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Trials of Asset Condition Accounts in Australia

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1. Introduction

Thank you for the opportunity to present to you some of the findings from the first year of our trials of asset condition accounts across Australia, and to give you some examples of how scientifically robust asset condition accounts can be used to inform economic decisions.

These trials are testing the practical application of a scientifically robust model that places a non-monetary measure of the condition of any environmental asset, that can be applied at scale, which can inform economic decisions.

2. Why do we need to measure condition ?

Firstly let me address the question why do we need to measure the condition of environmental assets, and then describe the benefits of a common unit of measure of condition that we are using in these regional trials.

So let me start by going back to first principles: why we are constructing SEEA.

Since 1970 the size of the world economy has more than trebled. Over the next 40 years global GDP is projected to almost quadruple, despite the recent recession.

That's a seven fold increase in GDP in the lifetime of one human being.

While economic growth has pulled millions out of poverty, it has incurred significant costs to the environment. According to the Millennium Assessment, human impacts on the environment are now approaching (and in many cases have already exceeded) the ability of biophysical systems to meet future demands on them.[1]

In its most recent *Outlook* report, the OECD warn that "providing for a further 2 billion (people) by 2050 and improving the living standards for all, will challenge our ability to manage and restore those natural assets on which all life depends", and that without new policies, continued degradation of natural capital risks irreversible changes that could endanger two centuries of rising living standards.[2]

If humanity is to live within the biophysical limits of nature, we need to develop policy responses which decouple economic growth from those activities which lead to ongoing damage to the natural environment.

This requires policies and economic tools that both enable society to increase economic efficiency in the use of natural resources, and that maintain environmental assets, including ecosystems, in a healthy condition indefinitely.

We need to measure the quantity of physical natural resources and their economic value so that we know how efficiently they are being used and how economic activity affects the stocks of those assets. We must also be able to measure the impact economic activity is having on the condition of the natural environment from which these resources are being extracted.

There is some evidence of a natural decoupling in recent decades as some economies transition from primary and secondary industries into the services sector, but even this research suggests that exponential economic growth is still accompanied by a significant increase in the absolute level of resource use.[3]

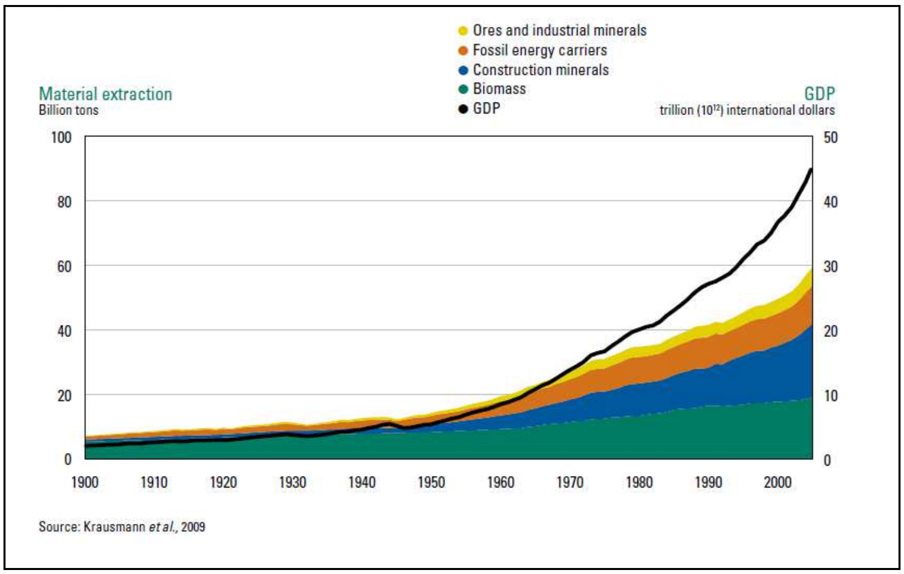


Figure 1 - Global GDP and Global Material Extraction, 1900-2005 [9]

There are many parallels between economic accounts and environmental accounts but there is one important difference. Economic policy is focused on improving living standards by continually expanding the value of the flows of good and services, whereas environmental policy is about maintaining the stock (condition) of natural capital, including ecosystems, so that they continue to provide services to humanity into the future.

Decoupling economic growth from on-going damage to ecosystems therefore requires policies and economic tools that both increase the economic efficiency in the use of natural resources, and that maintain environmental assets in a healthy condition indefinitely.

If development is to be sustainable we need economic tools that both enables society to increase economic efficiency in the use of natural resources, and that maintains the environment in a condition that can continue to provide goods and services to humanity, indefinitely into the future.

SEEA has made significant steps forward in providing a framework for measuring physical quantities of resources so that they can better inform economic decisions, but the core challenge of environmental accounting, to measure the condition of environmental assets, remains elusive.

There can be no other definition of sustainable development.

We must be able to measure the impact economic activity is having on the condition of the natural environment from which these resources are being extracted and to which wastes are being added.

If you don't measure it, you can't manage it.

Decoupling economic growth from environmental degradation is a phenomenally difficult challenge, made all the more difficult, because we do not have the information systems that measure the condition of our environmental assets at scales which can inform economic decisions.

To assess degradation you need to measure condition.

Carl recently quoted Paul Samuelson that national accounts are one of the great inventions of the 20th century. If that is true, then I have no doubt that environmental accounts have the potential to be one of the great inventions of the 21st century.

3. The measure of condition needs to be scientifically credible

Accounting for the condition of environmental assets must confront two problems: first we do not have, nor will we ever have, enough money to systematically measure everything in nature; and secondly without a common unit of measure that places diverse scientific information into an accounting framework, it is not possible to link the health of the natural environment to economic decision making.

Unlike the SNA, there is no agreed common unit of measure for the condition of environmental assets.

One of the more challenging elements of the Australian trials, is establishing a scientifically credible common unit of measure of condition, using the science of reference condition benchmarking.

There are many practical and scientific reasons for using this model. It does however, present a couple of significant challenges for SEEA.

Firstly, in most instances you will need to construct indices of a number of physical indicators to give a scientifically valid measure of the condition of an ecosystem.

Secondly, if you don't use a common unit of measure the accounts can't then be used to direct investments across asset boundaries.

And thirdly, for the vast majority of ecosystems, the use of a 'natural' benchmark is how science already measures condition. Water quality and biodiversity conservation are the notable examples.

