National Land & Water Resources Audit

An Initiative of the Natural Heritage Trust

REPORT CARD REVIEW AND CONCEPT DEVELOPMENT - JULY, 2004

Natural Heritage Trust

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Report Card Review and Concept Development - JULY, 2004

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Executive Summary

A wide variety of resource condition and trend assessment frameworks and initiatives are currently available from within Australia and Internationally.

The Audit is currently developing a 'Report Card' concept to enable the dynamic on-line presentation of information on the condition and trend of Australia's natural resources. Information will be provided at national, state and regional level aligned to the National Framework for Natural Resources Management Standards and Targets, Matters for Target and Indicator Headings.

These matters for target and indicators were developed primarily for the measurement of the performance of investments made by programs such as the National Action Plan for Salinity and Water Quality (NAP), and the Natural Heritage Trust (NHT). However, the use of consistent measurement methods will enable data collected for indicators to be used as inputs to assist in the determination of overall assessments for resource condition. As such, it is important that Regional bodies undertake the monitoring of indicators deemed relevant to the investments that are taking place.

This report was carried out for the Audit to identify, document and review relevant natural resource condition and trend reporting initiatives and applications. The results of this work will support the advancement of the Audits Report Card concept by providing a background document suitable for discussion with the States and regions as part of workshop activities.

The Way Forward - Ensuring the Audit's Report Card Concept Achieves its Full Potential

Giving consideration to existing resource condition and assessment reporting initiatives available both Internationally and from throughout Australia the following key issues are identified for consideration by the Audit in the further development of a Report Card concept for Assessing the Condition and Trend of Australia's Natural Resources.

1. Consistent Framework

   The adoption of a consistent framework (and standards) for the collection, recording and reporting of resource condition information is critical to the enable the development of a 'Big Picture' assessment of ecosystem health.

2. Frequency of Reporting

   Regular reporting of natural resource condition and trend assessments is required to enable impacts to be monitored and thereby determine the value of investments, their viability and sustainability. Such an approach enables the tracking of changes in various indicators and opportunity to provide a mix of both short term (real time, daily, weekly, monthly or yearly) and longer-term (five year) intervals for observing trends.

3. Access to easily understood credible information

   Collectively, the outcome of 1 and 2 above will enable results to be comparable across jurisdictions and over time. Adoption of an integrated information system will enable multiple products, presentable at multi-levels for a range of clients e.g. high level 'traffic lights' for policy through to detailed data for on-ground technical managers.

4. Linkage to other information

   One of the strengths of the proposed Report Card is that it will draw much of its material from the same organisations and groups that are involved in the collection and collation of data. Most groups are currently developing applications to report this information and make it widely available. The ability to be able to link to such

information from within the Audit's Report Card is considered key to the overall value of the application.

5. Range of Thematic Elements

Many traditional resource condition reporting initiatives have failed to meet their full potential as they focussed only on the standard bio-physical data themes for monitoring. International and Australian experience has demonstrated that it is important to include social and economic aspects to support the decision making process.

6. Identification of Gaps

The identification of gaps in data and information are important to guide future program development and provide a contextual setting for the application of existing results.

7. User-Friendly and practical

It is important to identify the audience for which the proposed Report Card is being developed and ensure that a suitable 'User-Friendly and Practical' application is developed. Identification of client needs and the objectives of the report mechanism will also assist in assessing whether the Report Card is successful in achieving its purpose.

8. Incorporation of Local and Traditional Knowledge

Mechanisms for incorporating local and traditional knowledge are key elements in the two-way flow of data and information required to make reporting on resource condition and trend assessments successful and meaningful.

9. Capacity Building and Educational Component

Experience has demonstrated that successful resource condition and trend assessment reporting initiatives have a strong capacity building and eduction component.

10. Catalytic Approach and Leadership

The proposed Report Card concept provides a basis for a common reporting mechanism and an opportunity to facilitate comparability across jurisdictions.

11. Multi-scale Assessment and Linkage to other Programs

One of the major benefits of the proposed Report Card concept is its intention to provide an inter-linked multi-scale assessment of resource condition ranging from catch and regional to state and national levels. The adoption of an integrated information management system as proposed for the Report Card will assist to overcome a number of problems many users currently face, viz:

- Little data integration across programs
- Scattered data management
- Unfamiliarity with technology and complex application interfaces etc

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1 Introduction

1.1 Background

Reporting on resource condition and trend assessment involves communicating information about the bio-physical condition or state of an area or location. Access to such information helps to identify and analyse situations and issues. Strategies may then be developed and implemented with the impacts monitored over time as part of an overall system. The value of the information and the effectiveness of the decision making / planning process is closely related to the quality and completeness of the information, and the manner in which it is made available. In this respect, regular publishing of information on resource condition for communication to clearly defined target audiences (and stakeholders) are considered key components of any Natural Resources Management activity.

Increasingly, throughout Australia and Internationally many organisations, local government, catchment authorities and community groups are choosing to produce and publish information about resource condition based on some form of formal reporting process or framework. These tend to range from detailed State of the Environment type reports based on Internationally accepted frameworks, through to simple score-card or Report Card type outputs, based on national or locally developed frameworks e.g. the Framework for Public Environmental Reporting developed in 2000 by the Department of the Environment and Heritage. In some situations -eg, in the case of State of the Environment Reports - the output may be produced to fulfil legislative requirements at national, state or local jurisdictional level, while in others the report may be in response to mandatory requirements such as access to funding or bilateral signatory requirements. More recently however there has been an emerging trend to produce such 'condition assessments' as part of Best Practice procedures, and to satisfy stakeholder and community expectations. These changes form part of a shift towards increased transparency and accountability currently being experienced throughout all levels of Government, various industry sectors and the community.

Further, as a result of improvements in information technology and software applications there is an increasing ability to deliver dynamic 'real time' or 'near real time' datasets (e.g. rainfall, surface sea temperatures, normalized vegetation indexes, stream salinity monitoring stations etc), which when coupled with the development of custom on-line 'user-defined' reporting applications and interoperability provide a wide range of reporting capabilities over and above the 'snap-shot' hard copy outputs of traditional reporting formats[1]. As a result, potential exists to use datasets as inputs to modelling exercises and to identify changes / trends based on time series data. Consequently, it is now possible for reporting to be more predictive and forward looking, as opposed to conventional static assessments which reflect current or recent status and were often 'backward looking'.

[1] Interoperability as defined by the OpenGIS Consortium refers to the *Capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units ISO 2382-1. "The ability for a system or components of a system to provide information portability and interapplication, cooperative process control. Interoperability, in the context of the OpenGIS Specification, is software components operating reciprocally (working with each other) to overcome tedious batch conversion tasks, import/export obstacles, and distributed resource access barriers imposed by heterogeneous processing environments and heterogeneous data".*

refer http://www.opengis.org/resources/?page=glossary

International experience has demonstrated that the actual effectiveness and overall efficiency of various resource condition initiatives is greatly improved if such resource assessments can be incorporated with social and economic data as part of an integrated information system in which results are interoperable between organisations, jurisdictions and scales or tiers of operation. This scenario involves a two-way flow of data and information between various groups and tiers, and as such needs to be underpinned by appropriate access policies, sharing arrangements, standards and consistent methods of data collection and reporting. Recent initiatives of ANZLIC and the National Land and Water Resources Audit (the Audit) supported by State, Territory and Australian Government agencies have laid a solid foundation to improve access to data and information. The view of the Australian Government is that datasets and information developed by projects carried out under the various themes of the Audit accrue far greater value if they can be readily accessible to a wide range of users.[2]

1.2 Purpose

To identify, document and review relevant natural resource condition and trend reporting initiatives and applications from around Australia and Internationally. The results of this work will support the advancement of the Audits Report Card concept by providing a background document suitable for discussion with the States and regions as part of workshop activities.

1.3 Objectives

To achieve the above goal, the Audit contracted the services of a consultant to review various resource condition and trend reporting initiatives to provide information on:

- Organisational Details
- Reporting Elements or Themes
- Reporting Formats
- Source of Data and Information
- Frequency of Reporting Period

1.4 Scope of Work to be Undertaken

The consultant is required to identify, document and review relevant natural resource condition / trend reporting initiatives from around Australia and Internationally. The results of the above activity are to be presented in a report to the Audit along with recommendations regarding relevant content and ideas which could be incorporated into the Audit's current concept of a 'Regional Report Card'.

1.5 The Consultancy Process

The method employed for the consultancy has been both analytical and descriptive, adopting a thematic approach in line with the scope and objectives of the Terms of Reference. This involved developing a structured work plan in which the consultant liaised closely with the Audit team and consulted with staff from various national, state and local

[2] In 2001, the Audit, and ANZLIC - the Spatial Information Council, supported by data custodians in State, Territory and Commonwealth agencies, signed the single Data Access and Management Agreement. The agreement streamlines access to:

- natural resource data and information products developed by the Audit; and
- data that are required to update natural resource information products and undertake natural resource assessments by Commonwealth, State and Territory natural resource management agencies.

The landmark agreement specifies access, ownership, custodianship, archiving and updating arrangements for the data collected, developed for and used in the assessments undertaken by the Audit. Ref. NLWRA (2002) Australian Natural Resources Information 2002, National Land & Water Resources Audit, Canberra.

level jurisdictions. Additional material was sourced from various initiatives available from a variety of sources – predominantly from the Internet.

It is felt that the above approach would leverage maximum benefit, provide information on a cross-section of reporting and trend condition initiatives, and ensure greatest return for effort within the timeframe available.[3]

2 Resource Condition Frameworks

As mentioned above, resource condition assessment and environmental reports are increasingly emerging at all levels of government as well as in the corporate world (e.g. industry), and the private and community sectors (e.g. landholder and Landcare type groups). The type of framework used for reporting varies depending on who the report is produced for, its given purpose, and financial considerations, however as a guiding principle different frameworks have been developed to facilitate the organisation and presentation of information, and to define the issues on which to report.

