

# **Australian Regional Environmental Accounts Trial**

---

**Report to NRM Regions Australia**

March 2015

WENTWORTH GROUP OF CONCERNED SCIENTISTS

---

Sbrocchi, CD (2015) Australian Regional Environmental Accounts Trial: Report to NRM Regions Australia. Wentworth Group of Concerned Scientists, Sydney.

## Acknowledgements

I would like to thank many people for their invaluable contributions, expert advice and assistance in preparing the Proof of Concept Accounts methods and approaches. In particular I would like to thank members and secretariat of the Wentworth Group for their direction and support throughout the trial; Carley Bartlett, Ian Ball, Celine Steinfeld, Diana Margaretha, Miriam Alexander, and George Argyrous for their assistance with manuscript preparation; and Peter Cosier, Bruce Thom, Max Kitchell and Neil Byron for reviewing the report. I also gratefully acknowledge the funding support from the Purves Environmental Fund and the Ian Potter Foundation.

This report has used material prepared for the Proof of Concept, Australian regional environmental accounts trial and I acknowledge the following regional NRM bodies who contributed to the trial: Central West Catchment Management Authority, Corangamite Catchment Management Authority, Namoi Catchment Management Authority, Natural Resources Eyre Peninsula, North Central Catchment Management Authority, Northern Agricultural Catchments Council, Northern Gulf Resource Management Group, NRM North, Queensland Murray-Darling Committee, SEQ Catchments. I trust the views of all contributors are adequately represented in this report.

# Table of Contents

<b>1</b>	<b>Executive Summary</b>	<b>4</b>
1.1	Scope of the Trial	4
1.2	Scope of the Evaluation	5
1.3	Overall Findings	5
1.4	Key Recommendations	7
<b>2</b>	<b>Background to the Trial</b>	<b>8</b>
2.1	Policy Context for Environmental Accounting	8
2.2	The <i>Accounting for Nature</i> Model	9
2.3	The Proof of Concept Trial	10
2.4	Program Logic	14
2.5	Relationship to Other Environmental Accounting Initiatives	15
2.6	Evaluation of the Trial	17
<b>3</b>	<b>Evaluation of Trial Outcomes</b>	<b>18</b>
3.1	Program Outcomes	18
3.1.1	The <i>Accounting for Nature</i> Method is Feasible	18
3.1.2	The <i>Accounting for Nature</i> Method is Practical	20
3.1.3	The <i>Accounting for Nature</i> Method is Robust	22
3.2	Lessons for Asset Condition Accounting	24
3.2.1	Importance of Standards	24
3.2.2	Collaborations Across Institutions are Essential	26
3.2.3	Accreditation Systems are Required	28
3.2.4	Existing Resources are Insufficient to Create National Accounts	29
3.2.5	A National Program Requires Strategic Implementation	30
3.2.6	Provision of Technical Support and Building Capacity	31
<b>4</b>	<b>Examples of Regional Asset Accounts</b>	<b>34</b>
4.1	Measuring Condition	34
4.2	Measuring Trend in Condition:	40
<b>5</b>	<b>Appendix 1: Contributors &amp; Committees</b>	<b>44</b>
<b>6</b>	<b>Appendix 2: Logic Model &amp; Evaluation Questions</b>	<b>48</b>
<b>7</b>	<b>Appendix 3: Evaluation Questions Relating to the Application of the Seven Step Process</b>	<b>52</b>
<b>8</b>	<b>References</b>	<b>54</b>

# 1 Executive Summary

This report to NRM Regions Australia describes the application of an environmental asset condition accounting method, called *Accounting for Nature*, at a regional (sub-national) scale, based on the findings of a three year trial.

The purpose of environmental accounting is to compile environmental information for improving decision making relating to policy development, investment, monitoring, review of outcomes and reporting on progress.

The purpose of the trial was to evaluate whether the *Accounting for Nature* model was a practical, feasible, statistically and scientifically robust method to establish regional scale national environmental accounts that measure and track changes in the condition of Australia's major environmental assets.

## 1.1 Scope of the Trial

*Accounting for Nature* is a method developed by the Wentworth Group of Concerned Scientists for building an enduring set of accounts which measure the condition of environmental assets (Wentworth Group of Concerned Scientists 2008). The accounts measure physical attributes of the biophysical environment (assets) over time, allowing examination of trends in change in those attributes. Measures can be aggregated to an index of condition, which informs investment decisions at multiple scales, including local, regional, state and national levels, across terrestrial and marine environments. Wentworth Group, in collaboration with management, research and statistical institutions, trialled the implementation of the environmental accounts framework in Australia.

Australia's natural resource management bodies (NRM regions) formed the institutional setting for the regional environmental accounts trial (the trial). Australia has 54 NRM regions. The geographic extent and operational functions of these organisations were not evaluated or modified as part of this trial.

Ten NRM regions trialled the *Accounting for Nature* model of regional environmental accounting between 2011 and 2013. NRM regions contributed towards the development of trial accounts through existing operational budgets. In-kind advice and expertise was provided by a number of individuals within research, management and government organisations (see **Appendix 1**). Funding was not attached to the trial apart from a coordinator position, provided by the Wentworth Group of Concerned Scientists through funding from the Ian Potter Foundation.

The *Accounting for Nature* methodology precedes the revision of the United Nations' System of Environmental-Economic Accounting (SEEA) and the subsequent development of the Experimental Ecosystem Accounting framework (SEEA-EEA) (United Nations *et al.* 2012; United Nations *et al.* 2013). The trial has contributed to this important international work, and subsequent collaboration between the *Accounting for Nature* and SEEA teams has endeavoured to ensure consistency between the approaches.



## 1.2 Scope of the Evaluation

This evaluation examines processes and operational aspects of the regional environmental accounting trial in order to inform the implementation of a national program, based on the *Accounting for Nature* model.

Specifically, the report focuses on:

1. Processes developed through the trial;
2. Application of the *Accounting for Nature* model to regional environmental accounting;
3. Testing aggregation measures of environmental condition; and
4. Overall assessment of the model for multi-scale environmental accounting.

The evaluation is based on evidence collected throughout the trial, including a review of the technical (scientific) findings by the Scientific Standards and Accreditation Committee (Sbrocchi *et al.* in prep), discussions in committee meetings, conversations with individuals engaged in the trial, literature reviews which placed the trial in context of other work in the field, and personal reflections as the project coordinator.

## 1.3 Overall Findings

1. Regional trials, undertaken with limited financial resources, have made significant progress in demonstrating that it is practical, feasible, scientifically and statistically robust to establish an on-going national program to measure the condition of Australia's environmental assets. Key achievements of the Proof of Concept Trial were: (1) establishing procedures, methods and standards for compiling national accounts from a regional (sub-national) scale; and (2) engaging natural resource managers in the entire process. NRM regions involved in the trial embraced the environmental asset condition accounting framework and delivered a substantial output within financial and operational constraints.
2. The geographical diversity of environmental assets across the continent are represented in natural resource management plans, which also incorporate vision statements of asset condition by communities. These plans compliment and facilitate development of regional environmental accounts. Regional delivery of natural resource management in Australia is well-established and supported by Commonwealth, states and territories.
3. NRM regions have been presented with a framework for consistently measuring and documenting the condition of assets. Application of the *Accounting for Nature* framework has required organisations to adapt their existing methods for reporting environmental statistics. The experience of the trial has led to valuable exchanges among regions, through sharing information, skills and techniques. This change has resulted in collaborative approaches and best practice in compiling information on asset condition.
4. The trial substantially improved understanding of the condition of regional environmental assets such as native vegetation, native fauna and wetlands, with new information becoming available through refining the accounting process.
5. One of the achievements of the Trial is the development of the *Econd*. An *Econd* is a composite index of environmental asset condition. *Econds* should be constructed using

the Seven Step methodological standard (outlined in the *Quick Guide* (Sbrocchi 2013)), and need to measure both the quantity and quality of each asset. These were found to be useful in spatially identifying areas that require management, which informs prioritisation processes and then directs investment decisions. *Econds* have also been used in the aggregation of measures of environmental condition.

6. Standards of the *Accounting for Nature* model are consistent with standards for composite indices developed by OECD (Organisation for Economic Co-Operation and Development 2008). Process and technical standards developed in the trial have provided a strong basis for the development of a national and international environmental asset condition accounting system.
7. Establishment of the SEEA as an international environmental accounting standard complements the work of the Australian regional environmental asset condition accounts, by acknowledging the trans-disciplinary nature of environmental accounting, providing an agreed structure and approach to environmental accounting and generating momentum for experimentation in condition accounting (United Nations et al. 2012; United Nations et al. 2013). The trial has contributed valuable insights into this process, consistent with the principles of SEEA accounting concepts and aligned with other international initiatives. The trial has resulted in presentations at national and international conferences (Cosier and McDonald 2010; Cosier 2011; Cosier 2012; Cosier and Sbrocchi 2012; Sbrocchi 2014).
8. The trial was made possible because of the commitment by NRM Regions Australia and the phenomenal level of cooperation from the many dedicated scientists, economists and statisticians in state and federal government agencies, universities, CSIRO, the Australian Bureau of Statistics, the Bureau of Meteorology, members of the Wentworth Group of Concerned Scientists, the Ian Potter Foundation and others. Those involved in the trial state that the inherent commitment to a long-term program of asset condition assessment is significant and differs from current models. Evidence indicates the *Accounting for Nature* model has been well received by individuals and institutions involved in the trial and uptake of the program is expected to increase (NRM Regions Australia 2013; 2014).
9. Implementing a national program of environmental asset condition accounts will require financial inputs. Realigning the existing collection of environmental information to a national environmental accounting standard is likely to result in significant cost savings in the production of annual accounts. Enabling an environmental accounts program at the national level is possible through streamlined and strategic institutional support to the regions, including:
  - commitment from NRM regions and agencies to the *Accounting for Nature* model;
  - investment in all regions to resource data collection and to build capacity;
  - national oversight including setting of national standards and auditing; and
  - active participation and technical support from experts in regional, state and federal agencies and research institutions.

## 1.4 Key Recommendations

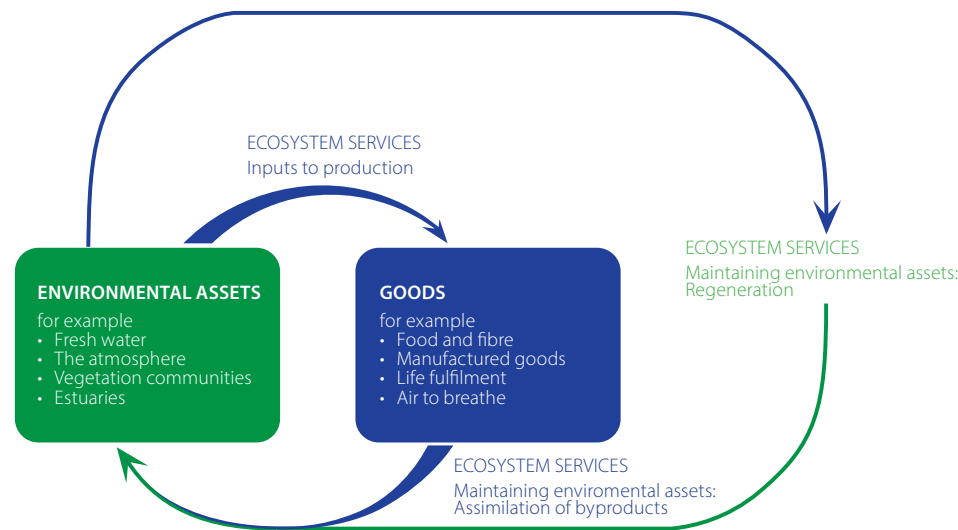
1. That the NRM regions endorse the *Accounting for Nature* model, whereby:
  - a. Measures of condition are used to account for environmental change;
  - b. Asset condition accounts are expressed as a composite index (***Econd***); and
  - c. The accounts are compiled at the level of the NRM regions.
2. That environmental asset condition accounts should be **produced annually**, constructed **using the Seven Step methodological standard** (outlined in the *Quick Guide* (Sbrocchi 2013)), and need to measure both the quantity and quality of each asset.
3. That the NRM regions should seek to implement a national program of regional environmental accounts. This program would include:
  - a. Provision of technical input and support from all levels of government and research institutions;
  - b. ABS serving as the host for national environmental accounts;
  - c. An independent national accreditation body to set national standards and establish and audit accreditation processes; and
  - d. Financial support to the regions to compile the accounts.
5. That NRM regions involved in producing asset condition accounts should use the accounts to prioritise investments in natural resource management within their region.

## 2 Background to the Trial

### 2.1 Policy Context for Environmental Accounting

If Australia is to become a sustainable society, one that creates wealth without degrading its natural capital, a most fundamental reform is to integrate the management of our environment into everyday economic decisions. The absence of environmental information in economic decision making has resulted in policies and land use decisions that have caused significant and unnecessary damage to our natural environment (Wentworth Group of Concerned Scientists 2014). It has resulted in the waste of billions of dollars of public funds aimed at repairing this damage. As climate change imposes its footprint across the Australian landscape, it means we do not have the information we need to adapt to these changes.

Sustained production of environmental goods and services that are of value to people, such as food, fibre and drinking water (blue box in **Figure 1**), depends upon maintaining healthy environmental assets.



**Figure 1: Environmental assets comprise the physical form of both ecosystems and other natural resources which provide goods and ecosystem services (adapted from CSIRO 2001).**

Assets represent measurable components of the biophysical world, which can be tracked through time. Environmental assets comprise the physical form of both ecosystems and natural resources and can be defined as *the naturally occurring living and non-living components of the Earth, together comprising the biophysical environment that may provide benefits to humanity* (United Nations *et al.* 2012). Also referred to as 'natural capital', an environmental asset can be an ecosystem such as a forest, river or an estuary, it can be an individual species of mammal or bird, or it can be any other feature in nature, such as a fish stock, agricultural soil, or a groundwater resource.

We cannot manage the economy without economic accounts. Neither is it possible to manage

the environment without measuring the condition of the environment. To do this we need an agreed, practical and affordable way to measure the condition of environmental assets (rivers, soil, native vegetation, estuaries, etc.) at all scales at which economic and policy decisions are being made.

The international community has responded to this issue in recent years with the development and adoption of the System of Environmental Economic Accounts (SEEA) (United Nations *et al.* 2012). This work recognised the widespread problem of environmental degradation caused by economic activity, has provided initial measures of linking this to economic accounts, and has been continued in a series of other developing works, including the SEEA Experimental Ecosystems Accounts (SEEA-EEA) (United Nations *et al.* 2013).

## **2.2 The Accounting for Nature Model**

In 2008 the Wentworth Group released its blueprint *Accounting for Nature: A model for building the national environmental accounts of Australia* (Wentworth Group of Concerned Scientists 2008). It addressed a major institutional challenge of providing a consistent methodology for measuring the condition of environmental assets at scales that can inform economic decisions. Despite significant investment in environmental protection and natural resource management activities nationally (e.g. \$7.1 billion in 2010-2011 (Australian Bureau of Statistics 2014b)), numerous State of the Environment reports were unable to describe the condition of Australia's environmental assets in ways that can effect management or policy (State of the Environment Advisory Council 1996; Australian State of the Environment Committee 2001; Beeton *et al.* 2006; State of the Environment Committee 2011), nor can they capture whether these investments have achieved the intended environmental outcomes. At a national scale it is therefore unclear whether such investments have maintained or improved natural assets across the country. We have no hope of meeting our regional, state, national and international obligations of protecting and managing wetlands, migratory species, agricultural production areas, World Heritage areas and other natural assets of value to Australians, if we do not have a system that can address this.

Economic accounting is an established standard that tracks the state of the economy and business activities. National economic accounts are constructed by aggregating financial information from individuals and enterprises (Australian Bureau of Statistics 2005). Such an accounting structure provides a consistent framework for housing information that can track the changes in assets, for a variety of spatial areas.

An environmental accounting framework enables the understanding of a spatial area (a catchment, a regional natural resource management area, a nation) through considering the condition of the assets across the area and the interactions with and between adjoining assets (United Nations *et al.* 2013). *Accounting for Nature* (2008) advocated compiling information in an accounting framework through the use of a non-monetary unit of measure. Described in the logic model below (see Section 2.4), it allows rigorous and systematic information on the environment to become available where an important share of the management and implementation of environmental policies takes place. In Australia, significant investment occurs at the sub-national scale. In NSW alone, state government investment is around \$1

billion per year and local government contributions are estimated around \$1.7 billion per year (Natural Resources Commission 2010). The use of nested, interlinked accounts to integrate different sets of institutions and stakeholders enables the study of cross-scale interactions (Millennium Ecosystem Assessment 2005) important for decision-makers who manage natural assets at a range of levels (Dalmazzone and La Notte 2009) (e.g. local (paddock or farm) to regional, state and national). An environmental accounting framework at relevant scales provides a metric for assessing the effectiveness of efforts to conserve assets and manage or reverse environmental degradation.

Degradation of assets can affect both the quantity and quality of the stock. In ecology, the aspects of quantity and quality of environmental assets are jointly referred to as condition. Condition is a scientific description of the ecological quality or 'state' of an environmental asset, measured through the use of indicators relating to the asset's vigour (level of productivity), organisation (structure and interactions) and resilience (ability to rebound from a shock) against a reference condition (Costanza and Mageau 1999; Stoddard *et al.* 2006; Tierney *et al.* 2009; Bunn *et al.* 2010). Quantity is an important aspect of condition because it provides an indication of the levels of stock. For example, the amount of native vegetation across a landscape is strongly correlated to the levels of biodiversity it can support (Bennett and Ford 1997; Fahrig 2003; Bennett and Radford 2004; Radford *et al.* 2005). Degradation can occur where both the quantity and the quality of the asset is affected. For example, a stand of trees can be severely affected by weeds, disease or a river can become polluted. Indicators of quality for many assets in Australian landscapes are critical. For example, where dieback disease occurs, indicators of disease prevalence are relevant because changes in extent will be observed too late (Williams *et al.* 2001).