So for all these reasons and more, if it proves scientifically valid to do so, then in makes great sense to adopt this common unit of measure for the condition of all assets. And that is what our proof of concept trials are seeking to test.

This has three implications for the SEEA accounts.

Firstly, it is not possible to avoid using indices to give an accurate measure of the condition of an indicator.

If you don't you won't be able to construct accounts that are a valid scientific measure of condition. What you are left with are physical measures of elements of an ecosystem. That is not a measure of condition.

This presents a significant challenge for SEEA because it seeks to replicate the structure of the SNA. But it is unavoidable if you wish to create an asset condition account.

This then raises the question, who then accredits the indices before they enter the asset condition accounts? If you don't do this, then the accounts won't represent a valid indicator of condition, and practitioners and policy makers simply won't use them.

This is where you need science, so somehow I believe SEEA needs to provide a process by which this happens.

We then need to address the question of aggregation within each asset, because different regions, or states will, by necessity, both financial and scientific, use different indicators to measure the condition of the same asset. I will give you an example of this in a minute.

In other words, we need to find a means by which science is given a formal role in the accreditation process.

The third implication for SEEA is the issue of comparing across asset types - comparing a river ecosystem with a forest ecosystem. I think this is the area that has most people concerned, and whether or not that's formally structured into Part 2, doesn't particularly worry me.

It also seems to me that this issue is getting mixed up with the first two points - and maybe for that reason, we should move this issue of summary tables to Part 3. I don't know. How far can we reasonably aggregate across asset types for them to still be meaningful? I don't know. That’s part of the test of the trials.

I don't think it matters where this goes, because if you accept the value proposition in the first and second points, the need to use indices and the need to use different indicators is different landscapes for the same ecosystem, then the accounts already provide that information for this to be done anyway.

I will give you an example of how these 'summary' tables can be a useful information tool.

Let me turn specifically to the issue of establishing a reference from which to base the condition measure.

There is a world of science sitting behind reference condition benchmarking, which I will not go into today, but if you are interested, we can provide it for you.

The reference condition benchmark is a scientific estimate of the natural or potential condition of an ecosystem in the absence of significant, post industrial human alteration.

The current condition of an asset is compared against the reference condition benchmark. This gives us a relative condition of any environmental asset, at any scale, irrespective of the unit of measure of each indicator, out of a possible score of 100.

Reference condition does not have to mean a pre-industrial benchmark date, although that is often the most convenient way to describe it - another option is to measure an area in an undisturbed condition - what science calls a reference site, another option is for science to simply estimate this biophysical condition using models.

That's the technical description, which works fine for scientists, but to non experts, they seem to focus on a pre-industrial date, and then worry that the accounts imply or will be assumed to be describing targets instead of simply being a measure of condition.

I am very aware that this is a real issue and it needs to be resolved. Reference condition does not imply a policy objective or target. It is therefore critical that we make this abundantly clear in the text.

So me try and ground this in reality. Picture an environmental asset - say a river. Somewhere within the national boundary there will be a river in pristine or near pristine condition - in the mountains, in a national park, wherever. Or certainly parts of a river at the scale we are accounting for.

When you measure its condition, that sets the upper boundary for the measure of that asset in your account. That is all reference benchmarking is doing – setting the upper boundary for a measure of condition.

It really doesn't matter if we have variations at the margin, what is important, and this is where the value lies for environmental accounting, is that in the same way monetary currencies convert infinite complexity into an easily understood and usable means of exchange, so too does a common unit of measure for the condition of environmental assets.

Science does all that work for you, before the information is put into the accounts.

One of the other benefits of establishing a common unit of measure of condition is a fundamentally important issue that often gets lost in these national processes, and that is that environmental accounts need to inform economic decisions at all scales, not just national policy.

Millions of people, make millions of decisions every day that has an impact on the environment. They can't be expected to make better decisions without environmental information that informs their economic decisions.

I cannot over-emphasise this point.

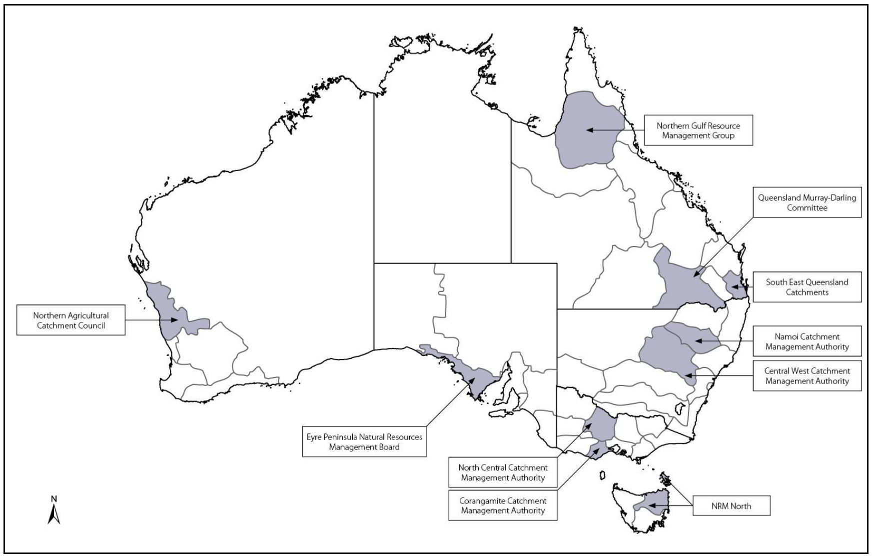
It would be absurd to suggest that every unit in the economy should establish its own measure of asset condition – every individual, every enterprise, every industry sector, every level of government. Yet that is precisely what we have today.

This is why you need a national standard based on the upper boundary ‘reference’ condition. Otherwise different people at different scales will construct accounts with different boundary conditions.

4. The Regional Environmental Accounting Trials

I would now like to take you though some of the progress we have made in Australia where regional natural resource management groups are testing the construction of environmental asset condition accounts.

If our policy objective is to 'conserve, protect and restore the health of maintain our ecosystems', then condition accounts also need to be constructed at the scale those ecosystems function – at catchment or landscape scales.



Led by the vigour of the natural resource management bodies and in partnership with the Wentworth Group and other experts from the natural resource sciences, the Ian Potter Foundation, the ABS, the BoM, CSIRO, and a number of state government agencies, we embarked on a trial using the *Accounting for Nature*[4] model developed in 2008.

