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Unearthing a new frontier: the ABS Environmental-Economic Accounts

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Abstract

Environmental-economic accounting, utilising the System of Environmental-Economic Accounting (SEEA) as a framework, is a field that is rapidly beginning to show its importance around the world. This paper provides a brief introduction to the SEEA and outlines its importance, also addressing issues around big data and data integration.

Why the SEEA was developed

"A country could exhaust its mineral resources, cut down its forests, erode its soil, pollute its aquifers, and hunt its wildlife to extinction, but measured income would not be affected as these assets disappeared" (Repetto et al., 1989). The development of the SEEA was driven by a desire for more complete and integrated information on the economy and the environment and the interactions between the two. This is due to the increasing realisation that economic prosperity is dependent on the ability of the environment to supply natural resources and to absorb pollution (and to support life on the planet), and that environmental policies can impact the economy and vice versa. Natural assets and the services they produce are not fully quantified in the System of National Accounts (SNA) — this means that decisions are not always informed about the long-term implications of depleting non-renewable assets.

Gross Domestic Product (GDP) is one of the key indicators presented in the SNA, which includes estimates of the value of natural assets where they fit the definition of an economic asset. An economic asset must have an identifiable owner and the owner must be able to hold or use these assets for economic gain. It has been recognised that there is a need to consider a broader range of benefits, and this gave rise to the SEEA. Through experimental application of the SEEA Central Framework and its companion, the guide to Experimental Ecosystem Accounts, countries are starting to explore the possibilities of this approach. An example is China's interest in developing a measure of Gross Ecosystem Product (GEP), proposed by the Chinese Academy of Sciences, as an indicator for natural capital.

What is the SEEA?

The SEEA is a measurement framework that can provide a range of metrics that link information on the environment and the economy. This integration is achieved through the use of common formats, classifications and standards. It is effectively a series of accounting tables that seek to record, as completely as possible, the stocks and flows relevant to the analysis of environmental and economic issues. The SEEA has the great advantage of being one of only two international statistical standards, having the endorsement of the IMF, World Bank and United Nations. This imprimatur and standardisation encourages the development of comprehensive and consistent datasets over time. Importantly, SEEA accounts are structured in monetary and *physical* terms. It is difficult to compare accounts simply using physical units of measurement (e.g. megalitres, petajoules), so monetary measures are required.

SEEA was endorsed as an international standard in 2012. Although SEEA has been around since the early 1990s it is still in its infancy compared to the SNA, which was first published in 1953.

Challenges the SEEA was designed to address

The fragmentation of information in silos and data "puddles" is a major barrier to achieving integrated decision-making. The high degree of specialisation in scientific fields, and the tendency to study specific problems at a point in time, or commission one-off consultancies, creates dense "puddles" of data that can be difficult to connect, and do not offer capacity for time series analysis, which is so critical to understand the implications of potential decisions. A vast field of information puddles is therefore lying dormant, unconnected and isolated after the heady media attention on day one, and perhaps the odd citation in the academic press. There have been efforts to pull the puddles together through initiatives like the State of the Environment Reports that collate a range of environmental metrics, however these are not inclusive of the economic perspective. By bringing all these elements together in accounts under a broad framework, the SEEA provides a platform that enables visibility of environmental data to decision-makers in non-environmental portfolios.

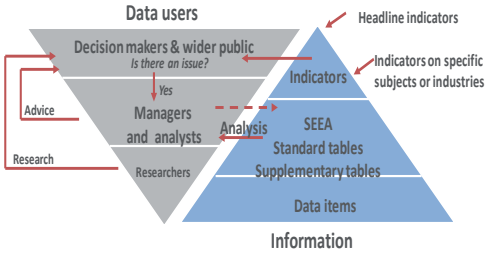
Secondly, as discussed above, there are barriers around values, languages, and philosophical approaches. At the moment it is often the case that there are two distinct narratives competing, each with their own proponents: one for economic development and the other for environmental protection. As long as these two narratives remain separate, competing, and speaking different languages with different value systems, then it is the decision-makers who must take on the burden of somehow evaluating the relative strengths of these arguments, and choose to be swayed either one way or the other. Many of the decisions that affect the environment are made in the economic sphere. Unless we institutionalise frameworks like the SEEA, these decisions will not automatically be made with the full picture in view.