2.1 International

In order to develop and employ indicators of sustainable development and of the environment - and thereby be in a position to report on condition and trends - the International Community has utilized several approaches. A review of literature brings out the following frameworks that have been used recently:

- Framework for the Development of Environmental Statistics (FDES), which relates components of the environment categories with information categories. The components of the environment consisted of flora, fauna, atmosphere, water, land/soil and the man-made environments (human settlements). The information categories, which are based on the recognition that environmental problems are the result of human activities and natural events, are (i) social and economic activities, and natural events; (ii) environmental impacts of activities and events; (iii) responses to environmental impacts and events; (iv) inventories, stocks and background conditions.
- Framework for the Indicators of Sustainable Development (FISD), which is a modified version of the FDES. While the information categories included in the FISD are the same as those in the FDES, the components of the environment categories or issues included in the FISD are based on Agenda 21 clusters (economic issues, social/demographic issues, air/climate, land/soil, water, other natural resources, waste, human settlement and natural disasters, institutional support).
- Pressure–State–Response (PSR) Framework of the OECD (Organization for Economic Co-operation and Development), which is similar to FDES but based on a concept of causality. It implies that human activities exert pressure on the environment and change its quality and the quantity of natural resources. Society responds to the changes in the environment through environmental, general economic and social policies; and the responses in turn influence pressures through human activities.
- Driving Force–State–Response (DSR) Framework utilized by the UN Commission on Sustainable Development (CSD). This is the same framework as the PSR except that the term “Driving Force” is used instead of “Pressure,” which tends to have a negative connotation.

[3] In this sense the consultancy should be viewed as a desk study exercise. Time limitations meant that it was not appropriate to design and implement a formal survey or program to visit various regional projects.

Even though PSR/DSR frameworks are similar to FDES in a broad way, there is one important difference with respect to the State category. While in the FDES this category is divided into two classes - the impacts, and the inventories/stocks/background conditions - in the PSR/DSR, these two classes are combined into the single category State. The PSR framework has been adopted by many OECD countries and by the World Bank for **State of the Environment Report** or SoE reporting. For a listing of the range of SoE reporting frameworks found in Australia refer sections 2.2.1 below.

Sustainability Reporting Frameworks

Sustainable Development is 'development which meets the needs of the present without compromising the ability of future generations to meet their own needs'. Sustainable development recognises the interdependence of environmental, social and economic systems and promotes equality and justice through people empowerment and a sense of global citizenship.

The indicators used for 'sustainability reporting' differ from state of the environment reporting as they are based on different models that combine social, economic and environmental trends, and the inter-relationships between these systems.

Some examples of sustainability reporting frameworks and indicators include the following:

- The Natural Step (TNS) http://www.naturalstep.org/
- Sustainability Counts http://www.sustainable-development.gov.uk/sustainable/consult/index.htm
- Indicators of Sustainable Development prepared by the Commission on Sustainable Development.

Other frameworks include Agenda 21 which are used at National and State or Regional / Local level see http://www.deh.gov.au/esd/la21/manual/index.html and various 'Corporate' Reporting Frameworks.

2.2 National Frameworks

Within Australia a number of Frameworks exist for which information on natural resources condition and trend assessments are produced. The most widely known is the State of the Environment or SoE Reporting Framework, for which the Organisation for Economic Co-operation and Development's (OECD's) 'pressure-state-response' (PSR) model is most commonly used as the basis for reporting.

In most states and nationally, an expanded version of the OECD-PSR model, the driving force-pressure-state-impact-response (DPSIR) model is used to take into account driving forces or causes for the change as well as the impacts to environmental, social and economic systems.

To simplify interpretation of a complex environment, SoE reports are structured around a number of environmental themes, issues and indicators.

When applying the PSR Model (or adaptations of the model) there are three types of indicators:

- Pressure indicators - describe the pressures from human activity that affect the environment.
- State (or condition) indicators - measure the quality of the environment and the functioning of important environmental processes.
- Response indicators - identify the human actions or efforts that have been made to address pressures on the environment.

An indication on the type and range of indicators used in SoE reporting is presented in the report 'Core Environmental Indicators for Reporting on the State of the Environment'

report issued under the authority the Australian and New Zealand Environment and Conservation Council by the State of the Environment Reporting Task Force in March, 2000. See http://www.deh.gov.au/soe/publications/envindicators.html

2.2.1 State of the Environment Reporting

National Level: The Environment Protection and Biodiversity Conservation Act 1999 requires that a national SoE Report be produced every five years. This provides scope for changes in environmental pressures and condition to be tracked over the long term.

The purpose and objectives of national State of the Environment (SoE) reporting are to:

- Provide accurate, timely and accessible information on the condition and prospects of the Australian environment;
- Increase public understanding of these issues;
- Continue the development of national environmental indicators, and report on these indicators;
- Provide an early warning of potential problems; and
- Report on the effectiveness of policies and programs designed to respond to environmental change, including progress toward achieving environmental standards and targets.

The national SoE report is the major mechanism in which resource management and environmental issues are comprehensively reported and analysed for scales that transcend State and Territory boundaries. National SoE reporting is carried out at a continental scale on the land and for coastal and marine environments, and includes Australia's external territories. The environment is covered in seven major themes:

- Atmosphere
- Land
- Inland Waters
- Coasts and Oceans
- Biodiversity
- Human Settlements
- Natural and Cultural Heritage

Information on SoE reporting in Australia is given in Attachment 1, while a more detailed account of the development of a National SoE Reporting System for Australia is available from the Department of the Environment and Heritage web site. Refer (http://www.deh.gov.au/soe/index.html). Information on various local government SoE reporting initiatives are generally available from State SoE sites or information portal web channels e.g. NSW http://www.epa.nsw.gov.au/soe/locregreports.htm

2.2.2 National Land and Water Resources Audit and the National Natural Resources Management Monitoring and Evaluation Framework

In recognition of the need to provide a detailed assessment the status of Australia's natural resources, the health of its ecosystems and the opportunities for improving the use of natural resources, the National Land and Water Resources Audit (or the Audit) was established under legislation by the Australian Government … '*to provide the baseline for the purposes of carrying out assessments of the effectiveness of land and water degradation policies and programs, …[and] … to improve Commonwealth, State and regional decision-making on natural resources management*'. (NLWRA, 2002 – Australia's Natural Resources: 1997-2002 and Beyond. See: http://audit.ea.gov.au/anra/docs/final_report/final_report_summary.cfm)

During the period 1997-2002 the Audit coordinated and commissioned a number of assessments that provided a range of reports, data and information the nation's land,

water and biodiversity. The results of this activity are available as hard copy reports, however in order to improve access they have been made readily available to the community via two information tools developed under support from the Audit. Both tools are accessible via the internet – the Australian Natural Resources Atlas (for the presentation of assessments for various regions and themes), and the Australian Natural Resources Data Library (a search and discovery tool, for the identification and download off information products and datasets).

In May 2002, the Natural Resources Ministerial Council, on which State, Territory and Australian Government jurisdictions are represented, approved the National Natural Resource Management Monitoring and Evaluation Framework aimed at assessing the health of the nation's land, water, vegetation and biological resources. The Council has also endorsed a further national level document, the 'National Framework for Natural Resources Management Standards and Targets' to assist with setting targets, monitoring, evaluation and reporting on natural resources management.

Under the framework a core set of resource condition indicators are being developed to measure progress towards agreed national outcomes and 'matter for target' on a medium and long-term basis. It is envisaged that reports will be provided on resource condition trends and associated measures at least every five years thereby providing a continuing reference from which the appropriateness and effectiveness of national policies, strategies and programs may be assessed.

The framework supports the transmission of complete and accurate information (according to agreed formats) to stakeholders in time for it to be used in the processes for which it was collected. National protocols for monitoring and reporting of progress against targets are currently being identified to:

- Promote consistency in setting and measuring progress towards targets within and across regions
- Allow aggregation and reporting on progress nationally
- Allow comparison of program achievements with national assessments of condition or trends in resource condition (e.g. the Audit and SoE reporting)
- Enable feedback to regions on how they are contributing to achieving national outcomes

For additional information on the Monitoring and Evaluation, and Standards and Targets refer http://nrm.gov.au/monitoring/index.html

It is based on the above framework that the Audit is fostering the development of a Regional Report Card initiative to be developed in close cooperation with respective State and Territory and Australian Government jurisdictions and other stakeholders to monitor and report on each 'matter for target' set out in the National Framework for Natural Resource Management Standards and Targets. Refer Attachment 2. As such, resource managers will have access to relevant information to make improved decisions and / or establish priorities to invest limited NRM funds.

Information from most States and Territories indicates that they are currently in the process of developing their monitoring and progress systems, though a number of initial applications have already been introduced in some areas. For example, South Australia has developed an application called Natural Resources Tracker to report on project and program activities. The focus of this and other applications e.g. CAMS – the Catchment Activity Management System developed by the Department of Sustainability and Environment in Victoria tend to concentrate on the recording and reporting of catchment activities implemented by landholders and regional groups. That is, they tend to focus on reporting of 'on-ground' work activities from a funding accountability perspective as opposed to a viewing the reporting process through a resource condition lens. Notwithstanding, CAMS does has some spatial capacity and experience has

demonstrated that landholders and/or catchment groups have been successful in populating on-line database applications. Since going on-line in June 2001, CAMS has over 240 registered users, and as of September 2003 had 7504 people listed in the person maintenance, 9490 works projects created and 6778 sites mapped. CAMS currently contains tools to:

- Record details on activities (on-ground works)
- Record spatially where the activity is (map it)
- Report on activities, outputs, issues and budget lines using maps, standard reports and letters
- Simple GIS functions – turning layers on and off and printing maps.

Refer:
http://www.dse.vic.gov.au/dse/nrenlwm.nsf/9e58661e880ba9e44a256c640023eb2e/3300c3adc9e642bdca256eb0001277d5/$FILE/cams%20fact%20sheet.pdf

2.2.3 Other Frameworks in used in Australia

Corporate Reporting Frameworks

Corporate environmental reporting is about the communication of information to the community concerning a private or public organisation's performance. Two types of corporate reporting framework are described below.

Public Environmental Reporting

Public or corporate environmental reporting is about the communication of information to the community concerning a private or public organisation's environmental performance. Companies are increasingly adopting this style of reporting in response to mandatory requirements and the demands of consumers.