We are currently in a "proof of concept" stage, which involves 10 of the 56 regional bodies that cover the Australian continent. We are half way through this stage with the aim to complete by the end of this year.

These 10 regions cover a wide variety of landscapes across the 7.5 million square kilometres of our country. Each of the regions in our trial varies in its technical capacity, its resourcing capabilities, its data sources, and its organisational arrangements. It's one thing to test a methodology in the most highly resourced regions or agencies; the real test is whether the least resourced, most data poor regions can.

We have established two expert committees to assist with the trials: a Scientific Standards and Accreditation Committee to accredit the science, and a Technical Accounting committee to ensure the information fits within an appropriate environmental-economic accounting framework.

In the past 12 months, the committees have focussed on developing a set of resources that provide advice and structure to constructing the accounts: 'Guidelines' which set out a 6 step process for constructing the condition accounts, an 'Accreditation Manual', which sets the standards for their accreditation and "Technical papers" which explore some of the more challenging scientific aspects of determining Econds for some environmental assets.

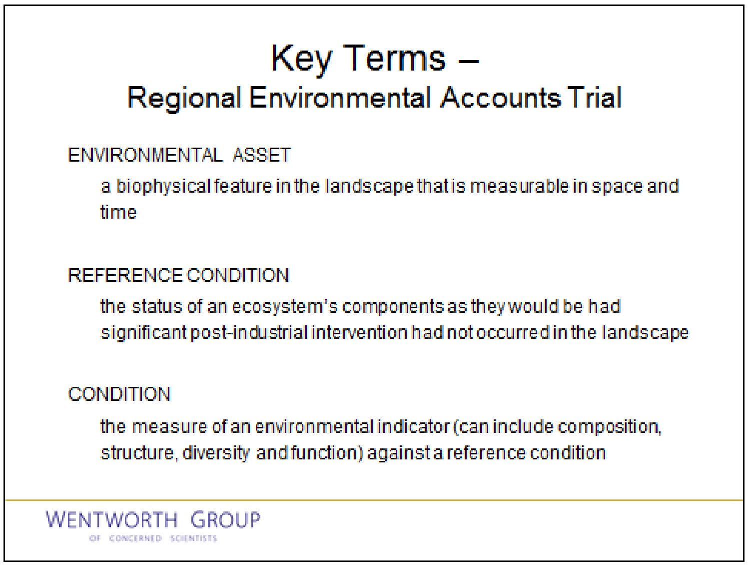
We have put this effort in at the beginning of these trials to ensure the framework used by the regions is robust and accepted by scientific and statistical communities. I will return to this point again in a minute.

5. Structure of the Environmental Asset Condition Accounts

Let me describe the structure of the condition accounts.

Environmental assets can be described under broad asset classes: Land, Water, Atmosphere, and Marine. Within each asset class there are a range of environmental assets.

We define an environmental asset as "any biophysical feature in nature that can be measured in time and space." [5]



In other words, an environmental asset can be just about anything that society considers to be an asset.

It <u>can</u> be an ecosystem such as a forest or a river system, but the accounts are not restricted to just measuring the condition of ecosystems. It can be a fishery, agricultural soils, or any other physical feature in nature, such as groundwater, or it can simply be a population of an individual species of whale or birds.

Accounting structure

TABLE A: Environmental Asset Summary Table

Environmental Asset Class	Environmental Asset	Econd		
		2008	2009	2010
LAND	Vegetation	40	50	
	Soils	60	65	
	Fauna	80	72	
WATER	Rivers	60	44	
	Wetlands	54	54	
	Floodplain	75	77	
	Groundwater	68	59	

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The Asset Condition accounts are based around three sets of tables. The most basic structure of an environmental account is a summary table, describing the environmental asset classes, displaying each individual environmental asset, and the environmental condition indices (what we call Econds) generated for that time period and over a period of time.

TABLE E – Environmental ASSET table (Rivers)

Rivers				Year 1		Year 2	
	Indicator*	Unit of Measure	Reference Condition Benchmark	Year 1 Measure	Condition Score	Year 2 Measure	Condition Score
Econd TOTAL				60			
Creek 1 Econd							
Creek 1	Macroinverts						
	Water flow						
	Riparian						
Creek 2 Econd							
Creek 2	Macroinverts						
	Water flow						
	Riparian						
Creek 3 Econd							
Creek 3	Macroinverts						
	Water flow						
	Riparian						
Creek 4 Econd							
Creek 4	Macroinverts						
	Water flow						
	Riparian						

TABLE I – DATA table - Rivers – Macroinvertebrate indicators for Creek 1

Creek 1	Year 1
Indicator	Year 1 measure
Macroinverts	20
Sample 1	10
Sample 2	20
Sample 3	20
Sample 4	40
Sample 5	16
Sample 6	20
Sample 7	18
Sample 8	18
Sample 9	18

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The second set that sits underneath contains the asset tables for each environmental asset. These tables describe the Condition Scores for each indicator, and calculate the *Econd's* for each asset.

The third set of tables contains the raw data. This data table shows the data for the samples used to calculate the condition scores in for each indicator of the asset.

These tables are all linked so that users can drill downwards through the cells and because they are structured around a common unit of measure they can also be aggregated upwards.

These tables are a simplified version of, but consistent with the Asset Tables in Chapter 5 of SEEA.

You will recall I spoke a moment ago about ensuring the framework is robust and accepted by both the scientific and statistical community: let me show you an example account for one asset of one region in our trial – vegetation condition.

The region has taken the steps outlined by the committees and presented condition scores for each of their vegetation types, which have been scaled to give an Econd for the asset.

However, the users of the account need to know that the number presented here as the number that describes the condition of native vegetation in this particular region is, in fact, a valid number. This highlights the importance of an accreditation process – a process that can clearly and robustly ensure the reliability of the numbers presented in a condition account.

As part of our trial we are also trialling this accreditation process – one that analyses the sampling methods, datasets and analysis procedures and provide an accreditation score, like a confidence rating, to each of the Econds generated in the account. An accreditation score of 0 is not allowed into the account, 1 is minimally acceptable and 5 is comprehensive.

