sa.gov.au/mapland/sicom/> and <http://www.environment.sa.gov.au/mapland/>

See also material in local tab section for additional information.

Examples of spatial data infrastructure projects

Australia

Herbert Resource Information Centre: http://www.hric.org.au/hric_site/hric.asp

Overseas

General: <http://www.gsdi.org/>

Canadian Geospatial Data Infrastructure: Aims to be a source of geospatial information and services in Canada:

http://www.geoconnections.org/publications/Technical_Manual/html_e/toc.html

INSPIRE: The Infrastructure for Spatial Information in Europe:

<http://www.ec-gis.org/inspire/>

As is the case in many countries, the general situation on spatial information in Europe is one of fragmentation of datasets and sources, gaps in availability, lack of harmonisation between datasets at different geographical scales, and duplication in collection of data and information. These problems make it difficult to identify, access and use data that are available.

Fortunately, awareness is growing at national and EU levels about the need for quality geo-referenced information to support understanding of the complexity and interactions between human activities and environmental pressures and impacts. The INSPIRE initiative intends to trigger the creation of a European spatial information infrastructure that delivers integrated spatial information services to the users. These services should allow the users to identify and access spatial or geographical information from a wide range of sources (from the local to the global level) in an interoperable way for a variety of uses. The target of INSPIRE includes policy-makers, planners

and managers at European, national and local levels and the citizens and their organisations. Possible services are the visualisation of information layers, overlay of information from different sources, spatial and temporal analysis, etc.

1.6.3 Example GIS needs assessment

<http://www.fgdc.gov/grants/2004CAP/2004FinalReport/184-04-3-ME-ReportFinal.pdf>

1.6.4 Material on capability-raising frameworks

Capacity Building Resource Manual—developed by the Australian Cooperative Venture for Capacity Building, this manual provides a framework for practitioners to develop, implement and evaluate capacity-building projects and activities. It includes case studies to illustrate the framework and the theory of capacity building, and provides additional references about capacity building:

<http://www.rirdc.gov.au/reports/HCC/07-102sum.html>

Download the report: <http://www.rirdc.gov.au/reports/HCC/07-102.pdf>

Federal Government Public Service Commission building organisational capability material:

<http://www.apsc.gov.au/buildingcapability/index.html> including the Building capability: A framework for managing learning and development in the APS at:

<http://www.apsc.gov.au/publications03/capability.htm>

1.6.5 Material on establishing collaborative resource information centres

The Herbert Resource Information Centre has material available online about Collaborative Resource Information Centres.

Collaborative Resource Information Centres: Guidelines for Establishment and Management

Web reference: http://www.hric.org.au/hric_site/downloads/hric_pub/cric_kit/Guidelines.pdf

Collaborative Resource Information Centres: Resource Kit

Web reference: http://www.hric.org.au/hric_site/downloads/hric_pub/cric_kit/Resource%20Kit.pdf

Collaborative Resource Information Centres: Australian Spatial Data Infrastructure Project

Web reference: http://www.hric.org.au/hric_site/downloads/hric_pub/cric_kit/ASDI_proj.asp