A Framework for Public Environmental Reporting has been developed by Department of the Environment and Heritage. This framework was developed to facilitate and encourage voluntary public environmental reporting in Australia, by providing simple and effective guidance at a national level. The objectives of the Australian Framework for Public Environmental Reporting are to:

- Provide flexible and broad guidance at a national level on voluntary public environmental reporting
- Facilitate voluntary environmental reporting within private and public sectors
- Provide simple and effective guidance on how to report and what to report
- Facilitate reporting to stakeholders with reliable information relevant to their needs and interests
- Facilitate transparency, credibility and more consistency in reporting
- Be compatible with other related national and international guidelines such as the Global Reporting Initiative see http://www.globalreporting.org
- Be a continuously evolving document that is periodically reviewed and updated

See http://www.deh.gov.au/industry/finance/publications/framework/index.html

The Finance, Accounting and Reporting section of the Department of Environment and Heritage's web site is an excellent resource for electronically available Public Environmental Reports links to company sites, publications, tools and other resources. See: http://www.deh.gov.au/industry/corporate/reporting/reports/index.html

Triple Bottom Line (TBL)

TBL focuses corporations not just on the economic value they add, but also on the environmental and social value they add. The notion of reporting against the three components of economic, environmental, and social performance is directly tied to the concept of sustainable development.

The Global Reporting Initiative (GRI) was established in late 1997 with the mission of developing globally applicable guidelines for reporting on the economic, environmental, and social performance, initially for corporations and eventually for any business, governmental, or non-governmental organisation (NGO). The publication Sustainability reporting Guidelines on Economic, Environmental and Social Performance can be downloaded from the Global Reporting Initiative web site.

See http://www.globalreporting.org/

Some examples of companies in Australia producing public environmental reports or triple bottom line reports include WMC Limited, Sydney Water who provides drinking water and wastewater services to people in NSW, BHP Billiton, Western Power and Telstra.

See for example:

WMC Limited http://www.wmc.com.au/sustain/sr2001/
Sydney Water http://www.sydneywater.com.au
BHP Billiton http://hsec.bhpbilliton.amm.com.au
Western Power http://www.westernpower.com.au
Telstra http://www.telstra.com.au

3 Best Practice for Natural Resources Management Reporting

Based on a review of available literate it is clear that most frameworks for reporting on natural resource management including trend and condition assessment follow an adaptive management cycle which begins by establishing objectives and identifying issues. This is followed by the identification of targets that must be achieved if the objectives are to be met and issues addressed. Next, actions are taken to achieve the desired targets. A series of monitoring and evaluation steps are included which feed back into various stages of the management cycle, with feedback occurring on a variety of timescales. The development of Report Cards is one aspect of the reporting process which in most NRM projects are designed as a communication component to transmit information to various stakeholders, as well as capacity building component to increase expertise and skills. Such actions and products are required in order to better use available information to advise on the use of limited NRM funding. Additional information on Best Practice for Natural Resources Management reporting is given in Attachment 3.

4 A Snapshot of International Natural Resource Condition Monitoring Initiatives

A number of initiatives are currently being implemented within the International community operating at global, national and sub-national scale to provide information on resource condition and / or trend assessment. Though far from exhaustive the following provides a brief account for selected examples.

4.1 World Resources 2000-2001 and the PAGE Study

Prepared by the United Nations, World Bank and the World Resources Institute the World Resources 2000-2001: People and ecosystems: The fraying web of life focuses on five major ecosystems using a scorecard of conditions and changing capacity.

In most countries at national level, policy makers have ready access to information about the condition of their respective nation's economy, education, employment and healthcare programs, however comparable information about the condition of natural resources has largely been unavailable. Prior to the World Resources 2000-2001 program no global institution had undertaken an assessment of how ecosystems are meeting human needs. In many situations information about certain environment conditions existed but it lacked the necessary coherence and coverage to provide a clear picture of the state of major ecosystems worldwide.

To help fulfil this information gap the Pilot Analysis of Global Ecosystems (PAGE) study was undertaken. The PAGE study is unique in that it evaluated the state of five ecosystems by examining the condition of a range of goods and services the ecosystems produce and made an explicit link between the biological capacity of ecosystems and human-wellbeing. The goal of PAGE was to provide 'state of the art' information on the condition of global ecosystems and to identify gaps in data and information. The study was designed to demonstrate the utility of an integrated assessment approach on a global level, thereby providing a 'Big Picture' view of ecosystem health and change at global or continental scale.

In order to present information in an easily understandable format the PAGE study developed an Ecosystems Scorecard concept representing condition and changing capacity. The *Condition* score (indicated by colour) reflects how the ecosystem's ability to yield goods and services has changed over time by comparing current output and quality of these goods and services with output and quality 20-30 years ago. The *Changing Capacity* score reflects the trend in an ecosystems biological capacity – its ability to

continue to provide goods or services in the future. In all cases, the scores represent expert judgement that integrates a number of different variables and assumptions to accommodate gaps in data sets. The combination of Condition and Changing Capacity scores provides a picture of how ecosystems are serving today's communities and their trend for the future based on current pressures. See Box 1 below.

Through the identification of key ecosystem indicators and data gaps, and the breadth of its findings the PAGE process has laid the substantive groundwork for the Millennium Ecosystem Assessment.

Box 1. Ecosystem Scorecard

Condition (indicated by colour) assesses the current output and quality of the ecosystem good or service compared with output and quality of 20-30 years ago.

Excellent

Good

Fair

Poor

Bad

Not assessed

Changing capacity (indicated by arrows and symbols) assesses the underlying biological ability of the ecosystem to continue to provide the good or service.

Increasing

Mixed

Decreasing

Unknown

Scores are expert judgments about each ecosystem good or service over time, without regard to changes in other ecosystems. Scores estimate the predominant global condition or capacity by balancing the relative strength and reliability of the various indicators described in the notes on data quality. When regional findings diverge, in the absence of global quality, weight is given to better-quality data, larger geographic coverage, and longer time series. Pronounced differences in global trends are scored as "mixed" if a net value cannot be determined. Serious inadequacy of current data is scored as "unknown."

Source: Obtained from the Internet during July, 2004 Refer - http://forests.wri.org/pubs_content_text.cfm?ContentID=838

4.2 Millennium Ecosystem Assessment

The Millennium Ecosystem Assessment (MA) to be completed in 2004 is an international program designed to meet the needs of decision makers and the public for scientific information concerning the consequences of ecosystem change for human well-being and options for responding to those changes. It was launched in June 2001 and will help meet the assessment needs of a number of international conventions e.g. Convention on Biological Diversity, Convention to Combat Desertification, the Ramsar Convention on Wetlands, and the Convention on Migratory Species, as well as the needs of other users that will enable governments and communities to better manage their use of ecosystems.

In response to the lessons learnt from previous international assessments and in light of unique features of ecosystems and their management, the MA has been designed as a multi-scale assessment and has established mechanisms to incorporate information and knowledge from non-peer-reviewed sources including local and traditional knowledge. As a multi-scale assessment, the MA consists of interlinked assessments undertaken at local, watershed, national, regional and global scales and is designed to provide both information and build capacity to provide information.

It is expected that the assessment will be repeated at 5 – 10 year intervals.

For additional information on the MA refer to the Millennium Assessment website. See http://www.millenniumassessment.org/en/index.aspx

4.3 EarthTrends: The Environmental Information Portal

EarthTrends is an online collection of information regarding the environmental, social, and economic trends. Committed to the principle that accurate information drives responsible decisions EarthTrends gathers data from the world's leading statistical agencies, along with maps and analyses by the World Resources Institute to create a single database for rapid searching and retrieving.

Data and information is provided for a range of themes in a variety of formats and differing levels of complexity based on a range of internet delivery tools. To facilitate the comparison of data from different sources, EarthTrends supplements its content with detailed metadata that reports on research methodologies and evaluates the information's reliability. All of these resources are made available to the public at no charge.

Country profiles within the portal present environmental information about key variables for a range of topics along with charts, charts, maps, time series data and statistics on trends and national or country level information relative to regional and global figures.

For additional information on EarthTrends see http://www.earthtrends.wri.org

4.4 GTOS – Global Terrestrial Observation System and GOSIC – Global Observing Systems Information Centre.

In addition to the above, a number of other activities are currently being carried out that provide information on resource condition data and information. For example, the Global Terrestrial Observation System (GTOS) which was established in 1996 to address the lack of key data to facilitate the study and understanding of global environmental change. The GTOS mission is to provide policy makers, resource managers and researchers with access to data on natural resources so that researchers and policy makers can detect and manage global and regional environmental change. Though not a scorecard or Report Card initiative, the GTOS program through the development of its TEMS (terrestrial ecosystem monitoring sites) initiative provides an international directory of sites and networks that carry out long-term terrestrial monitoring and research activities enabling users to access datasets to undertake condition and trend assessment work.

For more information on GTOS refer http://www.fao.org/gtos/

The Global Observation Systems Information Centre (GOSIC) was established to provide a single point for users of data and information produced by the Global Climate Observation System (GCOS), the Global Ocean Observation System (GOOS) and GTOS. Refer http://www.gosic.org/

4.5 Additional Measurement and Assessment Initiatives

The International Institute for Sustainable Development (IISD) maintains a web site on Measurement and Assessment indicators designed to facilitate the development of robust sets of indicators for public and private sector decision makers to measure progress toward sustainable development and build an international consensus to promote their systematic use in assessment, reporting and planning. The measurement and assessment section of the website found at http://www.iisd.org/measure/ also has a global directory of indicator initiatives. Another useful tool available on the IISD site includes the 'Dashboard of Sustainability' – an online tool designed to be understood by experts, the media, policy-makers and the general public.

4.5.1 The 'Dashboard of Sustainability'

Using the metaphor of a vehicle's instrument panel, the Dashboard of Sustainability displays country-specific assessments of economic, environmental, social and institutional performance toward (or away from) sustainability.

Developed by the Consultative Group on Sustainable Indicators CGSDI - (http://www.iisd.org/cgsdi/) and coordinated by IISD, the Dashboard project is part of the sustainability indicator initiative of the Bellagio Forum for Sustainable Development.

Key Features of the Dashboard software program include:

- Performance evaluation with individual indicators and aggregate indices
- Country comparison with distribution curves and maps
- Comparison within selected country groups
- Linkage analysis and scatterplots
- Multi-lingual functions
- Internet connectivity
- Extended help function

Increased functionality to compare 10 years of environment, social and economic data are currently being added to the software. The Dashboard software mapping function enables links to MapInfo and ArcGIS. An explanation of Dashboard functions is given in Box 2.