The user can then be confident in how the data might be interpreted or used in various communication products or analyses. This also overcomes the practical issue of only using data that currently exists – data that may not be the most sophisticated, but that is available. This allows the region to make this valuable condition information available to the account, with the view of incorporating more sophisticated and sensitive measures of condition into their planning processes over time.

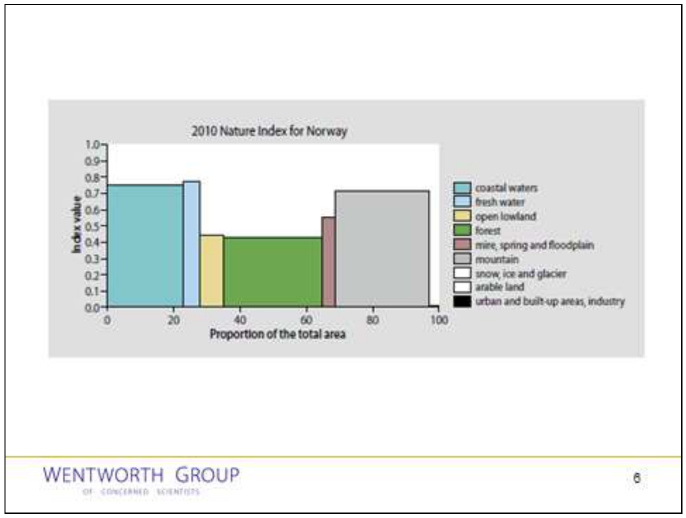
This, for us, has highlighted the need and the value of integration b/t statisticians, scientists, managers, community.

6. Information to Inform Decision Making

Let me give you some examples of how this accounting model can produce information to inform better decisions.

Summary tables

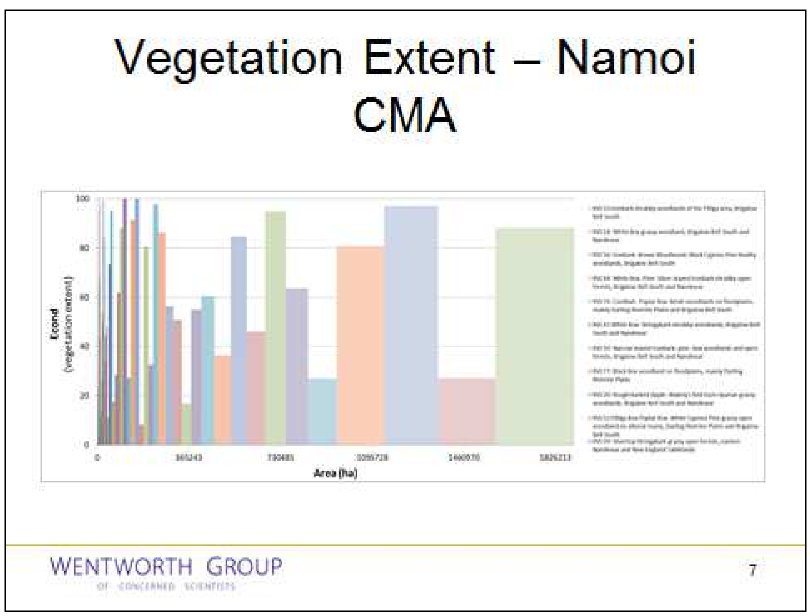
The first benefit on a common unit of measure is that it provides a simple, but scientifically robust process, that distils scientific complexity so that we can compare the condition of any environmental asset to any other asset, at any scale, anywhere.



Using reference condition methodology in a similar manner to our Econd methodology the Norway Nature Index can be constructed.

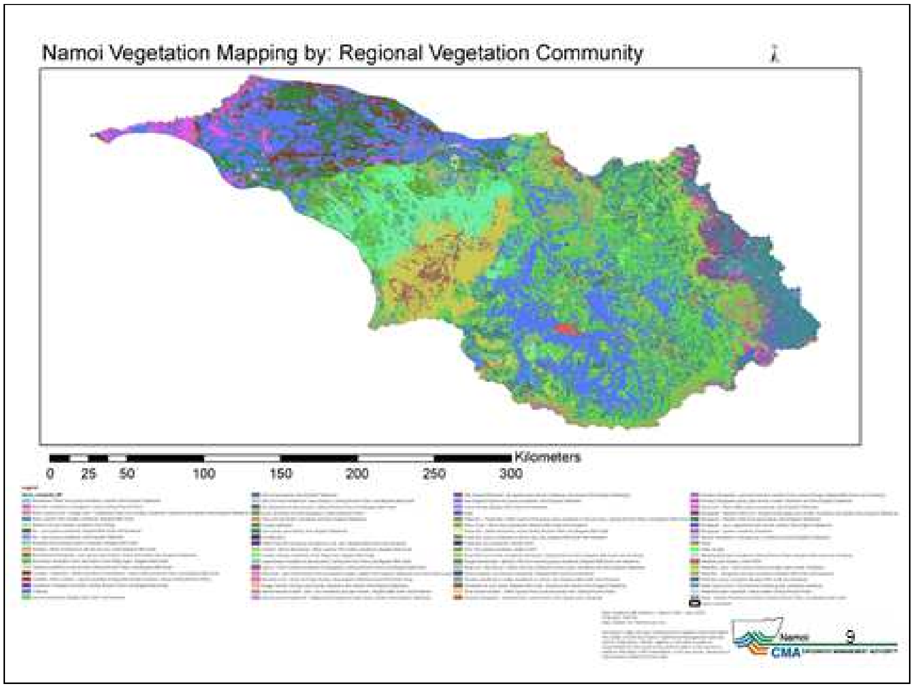
This graphic is very clever, because not only does it present the condition of all assets on a common reference scale (in their case 0 to 1), it also describes the spatial representation of each of those assets relative to each other.

Embedded in the condition accounts is the underlying information from which this type of summary can be constructed.