One of the strengths of environmental-economic accounting systems is that they work well even when not all of the required data are available. Because the components are designed to sum to a whole, an account can reveal what is missing and help to make assumptions or hypotheses about the missing pieces. In the case of environmental-

economic accounts, it can inform those assumptions through knowledge of what is going on in the economic sphere — this may help explain the changes in the physical environment, and vice versa. Investing in a system of accounts, rather than separate puddles, also allows for that all-important longitudinal view.

There exist differing viewpoints around the challenge of placing a value on nature — these are presently on the research agenda of the UNCEEA. "One of the softer but still tangible results of doing accounting is that we now have ecologists and economists talking the same language. I feel quite a sense of achievement when I hear ecologist colleagues referring to assets and services and the need to monitor both in a more holistic way, treating the ecosystem as a whole as the asset and the components of the ecosystem (biodiversity, soil etc.) as indicators of the quality of the ecosystem." (Rocky Harris, from the UK Department of Environment, Food and Rural Affairs).

The figure below presents an idea of how the different levels of accounting are utilised by different parts of the professional community to meet their needs:



For example, researchers and modellers are more likely to be interested in the detailed source data, but, as you make your way up the line, policy analysts and managers are likely to look for more synthesised information, and policy advisers and decision-makers are more likely to focus on distilled indicators relevant to their context. The SEEA tables form the middle layer, organising a variety of source data into formats that can be used to generate indicators.

Accounts make hidden data visible

The SEEA can be used to produce indicators that are derived from a clear set of accounting principles that relate logically to the base accounts and down to the primary data. The Australian Bureau of Statistics has focused on such economic measures because economic statistics is one of our primary domains — it is our core business. Many other indicators can be produced from ecosystem accounts, however the full realisation of this is beyond the ABS's expertise or remit.

A lot of relevant data fades from memory because it is collected in isolation rather than as part of a system. It becomes part of the hidden part of the data iceberg. Better return on investment can be achieved when data exercises are undertaken in ways that lend themselves to incorporation into a publicly accessible system of accounts that measures change over time across a range of dimensions. There will, however, be cases where these existing puddles can be incorporated into specific accounts right now, and that is fine as well. In this way the SEEA can help make visible important data that should be available to decision-makers right now.

We have only just scratched the surface in terms of the indicators that can be established using SEEA. For example, much work is being devoted to monitoring the UN Sustainable Development Goals (SDGs) — Mexico conducted some work earlier this year as part of a UNCEEA working group to map the goals to possible SEEA indicators, proving that a whole host of the SDGs can be monitored using SEEA accounts. For

example, in SDG6 — "Ensure availability and sustainable management of water and sanitation for all" — there are a number of indicators that can be supported by SEEA Water Accounts, including:

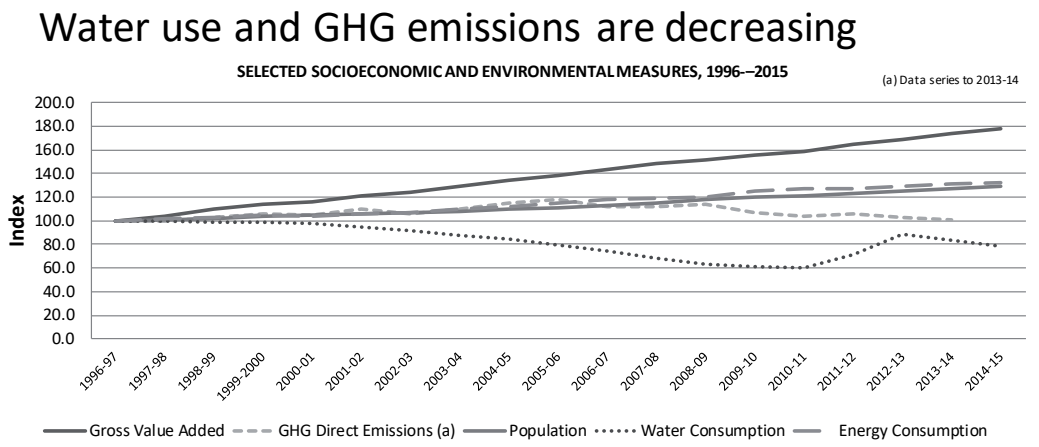
- 6.4.1 Percentage change in water use efficiency over time,
- 6.4.2 Percentage of total available water resources used, taking environmental water requirements into account (level of water stress), and
- 6.6.1 Percentage of change in the extent of water-related ecosystems over time.