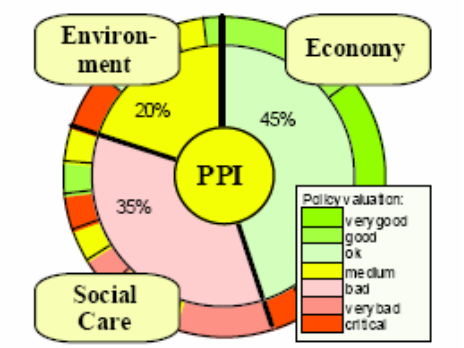
Box 2. Dashboard of Sustainability

What is it for? The Dashboard tool is designed to assist the greater utilization of indicators in the decision-making process. Like a car driver, an Airbus pilot, or the captain of a ship, the 'captains' of nations need tools to steer modern societies into the 21st century. In a participatory democracy, citizens insist on 'looking over the captain's shoulder' so they can understand, comment and criticize.

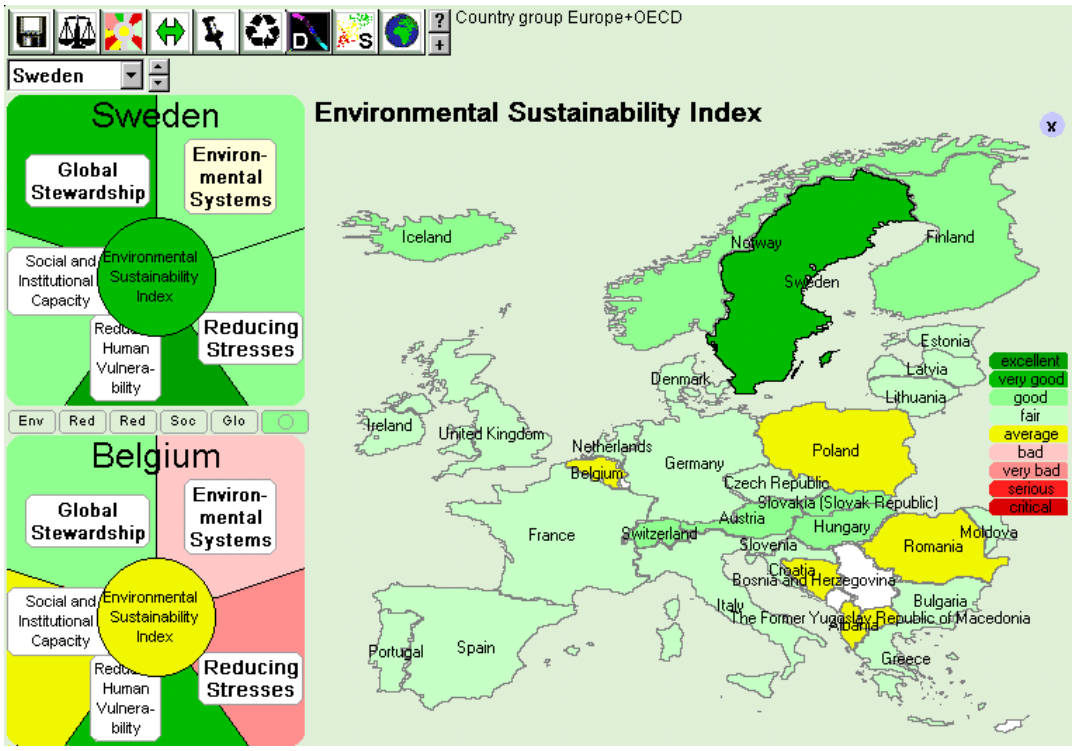
Why is it needed? Currently only a handful of indicators e.g. GDP growth, unemployment and inflation are communicated to the citizen. However, judging government performance with only three indicators is like travelling with a captain who tells the passengers 'as long as there is fuel on board, and the compass is pointing in the right direction, everything is OK'. The complexity of decision making in the 21st Century needs more adequate decision support tools.

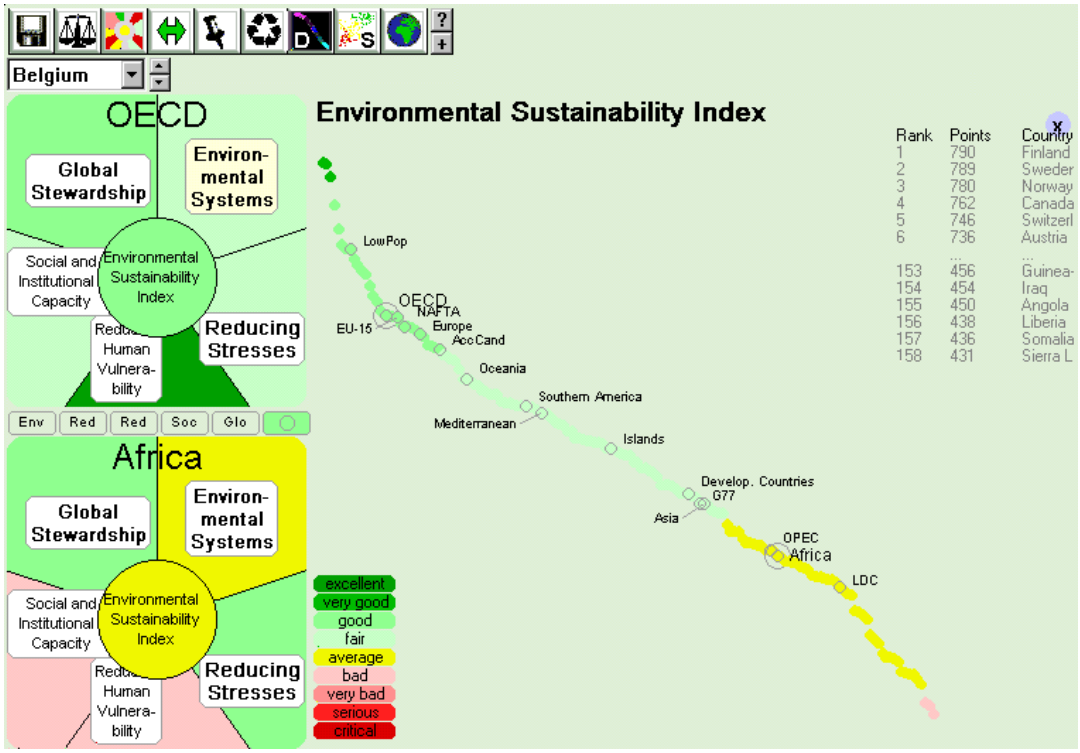
What does it do? The Dashboard presents sets of indicators in a simple pie chart format based on three principles –

1. The size of the segment reflects the relative importance of the issue described by the indicator
2. Colour codes signal relative performance, with green meaning 'good' and red meaning 'bad'.
3. A central circle, the Policy Performance Index (PPI), summarizes the information of the component indicators.



Examples of Dashboard Outputs





Source: Obtained from the Internet during July, 2004 Refer - http://esl.jrc.it/envind/dbquickref.pdf

4.6 Summary of International Initiatives

The following table presents a summary of selected international reporting initiatives.

Table 1: Summary of Selected International Resource Condition Initiatives

Initiative	Organisation	Themes	Format	Frequency	Comments, Data Sources and Scale
World Resources 2000-2001 and PAGE Study	United Nations, World Bank and World Resources Institute	Assessed five of the world's major ecosystem types – *Agroecosystems*: revealing that environmental damage threatens future world food production *Forest ecosystems*: shows that forest areas in developed countries continue to increase slightly, while clearance for agriculture, development and logging in developing countries is reducing forests by at least 140,000 km2 every year. *Freshwater systems*: reveals that the world's freshwater systems are so degraded that their ability to support human, plant and animal life is greatly in peril Grassland ecosystems: warns that the world's grasslands have declined in their extent and condition, as well as their ability to support human, plan and animal life. *Coastal and Marine ecosystems*: warns that the planet's coastal zone is in danger of loosing its capacity to provide fish, protect homes and businesses, reduce pollution and	Hard copy publications and digital information on the web PowerPoint presentation downloadable from the web.	One off study that laid the substantive groundwork for the Millennium Ecosystem Assessment.	Provides a 'Big Picture' overview of ecosystems using indicators and maps at global and continental scales. Data from various global, national and regional data sets, sectoral reports, national SoE reports, and national and global assessments of ecosystem extent and change data Utilized an Ecosystem Scorecard concept reflecting how the ecosystems ability to yield goods and services has changed over time by comparing current output and quality with goods and services from 20-30 years ago.

Initiative	Organisation	Themes	Format	Frequency	Comments, Data Sources and Scale
		erosion, and sustain biological diversity			
Millennium Assessment	Various International organisations, national and sub-national governments, and local communities & civil society	Numerous reporting categories including the following ecosystems – Inland waters, Drylands, Mountain Systems, Marine Systems, Coastal Systems, Inland Systems, Forests and wooded lands, Polar Systems, Cultivated Systems, Urban Systems,	Expected to be in a variety of formats. PowerPoint presentation downloadable from the web.	Expected to be 5 – 10 years First assessment due 2004.	Has a series of working groups. The conditions and trends working group aims to answer the following core questions: • What is the current condition and historical trends of ecosystems and their services • What have been the consequences of changes in ecosystems for human well-being Data from various data sources with analysis.
EarthTrends	World Resources Institute	Comprehensive online database that focuses on environmental, social and economic trends. Data, maps and statistics available on the following major themes: • Coastal and Marine Ecosystems • Water Resources and Freshwater Ecosystems • Climate and Atmosphere • Population, Health and Human Well-being • Economics, Business and the Environment • Energy and Resources	Digital via the internet.	On-going	Data and information is provided for a range of themes in a variety of formats and differing levels of complexity based on a range of internet delivery tools. To facilitate the comparison of data from different sources, EarthTrends supplements its content with detailed metadata that reports on research methodologies and evaluates the information's reliability. All of these resources are made available to the public at no charge.