Creating accounts which measure the condition of environmental assets is challenging because there is no agreed unit of measure of asset condition on which to populate accounts. As such, there is a need for a unit of measure – a type of environmental currency that takes the place of a monetary currency, but is based on physical units of measure. Using the principles of reference benchmarking, measures of asset condition can be indexed (Cosier and McDonald 2010). This composite index thus becomes the non-monetary environmental currency, known as the environmental condition index, or, *Econd*.

## 2.3 The Proof of Concept Trial

The *Accounting for Nature* model was designed for use across sectors, although its primary focus was government and environmental management agencies. Led by Australia's regional natural resource management bodies ("regions"), a Proof of Concept Trial was initiated to test the application of the *Accounting for Nature* framework at the regional scale and document its role in environmental decision-making. The trial period extended from June 2011 to December 2013, with refinements and additional information developed during 2014. The Ian Potter Foundation provided funding for a trial coordinator position (Policy Analyst, Environmental Accounts), housed at the Wentworth Group of Concerned Scientists. The trial was funded through in-kind contributions from regions, and individuals in both state agencies and federal institutions, such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Australian Bureau of Statistics (ABS), and the Bureau of Meteorology (BoM).

The purpose of the trial was to evaluate the operational aspects and institutional arrangements necessary for carrying out an ongoing national environmental accounts program, based on the *Accounting for Nature* model, as well as to evaluate the application of *Econds* (the measure of environmental condition), at various levels (regional, state, national, as it evolved, international).

### Key Features of the Proof of Concept Trial

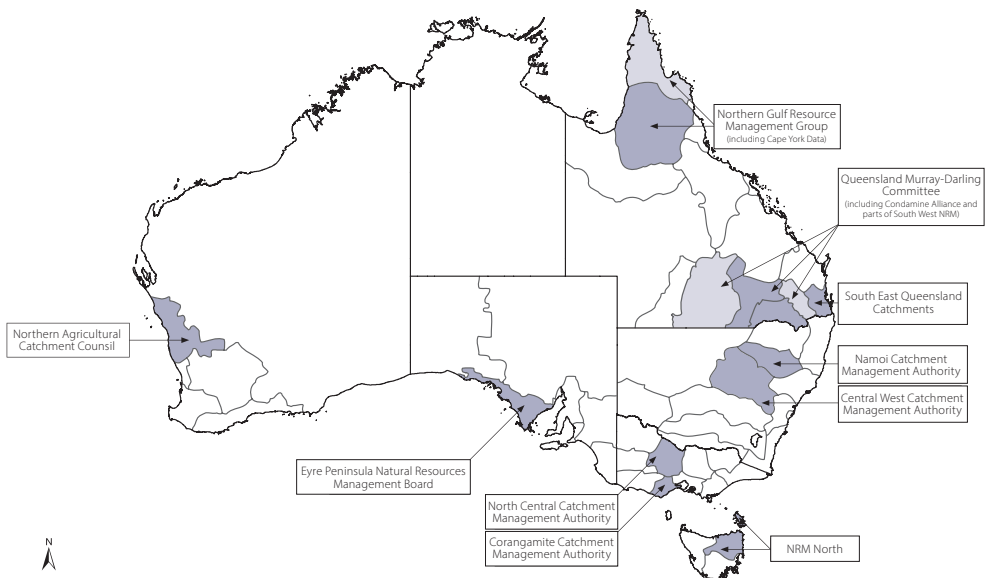
10 NRM regions involved

40 individuals partnering with the regions and the Wentworth Group in the trial

4 asset classes tested (Land, Freshwater, Coast and Marine)

30 individual assets tested

Ten regions nominated to undertake the trial. They covered a wide variety of landscapes across Australia's 7.5 million square kilometres (**Figure 2**). The 10 regions encompassed different landscapes (tropics, woodlands, coasts), and regions varied in technical capacity, resourcing capabilities, data sources, and organisational arrangements. This is important, because it enabled us to test a method in highly resourced regions as well as data and resource poor regions. Some of the regions undertook accounts beyond their regions. They recognised that representing assets adequately required extending the boundaries of their account into neighbouring NRM regions (areas of light grey in **Figure 2**).

































**Figure 2:** Ten NRM regions (dark grey areas) tested *Accounting for Nature* as part of the Proof of Concept Trial, but also covered some assets in adjoining regions (light grey areas).

There were four main asset classes (*Land, Freshwater, Coast, Marine*) represented in the trial (State of the Environment Committee 2011). Atmosphere, although considered as an asset by many of the regions, was not included in the trial.

NRM regions defined their assets as part of their regional natural resource management planning processes (GHD 2012). It was not possible to test the application of the *Accounting for Nature* concept across all assets in all ten regions. A subset of these regional assets were submitted for the regional environmental account trial (**Table 1**) representing the range of assets within the country. Regions selected assets which they could use for the trial and this selection highlighted the diversity of assets to be evaluated.

One asset common to all regions (native vegetation) was chosen to test whether different measures of the same asset could be aggregated to create national accounts. A draft standard was developed for this purpose. Nine of the ten regions were able to complete this account.. A range of other assets across the regions were also compiled so that the practical and technical implications for constructing a holistic set of accounts for assets across the continent could be evaluated.

Table 1: Assets submitted by regions for the Proof of Concept Trial.

REGION	LAND			FRESHWATER				COAST	MARINE		
	Native Vegetation	Native Fauna	Soil	Rivers	Wetlands	Groundwater	Floodplains	Estuaries	Marine Fauna	Fish Stocks	Other
Central West Catchment Management Authority (NSW)											
Corangamite Catchment Management Authority (VIC)											
Natural Resources Eyre Peninsula (SA)											
Northern Agricultural Catchments Council (WA)											
Namoi Catchment Management Authority (NSW)											
North Central Catchment Management Authority (VIC)											
Northern Gulf Resource Management Group (QLD)											
NRM North (TAS)											
Queensland Murray-Darling Committee (QLD)											
SEQ Catchments (QLD)											

 Southern Right Whales.  Dugongs.  Moreton Bay.

At the time the trial was initiated, environmental accounting was an emerging field with few practical examples. Those involved in the trial contributed to the development of the method by defining overarching principles to guide the compilation of accounts (see box below).



### Six Design Principles

1. Environmental accounts should enable people to understand and track the status and direction of changes to their environmental assets.
2. Environmental assets should be selected from the environmental asset classes (Land, Freshwater, Coastal, Marine and Atmosphere). Corresponding indicators should be selected to measure condition of environmental assets and changes in their condition.
3. Indicators may vary from region to region according to agreed standards.
4. Measurements of condition are based on specified reference condition benchmarks against which change can be measured and compared.
5. Existing data should be used wherever possible.
6. Measurements generated at a regional scale should be relevant for decision-making at multiple scales.

These principles set out a consistent approach for constructing the accounts, including the process for selecting assets, indicators, data and aggregation methods. This developed into a method called the Seven Steps (Figure 3) published in the *Quick Guide* (Sbrocchi 2013).

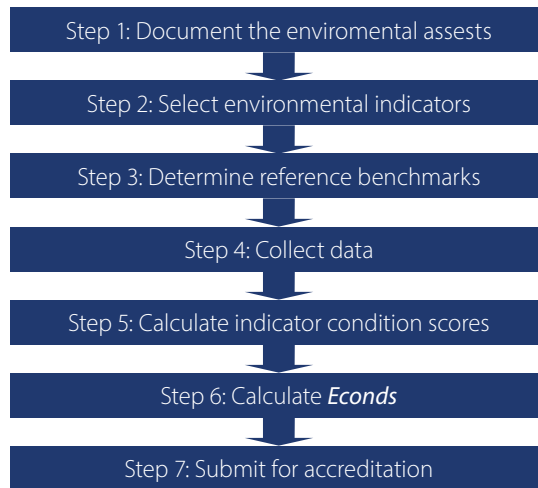


Figure 3: The Seven Steps for constructing environmental asset condition accounts (Sbrocchi 2013).

Colleagues within statistical agencies assisted in designing a set of nested accounting tables which could be tested by the regions as part of the trial. This consisted of summary tables, asset tables (Figure 4) and data tables showing the underlying data. Proof of Concept accounts can be found at [www.wentworthgroup.org](http://www.wentworthgroup.org).


Asset (See Step 1)		Reference Benchmark (See Step 3)		Indicator Condition Score (See Step 5)							
		Indicator (See Step 2)		Data (See Step 4)		Econd (See Step 6)					
NATIVE VEGETATION ASSET ACCOUNT - EYRE PENINSULA, SOUTH AUSTRALIA - 2012											
<div> Government of South Australia Eyre Peninsula Natural Resources Management Board</div>											
Asset Category	Indicator of Asset Condition (unit of measure)	Reference Benchmark	% Total Area	Condition Measure	Indicator Condition Score	Econd					
Eyre Peninsula Region		5,130,353				25.0					
Arid & semi-arid acacia low open woodlands & shrublands with chenopods						62					
	Extent (Ha)	186,558	3.6	165,245.94	89						
	Composition (index)	100		66.30	66						
	Configuration (index)	100		73.62	74						
Arid & semi-arid hummock grasslands						11					
	Extent (Ha)	23,320	0.5	5,012.70	21						
	Composition (index)	100		59.67	60						
	Configuration (index)	100		46.67	47						
Callitris forests & woodland						42					
	Extent (Ha)	23,320	0.5	17,594.58	75						
	Composition (index)	100		62.80	63						
	Configuration (index)	100		48.17	48						
Casuarina & Allocasuarina forests & woodlands						7					
	Extent (Ha)	233,198	4.5	30,910.94	13						
	Composition (index)	100		54.40	54						
	Configuration (index)	100		50.67	51						
Chenopod shrublands						52					
	Extent (Ha)	233,198	4.5	190,627.95	82						
	Composition (index)	100		61.16	61						

Figure 4: The features of an environmental asset condition account. The boxes in BLUE indicate the relevant step for constructing an environmental asset condition account, outlined in the *Quick Guide* (Sbrocchi 2013).

2.4 Program Logic

The *Accounting for Nature* model provided the measurement of environmental condition, which can be integrated into a suite of tools used by decision makers. The trial was the first step towards full-scale application of the *Accounting for Nature* model on an annual and ongoing basis across 54 NRM regions in Australia.

This evaluation assessed whether the application of the *Accounting for Nature* model by the NRM regions in the Trial was **feasible, practical and scientifically robust**.

A common aspect of program evaluation is a logic model, also known as program logic, which, together with an evaluation framework, helps to communicate the program's objectives, assess progress and evaluate the overall effectiveness of the program (Funnell and Rogers

2011). The evaluation framework for the trial was developed by the project coordinator and summarised in the program logic diagram in **Appendix 2**.

A logic model represents the theory behind how an intervention (such as a program, project or policy) is understood to contribute to its impacts (Rogers 2013). Although there is no prescribed form, a logic model helps tease out different possible causal paths between program inputs, activities and outcomes. The program logic model developed for the trial (see **Appendix 2**) outlines all the elements of the trial and helps to identify key evaluation questions against achievement of intended outcomes and the effectiveness of applied processes. The logic model is based on a format used in evaluation processes (Funnell and Rogers 2011) required in many government programs, both nationally and internationally (HM Treasury 2011; NSW Government 2013; Government of Western Australia 2014).

## 2.5 Relationship to Other Environmental Accounting Initiatives

A variety of approaches have attempted to provide a 'holistic' view of society in its relationship to the economy: (e.g. Sustainable Society Index, Environmental Performance Index, Ecological Footprint, Wellbeing Index and the Living Planet Index) (Saisana *et al.* 2002; Moldan *et al.* 2004). A recent compilation of programs is provided in the Bureau of Meteorology's The Environmental Accounts Landscape (Bureau of Meteorology 2013) and discusses both accounting and environmental statistics frameworks<sup>1</sup>. In Australia, the Australian Bureau of Statistics regularly produces accounts related to energy, land use change, waste, greenhouse gas emissions and the economic value of assets for which there is an established market value (Australian Bureau of Statistics 2014a) and also produces the Measures of Australia's Progress report (<http://www.abs.gov.au/AUSSTATS/abs@nsf/mf/1370.0>). The Bureau of Meteorology also produces environmental accounts for water storages across Australia (Bureau of Meteorology 2014a).

Environmental accounting initiatives vary in focus relating to the subject of the account (either assets or ecosystem services), and the type of measure (physical or monetary) (**Figure 5**). Physical measures can provide input into monetary measures but can also directly provide input into decision-making.

Some environmental accounting platforms have attempted to assign prices to environmental assets to demonstrate their societal value (Costanza *et al.* 1997; Sukhdev *et al.* 2010). Gorecki *et al.* (2011) discussed that *for many stocks, particularly natural and social capital, placing a monetary value is very difficult if not impossible, because most are non-market values and monetisation relies on discounting the future, which breaches the fundamental principles of sustainable development. Stiglitz et al. (2009) recommended that a set of physical indicators to monitor the environment is sensible, particularly in the case of irreversible or discontinuous changes in natural capital (Rio Declaration on Environment and Development 1992).* Physical (non-monetary) accounts are considered as complementary to monetary accounts in the System of Environmental-Economic Accounts (SEEA) (United Nations *et al.* 2012) as they can help broaden understanding of the economy as represented in monetary accounts (Australian Bureau of Statistics 2005).

<sup>1</sup> Environmental statistics are the data that are provided to the accounts.

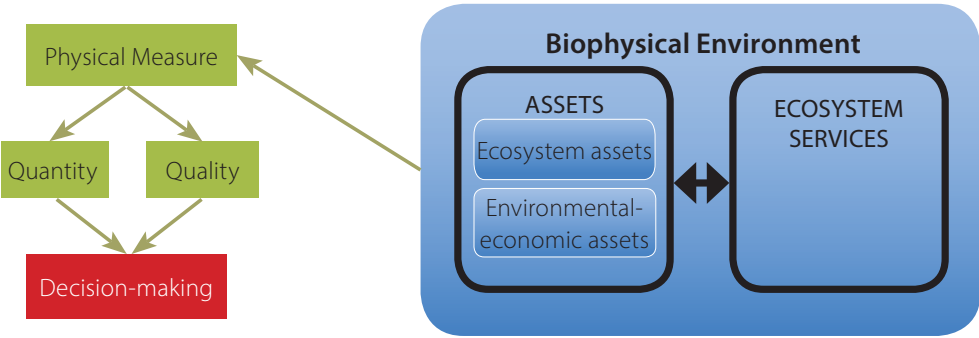


Figure 5: Environmental accounting initiatives vary in focus relating to the subject of the account (either assets or ecosystem services), and the type of measure (physical or monetary; depletion or degradation). *Accounting for Nature* focusses on the physical and ongoing measures of environmental assets as inputs into decision making.

Progress in environmental accounting has been guided by the United Nations' Committee of Experts on Environmental Accounting and associated technical groups, such as the London Group of Environmental Accounting. The System of Environmental Economic Accounting Central Framework was adopted as an international standard in 2012, and other complementary works such as SEEA-Water, SEEA-Energy and the Experimental Ecosystem Accounts (SEEA-EEA) have also been produced.<sup>2</sup> The *Accounting for Nature* model was published in 2008, prior to the adoption and further development of the SEEA and SEEA-EEA, but collaboration between the *Accounting for Nature* and SEEA teams has allowed the Wentworth Group to share knowledge gained from the regional trials with ongoing SEEA work (Cosier and McDonald 2010; Cosier 2011; Cosier 2012; Cosier and Sbrocchi 2012; Sbrocchi 2014). In particular, the lessons learned from this trial show how to capture measures of condition, which may have application to other accounting methods and may contribute to further development of concepts relating to ecosystem accounting (United Nations *et al.* 2013; Weber 2014).

The *Accounting for Nature* approach does not directly assess the ecosystem services or flows between assets. However, it contributes to further understanding on these topics, because measures of condition are essential for understanding the capacity of the asset to provide ecosystem services, account for intra-ecosystem flows, and determine the inter-ecosystem flows which provide direct benefits to humanity (United Nations *et al.* 2012; Eigenraam *et al.* 2013; United Nations *et al.* 2013; Weber 2014).

*Accounting for Nature* proposes an enduring program of environmental accounting for Australia as a set of national environmental asset condition accounts that parallel nation economic accounts. *Accounting for Nature* does not propose a new way of measuring assets—rather it builds on existing monitoring programs, allowing for comparison of the relative condition of assets for better environmental investment and decision making. The *Accounting for Nature* approach to measuring asset condition is outlined in the *Quick Guide* (Sbrocchi 2013) and presents an approach consistent with many condition assessment programs.

<sup>2</sup> For more information see <http://unstats.un.org/unsd/envaccounting/seea.asp>

However, the *Accounting for Nature* model differs as it allows for the use of different indicators to measure condition of the same asset in different jurisdictions and ecological systems provided they satisfy a scientific standard that is fit for purpose and incorporate aspects of both quantity and quality of the asset. *Accounting for Nature* also requires the conversion of environmental statistics into a composite index.

## 2.6 Evaluation of the Trial

The trial tested certain key elements of a national program based on the *Accounting for Nature* model. Specifically, the trial tested how different assets were measured and compared using this model and applied at multiple scales. This involved the calculation of the environmental condition index (*Econd*) for each asset.

Part of the objective of the trial was to articulate and flesh out the program logic, including identifying key questions and connections (Appendices 2 and 3). Evaluation questions were addressed together as their role was to help evaluate overarching and key aspects of the trial (see **Table 10**). Evaluation questions relating to technical rigour (see **Appendix 3**) stemmed from an original set of design principles for the trial and are further explored in the evaluation document (Sbrocchi *et al.* in prep)

The main sources of data for the evaluation were:

- Reports produced from the trial, including a full technical report which presents a comparison of methods used by the regions in the trial
- Draft Guidelines and Accreditation Manuals
- Worksheets and reports, accounts and information statements from the regions
- Notes from meetings of the Scientific Standards and Accreditation Committee, Technical Accounting Standards Committee, management committee
- Conversations with individuals engaged in the trial
- Literature reviews
- Notes from attending and participating in national and international conferences (Cosier and McDonald 2010; Cosier 2011; Cosier 2012; Sbrocchi 2014)
- Personal reflections, as project coordinator

## 3 Evaluation of Trial Outcomes

This chapter examines the overall outcomes and lessons learned from the trial, drawing upon process and technical findings from the evaluations of the asset accounts.