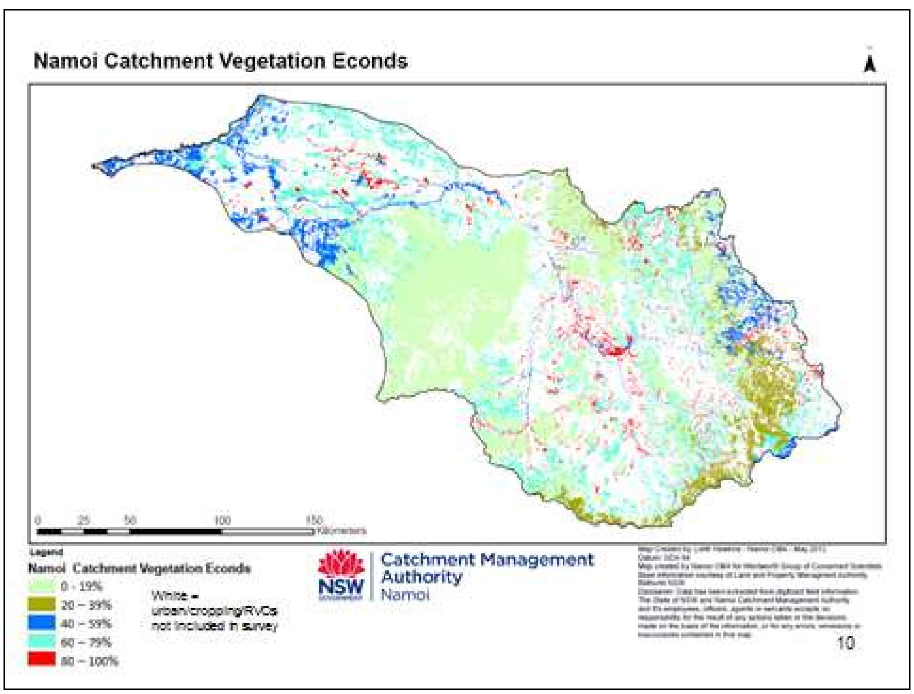
We have applied this cleverness to graphics from our Trial regions: this example is from the Namoi CMA in NSW, which shows just a sample of the extent of the 77 types of native vegetation that are present across the Namoi region and the area each occupies.

It is also possible to use this same account information to describe the native vegetation extent spatially.



Extent versus condition measures

This example from the Namoi shows you the location of various types of vegetation communities, however, it does not tell you the condition of each. If we were to then use the same extent information as an indicator of native vegetation condition, we could observe the following:



This immediately provides context to the vegetation extent map by showing the condition of the vegetation that remains in the catchment.

In that regard, it is not dissimilar to what could be derived from the SEEA Accounts.

And here is where we need to be careful: If environmental accounts are to be accepted by markets and decision-makers, they must have confidence that the environmental condition accounts contain information that accurately reflects the environmental assets being measured.

Let me give you an example:

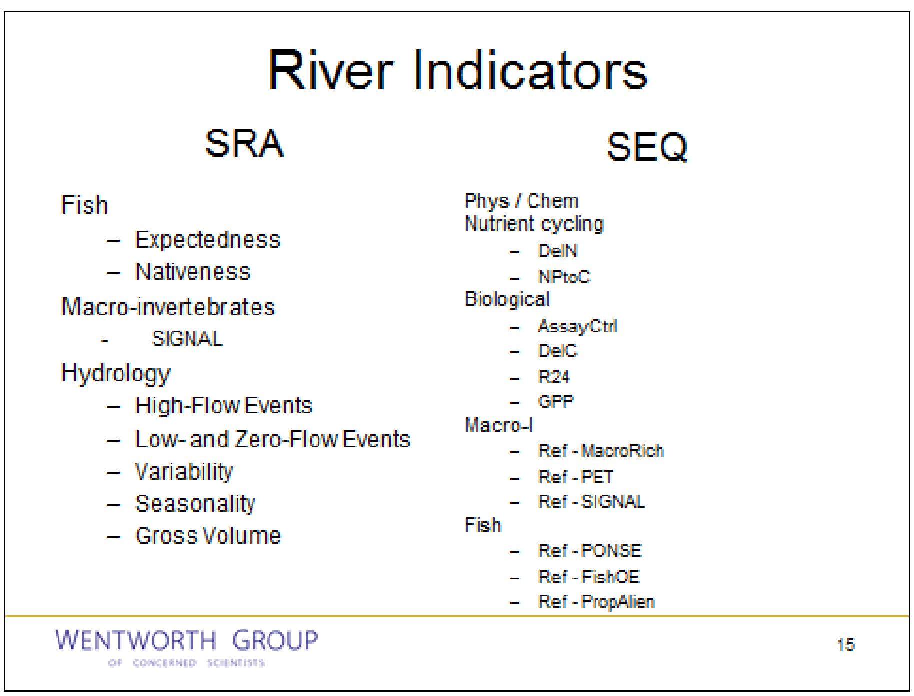
The ABS Land Account tells us that 75% of the Australian continent is covered in native vegetation. If policy makers simply used the extent measure as an indicator of condition, the conclusion would be that the Australian landscape is in a pretty good health, overall. However, science tells us that only 10% of this vegetation is in an undisturbed condition suggesting that much of the continent is in very poor condition.

The point? Sometimes vegetation extent is a valid indicator of condition, at other times it is not. If the wrong information is used to populate condition accounts, either the accounts will be ignored as the information is seen as useless, or, they will be used, which will lead to very poor policy decisions.

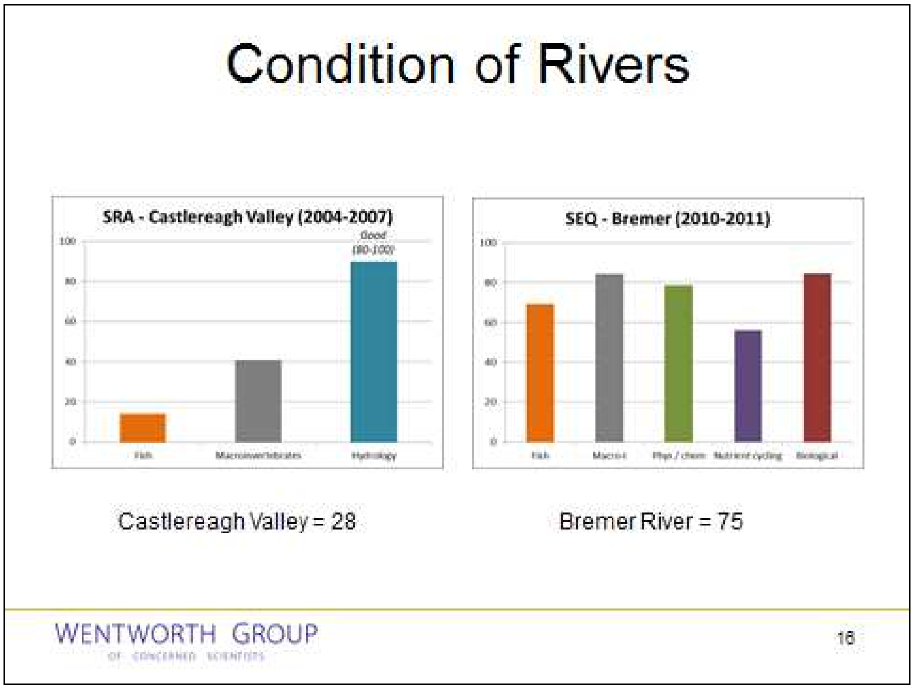
Comparing the same assets using different indicators

Another question we are testing is how the condition of the same assets can be recorded using different indicators.