Initiative	Organisation	Themes	Format	Frequency	Comments, Data Sources and Scale
		• Biodiversity and Protected Areas • Agriculture and Food • Forests Grasslands and Drylands • Environmental Governance and Institutions			
Dashboard of Sustainability	Consultative Group on Sustainable Development Indicators	Software tool for presenting complex relationships between economic, social and environmental issues in a highly communicative format aimed at decision-makers and citizens interested in Sustainable Development.	Digital desktop and on-line	User defined.	Has been used to present results for a number of global datasets

For examples of scorecard outputs from the above initiatives refer:

Biodiversity - http://forests.wri.org/pubs_content_text.cfm?ContentID=236

Grassland ecosystems - http://forests.wri.org/pubs_content_text.cfm?ContentID=283

Dashboard of Sustainability - http://esl.jrc.it/dc/index.htm

5 Australian Initiatives

A large number of initiatives are currently being implemented throughout Australia at varying levels and stages of development. These range from pilots to well established programs, and from individual farm or landholder scale, through to assessments at continental extent for a range of resource condition parameters.

Details for selected initiatives are presented below to provide a cross-section of the range of reporting initiatives and the methods they employ.

5.1 Gippsland Integrated Natural Resources Forum

Organisation: Gippsland Integrated Natural Resources Forum
Contact: 16 Hotham Street
Traralgon
Victoria 3844
Phone: 03 5175 7800
Web: www.ginrf.org.au

Description: The Gippsland Integrated Natural Resources Forum (GINRF) is a whole-of-Gippsland approach to the management of the region's natural resources under the slogan of Catchment Health – Gippsland's Wealth. The role of the Forum is to achieve a cooperative and strategic approach to natural resource management in the region.

Natural Resources Report Card:

Reports on assessment for fifteen of Gippsland's natural assets (areas). The assets are rated for both their environmental condition and stewardship i.e. how well government, industry and community are responding to protect and enhance the assets.

Condition Rating System

An assessment is made on the overall environmental condition of each natural asset by measurement against indicators relating to land, water, biodiversity and air values. Both the immediate location of the asset and offsite impacts are considered.

Rating	Description	Definition
A	Excellent	Environmental values are in good to excellent condition. No adverse offsite impacts
B	Good	Most environmental values are good. Minimal offsite impact
C	Reasonable	Some environmental values are indicated as poor, but are recoverable. Some offsite impacts
D	Poor	Many environmental values are poor. Improvement of assets needs addressing. Several adverse offsite impacts.
F	Degraded	Natural values are degraded. Extensive offsite impacts

Steward Rating System

Stewardship is defined as 'The careful and responsible management of the natural asset by the range of agency, industry and community stakeholders entrusted with its care'. It is generally accepted that good stewardship requires genuine engagement across community, government and industry and an integrated approach to natural resource management.

Rating	Description	Definition
*****	Fully integrated	Complete with high quality stewardship process, significantly impacting the asset condition. High level of government, community and industry engagement.
****	Mostly integrated	Complete with average/good quality of most parts of the stewardship process, having potential to improve the asset condition. Some evidence of partnership arrangements.
***	Some integration	Most parts of the stewardship process complete with average/poor quality, having unclear impacts on the condition. Government, community and industry engagement may be fragmented. Weak partnerships.
**	Little integration	Gap in one or more of the processes and low quality is hampering effective stewardship of the natural asset. There is danger of contributing to asset condition decline.
*	No integration	Significant gaps in the stewardship process. Contributing to decline in asset condition.

Report Card Key Stakeholders/Audience

- Members of the Gippsland Integrated Natural Resources Forum
- State and Federal Government
- Gippsland community
- Victorian community

Report Card Development Process: Follows an eight step process as outlined in the Department of Environment and Heritage publication 'A Framework for Public Environmental Reporting' which follows a plan, measure, report and review cycle.

Reporting Formats: To date reporting has been provided as static assessments made available in hard copy format. Consideration is being given to increase the range of formats and availability of report as part MERGe project – see info on 'Future Plans' below.

Reporting Frequency: Annually

Future Plans: Have initiated a project on Monitoring, Evaluation and Reporting – MERGe to coordinate monitoring, evaluation and reporting activity in natural resource management across the whole Gippsland region.

5.2 Ecosystem Health Monitoring Program

Organisation: All major organisations that discharge nitrogen into the Moreton Bay and its river estuaries are involved in the Ecosystem Health Monitoring Program (EHMP), including eight local government jurisdictions and four industrial companies.

Contact: Healthy Waterways Secretariat
Moreton Bay Waterways and Catchments Partnership
Level 7 MLC Court
15 Adelaide Street, Brisbane, QLD 4001
Phone: 07 3403 4206
Web: http://www.healthywaterways.org/

Description: The Ecosystem Health Monitoring Program (EHMP) is a South East Queensland wide water monitoring program established by the Moreton Bay Waterways and Catchment Partnership. The program gives a regional overview of ecosystem health

as well as providing detailed assessments of health for each of the regions major waterways.

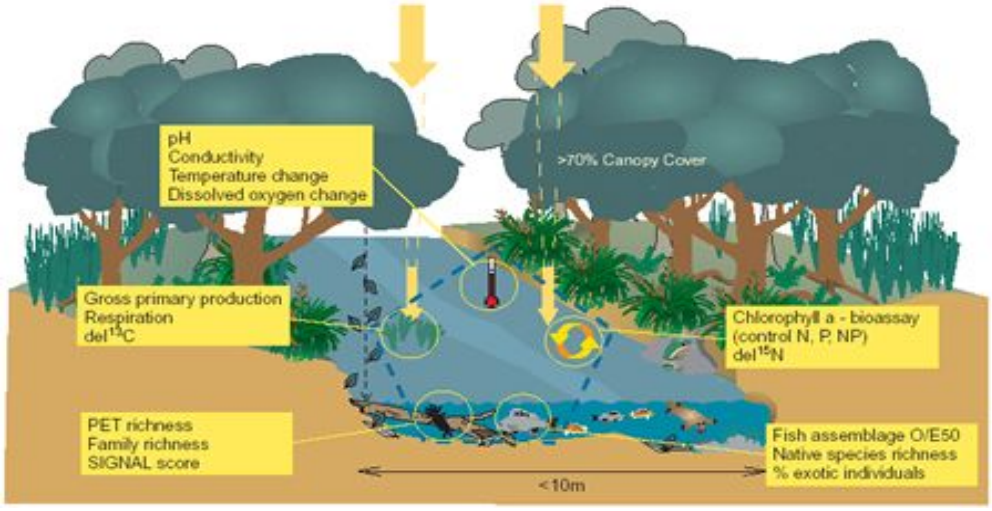
Ecosystem Health Reporting

The Ecosystem Health Monitoring Program comprises two components – Freshwater and Marine.

The Freshwater component comprised of scientists and technical staff from Griffith University and the Department of Natural Resources Mines and Energy. It undertakes bi-annual monitoring of rivers and streams, using indicators of ecological processes, biodiversity and water quality.

All assessments of stream health are made by comparison with data collected from minimally disturbed reference sites i.e. sites where human impact has been kept to a minimum and ecological integrity is very much in tact. Data from reference sites is used to derive regionally relevant guidelines for each of five indicators. Results from the freshwater EHMP are then compared with these guidelines to assess the condition of a site.

- Figure 1: Example of indicators for monitoring ecosystem health

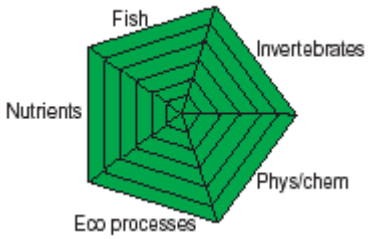


Given that five indicators are used in the freshwater monitoring program, results are depicted using pentagons, with each wedge of the pentagon representing one of the five indicators. A traffic light approach is used to report system health where the background of each pentagon is coloured orange and red. The score of each indicator is then represented by a green wedge which is placed over the background. The better the score the larger the green wedge. As such, a perfectly health site would be represented by an all green pentagon, whereas a heavily disturbed site would be predominately orange and red.

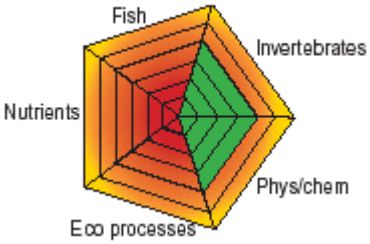
Individual wedges can be used to diagnose the cause of a disturbance as the colour of each wedge reflects the score for that particular indicator, and because the different indicators have been shown to respond to different disturbances.

The following examples illustrate the differences between disturbed and undisturbed sites.

• Figure 2: Example of catchment site conditions and the indicator condition



Undisturbed site on Back Creek near Canungra where all indicators depict a healthy "reference" condition



Disturbed site on Petrie Creek in Nambour where poor scores for fish, nutrients and ecosystem processes indicate barrier effects, loss of riparian cover, and degraded in-stream habitat

Source: EHMP Website http://www.coastal.crc.org.au/ehmp/freshwater_reporting.html

The Marine and Estuarine component comprises scientists and technical staff from the University of Queensland, Queensland Health and the EPA. The program is comprised of monthly water quality monitoring including physical and chemical parameters, bi-annual seagrass depth range monitoring, annual sewage nitrogen monitoring and annual coral monitoring.

Ecosystem Health Report Cards

Since 1998, a report card has been presented each year to evaluate improvements or declines in ecosystem health across the Moreton region. The Report Card is designed to present an easy-to-understand snapshot of Ecosystem Health. A grading system ranging from 'A' to 'F' is used to depict health ratings. By comparing ratings over time it is possible to provide an evaluation of the effectiveness of investments in waterway and catchment management undertaken by the community, local and state government agencies and industry.

Examples of the Moreton Bay Report Card for 2000 and 2003 are given as Attachment 4.

5.3 Australian Natural Resource Management – Regional Report Cards.

The Australian Governments Natural Resource Management Web Site www.nrm.gova.au provides information about the cooperative and integrated implementation of Natural Resource Management programs throughout Australia. Recently a number of Regional Report Cards have been published on the site.
Refer: http://www.nrm.gov.au/publications/index.html#report-cards

The contents of the Report Card provide a brief snapshot on the NRM issues, location, Australian and State or Territory Government investment, vision, web links and contacts for each region based on material from Regional Resource Management Plans developed for each respective region.