### 3.1 Program Outcomes

The trial aimed to determine whether a national program of regional environmental asset condition accounts is feasible, practical and robust.

- *Feasible* asks whether the framework and processes can reasonably provide environmental condition information at scales that can inform policy and investment decisions;
- *Practical* refers to whether the program can be done without excessive demands on resources and within existing institutional structures;
- *Robust* relates to whether accounts can satisfy both scientific and accounting standards so that they are of a quality that is fit for purpose for regional scale investment and policy decisions, including whether the measures are transparent and scientifically credible.

#### 3.1.1 The Accounting for Nature Method is Feasible

The emergence of environmental accounting and the *Accounting for Nature* model specifically required individuals and organisations to adapt their usual approach to environmental assessment. The *Accounting for Nature* model has provided the NRM regions with a consistent framework to measure and document the condition of regional assets. The Regions in the trial found that the framework provided consistency and structure to environmental asset reporting for any organisation, is transparent and provides a mechanism for filling gaps in knowledge. Evidence from the regions' Information Statements and evaluations by the Scientific Standards and Accreditation Committee, indicated that the *Accounting for Nature* model was an important long-term program for environmental assessment and an input into decision-making.

Outlined in the *Quick Guide* (Sbrocchi 2013), the *Accounting for Nature* model presents an approach consistent with many condition assessment programs, however, it also allows for the use of different indicators to measure condition of the same asset in different jurisdictions and ecological systems provided they satisfy a scientific standard that is fit for purpose and provided they incorporate aspects of both quantity and quality of the asset into a composite index (the *Econd*). The trial found that differences in methodology across the country meant that in order to produce national accounts it is necessary to first ensure that all regional accounts have been developed against a common scientific standard. Such a standard was developed for the native vegetation asset, which both improved the quality of the regional accounts and has demonstrated that aggregation of regional data to create a national account is possible.

*Econds*, based on a reference condition that reflects the condition of the asset prior to significant post-industrial human alteration, were found to be useful in spatially identifying areas that require management, which then directs investment and prioritisation processes. *Econds* have also been used to set measurable policy standards at a regional scale and can inform the cost-

effectiveness of investments aimed at meeting those policy targets (Sbrocchi *et al.* in prep; Wentworth Group of Concerned Scientists and NRM Regions Australia in prep). The further intent to aggregate **Econds** across regions for different assets is a work in progress although Native Vegetation asset accounts appear to be successful as a first approximation.

Many NRM regions used data from existing programs in order to “ground truth” the consistency, practicality and feasibility of the *Accounting for Nature* model. In most cases this existing data proved insufficient and/or required detailed analysis and interpretation. Despite this, application of the *Accounting for Nature* model has substantially improved understanding of the condition of regional environmental assets in many regions, either through new information coming to light or through products stemming from application of the model (Sbrocchi *et al.* in prep). Local pools of experts assisted the regions with synthesizing and analysing existing data and in new data collection. For example, Natural Resources Eyre Peninsula, SEQ Catchments, Northern Agricultural Catchments and Northern Gulf Resource Management Group used this framework and local collaborations to source new data on native vegetation condition, previously unknown in their region (Figure 6).

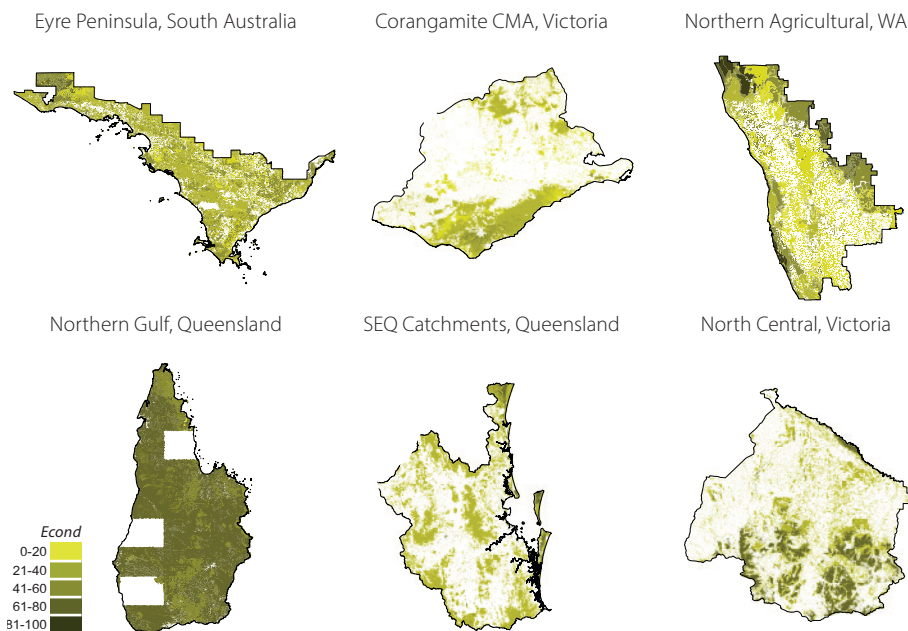


Figure 6: Condition of native vegetation for six NRM regions.

Further, the trial led to a unique experiment, in North Central CMA, Victoria, which integrated **Econds** from native vegetation and rivers to identify areas of the landscape affected by combined pressures on assets (Figure 7).

To construct a complete set of accounts for all regions, additional and ongoing data collection will be required to evaluate the condition of these assets.

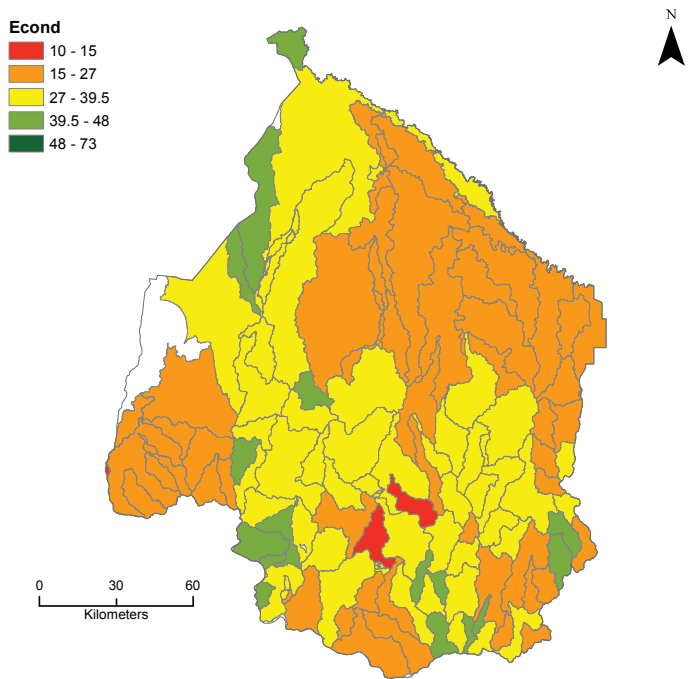


Figure 7: Integrating *Econds* for native vegetation and rivers produced a spatial map which can be used for prioritisation of management and investment in the NRM region.

3.1.2 The Accounting for Nature Method is Practical

The trial has shown that investment in regional environmental accounts has resulted in consolidation of existing data in a format that is practical for management. It has also helped initiate other collaborations and discussions beyond the environmental accounts trial. This tremendous level of support has enabled the discovery and reuse of data that previously would not have been utilised for such a purpose, overcoming some of the challenges in regional administration.

An iterative process was used to identify, research and address issues relating to the design of the accounts to ensure a reasonable and suitable approach for the regions. Supporting documentation was produced, improved and revised as the trial progressed and learnings emerged (Table 2). For example, testing of the original design principles yielded the Seven Step method for constructing asset condition accounts (see Figure 3, Section 2.3), which has now been established as a standard and published in the *Quick Guide*. The range of resource material includes the *Draft Standards and Accreditation Manual*, *Quick Guide* and templates for the accounts and information statements. In particular, the Issues Logs (“situation reports”), Issues and Technical Papers and communications registers developed as part of the Trial were particularly useful tools to document questions, recommendations and revisions. These documents have been pivotal to developing the concepts and documenting recommended changes. Ongoing development of these documents is recommended.



**Table 2: Products developed during the trial. Products available through two websites (NRM Regions Australia ([www.nrmregionsaustralia.com.au](http://www.nrmregionsaustralia.com.au)) and Wentworth Group of Concerned Scientists ([www.wentworthgroup.org](http://www.wentworthgroup.org))).**

Product	Description	Date produced
Draft Guidelines	Provided guiding material to regions on approach to constructing accounts	2011-2013
Draft Standards and Accreditation Manual	Provided guiding material to Scientific Standards and Accreditation Committee on approach to accreditation	2011-2013
Account Template	Provided examples to assist regions in placing information in accounts	2011-2013
Situation Reports	Documented issues raised by the regions, responses and progress in constructing regional accounts	2012-2013
Issues Paper (s)	Provided formal responses to issues raised by the regions	2012-2013
Draft Standards for Indicator and Data Quality (known as Technical Papers)	Draft standards initiated for: Native Vegetation Native Fauna (birds) Marine Soils Integrated Catchment Accounting	2012-2014
Information Statement Template	Described the method of approach in constructing individual regional accounts	2013-2014
Methods Statements	Described new methods developed for the regional environmental accounts. Available for: Native vegetation – fire metrics for native vegetation condition assessments Native vegetation – using LANDSAT data for measuring changes in vegetation extent Native fauna – applying an assigned condition score approach to Bird asset accounts Soils – application of USLE to measure soil erosion through time	2012-2014
Information Statements	Described the method of approach in constructing individual regional accounts	2013
Regional Environmental	Finalised accounts tables	2013
<i>Quick Guide</i>	Provided the methodological approach to regional environmental accounting	2013

Terms used to describe *Accounting for Nature* have evolved in response to concurrent work globally and in Australia through the trial. Environmental accounting is interdisciplinary – it requires national statisticians, economists and scientists to work together to overcome barriers and move forward. Certain words have very different meanings in different disciplines (eg. capital; natural capital; capacity; society). This has required some concessions from one field to another in order to continue to discuss and evolve the concepts. Certain terms are now

standard, through the adoption of the SEEA in 2012. However, where terms are not expressly addressed in the SEEA, improvements in our understanding have led to revised definitions of various terms used in regional environmental asset condition accounting and have provided openings for discussion with international environmental accounting colleagues. These collaborations are invaluable to the advancement of environmental accounting.

Lessons learned through the trial as a result of collaborations have demonstrated that, institutionally, moving ahead with the regional environmental accounts will require three types of organisations:

- NRM regions to create the accounts
- A national body to set and audit standards
- A national body to hold and take responsibility for the accounts

Further discussed in section 3.2.4, core funding to the regions will be essential to source, synthesise, and compile both existing and new data in order to construct accounts. In saying this, there are opportunities to explore cost savings given the number of Commonwealth and state agencies responsible for collecting environmental data (Australian Government Environmental Information Advisory Group 2012). For example, South Australia's Department of Environment, Water and Natural Resources assisted Natural Resources Eyre Peninsula with designing a cost-effective native vegetation survey program which could be undertaken by staff and volunteers. Eliciting assistance and cooperation from agencies and research institutions is integral to progressing regional environmental accounts.

### 3.1.3 The Accounting for Nature Method is Robust

The establishment of scientific standards and accreditation of accounts against these standards in the trial has been endorsed by some of the most prominent natural resource scientists and statistical experts in Australia.

The process of establishing standards has been essential for determining how credibility of the accounts would be assessed. The Scientific Standards and Accreditation Committee rigorously applied the accreditation processes and criteria to the Proof of Concept accounts, revealing a high level of technical achievement in the accounts.

Corroborated through the accreditation reports and committee findings (Sbrocchi *et al.* in prep) the set of process standards developed in the Proof of Concept Trial have provided a strong basis for the development of the proof of concept accounts and their further advancement. These standards determine the validity of particular methods used to measure the condition of environmental assets and construction of the *Econds*. For instance, while native vegetation assessment methodologies may vary from state to state or even within a state, it is the process standard that determines whether the methods used to determine condition are credible. These processes are laying the groundwork for future comparison and aggregation of asset *Econds* and certification (formal accreditation).

Each of the methods used to construct accounts in the trial were aimed at measuring the same concept: condition of the asset against a reference representing condition prior to significant human alteration. As such, the results of many of the trial accounts are meaningful and credible because of the diversity of methods used to calculate the *Econds*. National economic accounts function similarly, as for example, the output of every industry in Australia is estimated in a slightly different way reflecting that each operates somewhat differently (eg. comparing finance to retail, manufacturing, services or government).

The presence of SEEA as an international environmental accounting standard has provided strong complementary support to the work of the regional environmental asset condition accounts. SEEA acknowledges the trans-disciplinary nature of environmental accounting, and has provided an agreed structure and approach to environmental accounting. The international interest in this field has generated continued momentum to advance experimentation around condition accounting (United Nations *et al.* 2013). The trial has contributed valuable insights into this process, consistent with the principles of SEEA accounting concepts and aligned with other international initiatives (Cosier and McDonald 2010; Cosier 2011; Cosier 2012; Cosier and Sbrocchi 2012; Sbrocchi 2014).

Consistency between the Seven Step methodological standard used by the regions in the Trial (Sbrocchi 2013) and established standards for composite indices (Organisation for Economic Co-Operation and Development 2008) demonstrated the soundness of the *Accounting for Nature* approach (Table 3). Methods and supporting documentation will be refined through implementation and become more 'standardised' as the practice of environmental accounting progresses. The Seven Step methodological standard was a sound framework on which to build asset condition accounts.

**Table 3: Comparison of methodological framework for composite indicators using *Accounting for Nature's* Seven Step Standard and the OECD Decalogue for composite indicator construction.**

Accounting for Nature (Sbrocchi 2013) "Seven Step Standard for Constructing Environmental Asset Condition Accounts"	OECD (Organisation for Economic Co-Operation and Development 2008) "Decalogue for Composite Indicator Construction"
Step 1: Document the environmental assets	Step 1. Theoretical/conceptual framework
Step 2: Select indicators	
Step 3: Determine reference benchmarks	
Step 4: Collect data	Step 2. Data selection Step 3. Data treatment Step 4. Multivariate analysis
Step 5: Calculate indicator condition scores	Step 5. Normalisation
Step 6: Calculate <i>Econds</i>	Step 6. Weighting and aggregation
Step 7: Submit for accreditation	Step 7. Uncertainty and sensitivity analysis Step 8. Relation to other indicators Step 9. Decomposition into the underlying indicators Step 10. Visualization of the results

## 3.2 Lessons for Asset Condition Accounting

### 3.2.1 Importance of Standards

The trial found that differences in methodology across the country meant that in order to produce national accounts it is necessary to first ensure that all regional accounts have been developed against a common scientific standard. Such a standard was developed for the native vegetation asset (**Table 4**), which both improved the quality of the regional accounts and has demonstrated that aggregation of regional data to create a national account is possible.

An outcome of the trial was to develop standards and processes that would inform a national application of regional environmental accounts. This ‘learning by doing’ has created a great sense of cooperation amongst regions and support networks, and has encouraged continual innovation in developing and testing scientific and process-based concepts. This work has the potential to provide the building blocks for continued innovation in implementing a framework, to completely revamp how management of natural resources is approached in Australia.

The trial assessed the feasibility of developing standards for an accreditation process, which are necessary to ensure confidence in both the approach taken by the regions to construct their accounts and the data contained within the accounts. Standards are often employed in accreditation and assurance processes (Bureau of Meteorology 2013b; IPCC 2013; United Nations *et al.* 2013; Bureau of Meteorology 2014b). Proposed accreditation criteria were tested against the proof of concept accounts and indicative accreditation ratings were given to the accounts. Indicator and data quality standards are being developed iteratively and thus proof of concept accounts were not formally certified at this stage. Accreditation criteria and processes should be refined in line with the findings of this review.

Table 4: Draft accreditation standard for native vegetation condition indicators and data quality.

Accreditation Grade	Native Vegetation Extent	Native Vegetation Composition	Native Vegetation Configuration
<b>5</b> Comprehensive	An annual extent measure is provided for each regional native vegetation type and Major Vegetation Group; and →	The composition of each vegetation community has been determined by an annual random site survey of flora composition of not less than 10 sites per vegetation type*	The configuration of each vegetation community incorporates an appropriate measure
<b>4</b> Substantial	An annual extent measure is provided for each regional native vegetation type; and →	The composition of each vegetation community has been determined by a regular** random survey of flora composition of not less than 10 sites per vegetation type*; and →	The configuration of each vegetation community incorporates an appropriate measure
<b>3</b> Good	Extent measures are provided for each regional native vegetation type; and →	The composition of each vegetation community has been determined by a random site survey of flora composition of not less than 10 sites per vegetation type*; and →	The configuration of each vegetation community incorporates an appropriate measure
<b>2</b> Reasonable	Extent measures are provided for each regional native vegetation type; and →	Expert judgment has been used to estimate the composition of each vegetation type, and →	The configuration of each vegetation community incorporates an appropriate measure
<b>1</b> Acceptable	Extent measures are provided for each Major Vegetation Group; and →	Expert judgment has been used to estimate the composition of each Major Vegetation Group; and →	The configuration of each vegetation community incorporates an appropriate measure
<b>0</b> Not Accredited	<p>Measures of Native Vegetation extent only where:</p> <p>Woody vegetation communities are known to be degraded by clearing of understory, grazing or weed invasion;</p> <p>Grassland (non woody) vegetation communities are known to be significantly degraded by grazing or weed invasion (including grasslands dominated by improved pastures); or</p> <p>Vegetation communities are known to have been significantly altered by changed fire regimes (eg invasive native scrub in western NSW or northern Australian savannahs).</p>		

\* A minimum of 10 survey sites per vegetation type should be selected based on expert experience of statistical analysis of sampling strategies. Where it is not practical to undertake 10 random samples in every vegetation type, the accreditation will be one grade less, provided the assessment incorporates an expert judgement of the sampling size that has been carried out.