Below are indicators represented for measuring the condition of rivers in two programs, the Sustainable Rivers Audit for the Murray Darling Basin and the Ecosystem Health monitoring Program for the waterways of South East Queensland.



Once an account is constructed using these indicators, the following condition scores are shown:



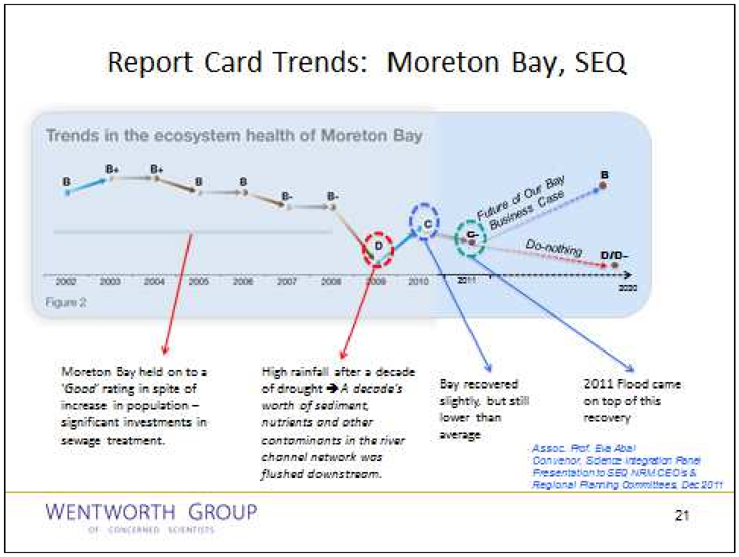
Because both of these assets have assessed condition using a scientifically accredited set of indicators, and because both use a reference condition methodology their overall Econd can be an accepted measure of its condition and judgement of its health.

Measuring Trend

Understanding the health of an environmental asset not only requires an understanding of the condition of an asset at a particular point in time. The direction and rate of change is of equal significance in environmental management.

Collecting trend data takes time, and in landscapes with high climate variability, it will be many years before a sufficient data base can be constructed to give useful trend information. That's just a fact of life, and the bottom line is that the sooner we begin, the sooner we will have trend.

Having said that, there is a lot of information about the condition of environmental assets that does go back, in come cases decades. We do for example have in many river systems across Australia, historical river flows data going back many decades.



Another example is to use historical Landsat data to measure that many nations are using to measure the change in forest ecosystems.

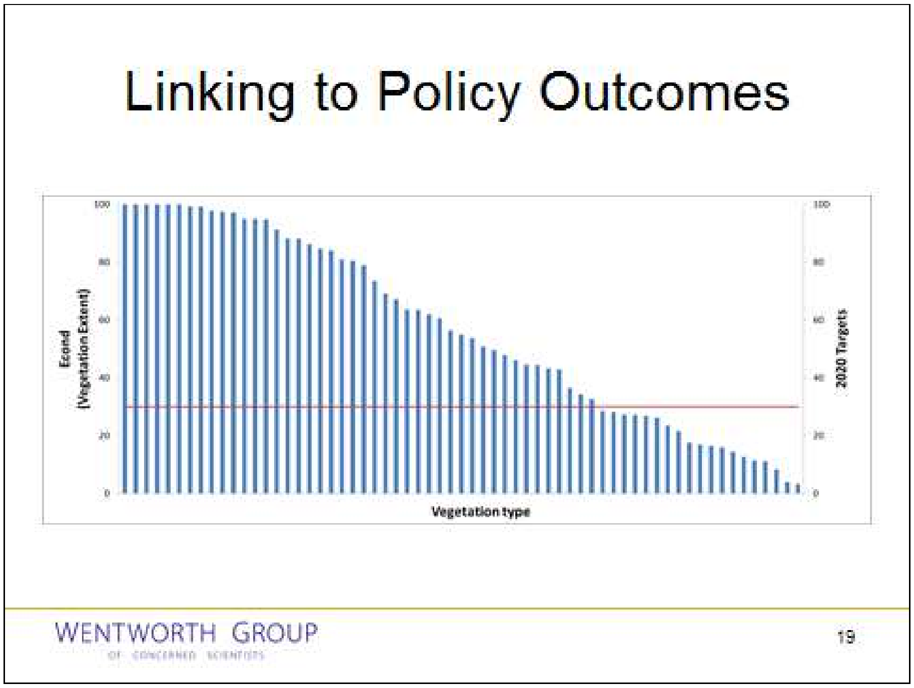
One of the challenges we will test in these trials is whether such historical information can be used to establish a reliable estimate of trend in the condition accounts.

7. Using the Condition Accounts to Guide Policy Development

The second benefit of the common unit of measure, the Econd, is that it makes it much easier for policy makers to use condition accounts to inform the setting of environmental standards and targets across a range of assets or within an asset class, estimating program investment budgets, and assessing cost effectiveness to prioritise projects.

Let me give a more simple example of the use of native vegetation to show how condition accounts can be used to both inform policy and set investment targets.

This graph is produced from the same Namoi CMA native vegetation condition account, but this time showing all of its 77 vegetation types, ranked from the most extensive to least extensive.



This information was used to set policy targets for prioritising investments in native vegetation management. Their Catchment Plan process, conducted over a number of years, concluded that the Namoi valley would be a more healthy and productive environment, taking into account social and economic factors, if the 19 vegetation communities with less than 30% of their original native vegetation were restored to the 30% level. This has become a policy target in their Catchment Plan.

The same Namoi vegetation condition account that was used to inform that policy process can now be used to calculate the cost of meeting their 2020 target.