Report cards produced under this initiative are designed to raise awareness and provide background information to engender additional support from the community i.e. no tangible information on resource condition or trends is provided.

5.4 National Land and Water Resources Audit Outputs

As a result of the Audits activities between 1997 and 2002 a number of initiatives were undertaken that resulted in assessment of natural resources condition and trend assessment, for example:

- **Australia's Catchment Condition** – refer http://audit.ea.gov.au/ANRA/land/land_frame.cfm?region_type=AUS&region_code=AUS&info=catchment_cond
- **Dryland Salinity In Australia – Monitoring and Evaluation** – refer http://audit.ea.gov.au/ANRA/land/land_frame.cfm?region_type=AUS&region_code=AUS&info=sal_monit
- **Rangelands Monitoring –** refer http://audit.ea.gov.au/ANRA/rangelands/rangelands_frame.cfm?region_type=AUS&region_code=AUS&info=monitoring
- **Landscape Health in Australia** – refer http://audit.ea.gov.au/ANRA/vegetation/vegetation_frame.cfm?region_type=AUS&region_code=AUS&info=landscape_health

Detailed information on the above assessments is available from the Audit's Australian Natural Resources Atlas – see www.nlwra.gov.au/atlas The following provides a brief account of activities as they relate to reporting outputs for selected samples.

5.4.1 Australia's Catchment Condition Assessment

The Audit's assessment of catchment condition presented a method to make comparative assessments of catchment biophysical condition. The assessment used an indicator approach and a Geographic Information System to define patterns of classes of relative catchment condition. Comparisons of catchment condition were made across Australia in which the condition is ultimately a value judgement that depends on the biophysical attributes interacting with social values and economic factors. The Audit's comparative assessment of catchment condition was limited to a biophysical definition with catchment function defined in terms of land, water and biota components.

Selection criteria were developed and applied to 110 biophysical attributes to screen for suitable indicators. Fourteen indicators were selected and used to generate a five-class condition scale from better to poorer that was used to rank and map relative catchment condition. This result produced colour-coded maps for:

- Individual indicators
- Composite sub-indices for water, land and biota condition
- An overall composite catchment condition index.

Catchments can be presented at a range of scales form sub-catchment to total river basin. For the Audit catchment condition assessment, each indicator and aggregate index was analysed and presented at three scales – 5 km^2 grid, 500 km^2 sub-catchments and the Australian Water Resources Council River Basins.

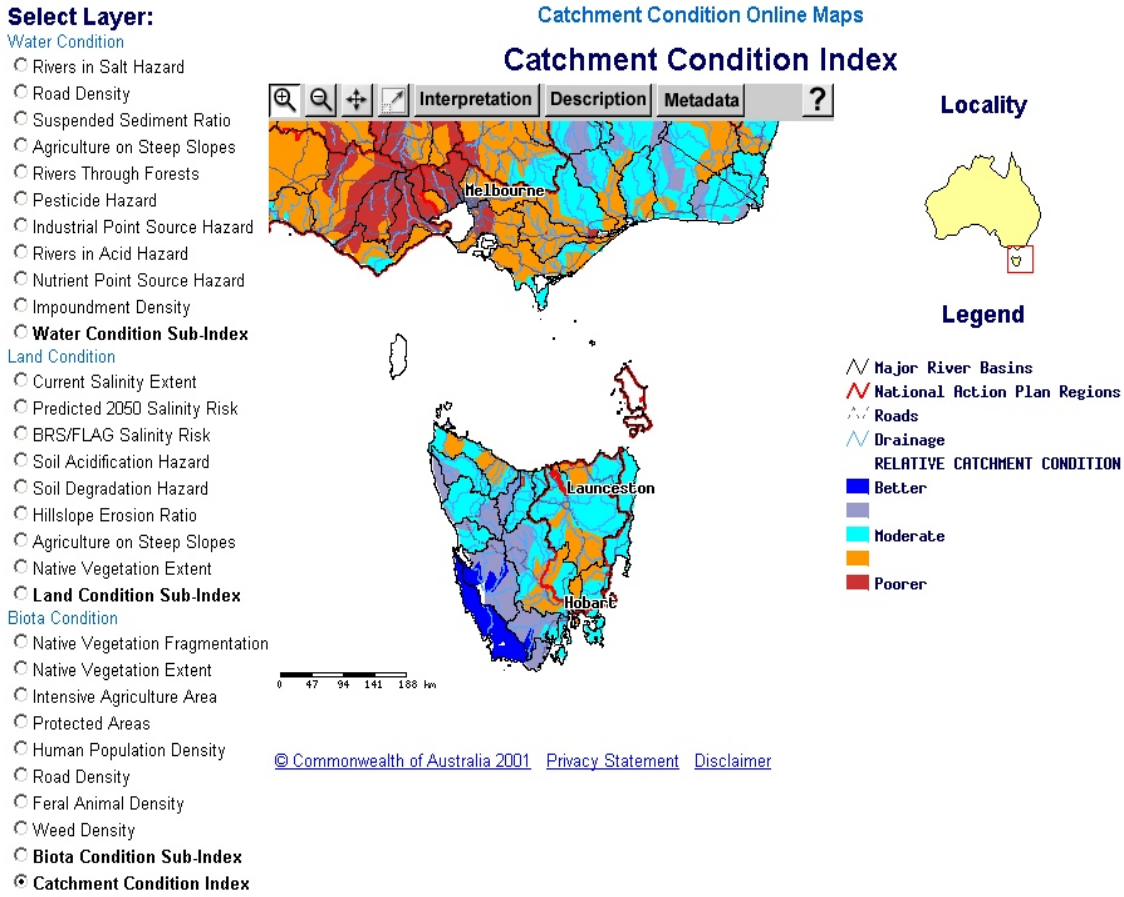
The results of this work are available in a variety of detail (summaries through to detailed reports) and products (viz hard copy to digital outputs in numerous formats). All are available over the internet via the Audits Atlas, the Atlas Navigator, and Atlas Online Map Maker tools.

Note: An additional Interactive Catchment Condition Online Mapping tool was also developed to present the results of the Catchment Condition Assessment – see

http://www.brs.gov.au/mapserv/catchment/ This enables dynamic viewing (pan, zoom etc) of individual indicators, sub-indices for water, land and biota condition and an overall composite catchment condition index.

A sample output of later for the south eastern part of Australia is given in Figure 3 below.

• Figure 3: The Audits Online Catchment Condition Mapping Application



Source – Obtained from the Internet in July – refer http://www.brs.gov.au/mapserv/catchment/

5.4.2 Landscape Health in Australia

The Audit's Landscape Health assessment was completed between 1997-2002 as part of the Audit's Ecosystem Health Theme focussing on:

- Rivers and Estuaries, their catchments , and aquatic ecosystems
- Regional Landscapes, their recurrent patterns of geology, landform, soil and associated biota

The Landscape Health study indicated the relative significance of issues associated with landscape health and biodiversity status for each of the IBRA sub-regions of Australia's bioregions. It shows the geographic distribution of the issues and their relative importance, and provides a broad indication of the scale of the challenges in maintaining or restoring landscape health. The study enables these challenges to be broken down into geographic extents that can be used to develop and guide responses.

Within the study landscape health was assess according to indicators for:

- Native vegetation
- Land use
- Soil and hydrology
- Weeds

- Feral Animals
- Threatened ecosystems and species

Each indicator was used to assess the status of Australia's 354 subregions. Subregions were grouped into two discrete zones – the intensive use zone (182 subregions) and the extensive use zone (172 subregions).

Outputs were reported in various hardcopy and digital reports containing a series of maps and tabular information.

Additional information on Landscape Health in Australia is available from Audit's Atlas, Atlas Navigator and Online Map Maker tools. Refer - http://audit.ea.gov.au/ANRA/vegetation/vegetation_frame.cfm?region_type=AUS&region_code=AUS&info=landscape_health

5.5 State of the Catchment 2002: Performance Assessment Reporting System - South Australian Murray-Darling Basin.

Organisation: South Australian Department of Water, Land and Biodiversity Conservation

Contact: Department of Water, Land and Biodiversity Conservation
GPO Box 2834
Adelaide 5001
South Australia

Phone: 08 8463 6800

Web: http://www.dwlbc.sa.gov.au and http://www.dwlbc.sa.gov.au/water/river_murray/pdfs/pars_state_of_the_catchment_2002.pdf

Description: The Performance Assessment and Reporting System (PARS) is designed to measure overall catchment health in the South Australian Murray-Darling Basin (SA MDB). It was established in 1998 by the South Australian CARE Committee Inc (SACC) and the River Murray Catchment Water Management Board (RMCWMB).

In 1999-200 a suite of 20 indicators were selected covering the river, irrigation and dryland farming areas and the issues of threatened species, proclaimed pests, native vegetation and revegetation, education, priority setting and overheads. This represents a varied suite of indicators to illustrate to overall picture of catchment health via the health of the agricultural, biodiversity and community groups of the SA MDB which are summarised by a PARS Index.

The PARS Index presents a snapshot of the health of the overall catchment. Local Action Planning (LAP) groups are used as the basis for reporting and provide the link between the community and the Integrated Natural Resources Management (INRM) group which is the major policy and decision making body for the region.

The State of the Catchment and Rating Indicators

One of the major outcomes of the PARS initiative is the generation of a single state of the catchment value – the PARS Index. The index provides a benchmark or base figure to measure against and an overall assessment of catchment condition taking into consideration the combined effect of agriculture, biodiversity and the community.

PARS has adopted the use of a data wheel to illustrate both the value of the index and enable the effects of the 20 indicators to be seen on the final value. While the process provides a single state of the catchment value it can also be applied to individual LAP areas. Additional information on the Data Wheel is presented in Box 3 and Attachment 5.