\*\* "Regular" – a consistent time period that is not annual (eg. 2-5 yearly surveys) and/or annual surveys in those vegetation classes that are showing/likely to show change over a short period of time

### 3.2.2 Collaborations Across Institutions are Essential

The design of the trial relied heavily on a number of important collaborations between the NRM regions, scientists and environmental accounting professionals. The trial provided an opportunity to bring together experts in a number of fields (NRM, ecological and agricultural sciences, statistics, economics) from a range of organizations and agencies (government, research, regional) across the country. Developing or nurturing collaborations across institutions was not an initial intended outcome of the trial, but these collaborations and partnerships became very important to the success of the trial.

What has been uniquely successful through the trial is the engagement of multiple parties at the regional level. The majority of trial regions took the opportunity to develop relationships with state and federal agency personnel and other experts where these relationships previously did not exist.

There are several examples from the trial which demonstrate this. For example, Central West CMA, NSW reused forest extent data compiled for the National Carbon Accounts to record trends in native vegetation extent dating back to 1972. Northern Agricultural Catchments Council, WA and SEQ Catchments, QLD utilised expertise in state agencies to construct their native vegetation accounts from disparate sources of data.

Eyre Peninsula benefited from multiple interactions with the state agency responsible for environmental knowledge management to produce native vegetation and marine fauna accounts. The experiences of Queensland Murray Darling Committee in undertaking a soil account demonstrated expertise from a range of agencies, including CSIRO and Queensland departmental experts, was essential to sourcing, analysing and interpreting data relevant to soil accounts. Expertise was provided to the regions upon request from the regions.

Committees were established to provide specific support to the regions and to advance concepts underpinning the trial (**Figure 8**). Comprised of experts from the scientific community, the role of the Scientific Standards and Accreditation Committee was to provide assistance and feedback on scientific matters that may arise during the trial. The role of the Technical Environmental Accounting Standards Committee was to advise on the development of the regional accounting framework and to ensure compatibility with national and international environmental accounts. This committee comprised professionals involved in environmental accounting. Collaborations were expanded during the trial to formalise and include additional experts – a Steering Committee, comprised primarily of Chairpersons of the ten Trial regions was initiated partway through 2012 to support the policy development of the program. Local pools of experts were convened as required to address scientific issues specific to assets and regions. Each of these collaborators gave freely of their time and expertise to assist the trial (see **Appendix 1**).

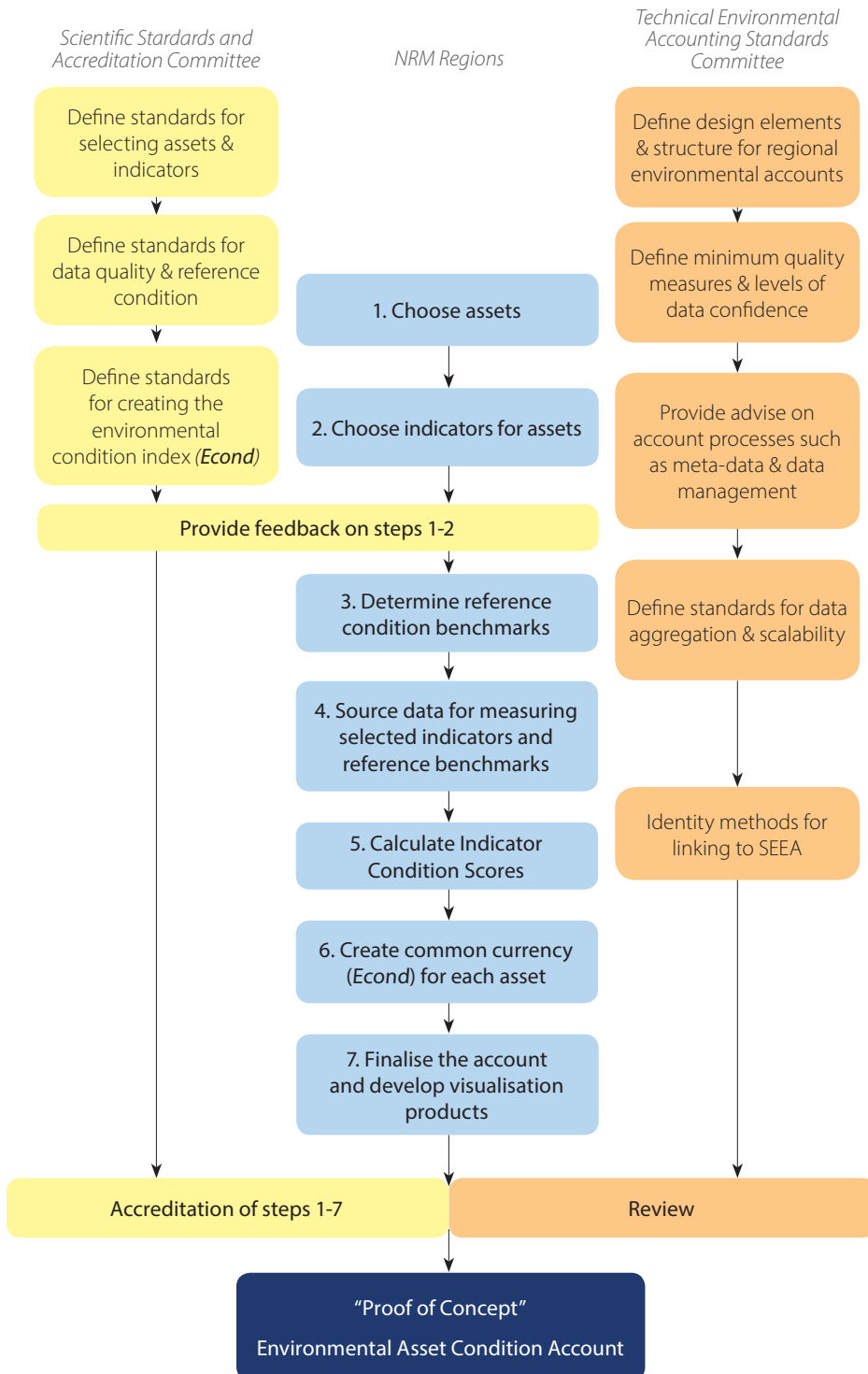


Figure 8: Roles of committees in the Proof of Concept Trial.

The Steering Committee, comprised of regional body Chairpersons, was critical to the ongoing momentum and development of the regional environmental accounts. This group maintained contact with the Boards of each of the trial regions and also with the wider group of regional boards. The involvement of the regional boards was critical to the ongoing application and success of regional accounts across the continent as not only is it a mechanism for communication amongst the many groups, it provides a direct link back to the communities and the evaluation of the accounts against developed regional plans.

In the case of the Technical Accounting Standards Committee, formal contributions were focussed mainly to the initial months of the trial, as their core focus was to endorse a set of working accounting tables. As the field of environmental accounting was relatively new, the functions of such a group were somewhat limited until the trial could advance the concepts being tested. However, as members of the committee were at the forefront of the field, they kept Trial members advised and abreast as the field advanced, and created pathways to collaborate nationally and internationally.

Regions and committees met independently but had a high level of engagement throughout the trial. Meetings for all but the management committee were on an as-needed basis, often by telephone. At least one face-to-face, joint committee meeting was held per year, to share knowledge and address issues. A number of meetings were held in the regions. Financial constraints restricted the number of face-to-face meetings but these opportunities were essential to nurturing relationships between regional staff and scientific and environmental accounting experts and for discussing and finding solutions to challenging concepts. The benefits of bringing these groups together cannot be overstated. These opportunities created new working relationships, deepened existing relationship and created a forum for advancing novel concepts in this relatively young field. Committee members expressed support for the way in which the committees and structures functioned at a Trial scale.

### **3.2.3 Accreditation Systems are Required**

The *Accounting for Nature* model requires any environmental account, at any scale, to be accredited by an independent scientific body against national environmental accounting standards. Data quality varied, therefore each asset received a quality grading so that policy makers have confidence that the data contained within the account meets a minimum standard.

The trial accreditation process included two aspects of environmental account preparation, which could be described as Design Accreditation and Account Accreditation stages. The design accreditation stage assessed the process of selecting assets, indicators and proposed datasets against the degree to which the region followed the Seven Steps. The account accreditation stage accredited the numbers contained within the accounts by assessing the data quality, the indicator condition scores and the *Econds*. These two processes were undertaken by the one committee, the Scientific Standards and Accreditation Committee. The Committee clearly encouraged establishment of an additional set of bodies to oversee accreditation of the regional accounts to enhance accreditation systems.

A more localised team of experts may provide a more effective scientific support base for assisting regions in constructing the accounts and performing accreditation functions. This expertise may



come from universities or state-based agency staff. However, this will require building capacity in these pools of experts to understand the *Accounting for Nature* model, understand and apply accreditation process and criteria, and be resourced to undertake this role.

A formal accreditation system will need to be established which sets standards for the accreditation process, as well as for indicator and data quality (Bureau of Meteorology 2013b). The developing Trial accreditation process made headway in producing a template and initial work towards publication of indicator and data quality standards for some assets which could form the basis of national standards. A national body could be responsible for setting the standards and auditing the regional accreditation panels. The regional accreditation panels could be formed either for each region, or on a state-basis and could accredit multiple regions. This body would make their assessment of the account and submit to the Scientific Standards and Accreditation Committee for review or auditing if required.

### 3.2.4 Existing Resources are Insufficient to Create National Accounts

The regions have demonstrated incredible leadership in volunteering to test the *Accounting for Nature* concept, collectively supporting the trial, undertaking the trial with no external resources and maintaining their enthusiasm over a three year period. The NRM regions made commendable efforts to reuse and reanalyse existing data towards producing regional environmental accounts. Existing data were sufficient to provide a 'snapshot' of the condition of some assets, including native vegetation, native fauna, and wetlands and some trend information was described for native vegetation, rivers and estuaries. Overwhelmingly, the regions have articulated that some information is better than none, and certainly sensible and pragmatic methods such as those used in the trial yield some very useful results for the purpose of prioritisation of investments, setting management targets and targeting future monitoring and research.

However, to construct a complete set of accounts for all regions, additional and ongoing data collection will be required to comment on the condition of these assets. In some cases, existing data must be supplemented with on-ground survey work to ensure adequate representation and coverage of data in each region. Core funding to the regions will be essential to source, synthesise, compile both existing and new data in order to construct accounts.

Given the reality that governments have a limited capacity to provide additional resources, this will require a rationalisation and reprioritisation of existing monitoring programs, with far greater priority given to the accessibility and distribution of existing data systems. There is opportunity to explore cost savings given the number of Commonwealth and state agencies responsible for collecting environmental data (Australian Government Environmental Information Advisory Group 2012). Eliciting assistance and cooperation from these agencies is integral to progressing regional environmental accounts.

A desktop assessment of existing national, state and local monitoring programs provided some estimates of cost to implement NRM region-based environmental asset condition accounts across the country (Table 5). It is important to note that data for each indicator of each asset are unlikely to be required for all accounts on an annual basis – often these data can be collected on some other regular basis (Davies *et al.* 2012). This is analogous to the data collection processes for the System of National Accounts (Australian Bureau of Statistics 2005).

**Table 5: Resources required to implement environmental asset condition accounts. These costs include program implementation but do not include monitoring activities (resource condition assessments).**

Institutions	Year 1	Year 2	Year 3	Year 4	Ongoing
10 Regions	\$ 4.0m				
54 Regions		\$ 21.6m	\$ 21.6m	\$ 10.8m	\$ 10.8m
ABS (as Accounts Holders)	\$ 0.5m	\$ 0.5m	\$ 0.5m	\$ 0.5m	\$ 0.5m
CSIRO (as Accounts Accreditors)	\$ 3.0m	\$ 2.0m	\$ 2.0m	\$ 2.0m	\$ 2.0m
Total Cost (\$ m)	\$ 7.5m	\$ 24.1m	\$ 24.1m	\$ 13.3m	\$ 13.3m

The trial has shown that the investment made in the regional environmental accounts has resulted in substantially more information at the manager level than previously known to the region. It has also spring boarded other collaborations and discussion, going beyond the environmental accounts Trial. Similar work in Italy has found that this investment in personnel capacity has become an essential and valued support for making decisions that impact on the environment and for managing natural resources in an informed and effective way (Dalmazzone and La Notte 2013). For the trial, this has already taken the form of:

- Enhancing relationships with agency scientists to collaborate on additional projects
- Increasing the regional organisation's exposure and involvement in data collection and provision
- Lifting the regional organisation's profile with the community and agricultural industry partners and synthesising mutually-beneficial information (the accounts) has provided opportunity to contribute to planning instruments.

### 3.2.5 A National Program Requires Strategic Implementation

The trial initially was conceived as a two-year program. However, it became clear that the trial would need to be flexible as no external resources were made available to the trial: progress was made when possible and not at any predictable rate. Over the trial periods, NRM regions and support organisations experienced staff and management changes and thus required an ongoing and continuous program of support and re-education for staff and boards. The extended timeline enabled a full exploration of these coordination and implementation aspects, which may have not been possible with a shorter program. Countless other environmental assessment programs have not moved beyond a 'Trial' stage because of inadequate institutional support. For us, this aspect is crucial to a national program and we feel the time we have spent addressing it has been well spent.

Institutionally, moving ahead with the regional environmental accounts will require three types of organisations:

- NRM regions to create the account;
- A national body to set and audit standards;
- A national body to hold and take responsibility for the accounts.

**NRM regions to create the accounts:** Each of the 54 regional NRM regions is an appropriate institution to create the accounts, for a variety of reasons: their primary objective is to work with communities for improved environmental management and conservation: regional strategic plans articulate ties between environmental, social and economic dimensions through agreed vision statements; boundaries tend to reflect biophysical landscapes; and the establishment of an overarching entity, NRM Regions Australia, provides a strategic collaborative frame to the diverse regional bodies.

**A National body to set and audit standards:** Implementation of a national program of regional environmental accounts would require the formal establishment of an independent body to set national standards around indicator selection, index creation and reporting (including data and metadata) and to establish, review and audit accreditation processes.

**A national body to hold and take responsibility for the accounts:** The Australian Bureau of Statistics is the appropriate organisation to house the accounts, considering their existing links to the production of economic and other statistics which ensures linkages and research into integration with economic accounting processes (Weber 2011; United Nations *et al.* 2013).

Wentworth Group of Concerned Scientists secretariat supported the trial primarily through a project coordinator, made possible through funding from the Ian Potter Foundation. The role was established to coordinate the Wentworth Group's contribution to the progress and evaluation of the trial and provide support to the Monitoring and Evaluation Officer within the NRM region to develop their environmental accounts. The duties fulfilled by this position included acting as secretariat to each of the committees and coordinating their activities, assisting the regions to source datasets and relevant additional experts, compiling reference material, maintaining websites, coordinating national workshops, evaluating the regional accounts submissions and producing reports.

Project coordination may be an important aspect to consider for national compilation of regional accounts, particularly for supporting a national program in early stages of program development and implementation. The trial demonstrated project coordination was essential to facilitate sharing of information between committees and regions. Project coordination may include coordinating the compilation of regional accounts, producing national reports (for example, standards or best practice guides), evaluating the national program to ensure the program is adaptive and relevant for management, building capability in regional accounting teams and pools of experts and supporting any new or existing committees. This team may be a secretariat of the proposed national bodies.

### **3.2.6 Provision of Technical Support and Building Capacity**

Technical support will be required for construction of regional accounts, particularly in the areas of data storage, data analysis and interpretation, statistical analysis of data, data visualisation, and data synthesis. These skills currently reside in agency and research organisations and could be better linked to management activities of the regional bodies (**Figure 9**). Local and regional scientists could work more closely with Monitoring Evaluation and Reporting and other officers within the regions to design appropriate monitoring programs which would feed into the accounts, provide relevant interpretation and assist in identifying appropriate management actions.

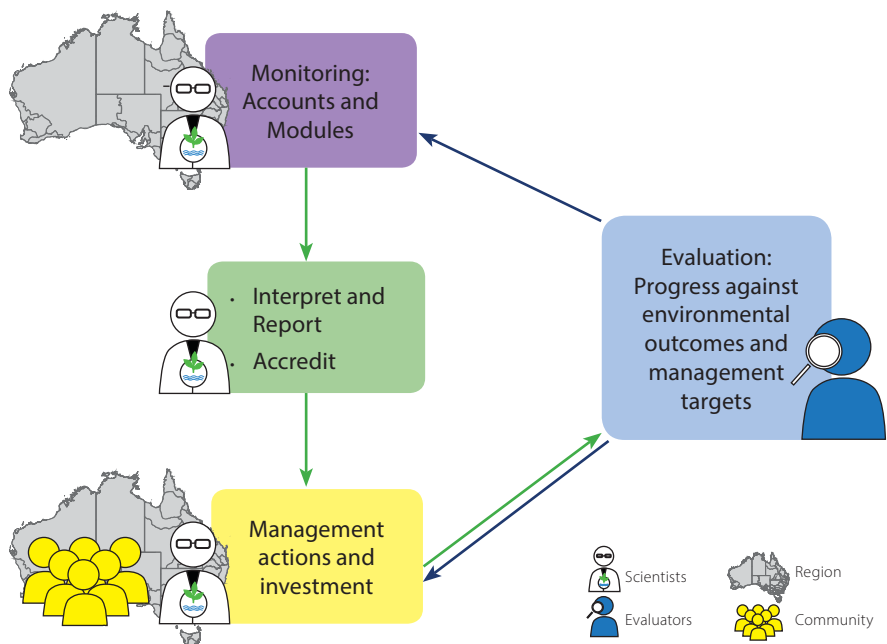


Figure 9: Processes involved in asset condition accounting. Local and regional scientists could provide more input into designing monitoring/assessment programs which provide input to the accounts, interpretation and reporting support and assist with setting appropriate management actions and policy targets.