Further, in SDG 7 — "Ensure access to affordable, reliable, sustainable and modern energy for all" —the energy accounts could measure:

- 7.2.1 Renewable energy share in the total final energy consumption,
- 7.3.1 Energy intensity measured in terms of primary energy and gross domestic product (GDP).

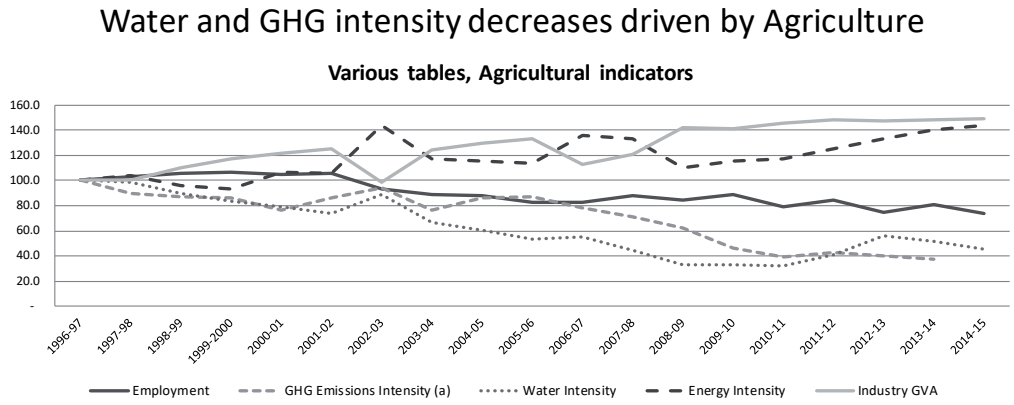
These are just a few of many examples.

The standard SEEA indicators that the ABS has traditionally published are resource intensity and decoupling measures. These show the economic value add per input of natural resource. The diagram below, from the ABS publication "Australia's Environmental-Economic Accounts", presents improvements in water efficiency and GHG emissions.



The top line shows that gross value added is growing while the use of water per unit of economic production is decreasing, as is the rate of GHG emissions.

When we want to know what we are doing right to achieve those results, we can drill down to see that these improvements are driven by improvements in the agricultural sector, where water and greenhouse emissions have become 'uncoupled' from the economic growth: that is they are going in the "other" direction.



Who are the end-users of the Accounts?

Currently there are more than 70 countries worldwide that produce SEEA accounts and there are a range of end users, primarily government.

An exciting development is the "Natural Capital Accounting and Valuation of Ecosystem Services" project, funded by the European Union and supported by implementing partners the United Nations Statistics Division (UNSD), the United Nations Environment Programme (UNEP) and the Secretariat of the Convention on Biological Diversity (SCBD). As a part of this project, China joins four other mega biodiverse countries — Brazil, India, Mexico, and South Africa — as a strategic partner in the creation of pilot ecosystem accounts under the SEEA Experimental Ecosystem Accounting (SEEA EEA) framework. The project is emphasizing links between the accounts and critical environmental challenges to ensure the information informs actual policy choices. As mentioned previously, emerging from this process is the development of a new measure of "Gross Ecosystem Product (GEP)", proposed by the Chinese Academy of Sciences, as an indicator for natural capital. China's president Xi Jingping has elevated the principle of "harmony between humankind and nature" to a central place in the nation's Global Vision.

The U.K. Office of National Statistics recently published a report on the monetary valuation of vegetation surrounding its urban and rural areas in removing harmful pollution and reducing healthcare related costs, based on SEEA-EEA accounts. These accounts showed a billion pounds of healthcare costs avoided due to ecosystem services provided by trees.