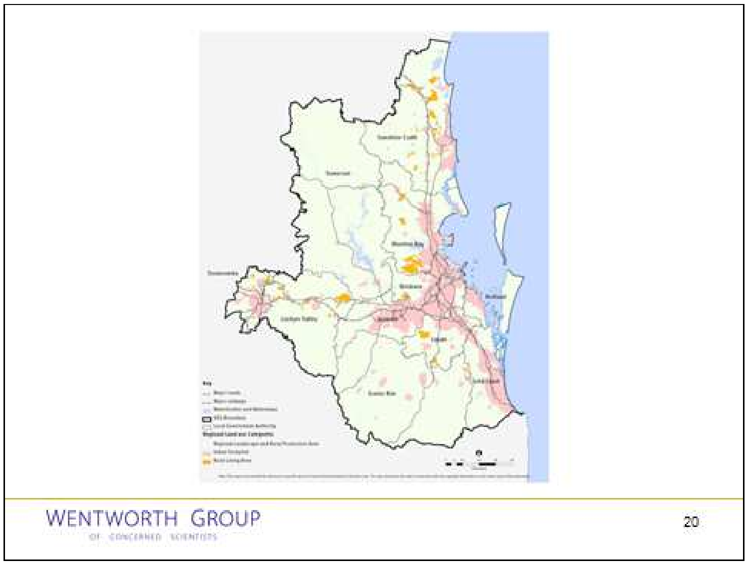
By taking the current extent of each under-represented vegetation type, it is possible to calculate the area of restoration required to achieve the 30% target. By combining this data for all 19 under-represented vegetation types, the total area targeted for restoration priority can be easily calculated. If you were to cost the restoration of each of those hectares based on previous project expenditure, you could estimate a total restoration cost.

It is also possible to estimate the carbon sequestration value of achieving that restoration target. We are only able to do this, because we have designed an environmental condition account which connects asset condition to policy targets and policy targets to investment decisions.

8. Using Condition Accounts to Improve Investment Decisions

(also use EBI example from Victoria?)

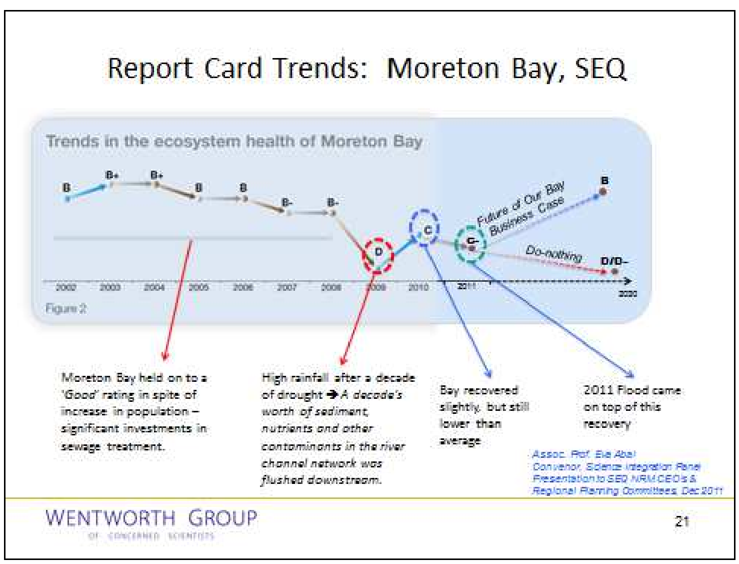
Finally, let me describe how asset condition accounts can be used to improve investment decisions aimed at maintaining the condition of our natural capital, using south east Queensland as an example.



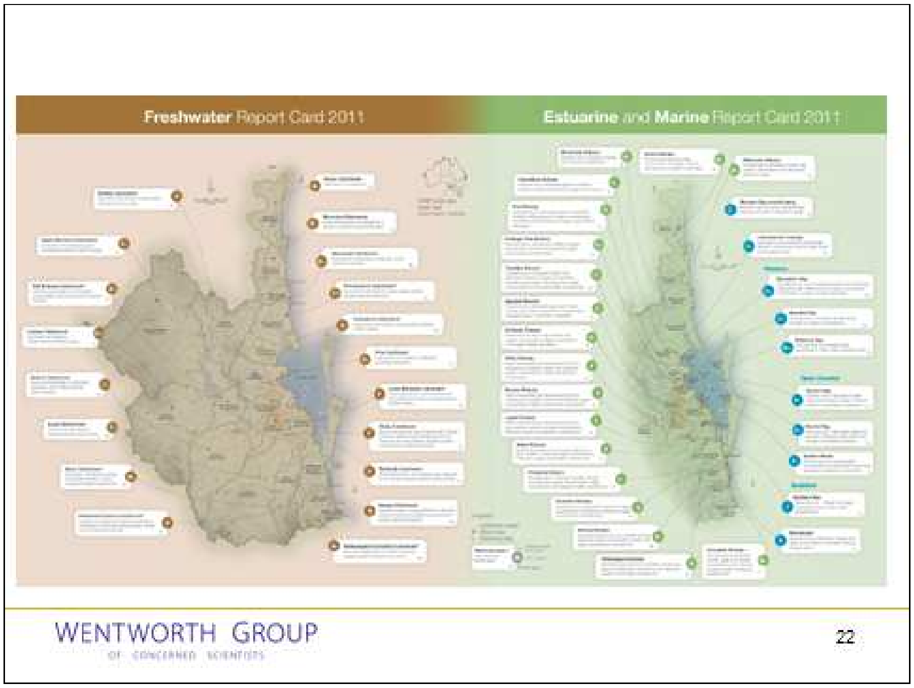
The SEQ region around Brisbane is facing huge social economic and environmental pressures from a rapidly growing population. In just the last 8 years, the population of south east Queensland has grown by over 600,000 people, to 3.2 million people, and is expected to add another 1.3 million by 2030.

To give you some idea of the scale of economic impact this is placing on the state of Queensland, the infrastructure investment program for this region, between 2010 and 2031, is $134 billion.

The increased pollution caused by urban development is placing significant pressures on the condition of the waterways flowing into the Ramsar listed Morton Bay estuary.