National data systems are in development in Australia through facilities, including TERN's ecoinformatics facility (<http://www.aekos.org.au/home>), CSIRO's Atlas of Living Australia (<http://www.ala.org.au>), Australian Ocean Data Network (<http://portal.aodn.org.au/aodn/>), the Bureau of Meteorology's National Plan for Environmental Information (<http://www.bom.gov.au/environment/about.shtml>), and it would be of mutual benefit should these systems consider the needs of the regions undertaking regional environmental accounting. Additionally, the trial determined there is a significant need for improved modelling to be made available to the regions to support their reference benchmark measures and to better separate anthropogenic and natural variability. Delivering professional development to upskill regional staff with the necessary data management tools and skills, for example, will enable data flow back to state and Commonwealth agencies (Campbell 2006).

Capacity is strongly linked to consistent streams of funding, particularly for asset (resource) condition monitoring. The NRM regions have not had consistent funds for this purpose, and consequently have not been able to maintain staff with these skills. Accordingly, where funding is guaranteed, staff with appropriate skills can be hired for this specific purpose.

There are weaknesses in state and national data collection systems and as a result, Australia is unable to comment on the current state or trend in condition of many assets (State of the Environment Advisory Council 1996; Australian State of the Environment Committee 2001; Beeton *et al.* 2006; State of the Environment Committee 2011). The work of the trial has provided a pathway for re-investment to allow for this important data collection, at scales at which policy and investment decisions need to be made. As part of a realignment of existing

monitoring programs (see section 3.2.4), the Commonwealth has an important role in providing support to the regions in the form of remote sensing products and interpretation, state agencies will have an important role in provision of scientific support for the development of regional accounting protocols and coordinating the scientific accreditation of regional accounts, and local government and non-government organisations will have an increasingly important role in co-ordinating citizen science activities to support ongoing monitoring and assessment programs.

Best practice in program management includes the development of sound evaluation frameworks. Any future environmental accounts program should ensure a program logic frames the activities in order to gauge progress against intended programmatic and environmental outcomes.

## 4 Examples of Regional Asset Accounts

This chapter provides examples of asset condition accounts described in the regional environmental accounts trial. All of the accounts produced through the trial are available online through the Wentworth Group and NRM Regions Australia websites<sup>3</sup>.

One of the great powers of an accounting system using the *Econd* (the composite index of environmental condition) is that it allows information for all assets, irrespective of the indicators used or the scale of measure, to be described.

### 4.1 Measuring Condition

Seven regions completed or partially completed a full condition-based native vegetation account. We can use these accounts to describe the condition of native vegetation within regions and between regions.

**Table 6** is a Summary Table of native vegetation condition accounts for the ten regions in the trial. The data in the account can be used to derive other products to demonstrate the relative comparison of condition between the assets. **Figure 10** orders and displays the information in the account, which shows that native vegetation in the Northern Gulf region shows a smaller departure from reference condition compared with the Corangamite region. A 30% target value (30% of reference) for native vegetation is used by managers and scientists as a benchmark, as it indicates a minimum threshold for maintaining biodiversity. If we were to apply this target to these accounts, *Econds* in four regions fall below this benchmark, indicating their native vegetation is in poor health.

**Table 6: Summary table of native vegetation *Econds*.**

Asset	Region	2013
Native Vegetation	Central West CMA (NSW)	
	Corangamite CMA (VIC)	17
	Eyre Peninsula (SA)	24
	Namoi CMA (NSW)	49*
	North Central CMA (VIC)	17
	Northern Agricultural Catchments Council (WA)	27
	Northern Gulf RMG (QLD)	65
	NRM North (TAS)	
	Queensland Murray Darling Basin (QLD)	
	SEQ Catchments (QLD)	35

<sup>3</sup> NRM Regions Australia ([www.nrmregionsaustralia.com.au](http://www.nrmregionsaustralia.com.au)) and Wentworth Group of Concerned Scientists ([www.wentworthgroup.org](http://www.wentworthgroup.org))

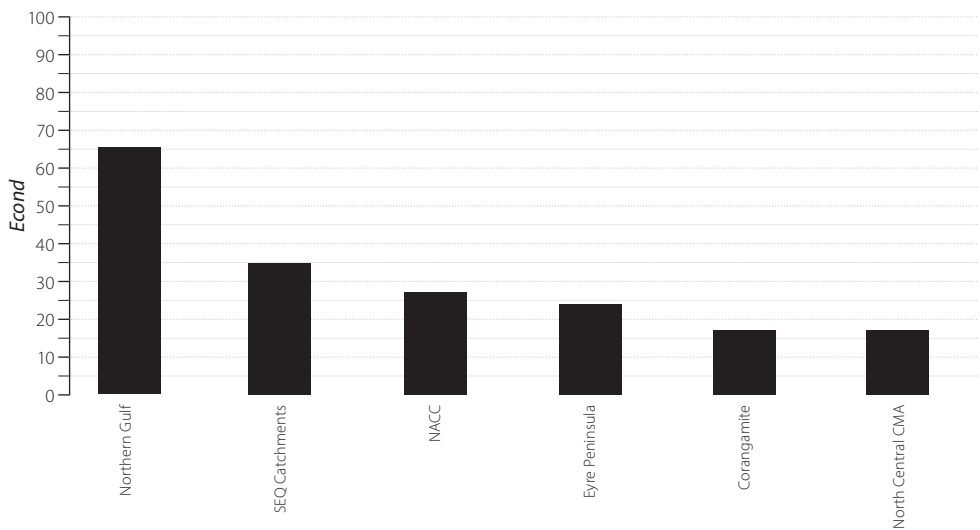


Figure 10: Relative condition of native vegetation amongst trial regions.

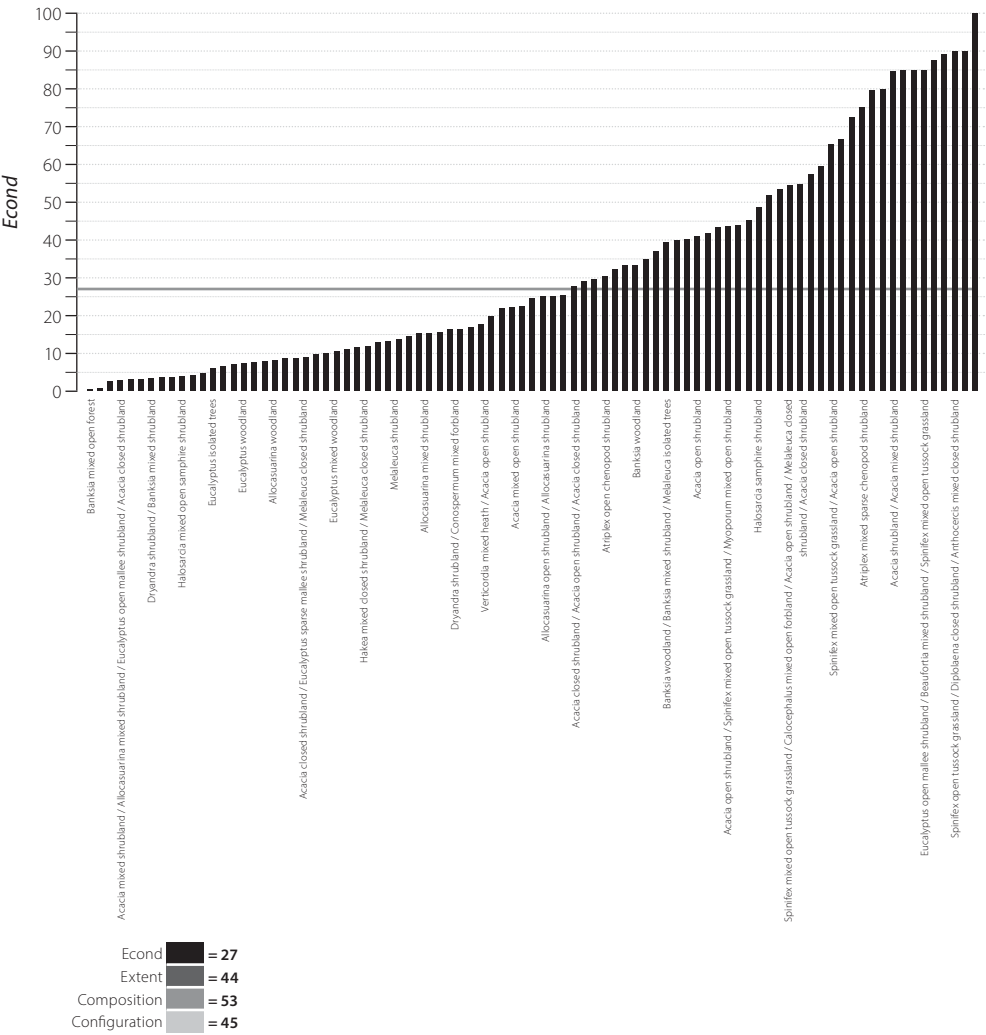
Table 7: Asset table for native vegetation, Northern Agricultural Catchments Council, WA. Proof of Concept Accounts (excerpt).

NATIVE VEGETATION ASSET ACCOUNT NACC, WEST AUSTRALIA	
Asset Table: Land > Native Vegetation	
Class	2012 Econd
Regional Econd	27
Acacia closed shrubland	43
Acacia closed shrubland / Acacia open shrubland / Acacia closed shrubland	29
Acacia closed shrubland / Eucalyptus sparse mallee shrubland / Melaleuca closed shrubland	9
Acacia closed shrubland / Verticordia mixed shrubland	4
Acacia mixed open forest	10
Acacia mixed open shrubland	23
Acacia mixed open shrubland / Banksia mixed open shrubland / Calytrix mixed heath	49
Acacia mixed shrubland	53
Acacia mixed shrubland / Allocasuarina mixed shrubland / Acacia mixed shrubland	80
Acacia mixed shrubland / Allocasuarina mixed shrubland / Eucalyptus open mallee shrubland /	3
Acacia closed shrubland	
Acacia mixed shrubland / Eucalyptus open woodland	28
Acacia mixed woodland	13
Acacia open shrubland	42
Acacia open shrubland / Allocasuarina shrubland	9

Table 7 shows an excerpt from Northern Agricultural Catchments Council’s Native Vegetation Asset Table. The level of detail that sits behind each of the regional native vegetation condition accounts can be seen, using the Northern Agricultural Catchments of Western Australia as one example (Table 7, Figure 11).

The graph in **Figure 11** shows that the overall condition of native vegetation in this region is an **Econd** of 27. It also shows that there are 22 vegetation types with an **Econd** of less than 10.

This means that the condition of this vegetation – how much there is (extent), combined with its functional and structural integrity (composition) and how it is configured across the landscape (configuration) – is less than 10 per cent of what it would have been prior to the clearing of the native vegetation.



**Figure 11: Native vegetation *Econds*, Northern Agricultural Catchments Council, WA, Proof of Concept Accounts.**

**Figure 12** shows the same information for native vegetation in six regions across the continent. **Figure 13** is the same information described in **Figure 12**, combined with spatial information, to show the spatial distribution of the condition of the remaining native vegetation in those same six regions.



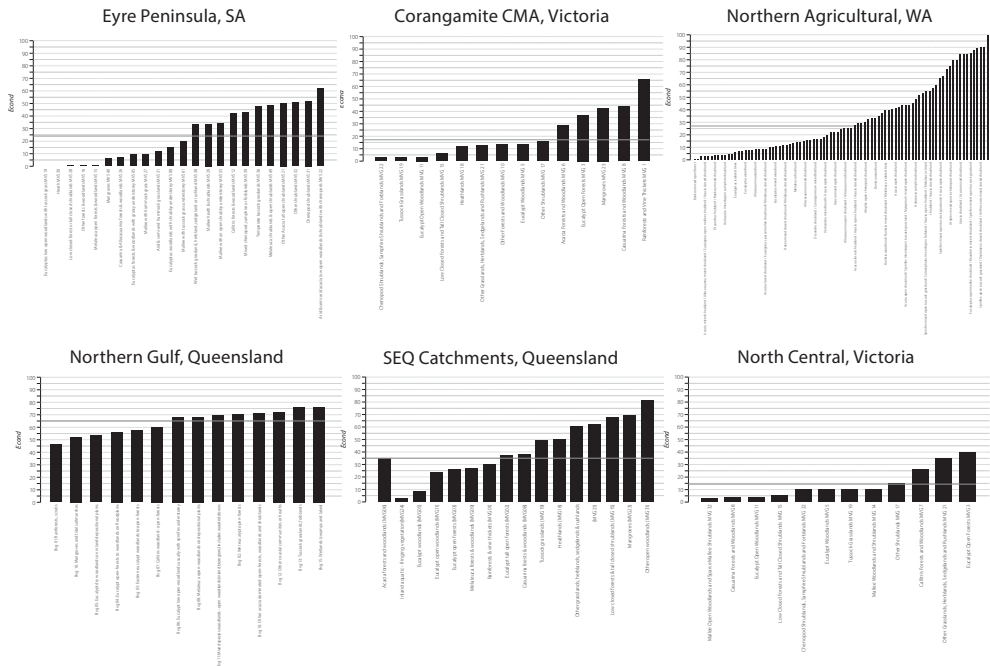


Figure 12: Condition of native vegetation in six regions, Proof of Concept Accounts.

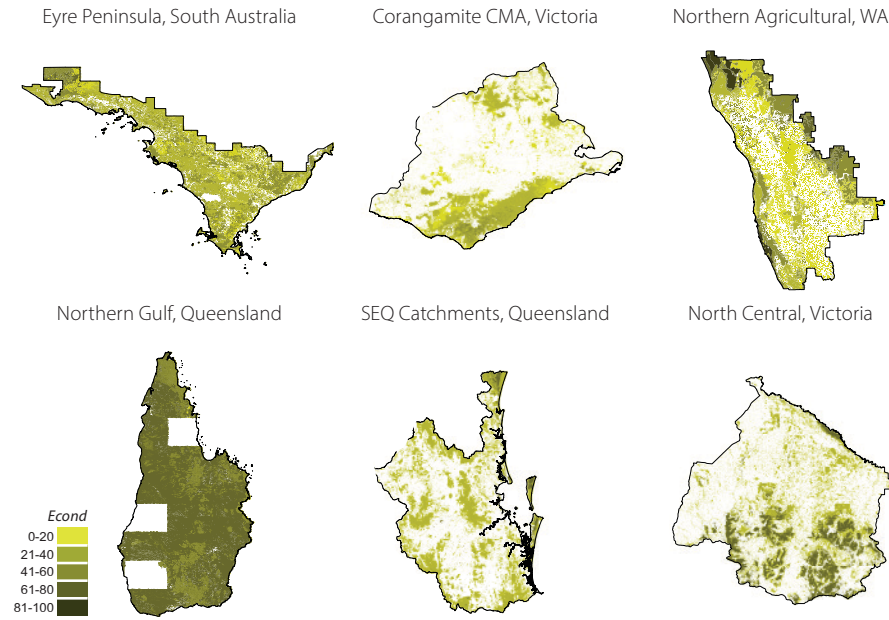


Figure 13: Spatially distributed condition of native vegetation for six regions, Proof of Concept Accounts.

Figure 14 shows the level of detail that imagery can provide to show the condition of native vegetation across the Eyre Peninsula region in South Australia.

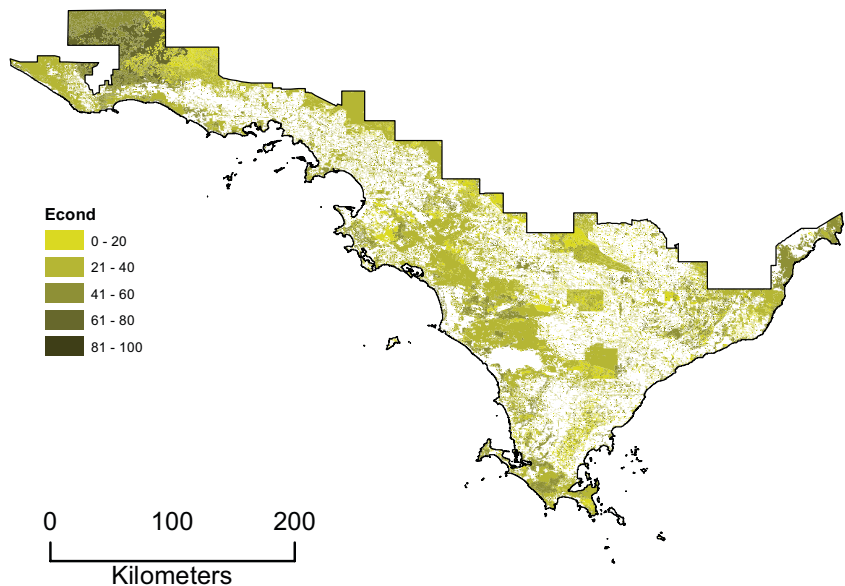


Figure 14: Condition of native vegetation, Natural Resources Eyre Peninsula, Proof of Concept Accounts.

Figure 15 presents a further level of detail in one of the regional vegetation accounts. It shows not only the *Econd* for each of the 23 major vegetation groups described in their account (the red bars); it also shows the main pressures that are affecting the condition of the vegetation:

- how much has been cleared (extent of remaining vegetation – green bars),
- the structural and functional integrity ('composition' – the orange bars), and
- the placement of the remaining vegetation across the landscape ('configuration' – the blue bars).

In this example, the left hand side of the graph shows that five vegetation groups have an *Econd* of less than 1, and that the primary reason for this is that they have been reduced in area to less than 1 per cent of their original extent. In comparison, the extent of Temperate tussock grasslands (fifth from the right) is high (with an extent indicator condition score of 93), but it has an *Econd* of less than 50 because the composition of that vegetation score is only 53. The *Econd* for this asset is calculated by multiplying the quantity (extent) by the quality (average of composition and configuration indicator scores).