The ways in which SEEA indicators can be used are myriad, including:

- Fiscal policy settings (e.g. taxes, levies, subsidies, offsets);
- Regulatory levers (e.g. environmental protection, land clearing restrictions, catch limits);
- Assessing options for planning and economic development (urban development, land use, infrastructure, industry);
- Assessing policy options across the range of sectors (waste, pollution, trade, energy, water);
- Monitoring progress and evaluating the effectiveness of policies and programmes (SDGs, Green Growth, sectorial policies).

There is currently a significant focus on agricultural sustainability/natural capital accounting and the ways in which farmers can continue to demonstrate improvements to the land they work on to improve long term sustainability and levels of business risk. Users such as banks, insurance brokers, superannuation agencies and the like are playing a stronger role in this space.

Examples of accounts such as the ABS's Great Barrier Reef regional ecosystem accounts show that there are a multitude of possible users due to the broad lens indicators we have included to measure the surrounding lands, rivers and ocean. As an example, if the reef were to deteriorate further this could have a greater effect on tourism, which in turn would affect the businesses in the region, then the employment, then the agricultural production feeders into the region, that could in turn affect the way the land is used, and therefore quality of soils, etc. Across this chain of impacts are potential users — we need to look to service further collaboration around particular issues.

Big data possibilities

"What difference can big data make in expanding research and analytics possibilities? What are key risks and challenges?"

Turning these questions around — what can the accounts do for big data and expanding the use of derived information for research and analytics? One of the key risks with big data is lack of coherence with other statistics or accounts. While they are a great source of information and potential, they are invariably scattered, lack cohesion and in some respects are an inferior data set to data that are directly collected. Despite this, they are usually cheaper to obtain and can include other variables of interest which will tell a good story.

Potential big data sources include: Satellite, Sensor, Scanner, Web scraping, GPS and Telco data. The accounts can assist by aligning broad concepts that can be applied to big data; they can help to refine information being derived from the dataset and then have some coherence with other information sets that have ownership (industry/sector) and an environment product in mind. Once this coherence is settled then you can move on to other things. For example, if the data set is supposed to be a comprehensive data set, then aligning information into the accounts can quickly show up gaps, inconsistencies and enable some editing (e.g. do people really pay $10 per litre for diesel?).

Another example: if there is research interest in determining the reasons for change, then pushing the dataset into an account can highlight the changes and where further characteristics can be applied more broadly for testing hypotheses, examining longitudinal effects or looking for correlation in panels or in similar data clouds analysis.

The potential for using big data in SEEA accounts is still exploratory. It was the main focus of a workshop on "Earth observation for environmental-economic accounting" held in May 2018. The workshop was jointly organised by the ANU Centre of Water and Landscape Dynamics, Australian Bureau of Statistics, Commonwealth Department of the Environment and Energy, and Geoscience Australia. The event brought together a transdisciplinary group of 40 experts in environmental policy, environmental accounting and Earth observation to discuss issues and opportunities in the use of Earth observations (EO) for Environmental-Economic Accounting (EEA). It was one in a series of Environment & Society Synthesis workshops supported by the Australian National

University's Fenner School for Environment & Society.

The workshop responded to challenges such as the requirement for spatial data on different aspects of environmental composition and condition (e.g. land cover type, vegetation health) and the natural resources and other ecosystem services it provides (e.g. biomass, soil protection). The scientific literature shows that Earth observation should be able to provide at least some of these data in a cost-efficient manner, however it currently does not. The workshop was an opportunity to further this potential but there is still much progress to be made in this space.

Can accountants really save the planet?

"I found I had stumbled into what I soon realised was a revolution … taking place in the least likely realm of all: our accounting systems" (Jane Gleeson-White).

The above is taken from Jane Gleeson-White's *Six Capitals*. The subtitle of this book "The revolution capitalism has to have — or can accountants save the planet?" is a very catchy one. In many ways the SEEA is the statistical community's gift to the universe. The SEEA does present a possible solution to the problems of overconsumption of national assets inherent in the dominant economic paradigm. Importantly, it does so from within that same paradigm. However, the truth is that accountants alone cannot save the planet, nor can statisticians, economists or ecologists or hydrologists or spatial scientists. But if we come together through our various disciplines to build a working system of integrated accounting so that decision-makers have the information they need to make evidence-informed decisions, well we might just do it — together.

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