Report Card Format

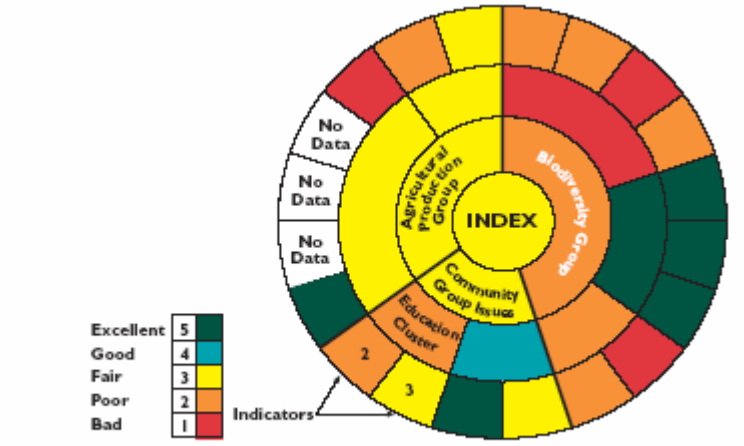
Made available as a detailed report and Summary report in hard copy and digital format downloadable from the web plus a CD.

Frequency

The original intention was to report annually on the state of the catchment, however as a result of the Natural Resources Management Bill 2004 currently before Parliament it is possible that some changes may occur. The new legislation replaces the current system of more than 70 Boards that separately manage issues relating to water, pest plants and animals, and soil conservation.

Box 3. PARS Data Wheel

Using the Data Wheel The data wheel is a set of concentric circles in which the outer ring has all 20 indicators. The first inner ring has seven indicator clusters with each indicator being allotted into one of the seven clusters. These in turn feed into three groups: Agricultural production, biodiversity issues and community issues. Agricultural production is made up of two indicator clusters and seven indicators, the community issues group is made up of two indicator clusters and four indicators, and the biodiversity group has three clusters covering nine indicators.



This diagram is an example for illustrative purposes only.

Explanation The data wheel, which illustrates the overall catchment health, draws together information for each indicator in each LAP and therefore represents all the values of the indicators to generate an overall value (The PARS index). The data wheels have been colour coded to ease understanding. Dark green represents '5', the highest value, while '1' is represented by red, the lowest value and least desirable rating.

The cluster value is the average of the contained indicators. Whilst this may not be the ideal treatment of data, it does provide for consistency within and between each data wheel. The clusters within each group are then averaged to give a final figure for each of the three groups. This overall figure is the PARS Index. This ensures that all 20 indicators have the same relative importance or weighting in catchment health considerations.

Note: The inability to obtain data for some of the indicators has weakened the overall affect of results to date, however there has been substantial work undertaken to develop (or make use of), other methods that will enable reporting on missing indicators in the future.

Further information on the relationships that build the index and the ratings for each indicator leading to the 2002 PARS index is given in Attachment 5.

5.6 Health of our Catchments – A Victorian Report Card 2002

Organisation: Victorian Catchment Management Council
Contact: Victorian Catchment Management Council (VCMC)
3/250 Victoria Parade
East Melbourne Victoria 3002
Australia
Phone: 03 9412 5045
Web: http://www.vcmc.vic.gov.au/Web/ProjectsandActivities.htm

Description: Provides a detailed regional and statewide assessment of natural resource condition and management, along with potential outcomes for catchment condition if current management responses and activities are maintained through to the year 2050. Also includes discussion of the preferred management and condition vision for the State in 2020, and an overview of the strategic planning required to reach the VCMC vision for the condition and management of the State's natural resources.

Report Card Format

Made available as a detailed report and Summary report in hard copy and digital format downloadable from the web.

Frequency

Under the Catchment and Land Protection Act 1994, the VCMC is required to report to Parliament on the condition and management of Victoria's land and water resources every 5 years.

5.7 Know Your Catchments –Assessment of Catchment Condition

Organisation: Victorian Department of Sustainability and Environment (DSE)
Contact: DSE Customer Service Centre
Phone: 136 186
Web: http://www.dse.vic.gov.au/catchmnt/conditn/

Description: The online web version of the Know Your Catchments provides an atlas of maps and graphs of 35 catchment condition indicators for Victoria's ten Catchment Regions. Information presented according to Catchment Communities, Soils, Pest Plants and Animals, Streams and Wetlands, Salinity & Watertables, and Vegetation & Wildlife Habitat.

The 'Know Your Catchments 1997 study laid the groundwork for the Health of Our Catchment reporting program currently being implemented in Victoria. Refer Section 5.6 above.

5.8 National Carbon Accounting System (NCAS)

Organisation: Australian Greenhouse Office
Contact: John Gorton Building
Canberra, Australia
Phone: 02 6274 1888
Web: http://greenhouse.gov.au/ncas/index.html

Description: The National Carbon Accounting System (NCAS) tracks greenhouse gas sources and sinks from the Land. Land-based sinks are of key interest to Australia, forming around 30% of the national emissions profile from activities such as land clearing, cropping, grazing and forestry.

Developed through extensive collaboration with scientists, policy makers and industry professionals, the NCAS system combines satellite imagery with models and data to provide a 30 year dynamic account across the country. The system is used to:

- Determine Australia's land-based sources and sinks
- Track progress towards national emissions targets
- Inform policies and programs in vegetation and land management

An example of the type of outputs produced by NCAS is available for Land Use Change Emissions Results 1988 – 2001. Refer: http://greenhouse.gov.au/ncas/factsheets/pubs/fs-results2003.pdf with a full copy of the Land Use Change report available at http://greenhouse.gov.au/ncas/reports/pubs/ncasresultsfinal.pdf See also http://greenhouse.gov.au/ncas/factsheets/fs-results2003.html

5.9 Sustainability Initiatives

In addition to the natural resources condition and trend assessment initiatives described above, there are a number of other initiatives currently being developed which focus on assessing the sustainability of land use. Such initiatives also provide useful information on condition.

5.9.1 Signposts for Australian Agriculture

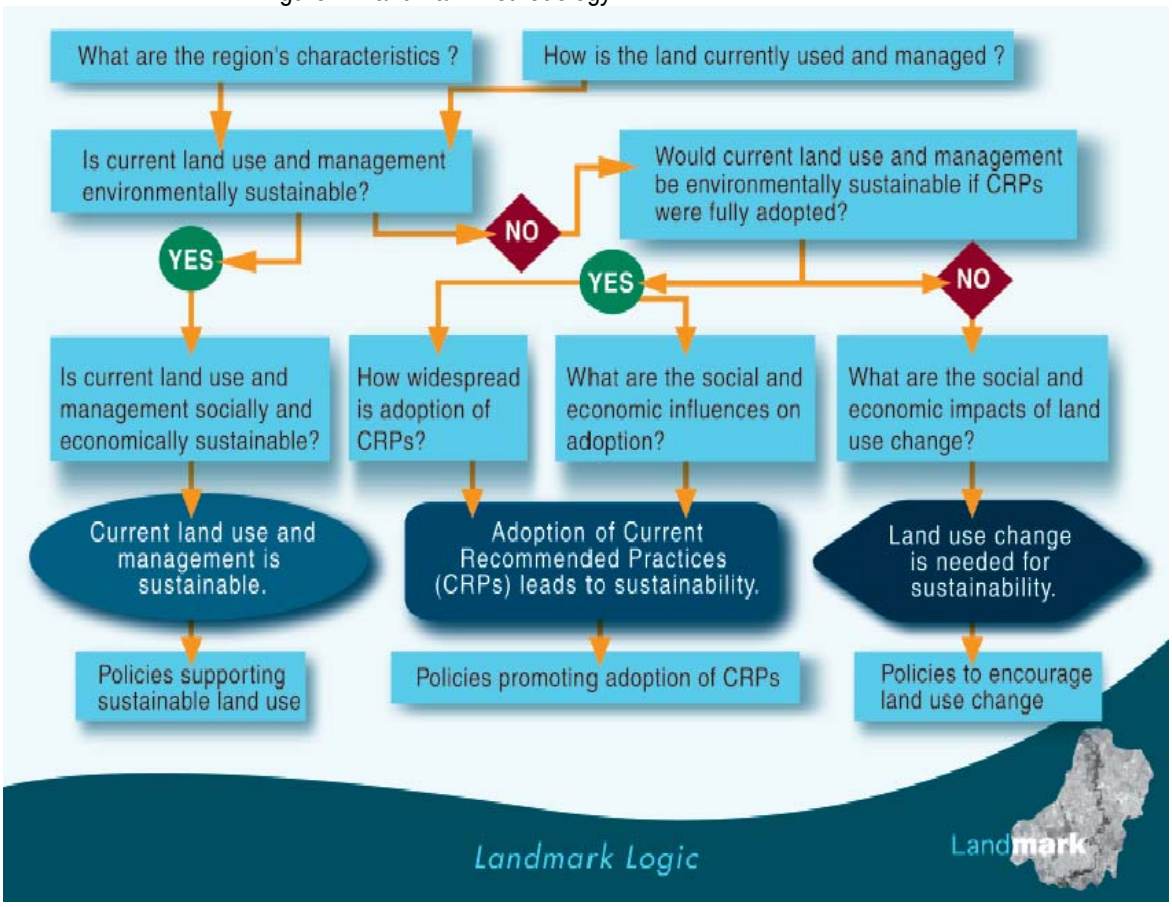
The Audit is currently funding a project within the Department of Agriculture, Fisheries and Forestry (DAFF) looking at developing a reporting framework that provides information on the contributions of Australian Agriculture towards Ecologically Sustainable Development (ESD). ESD is interpreted as increasing the quality of life now and in the future. As a result agriculture's contribution to ESD is measured in terms of its social, economic and environmental contributions in both the short and long term. The project attempts to assess the return from agriculture land uses now and in the future giving consideration to the full range of environmental, economic and social costs and benefits. The framework being developed will provide a basis for identifying and evaluating options - policy changes, programs, interventions and incentives.

5.9.2 Murray Darling Basin Commission – Landmark Project

This project was designed and promoted as a project researching the sustainability of land use in the Murray-Darling Basin focussing on a number of broad themes – soil health, water quality & quantity, nature conservation, greenhouse & air quality, financial return, quality of life, and cultural heritage. An innovative framework has been developed which applies agronomic knowledge and biophysical models which are applied to provide paddock and farm scale assessment of Current Recommended Practices or CPR's. These are ways of managing physical, financial and human resources of the farm that are recommended by industry and being adopted by leading local producers. Catchment assessment of CPR's are also being undertaken using existing GIS datasets of pilot regions to divide the catchment into a number of 'elements' representing significant land systems, uses and management practices. The outputs of biophysical models are used as inputs to Dynamic Programming (DP) which evaluates CPR's by assessing the loss of resources such as water and nutrients across time, space and any income trade-offs. The effects of any change on the system are also studied to determine the impact on the regions and the State. Further research is also being carried out to determine who is best able to capture the benefits of CRP's, the broader implications of wider adoption of CRP's and the potential social impacts on society beyond the farm of adoption of CRPS'.