Figure 16 maps one of the measures which contributes to the composition indicator, weed severity and intensity. This is possible because the survey undertaken to produce the composition indicator also recorded the severity of weeds that affect each vegetation type.

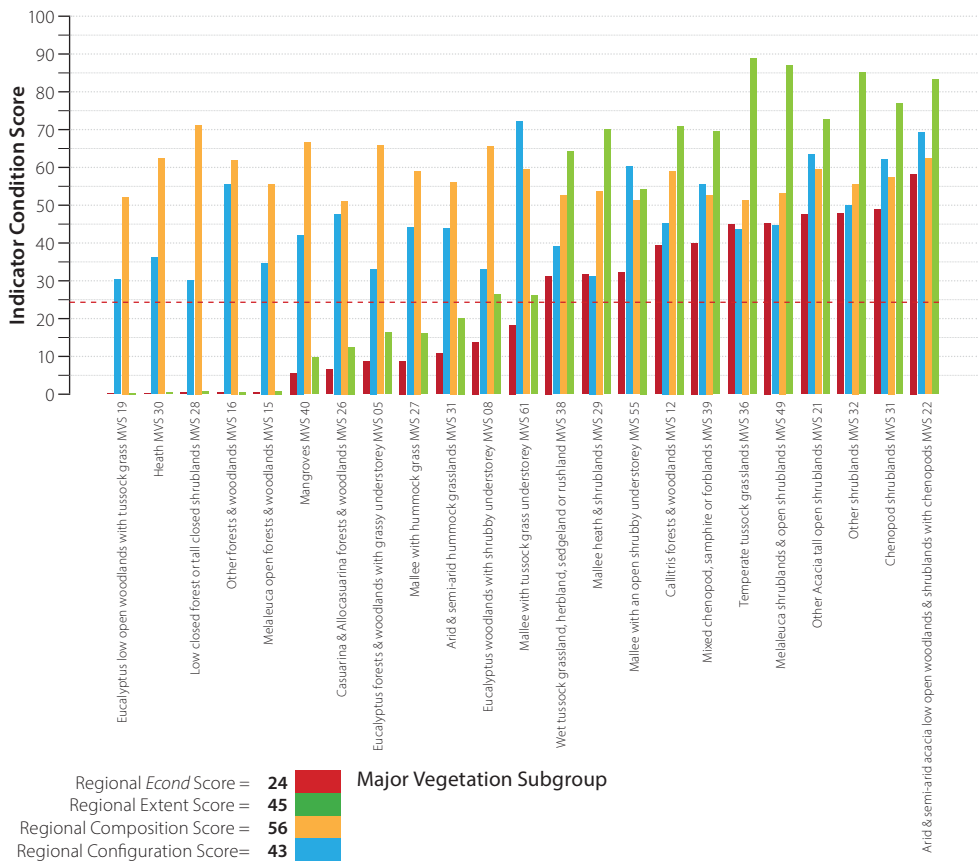


Figure 15: *Econds* and Indicator Condition Scores for native vegetation in Eyre Peninsula, SA. Proof of Concept Accounts. *Econds* are shown by red bars, extent scores in green, composition scores in yellow and configuration scores in blue.

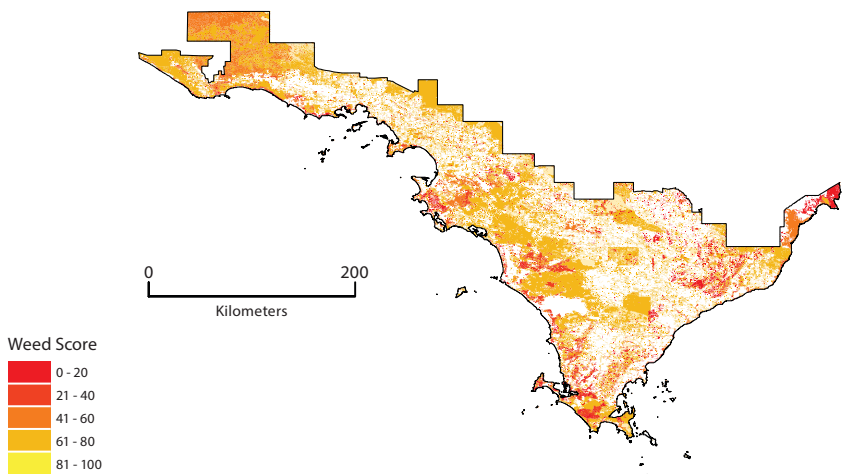


Figure 16: Weed severity and intensity as a pressure on native vegetation, Eyre Peninsula, SA. Proof of Concept accounts.

This figure shows the native vegetation types impacted by from weeds. The darker the colour, the greater the impact of weeds on that native vegetation type. If this measure was used in all regions across Australia, we would have, almost as a by-product of the accounts, a map of the impact of weeds across the entire country.

This is made possible because all the underpinning information on each indicator is now organised in this single common accounting framework, using the common environmental currency, the *Econd*.

## 4.2 Measuring Trend in Condition:

Understanding the health of an environmental asset requires an understanding of the condition of an asset at a particular point in time. Of equal importance to policy makers and investors is the ability to monitor the direction and rate of change in the condition of those assets.

Collecting trend data takes time, and in landscapes with high climate variability such as Australia, it can be many years before sufficient data can be assembled to give useful trend information.

We have however discovered that quite often there is a vast amount of existing data that can be used to measure the condition of environmental assets that dates back, in some cases, decades. For example, many regions across Australia have long time series data for rivers and estuaries.

South East Queensland's environmental account (**Table 8**) includes data from 2004 to 2011 for the condition of estuaries around Brisbane.

**Figure 17** also shows in detail the condition of various parts of the Ramsar-listed Moreton Bay estuary – a marine estuary of international conservation significance.




In this next example (**Figure 18**), we use Landsat data dating back to the 1970s, acquired for the National Carbon Accounting System and used to measure Australia's greenhouse emissions from land use change, to hindcast extent of the various vegetation groups in the Central West CMA region of NSW. It shows that the total extent of native vegetation (one major indicator of condition) in the Central West region of NSW was very low (< 20%). It also shows that there was a noticeable change around 1998 and 1999, particularly in two vegetation groups: the 'Dry sclerophyll forests' and the 'Arid shrublands'.

Another innovation to overcome the lack of historical data is to combine oral history, local knowledge and expert opinion to construct a long term trend graph which sets past and current management into context against the condition of the asset and documents changes to the asset over time (**Figure 19**).

These examples demonstrate the utility of the common environmental currency, the *Econd*, and how its application at the regional scale can improve management and policy.

A full appraisal of the regional environmental accounts described in the trial is available online from both the Wentworth Group and NRM Regions Australia websites.

Table 8: Estuaries asset table, SEQ Catchments, QLD. Proof of Concept Accounts (excerpt).

ESTUARIES ASSET ACCOUNT SEQ CATCHMENTS, 							
 <b>Asset Table: Freshwater &gt; Estuaries</b> 							
Class	2004	2006	2007	2008	2009	2010	2011
	Econd	Econd	Econd	Econd	Econd	Econd	Econd
<b>Total</b>	<b>57</b>	<b>55</b>	<b>42</b>	<b>44</b>	<b>39</b>	<b>41</b>	<b>41</b>
Albert River estuary	32	24	17	19	22	18	20
Bremer River estuary	31	19	28	23	22	21	22
Brisbane River estuary	43	42	34	33	30	31	32
Cabbage Tree Creek estuary	43	42	23	29	22	27	36
Caboolture River estuary	65	57	29	23	26	30	38
Coomera River estuary	90	91	66	71	59	50	67
Curumbin Creek estuary	89	86	55	69	57	43	59
Eprapah Creek estuary		64	33	42	42	38	42
Logan River estuary	52	38	23	25	21	17	20
Maroochy River estuary	50	61	36	40	30	45	36
Mooloolah River estuary	83	82	71	77	70	76	56
Nerang River estuary	84	82	65	65	65	59	55
Noosa River estuary	91	87	93	90	87	88	82
North Pine River estuary	58	52	38	48	34	42	45
Oxley Creek estuary	27	25	23	30	22	20	22
Pimpama River estuary	71	69	53	52	46	49	39
Tallebudgera Creek estuary	91	85	60	66	60	67	70
Tingalpa Creek estuary	47	58	35	44	39	51	45

© SEQ Catchments 2013

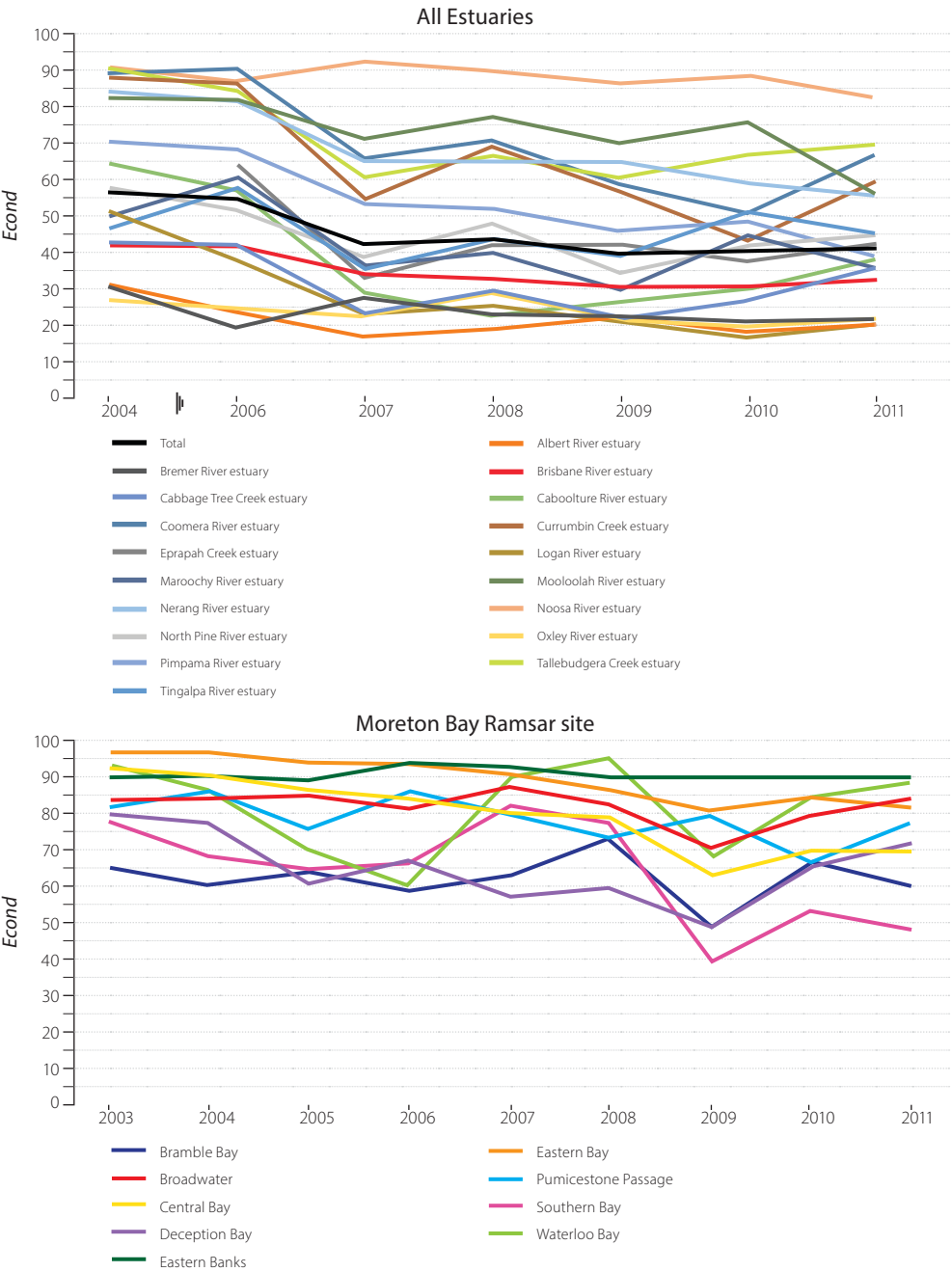


Figure 17: Trend in condition of estuaries in South East Queensland, SEQ Catchments, Proof of Concept Accounts.

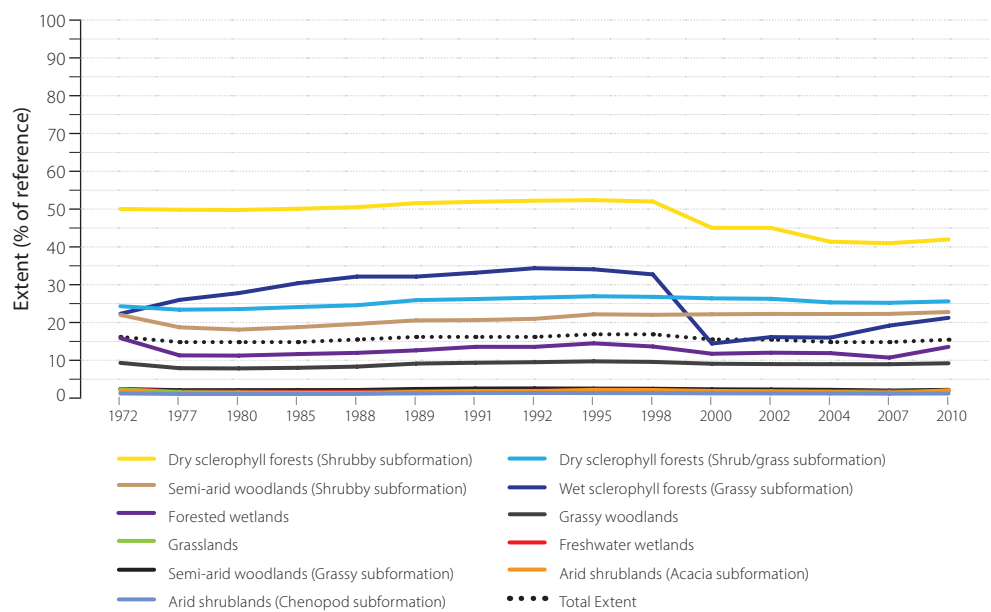


Figure 18: Central West, NSW – Trend in native vegetation extent.

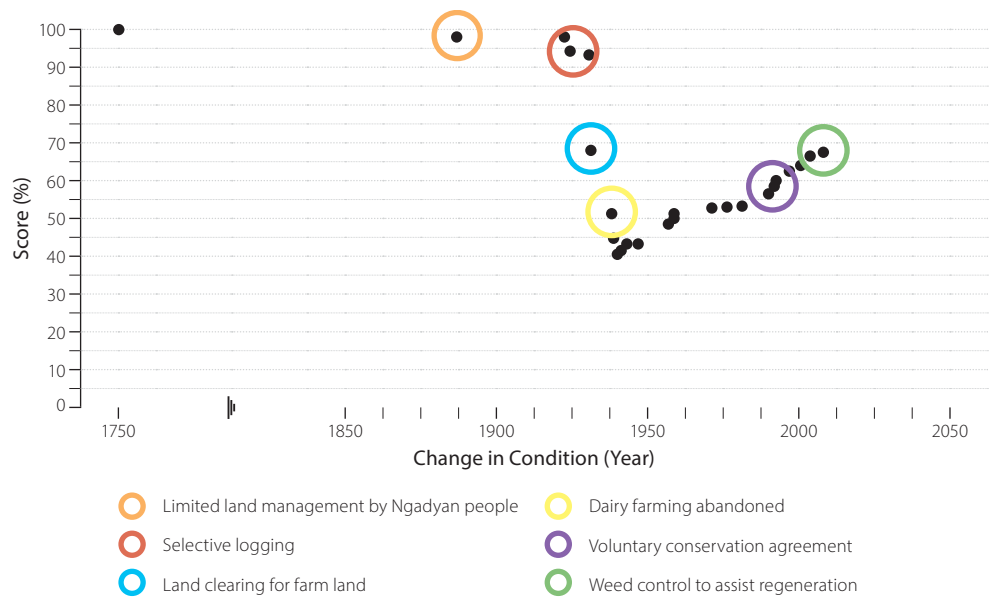


Figure 19: Condition change in native vegetation at Wooroonooran Nature Reserve, QLD, 1750-2010. Image courtesy of Richard Thackway (Thackway 2012).

## 5 Appendix 1: Contributors & Committees

Table 9: Roles and membership of parties in the trial. All organisational titles correct at time of contribution.