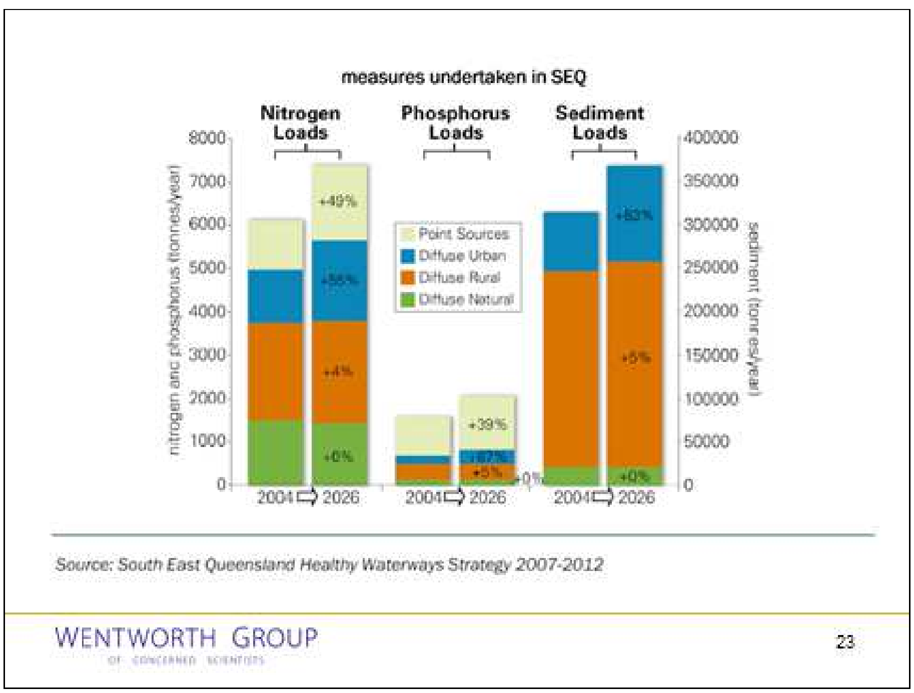


SEQ Catchments, the regional NRM body for this region, has produced an infrastructure investment plan, using the asset condition accounts that were developed over a decade ago from the Health Waterways Partnership.[6]



Don't be fooled by the simplicity of this reporting system. There is a world of science behind this monitoring program, which is all readily accessible on line.

Last year the Catchment Authority was able to use the information in what we would call their asset condition accounts, insert the decade of time series information into their hydrological and other modelling tools, …



…and to cost the infrastructure investments needed to satisfy their policy objective of maintaining the waterways in their current condition.

Table 5. Long-term annual marginal abatement costs (TSS loads)

Actions (including low and high cost estimates where available)	Amount of action (ha unless otherwise stated)	Cumulative load (tonnes/pa)	Cumulative cost ($/pa)
Gully treatment (low)	800 km	100,000	$5,000,000
Filter strips or buffer zones (low)	60,000	126,460	$6,991,115
Diversion banks (low)	20,000	135,770	$8,192,105
Diversion banks (high)	5,000	138,098	$8,842,641
Minimum tillage (low)	5,000	140,499	$9,849,261
Road runoff management (high)	2,000	140,989	$10,065,228
Livestock exclusion (low)	5,000	143,194	$12,245,973
Riparian projection or revegetation (low)	12,000	148,956	$18,564,445
Filter strips or buffer zones (high)	5,000	151,161	$21,124,450
Minimum tillage (high)	2,500	152,361	$22,621,473
Bioretention basins (detached house developments)	All greenfield development	154,246	$25,128,523
Bioretention basins (attached house developments)	All greenfield development	154,355	$25,325,813
Livestock exclusion (high)	1,000	154,796	$26,164,926

Source: MainStream analysis

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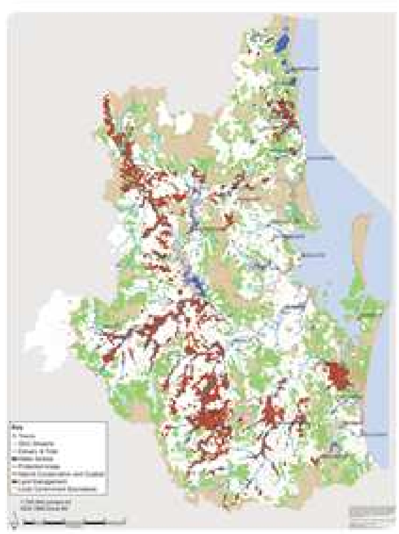
That investment comes to $570 million over 15 years, or $38 million per annum.

This sounds like a lot of money – it would consume one year of the entire budget of Commonwealth government's national environmental program, *Caring for Our Country*.



Identified 'hot spots' for land management

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But when seen though the perspective of maintaining the condition of natural capital, this $570 million investment represents less than half of one percent (0.43%) of the SEQ infrastructure program budget for that period.

The point is, a scientifically credible set of environmental assets condition accounts, collected regularly over a sufficient time to establish trend, can not only provide decision makers with information to underpin the setting of evidence based policy targets, it can also be used to formulate an investment package to deliver those targets, … and, where in the landscape to target those investments.

This is one example of how scientifically robust asset condition accounts can mainstream environmental management into long-term economic investment decisions.

And, it will be the same condition accounts that will monitor the progress of those investments into the future.

9. Conclusion

We still have some work to do to further test these concepts and their potential to inform our decision-making, but with the level of commitment to this process so far, we are optimistic and prepared to meet the challenge.

In summary, the primary reason we are building asset condition accounts, is because society is concerned that the explosion of economic activity over the past two centuries, and what is expected over the next half century, will continue to degrade our natural capital and that in turn will deplete the services that ecosystems provide to humanity.

To measure degradation, you need to measure condition, and for that you need science.

But science will only be of value if we can convert scientific theory into numbers in boxes, numbers which are of a sufficient quality to give policy makers confidence they will lead to better decisions.

If we don't satisfy that test, policy makers and markets simply won't use the accounts.

This means that the SEEA accounting framework for measuring condition needs to accommodate the science that is required to give you quality measure of condition.

This is the conceptual framework for our trials, but the real test, and the reason why we are doing the trials is to test the practical application of these principles in the real world, at the scale at which ecosystems function.

We expect to be in a position to report on the results of our first proof of concept stage by the end of this year.

Thank you.

4,800 words = 40 minutes. Will need to cut 10 minutes out at lease, maybe half – so which bits to cut, which to keep?

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