A schematic flow-chart of the Landmark methodology is given below in figure 3.

• Figure 4: Landmark methodology



Source: Downloaded from the Murray Darling Basin Website during July 2004. Refer - http://www.mdbc.gov.au/landmark/d_loads/FULL_DIAGRAM(no_icons).pdf

5.10 Farm Level Initiatives

Further to the above, a number of initiatives exist for monitoring resource condition at the farm or local catchment condition. One of the more established examples of such a system has been developed in Queensland. Refer to Attachment 6 for details.

In addition to the above, many landholders throughout Australia are actively involved in community or local resource condition monitoring exercises. For example:

Waterwatch – Is a national community water quality monitoring network that that aims to raise general community awareness about the relationship between water quality and the health of the whole catchment by encouraging the participation of land users, schools, community groups, industry, local authorities and government to improve water quality in catchments. Refer: http://www.waterwatch.org.au/ Since being launched in 1993 the number of monitoring groups has grown to approximately 3000 within 200 catchments, with regular monitoring at approximately 5,000 sites nationally.

Other initiatives which adopt a similar approach to Waterwatch have been initiated in a number of areas e.g. Queensland's Saltwatch and Pasture Watch. Refer -
http://www.nrme.qld.gov.au/education/programs/saltwatch.html
http://www.nrme.qld.gov.au/education/programs/pasturewatch.html

5.11 Summary

Though far from exhaustive the above information demonstrates that a voluminous number of initiatives are currently being carried out at national, state, regional and local level that monitor and report on natural resource condition according to a number of different reporting frameworks.

The challenge for the Audit in the development of the proposed Report Card on the condition and trend of Australia's natural resources is to incorporate the activities from the various initiatives into a robust, easy to use system that enables results to be comparable over time and between different jurisdictions. Besides being able to convey information to various stakeholders on resource condition and trends such a system will also greatly assist in the establishment of priorities at all levels (local through to national) and provide and information base providing advice for the investment of NRM funds.

6 The Audits Report Card Concept

The Audit is currently developing a concept to enable the dynamic on-line development of Report Cards which provide information on the condition and trend of Australia's natural resources at national, state and regional level according to indicator headings from the National Framework for Natural Resources Management Standards and Targets 'indicator headings'. (Refer: Attachment 2).

These indicators were developed with their primary purpose being the measurement of the performance of investments made by programs such as the National Action Plan for Salinity and Water Quality (NAP), and the Natural Heritage Trust (NHT). However, the use of consistent measurement methods will enable data collected for indicators to be used as inputs to assist in the determination of overall assessments for resource condition. As such, it is important that Regional bodies undertake the monitoring of indicators deemed relevant to the investments that are taking place.

6.1 The Way Forward - Ensuring the Audit's Report Card Concept Achieves its Full Potential

Giving consideration to existing resource condition and assessment reporting initiatives available both Internationally and from throughout Australia the following key issues are identified for consideration by the Audit in the further development of a Report Card Concept for Assessing the Condition and Trend of Australia's Natural Resources.

1. Consistent Framework

The existing National Framework for Natural Resources Management Standards and Targets, and the National Natural Resource Management Monitoring and Evaluation Framework - as endorsed by the Natural Resources Ministerial Council - establish the frame conditions and provide a solid foundation from which a Report Card concept can be developed. The adoption of a consistent framework (and standards) for the collection and recording of resource condition information are critical to the ability to develop 'big picture' assessment of ecosystem health. Where possible it is recommended that synergies with other reporting frameworks should be encouraged e.g. the data and information which is compiled to facilitate reporting against the Monitoring and Evaluation Framework indicators could also be accessed and assessed for other reporting initiatives such as State of the Environment reporting.

2. Frequency of Reporting

Regular reporting of natural resource condition and trend assessments is required to enable impacts to be monitored to determine the value of investments, and their viability and sustainability. Such an approach enables the tracking of changes in various indicators and opportunity to provide a mix of both short term (real time, daily, weekly, monthly or yearly) and longer-term (five year) intervals for observing trends. Access of up-to-date information reduces the uncertainty in planning and management by helping identify, model and analyse situations and issues.

3. Access to easily understood credible information

Collectively the outcome of 1 and 2 above will enable results to be comparable across jurisdictions and over time. As a result they assist in the development of a consistent 'Big Picture' snapshot of resource condition at various levels e.g. national, state/territory, regional and local, thereby facilitating access to nationally collated information for policy, natural resources management and the community. Adoption of an integrated information system approach will enable multiple products, presentable at multi-levels for a range of clients e.g. high level

'traffic lights' for policy through to detailed data for on-ground technical managers. The value of information and the effectiveness of the decision-making and planning processes are very closely related to the quality of information and the manner in which it is made available.

4. Linkage to other information

Based on information from various Australian Government, state/territory agencies and regional groups it is clear that a considerable amount of detailed information either exists or is being generated in relation to resource condition and trends.

One of the strengths of the proposed Report Card is that it will draw much of its material from the same organisations and groups that are involved in the collection and collation of data. Most groups are currently developing applications to report this information and make it widely available. The ability to be able to link to such information from within the Audit's Report Card is considered key to the overall value of the application.

In this respect it is recommended that the Audit follow-up on initiatives within the Department of Environment and Heritage aimed at improving the State of the Environment reporting system, and that the potential to integrate, and learn from the experiences of the Australian Greenhouse Office in the development of the National Carbon Accounting System (NCAS) be pursued. It is understood that the 30 year record of satellite imagery and various models developed as part of NCAS could be of considerable benefit to various state, regional and catchment groups in the assessment of resource condition and trends at state and regional level. Other relevant initiatives for linkage involve the Audits Atlas and Data Library, plus the material from the Audits Catchment Condition Project refer www.affa.gov.au/catcon/

5. Range of Thematic Elements

In addition to the standard bio-physical data themes collected as part of most existing monitoring activities, it is important that information on social and economic aspects are also made available in a format suitable to assist in the decision making process. Many traditional Report Card type initiatives have not fulfilled their potential due to the lack of social and economic information to support the decision making process. Numerous examples of such initiatives that do include social and economic elements are available eg the Dashboard of Sustainability provides a useful methodology to integrated social and economic aspects into resource condition assessments, while others are currently being developed e.g. the Murray Darling Basins 'Landmark' and the Department of Agriculture for Australian Agriculture, Fisheries and Forestry 'Signposts for Australian Agriculture' project.

6. Identification of Gaps

The application of any resource condition and trend assessment initiative will only ever be as good as the data and information base that underpins it. In this sense it is important that suitable mechanisms are available to identify gaps in data and information (for both detail and thematic content) in order for them to be addressed as part of future collection activities. An understanding of existing gaps and limitations in existing data and information is also required to ensure that suitable caveats are put in place and that data is not used out of context. The current work being completed by the Audit looking at various data sources and indicator issues should assist in providing a good understanding of these issues as they relate to national level datasets. See also the work of the Audit's Catchment Condition Project www.affa.gov.au/catcon/

7. User-Friendly and practical

It is important that the Audit's Report Card concept conveys meaningful (and usable information) that is simple to understand by a wide variety of stakeholders. This requires a robust system with a user-friendly interface in which the complexity is put behind the scenes. Such a system should also enable users to 'drill' down to obtain more detailed information (or links to it).

In this sense it is important to identify the audience for which the proposed Report Card is being developed. Identification of client needs and the objectives of the report mechanism will also assist in assessing whether the Report Card is successful in achieving its purpose.

8. Incorporation of Local and Traditional Knowledge

Lessons learnt from numerous initiatives that report on resource condition and trend is that they have failed to reach their full potential due to fact that they did not incorporate or cater for non-peer reviewed sources of data and information including local and traditional knowledge. Mechanisms for the incorporation of local and traditional knowledge are key elements in the two-way flow of data and information required to make reporting on resource condition and trend assessments successful and meaningful to a wide range of stakeholders.

9. Capacity Building and Educational Component

Consistent with the involvement of local and traditional knowledge in reporting, experience has demonstrated that successful resource condition and trend assessment reporting initiatives have a strong capacity building and education component. That is, in order for such initiatives to be utilized it is important that users have the necessary capacity and background skills to feel confident in the use of such applications. Development and implementation of structured capacity building program is essential to get buy-in or support and greatly assess in the two way flow of data and information and learning experiences.

10. Catalytic Approach and Leadership

Discussions with various Regional Groups, and State/Territory and Australian Government agencies indicates that they are currently working on the development of monitoring and reporting aspects of natural resources condition. It is understood that the Department of the Environment and Heritage is currently looking at options that enhance the current State of the Environment report.

The proposed Report Card concept provides a basis for common reporting and builds on the earlier Audit's earlier Catchment Condition work. Feedback from regional groups and State level agencies indicates that a window of opportunity currently exists for the Audit to take a leadership role in the development of a Report Card initiative, and to promote the range of initiatives that already exist (especially those at regional level). In this respect the Audit could achieve a positive and catalytic effect with their limited resources.

11. Multi-scale Assessment and Linkage to other Programs

One of the major benefits of the Report Card concept developed by the Audit is its intention to provide an inter-linked multi-scale assessment of resource condition ranging from catchment, to regional, state and national levels thereby providing information on ecosystem health and trends at a range of levels.

The adoption of an integrated information management system as proposed for the Report Card will assist to overcome a number of problems many users currently face, viz:

- Little data integration across programs

- Scattered data management
- Unfamiliarity with technology and complex application interfaces etc

As a result of recent advances in technology e.g. Interoperability, it is technically feasible to provide an interlinked multi-scale assessment of resource condition. The Australian Spatial Industry Business Association and the OpenGIS Consortium – Australia (OGC-A) are currently undertaking a 'Spatial Interoperability Demonstration Project' designed to demonstrate the application and benefits of technologies for enhancing spatial data interoperability. It is understood that the Audit is also currently looking at the potential benefits of interoperability. To this end it is recommended that the Report Card concept be closely involved in any interoperability demonstration developed by the Audit.