Role	Membership
<b>Scientific Standards And Accreditation Committee</b>	
<ul style="list-style-type: none"><li>• Provide expert advice to the regional NRM regions, as the need arises</li><li>• Establish processes and criteria for accreditation of regional environmental accounts including the selection of assets and indicators, data quality, selection of reference condition benchmarks, and development of <i>Econds</i></li><li>• Accredite accounts in each region against standards and criteria</li></ul>	<p>Mr Peter Cosier, Wentworth Group of Concerned Scientists, Convenor of Scientific Standards and Accreditation Committee</p> <p>Prof Bruce Thom, Wentworth Group of Concerned Scientists</p> <p>Dr Denis Saunders, Wentworth Group of Concerned Scientists</p> <p>Prof Hugh Possingham, University of Queensland, Wentworth Group of Concerned Scientists</p> <p>Dr John Williams, Wentworth Group of Concerned Scientists</p> <p>Mr Mike Grundy, CSIRO</p> <p>Dr Richard Davis, Wentworth Group of Concerned Scientists</p> <p>Dr Richard Mount, Bureau of Meteorology</p> <p>Dr Richard Thackway, University of Queensland</p> <p>Dr Ronnie Harding, Wentworth Group of Concerned Scientists</p> <p>Dr Terry Hillman, Wentworth Group of Concerned Scientists</p> <p>Dr Tony Smith, CSIRO</p>
<b>Regional Environmental Accounts Steering Committee</b>	
<ul style="list-style-type: none"><li>• Assist in managing trial implementation in each of the regions</li></ul>	<p>Max Kitchell, NRM Regions Australia Convenor, Convenor of Steering Committee</p> <p>Chris King, Presiding Member, Northern Agricultural Catchments Council</p> <p>Heather Baldock, Presiding Member, Natural Resources Eyre Peninsula</p> <p>John Bethel , Chair, Northern Gulf RMG</p> <p>Royce Bishop, Chair, Reef Catchments</p> <p>Danny O'Neill, Executive Officer, NRM Regions Australia</p>
<b>Regional Environmental Accounts Working Group</b>	
<ul style="list-style-type: none"><li>• Test the <i>Accounting for Nature</i> model at the regional scale and construct regional environmental asset condition accounts</li></ul>	<p>Andrew Baldwin, NRM North</p> <p>Annie Lane, Natural Resources Eyre Peninsula</p> <p>Anthony Greenhalgh, Central West Catchment Management Authority</p> <p>Bronwyn Cameron, Namoi Catchment Management Authority</p> <p>Bruce Brown, Namoi Catchment Management Authority</p>



	<p>Carolyn Raine, Central West Catchment Management Authority</p> <p>Damian Wells, North Central Catchment Management Authority</p> <p>David Manning, SEQ Catchments</p> <p>Donna Smithyman, Corangamite Catchment Management Authority</p> <p>Emma Jackson, Northern Agricultural Catchments Council</p> <p>Gareth Smith, Corangamite Catchment Management Authority</p> <p>Evelyn Poole, Natural Resources Eyre Peninsula</p> <p>Francesca Andreoni, Namoi Catchment Management Authority</p> <p>Geoff Penten, Queensland Murray Darling Committee</p> <p>George Truman, Namoi Catchment Management Authority</p> <p>James McKee, NRM North</p> <p>James Shaddick, North Central Catchment Management Authority</p> <p>Jen Shearing, Central West Catchment Management Authority</p> <p>Jim McDonald, Namoi Catchment Management Authority</p> <p>Marieke Jansen, Northern Agricultural Catchments Council</p> <p>Nick McCristal, Corangamite Catchment Management Authority</p> <p>Niilo Gobius, Northern Gulf Resource Management Group</p> <p>Noel Ainsworth, SEQ Catchments</p> <p>Pam Green, Southern Rivers Catchment Management Authority</p> <p>Rebecca Kelly, NRM North</p> <p>Roxane Blackley, Queensland Murray Darling Committee</p> <p>Shelley Spriggs, Northern Agricultural Catchments Council</p> <p>Simon Warner, SEQ Catchments</p> <p>Sophie Keen, Natural Resources Eyre Peninsula</p> <p>Tim Hoogwerf, Northern Gulf Resource Management Group</p> <p>Tracey Macdonald, Central West Catchment Management Authority</p>
<b>Technical Environmental Accounting Standards Committee</b>	
<ul style="list-style-type: none"> <li>• Provide expert advice to the trial NRM regions, as the need arises</li> <li>• Develop the regional accounting framework</li> <li>• Ensure compatibility with national and international environmental accounts</li> </ul>	<p>Peter Greig, Convenor of Technical Environmental Accounting Standards Committee</p> <p>Andre Zerger, Bureau of Meteorology</p> <p>Belinda Allison, Bureau of Meteorology</p> <p>Bill Allen, Australian Bureau of Statistics</p> <p>Jane McDonald, University of Queensland</p>

	<p>Jessica Hasker Bowman, VIC Department of Environment and Primary Industries</p> <p>Joselito Chua, VIC Department of Environment and Primary Industries</p> <p>Mark Eigenraam, VIC Department of Environment and Primary Industries</p> <p>Mark Lound, Australian Bureau of Statistics</p> <p>Michael Vardon, Australian Bureau of Statistics</p> <p>Neil Byron, Wentworth Group of Concerned Scientists</p> <p>Phil Tickle, CRC for Spatial Information</p> <p>Rob Sturgiss, Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education</p> <p>Warwick McDonald, Australian Bureau of Meteorology</p>
<b>Expert Panels and Additional Support</b>	
<ul style="list-style-type: none"> <li>Provide expertise to regions in constructing regional Environmental Asset Condition Accounts</li> </ul>	<p>Alan Anderson, CSIRO</p> <p>Andrew Biggs, QLD Department of Natural Resources and Mines</p> <p>Andrew Cadogan-Cowper, Australian Bureau of Statistics</p> <p>Andrew Houley, Reef Catchments</p> <p>Annelise Wiebkin, SA Department of Environment, Water and Natural Resources</p> <p>Annie Kelly, QLD Herbarium</p> <p>Ayesha Tulloch, University of Queensland</p> <p>Bob Walker, Queensland Murray-Darling Committee</p> <p>Brad Page, SA Department of Environment, Water and Natural Resources</p> <p>Brian Foster, Natural Resources Eyre Peninsula SA Department of Environment, Water and Natural Resources</p> <p>Bruce Wilson, QLD Herbarium</p> <p>Cecilia Woolford, Natural Resources Eyre Peninsula SA Department of Environment, Water and Natural Resources</p> <p>Dave Pongracz, WA Department of Parks and Wildlife</p> <p>Diane Allen, QLD Department of Science, Information Technology, Innovation and the Arts</p> <p>Eva Abal, University of Queensland</p> <p>Fiona McKenzie, Wentworth Group of Concerned Scientists</p> <p>Garry Cook, CSIRO</p> <p>Gary Stoneham, Victorian Department of Treasury and Finance</p> <p>Greg Keighery, WA Department of Parks and Wildlife</p> <p>Ian Overton, CSIRO</p>

	<p>Jeff Baldock, CSIRO</p> <p>Jeremy Russell-Smith, NAILSMA</p> <p>John Neldner, QLD Herbarium</p> <p>Judy Henderson, Northern Rivers Catchment Management Authority</p> <p>Kate Clarke, Natural Resources Eyre Peninsula SA Department of Environment, Water and Natural Resources</p> <p>Mark Silburn, QLD Department of Natural Resources and Mines</p> <p>Paul Grimshaw, QLD Herbarium</p> <p>Peter Thompson, Cape York Sustainable Futures</p> <p>Peter Young, QLD Herbarium</p> <p>Ram Dalal, QLD Department of Science, Information Technology, Innovation and the Arts</p> <p>Science Knowledge Unit, SA Department of Environment, Water and Natural Resources</p> <p>Steve Murphy, Australian Wildlife Conservancy</p> <p>Tim Ryan, QLD Herbarium</p>
<b>Wentworth Group of Concerned Scientists</b>	
Support regions and committees in development of Trial process and provide resource material	<p>Prof David Karoly, Member</p> <p>Prof Lesley Hughes, Member</p> <p>Mr Rob Purves, Member</p> <p>Prof Tim Flannery, Member</p> <p>Bradley Tucker, Secretariat</p> <p>Carla Sbrocchi, Secretariat, Environmental Accounts Implementation</p> <p>Carley Bartlett, Secretariat</p> <p>Caroline McFarlane, Secretariat</p> <p>Celine Steinfeld, Secretariat</p> <p>Claire Parkes, Secretariat, Accreditation Advisor</p> <p>Emma McIntosh, Secretariat</p> <p>Paula Steyer, Secretariat</p> <p>Tim Stubbs, Secretariat</p>

## 6 Appendix 2: Logic Model & Evaluation Questions

The Logic Model underpinned the evaluation by highlighting key relationships and guided the development of the evaluation questions (Table 10).

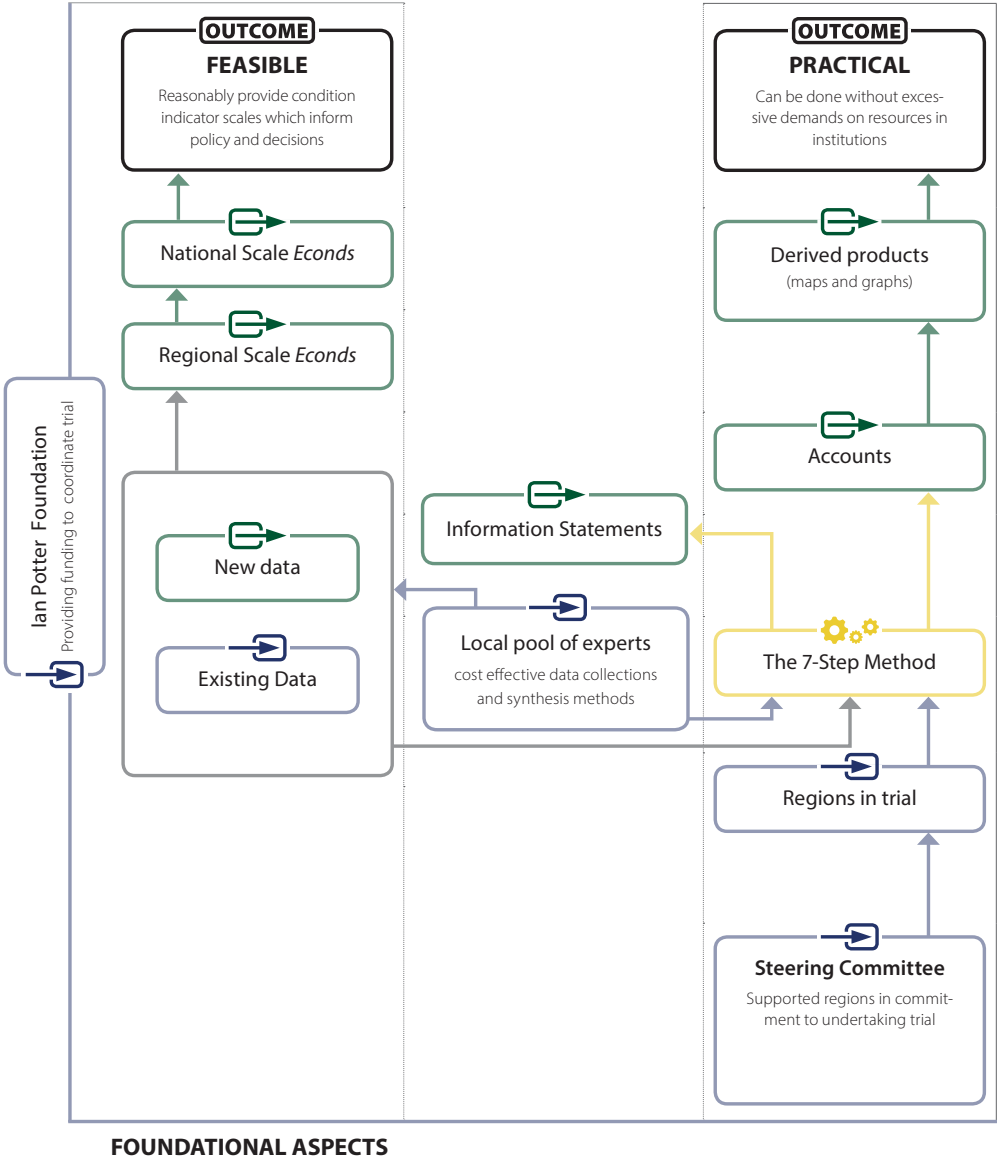
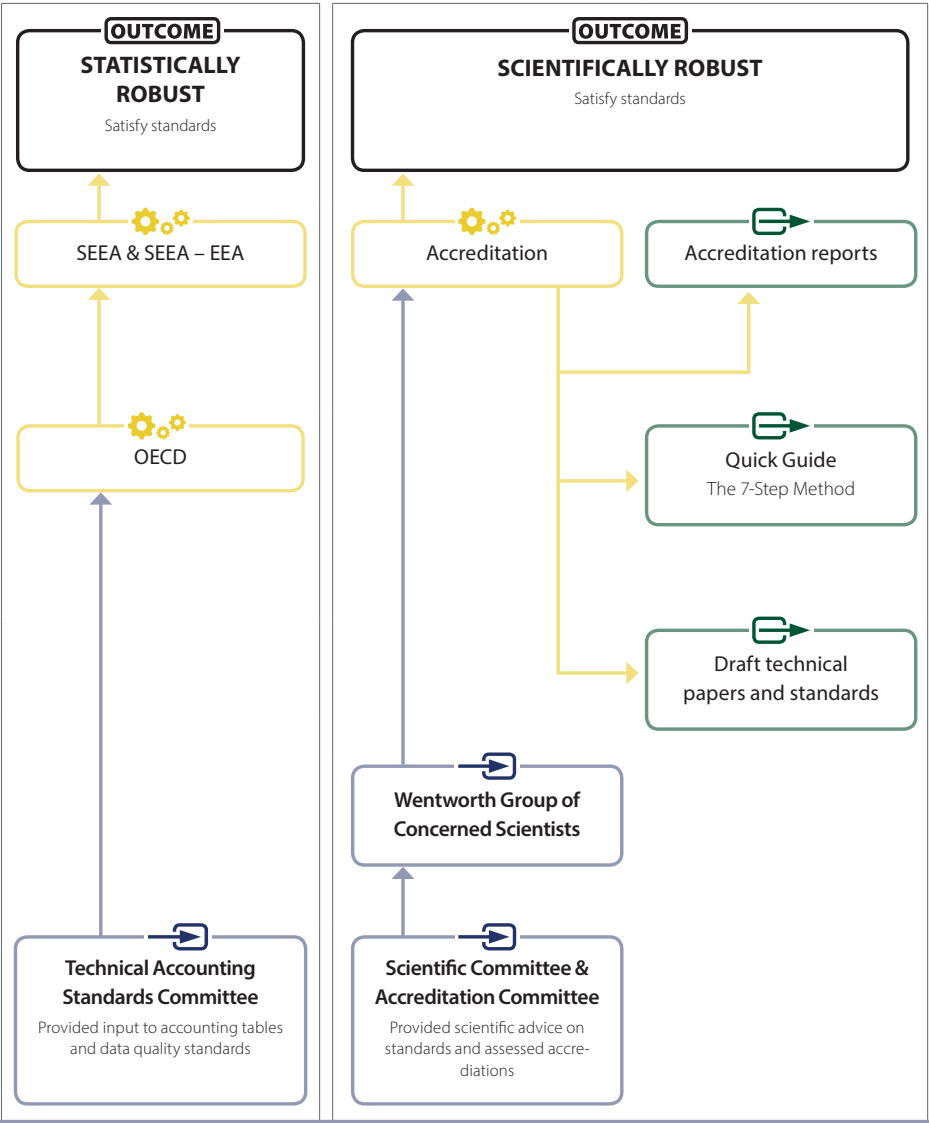


Figure 20: Logic model underpinning evaluation of the regional environmental accounts trial.



Regional Body Basis

- Fixed
- 54 across Australia

Accounting for Nature Model

- Accounts
- Assets
- Quantity and quality = *Econd*

Legend

- Process
- Output
- Input

Table 10: Evaluation questions, Proof of Concept Trial.

PRIMARY QUESTION	QUESTION SET	SOURCE OF EVIDENCE	SECTION QUESTIONS INFORM
Feasible – is it logically possible?	<ol style="list-style-type: none"> <li>1. Can it be done with assumed ‘no funding’ and ‘existing data’?</li> <li>2. What can be done now, what can be done with some known level of work and what is unknown/requires more study?</li> <li>3. Is it possible to compare <b>Econd</b> comprised of different indicators?</li> <li>4. Is it possible to aggregate <b>Econds</b> at regional scale to national scale?</li> <li>5. Does the general framework (Seven Step model) make sense?</li> <li>6. Are measurements scalable?</li> <li>7. Did environmental accounts at regional scale enable contributions from others (outside of region)?</li> </ol>	<p>Answered through Accreditation Reports regarding issues of indicator comparability and scalability of indices</p> <p>Committee and Policy Analyst responses on the application of the general framework</p>	<p>3.1.1</p> <p>3.2.1</p> <p>3.2.4</p> <p>3.2.5</p> <p>3.2.6</p>
Practical – can it be done cost-effectively and without excessive burdens?	<ol style="list-style-type: none"> <li>8. What would be the appropriate coordination structure? In what areas?</li> <li>9. How will the roll-out be resourced and staffed?</li> <li>10. What is the time-frame that is practical for repeating the measures?</li> <li>11. What are the skill and capability needs at scale?</li> <li>12. How did Trial processes inform national approach?</li> <li>13. Did various institutional arrangements affect application of <i>Accounting for Nature</i>?</li> <li>14. How did the various documentations develop? Was this useful? How did they help to inform the approach?</li> </ol>	<p>Answered through committee and Policy Analyst responses to coordination/capability, Accreditation Reports, committee responses regarding suitability of existing data or collection of primary data, Policy Analyst and Committee responses on the utility of framework and processes/systems</p>	<p>3.1.2</p> <p>3.2.2</p> <p>3.2.3</p> <p>3.2.4</p> <p>3.2.5</p> <p>3.2.6</p>

	15. What did a test of the practical and technical implications for constructing a set of accounts where there is great diversity within and across assets reveal?		
Robust – are the measures credible and how can credibility be demonstrated?	16. How is credibility generated for the measures? 17. What level of assurance is given to the actual (tested) measures? 18. Are different levels of credibility required for different purposes? 19. Are the measures sufficient for decision making purposes? 20. How do derived products support the analysis of 'credibility'?	Answered through derived products (maps and graphs), accreditation reports, and committee responses to processes	3.1.3 3.2.1 3.2.3 3.2.4 3.2.5 3.2.6

## 7 Appendix 3: Evaluation Questions Relating to the Application of the Seven Step Process

These questions form the basis of the Technical Evaluation (Sbrocchi *et al.* in prep) and are listed here for reference purposes.

The broad evaluation question (A) is underpinned by six additional questions (1-6).

Table 11: Evaluation questions relating to the application of the Seven Step process.

KEY QUESTION	QUESTION SET	SOURCE OF EVIDENCE
A. Does <i>Accounting for Nature</i> , as tested in the Proof of Concept Trial, enable the understanding of change in condition in environmental assets?	<ol style="list-style-type: none"><li>1. Was there sufficient information to understand change in condition?</li><li>2. How were changes in condition captured?</li><li>3. How meaningful are the results provided by application of the method to decision making?</li></ol>	Regional proof of concept accounts; Accreditation reports
1. Can indicators that vary between regions be used for environmental accounting?	<ol style="list-style-type: none"><li>4. What is the relationship between the assets that communities strongly value and ecological significance? Did the assets represent social significance to stakeholders?</li><li>5. Did the assets represent environmental significance?</li><li>6. How effective was the selection process to linking environment to decision making?</li><li>7. Are the assets in the trial adequate for describing the condition of national assets?</li><li>8. Was this change in condition captured for all assets?</li></ol>	Regional proof of concept accounts; Regional information statements; Accreditation reports
2. How necessary is it for measurements of condition to be based on specified reference condition benchmarks in order to compare the relative condition of assets?	<ol style="list-style-type: none"><li>9. How did indicators vary between regions?</li><li>10. Are standards necessary?</li><li>11. Were standards already established?</li><li>12. Were standards established as part of this Trial?</li><li>13. How did indicators stack up against the standards?</li></ol>	Regional proof of concept accounts; Accreditation reports



3. Was existing data sufficient for this purpose?	<p>14. To what degree was it possible to construe these specified reference benchmarks?</p> <p>15. To what degree was it necessary to use this specified reference benchmark to measure condition?</p> <p>16. To what degree was it necessary to use this specified reference benchmark to compare the relative condition of assets?</p>	Regional proof of concept accounts; Accreditation reports
4. Index construction	<p>17. Did the data in its raw form enable this understanding?</p> <p>18. If not, what transformations of the data had to occur to enable this understanding?</p> <p>19. What were the data gaps?</p> <p>20. Where do we need to harmonise data collection?</p> <p>21. Were some data too difficult to collect in a timely/cost-effective way?</p> <p>22. What were the pros and cons of primary data collection? Could we do more of this?</p>	Regional proof of concept accounts; Regional information statements; Accreditation reports
5. Was the validation process sufficient?	<p>23. Is the method as described sufficient to apply universally?</p> <p>24. How did index construction vary between regions and assets?</p> <p>25. Are processes required to make this process more transparent or effective?</p> <p>26. Evaluate application of <i>Econds</i> at different scales</p>	Regional proof of concept accounts; Regional information statements; Accreditation reports
6. Was the validation process sufficient?	<p>27. Were the criteria sufficient to evaluate accounts?</p> <p>28. Were the processes sufficient to evaluation accounts?</p> <p>29. Are the descriptions of validation sufficient to communicate credibility to community (scientific and regional)?</p>	Accreditation processes; Accreditation reports

## 8 References

- Australian Bureau of Statistics. (2005) Australian System of National Accounts. Australian Bureau of Statistics, Canberra.
- Australian Bureau of Statistics. (2014a) Australian Environmental-Economic Accounts. Australian Bureau of Statistics, Canberra.
- Australian Bureau of Statistics. (2014b) Towards an Environmental Expenditure Account, Australia. Australian Bureau of Statistics, Canberra.
- Australian Government Environmental Information Advisory Group. (2012) Statement of Australian Government Requirements for Environmental Information. Bureau of Meteorology, Canberra.
- Australian State of the Environment Committee. (2001) State of the Environment Report 2001: Independent Report to the Commonwealth Minister for the Environment and Heritage. Department of the Environment and Heritage, Canberra.
- Beeton R., Buckley K. I., Jones G. J., Morgan D., Reichelt R. E. & Trewin D. (2006) Australia State of the Environment 2006, Independent report to the Australian Government Minister for the Environment and Heritage. Department of the Environment and Heritage, Canberra.
- Bennett A. & Ford L. (1997) Land use, habitat change and the conservation of birds in fragmented rural environments: a landscape perspective from the Northern Plains, Victoria, Australia. *Pacific Conservation Biology* 3, 244–61.
- Bennett A. & Radford J. (2004) Landscape thresholds for the conservation of biodiversity in rural environments. Land & Water Australia, Canberra.
- Bunn S. E., Abal E. G., Smith M. J., Choy S. C., Fellows C. S., Harch B. D., Kennard M. J. & Sheldon F. (2010) Integration of science and monitoring of river ecosystem health to guide investments in catchment protection and rehabilitation. *Freshwater Biology* 55, 223–40.
- Bureau of Meteorology. (2013a) The Environmental Accounts Landscape. Bureau of Meteorology, Canberra.
- Bureau of Meteorology. (2013b) Guide to environmental accounting in Australia. p. 122. Bureau of Meteorology, Canberra.
- Bureau of Meteorology. (2014a) National Water Account. <http://www.bom.gov.au/water/nwa/>
- Bureau of Meteorology. (2014b) Water Accounting Standards Board. Australian Government. <http://www.bom.gov.au/water/standards/wasb/>
- Campbell A. (2006) The Australian Natural Resource Management Knowledge System. Land & Water Australia, Australian Government.
- Cosier P. (2011) Accounting for the Condition of Environmental Assets. In: Expert meeting on Ecosystem Accounts, London.
- Cosier P. (2012) Environmental Asset Condition Account Trials in Australia. In: Towards Linking Ecosystems and Ecosystem Services to Economic and Human Activity. United Nations Statistics Division, New York.
- Cosier P. & McDonald J. (2010) A common currency for building environmental (ecosystem) accounts. In: 16th Meeting of the London Group on Environmental Accounting.
- Cosier P. & Sbocchi C. (2012) Trials of Environmental Asset Condition Accounts in Australia. In: Seventh Meeting UN Committee of Experts on Environmental-Economic Accounting. United Nations Statistics Division, Instituto Brasileiro de Geografia e Estatística, Rio de Janeiro.
- Costanza R., d'Arge R., de Groot R., Farber S., Grasso M., Hannon B., Limburg K., Naeem S., O'Neill R. V., Paruelo J., Raskin R. G., Sutton P. & van den Belt M. (1997) The value of the world's ecosystem services and natural capital. *Nature* 387, 253–60.
- Costanza R. & Mageau M. (1999) What is a Healthy Ecosystem? *Aquatic Ecology* 33, 105–15.

- CSIRO. (2001) *Natural Assets: An Inventory of Ecosystem Goods and Services in the Goulburn Broken Catchment*. CSIRO, Canberra.
- Dalmazzone S. & La Notte A. (2009) Environmental accounting at different levels of government: the state of the art. In: *Governing the Environment: Salient Institutional Issues* (eds A. Breton, G. Brosio, S. Dalmazzone and G. Garrone) pp. 266-91. Edward Elgar Publishing, Gloucestershire, UK.
- Dalmazzone S. & La Notte A. (2013) Multi-scale environmental accounting: methodological lessons from the application of NAMEA at sub-national levels. *J Environ Manage* 130, 405-16.
- Davies P, Stewardson M., Hillman T., Roberts J. & Thoms M. (2012) *Sustainable Rivers Audit 2: The ecological health of rivers in the Murray–Darling Basin at the end of the Millennium Drought(2008–2010)*. Volume 1. Murray-Darling Basin Authority, Canberra, ACT.
- Eigenraam M., Chua J. & Hasker J. (2013) *Environmental-Economic Accounting: Victorian Experimental Ecosystem Accounts, Version 1.0*. Department of Sustainability and Environment, Melbourne.
- Fahrig L. (2003) Effects of habitat fragmentation on biodiversity. *Annual Review of Ecology Evolution and Systematics* 34, 487-515.
- Funnell S. C. & Rogers P. J. (2011) *Purposeful Program Theory: Effective Use of Theories of Change and Logic Models*. John Wiley and Sons, Inc., San Francisco.
- GHD. (2012) *Review of Regional Natural Resource Management Plans*. Final Report prepared for the National NRM Working Group.
- Gorecki S., Gruen D. & Johnson S. (2011) *Measuring wellbeing in theory and practice*. In: Working paper 2011-02. Treasury, Canberra, Australia.
- Government of Western Australia. (2014) *Government's Commitment [sic]*. <http://programevaluation.wa.gov.au/About/The-Government-s-Commitment-to-Program-Evaluation>
- HM Treasury. (2011) *The Magenta Book: Guidance for Evaluation*. (ed H. Treasury). Crown, London.
- IPCC. (2013) *Procedures for the preparation, review, acceptance, adoption, approval and publication of IPCC reports*. In: Appendix A to the Principles Governing IPCC Work, Adopted at the Fifteenth Session (San Jose, 15-18 April 1999) and amended the Thirty-Seventh Session (Batumi, 14-18 October 2013).
- Millennium Ecosystem Assessment. (2005) *Ecosystems and Human Well-being: Multiscale Assessments*. In: The Millennium Ecosystem Assessment Series. Island Press, Washington DC.
- Moldan B., Hák T., Kovanda J., Havránek M. & Kušková P. (2004) *Composite Indicators of Environmental Sustainability*. In: Statistics, Knowledge and Policy: OECD World Forum on Key Indicators, Palermo.
- Natural Resources Commission. (2010) *Progress towards healthy resilient landscapes: Implementing the standard, targets and catchment action plans*. Natural Resources Commission, Sydney.
- NRM Regions Australia. (2013) *National Chairs Forum Survey Results*. National NRM Regions Working Group, Mandurah, WA.
- NRM Regions Australia. (2014) *National Chairs Forum – Commitments*. NRM Regions Australia, Launceston.
- NSW Government. (2013) *NSW Government Evaluation Framework*. NSW Government, Sydney.
- Organisation for Economic Co-Operation and Development. (2008) *Handbook on Constructing Composite Indicators: Methodology and User Guide*. OECD Publishing, Paris, France.
- Radford J., Bennett A. & Cheers G. (2005) Landscape-level thresholds of habitat cover for woodland-dependent birds. *Biological Conservation* 124, 317-37.
- Rio Declaration on Environment and Development. (1992). United Nations Conference on Environment and Development, Rio de Janeiro. UN Doc. A/CONF.151/26 (vol. I) / 31 ILM 874 (1992).
- Rogers P. (2013) 52 weeks of BetterEvaluation: Week 3: Q & A about drawing logic models. BetterEvaluation. [http://betterevaluation.org/blog/drawing\\_logic\\_models](http://betterevaluation.org/blog/drawing_logic_models)

- Saisana M., Tarantola S. & Group) A. S. (2002) State-of-the-Art Report on Current Methodologies and Practices for Composite Indicator Development. European Commission Joint Research Centre, Institute for the Protection and the Security of the Citizen Technological and Economic Risk Management Unit, Italy.
- Sbrocchi C. (2013) Guidelines for Constructing Regional Environmental (Asset Condition) Accounts: *Quick Guide*. Wentworth Group of Concerned Scientists, Sydney.
- Sbrocchi C. (2014) Multiscale Environmental Asset Condition Accounts for Australia. In: 20th Meeting of the London Group on Environmental Accounting. United Nations Statistics Division, New Delhi, India.
- Sbrocchi C., Cosier P., Davis R., Grundy M., Harding R., Hillman T., Mount R., Possingham H., Saunders D. A., Smith T., Thackway R., Thom B. & Williams J. (in prep) Evaluation of the Australian regional environmental accounts trial. in prep.
- State of the Environment Advisory Council 1996. (1996) Australia state of the environment 1996. Independent report to the Commonwealth Minister for the Environment. Department of the Environment, Sport and Territories, Canberra.
- State of the Environment Committee. (2011) Australia state of the environment 2011. Independent report to the Australian Government Minister for Sustainability, Environment, Water, Population and Communities. DSEWPac, Canberra.
- Stiglitz J. E., Sen A. & Fitoussi J.-P. (2009) Report by the Commission on the Measurement of Economic and Social Progress. European Union.
- Stoddard J. L., Larsen D. P., Hawkins C. P., Johnson R. K. & Norris R. H. (2006) Setting expectations for the ecological condition of streams: the concept of reference condition. *Ecological applications* : a publication of the Ecological Society of America 16, 1267-76.
- Sukhdev P., Wittmer H., Schröter-Schlaack C., Nesshöver C., Bishop J., ten Brink P., Gundimeda H., Kumar P. & Simmons B. (2010) The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB. United Nations Environment Programme, Malta.
- Thackway R. (2012) Wooroonooran Nature Refuge, QLD. Ver.1. VAST-2: Tracking the Transformation of Australia's Vegetated Landscapes. Australian Centre for Ecological Analysis and Synthesis, University of Queensland, Brisbane.
- Tierney G. L., Faber-Langendoen D., Mitchell B. R., Shriver W. G. & Gibbs J. P. (2009) Monitoring and evaluating the ecological integrity of forest ecosystems. *Frontiers in Ecology and the Environment* 7, 308-16.
- United Nations, European Commission, Food and Agriculture Organization, International Monetary Fund, Organisation for Economic Cooperation and Development & World Bank. (2012) System of Environmental-Economic Accounting Central Framework. United Nations Statistics Division.
- United Nations, European Commission, Organisation for Economic Co-operation and Development & World Bank. (2013) System of Environmental-Economic Accounting Experimental Ecosystem Accounting.
- Weber J.-L. (2011) An experimental framework for ecosystem capital accounting in Europe. In: EEA Technical Report, . European Environment Agency.
- Weber J.-L. (2014) Ecosystem Natural Capital Accounts: A Quick Start Package for implementing the SEEA Experimental Ecosystem Accounts. In: *Ecosystems and Biodiversity in National Accounting*. Secretariat of the Convention on Biological Diversity.
- Wentworth Group of Concerned Scientists. (2008) *Accounting for Nature: A Model for Building the National Environmental Accounts of Australia*. Wentworth Group of Concerned Scientists, Sydney.
- Wentworth Group of Concerned Scientists. (2014) *Blueprint for a Healthy Environment and a Productive Economy*. Wentworth Group of Concerned Scientists, Sydney.
- Wentworth Group of Concerned Scientists. (in prep) *Applications of Environmental Asset Condition Accounts*.
- Williams J., Read C., Norton T., Dovers S., Burgman M., Proctor W. & Anderson H. (2001) Biodiversity Theme Report. Independent Report to the Commonwealth Minister for the Environment and Heritage. In: *Australia State of the Environment Report 2001*. CSIRO on behalf of the Department of the Environment and Heritage, Canberra.

## Summary of Figures

- Figure 1: Environmental assets comprise the physical form of both ecosystems and other natural resources which provide goods and ecosystem services (adapted from CSIRO 2001).
- Figure 2: Ten NRM regions (dark grey areas) tested *Accounting for Nature* as part of the Proof of Concept Trial, but also covered some assets in adjoining regions (light grey areas).
- Figure 3: The Seven Steps for constructing environmental asset condition accounts (Sbrocchi 2013).
- Figure 4: The features of an environmental asset condition account. The boxes in BLUE indicate the relevant step for constructing an environmental asset condition account, outlined in the *Quick Guide* (Sbrocchi 2013).
- Figure 5: Environmental accounting initiatives vary in focus relating to the subject of the account (either assets or ecosystem services), and the type of measure (physical or monetary; depletion or degradation). *Accounting for Nature* focusses on the physical and ongoing measures of environmental assets as inputs into decision making.
- Figure 6: Condition of native vegetation for six NRM regions.
- Figure 7: Integrating **Econds** for native vegetation and rivers produced a spatial map which can be used for prioritisation of management and investment in the NRM region.
- Figure 8: Roles of committees in the Proof of Concept Trial.
- Figure 9: Processes involved in asset condition accounting. Local and regional scientists could provide more input into designing monitoring/assessment programs which provide input to the accounts, interpretation and reporting support and assist with setting appropriate management actions and policy targets.
- Figure 10: Relative condition of native vegetation amongst trial regions.
- Figure 11: Native vegetation **Econds**, Northern Agricultural Catchments Council, WA, Proof of Concept Accounts.
- Figure 12: Condition of native vegetation in six regions, Proof of Concept Accounts.
- Figure 13: Spatially distributed condition of native vegetation for six regions, Proof of Concept Accounts.
- Figure 14: Condition of native vegetation, Natural Resources Eyre Peninsula, Proof of Concept Accounts.
- Figure 15: **Econds** and Indicator Condition Scores for native vegetation in Eyre Peninsula, SA. Proof of Concept Accounts. **Econds** are shown by red bars, extent scores in green, composition scores in yellow and configuration scores in blue.
- Figure 16: Weed severity and intensity as a pressure on native vegetation, Eyre Peninsula, SA. Proof of Concept accounts.
- Figure 17: Trend in condition of estuaries in South East Queensland, SEQ Catchments, Proof of Concept Accounts.
- Figure 18: Central West, NSW – Trend in native vegetation extent.
- Figure 19: Condition change in native vegetation at Wooroonooran Nature Reserve, QLD, 1750-2010. Image courtesy of Richard Thackway (Thackway 2012).
- Figure 20: Logic model underpinning evaluation of the regional environmental accounts trial.

Summary of Tables

- Table 1: Assets submitted by regions for the Proof of Concept Trial.
- Table 2: Products developed during the trial. Products available through two websites (NRM Regions Australia ([www.nrmregionsaustralia.com.au](http://www.nrmregionsaustralia.com.au)) and Wentworth Group of Concerned Scientists ([www.wentworthgroup.org](http://www.wentworthgroup.org))).
- Table 3: Comparison of methodological framework for composite indicators using *Accounting for Nature's Seven Step Standard* and the OECD Decalogue for composite indicator construction.
- Table 4: Draft accreditation standard for native vegetation condition indicators and data quality.
- Table 5: Resources required to implement environmental asset condition accounts. These costs include program implementation but do not include monitoring activities (resource condition assessments).
- Table 6: Summary table of native vegetation *Econds*.
- Table 7: Asset table for native vegetation, Northern Agricultural Catchments Council, WA. Proof of Concept Accounts (excerpt).
- Table 8: Estuaries asset table, SEQ Catchments, QLD. Proof of Concept Accounts (excerpt).
- Table 9: Roles and membership of parties in the trial. All organisational titles correct at time of contribution.
- Table 10: Evaluation questions, Proof of Concept Trial.
- Table 11: Evaluation questions relating to the application of the Seven Step process.



