Australian Bureau of Statistics

Linking the environment and economy:

Towards an integrated environmental-economic account for Australia

"What we measure affects what we do; and if our measurements are flawed, decisions may be distorted. Choices between promoting GDP and protecting the environment may be false choices once environmental degradation is appropriately included in our measurement of economic performance. So too, we often draw inferences about what are good policies by looking at what policies have promoted economic growth; but if our metrics of performance are flawed, so too may be the inferences that we draw."

2009 Report by the Commission on the Measurement of Economic Performance and Social Progress (Stiglitz, Sen, Fitoussi)

ABS Mission Statement

We assist and encourage informed decision making, research and discussion within governments and the community, by leading a high quality, objective and responsive national statistical service.

1. Introduction

High quality information is needed to inform decision-making. Environmental policy decisions are particularly complex because they typically involve consideration of many (often competing) values. Articulation and identification of these values is difficult, and of the elements which are measurable, resources have constrained the breadth and depth of information available.

Within Australia, and in many countries, responsibilities for environmental and economic policies are institutionally separated. So too are the information systems that inform those policies. Given that economic policies have environmental impacts and vice versa, policy-making suffers from the absence of an information system that can articulate these linkages. This paper describes the concept of environmental-economic accounting as a means of linking the environment and economy, and proposes a new set of work by the ABS to inform these linkages.

1.1 The Economic Information System

In 1953 the System of National Accounts (SNA) was released under the auspices of the United Nations (UN) as an international statistical standard for measuring economic activity. Based largely on the theories of John Maynard Keynes, John Hicks and Simon Kuznets, the SNA provides governments with effective ways of measuring economic activity, which in turn guides economic management through fluctuations in business cycles.

The SNA framework utilises the concept of stocks and flows to measure economic activity and wealth. It is underpinned by a framework that incorporates standard concepts and classifications, allowing countries to produce economic data that are consistent across time and place. The SNA has continued to evolve over time to reflect the changing world, with the most recent edition being released in 2008.

A full articulation of the SNA includes many aggregate measures, one of which is Gross Domestic Product (GDP). GDP growth has led to job creation and improved well-being for many people. As a result, many policy-makers simply equate GDP growth with enhanced wellbeing. This has profoundly impacted decision-making because GDP and other economic indicators were never intended to be definitive measures of wellbeing. In a 1934 speech to the US Congress, Kuznets (an originator of the SNA) warned that *'the welfare of a nation can scarcely be inferred from a measurement of national income'.*

This is because GDP and national income do not capture many vital aspects of national wealth and well-being, such as changes in quality of health, extent of education, social connection, political voice, unpaid household work, and changes in quality and quantity of natural resources. Further, GDP actually includes 'defensive expenditures' such as spending on household security, health and environmental protection. This is because the SNA measures activity within 'the market'.

It is well understood however, that much of what maintains and enhances wellbeing occurs outside the market. For example within the SNA, environmental goods and services are considered to be 'non-market', implicitly superabundant, free inputs to production. As a result, they are used as inputs to production, but not charged as costs of production.

> *'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)*

Therefore the key limitation of the economic information system is that it is not capable of answering the higher order questions policy-makers (and society) are asking. In particular, it does not describe the relationship between the environment and economy.

1.2 The Environmental Information System

It is widely recognised that the information used to support policy development and decision-making in relation to Australia's environment is inadequate. The Commonwealth State of the Environment Report 2006 said:

> *"The current environmental data reporting system has a plethora of players with little or no incentives for agencies and organisations to collaborate in the collection, management and sharing of specific data. The 2006 Australian State of the Environment Committee advised two Ministerial Council Standing Committees in September 2005 of the lack of access to environmental data that was hindering their attempts to report on the state of Australia's environment. The committees found that for many environmental domains, data are still patchy or only available at either local or regional scales. The standing committees, comprising the chief executives of environment and heritage agencies, agreed that the system for environmental reporting did need to be improved."*

Since then, others such as the Hawke Review of the Environment Protection and Biodiversity Conservation Act 1999, the ANAO and the Wentworth Group have also noted fundamental problems with the system.

Because Australia faces numerous environmental issues across a range of domains, there are many individuals and organisations collecting environmental information, often with a particular scientific, regulatory or administrative purpose in mind. This results in a highly fragmented set of data which suffers from a range of problems including:

- inconsistent definitions and standards
- independence from any framework which facilities data linkage or interconnectivity
- inconsistent frequency and timing
- poor spatial representation
- low levels of visibility, discoverability and accessibility
- lack of time series and therefore lack of stability over time
- poor capacity to support modelling and forecasting

Accordingly, there is significant frustration when trying to articulate the state of the environment, or in trying to address particular environmental issues that span jurisdictions and regions. It also becomes extremely difficult to understand, model or forecast the impact of a policy intervention collectively across the environment, economy and society.

In order to address our environmental issues it is essential that there is comprehensive, high quality information. Information about the state of the environment, including change, is a vital component. The state of the environment relates to the bio-physical attributes of environmental domains and is essentially scientific in nature.

The quality and extent of bio-physical information on environmental issues is mixed. Comprehensive and good quality information exists for some aspects, such as temperature and rainfall. However, in other areas, particularly those relating to ecosystems, the scientific information base is patchy, lacks integration and 'national' data sets are typically unavailable. As a result, the Australian Government has identified a high priority need for additional investments in bio-physical information, and has commissioned the Bureau of Meteorology (BoM) to develop a National Plan for Environmental Information (NPEI) as an initial step towards improved monitoring of the state of Australia's land, ocean, air and water resources.

Although responsibilities for managing natural resources and protecting the environment are institutionally separated from the economy, neither exists in isolation. Fundamental socio-economic forces drive human activities, which lead to pressures on the state of the environment. The state of the

environment impacts on human well-being, and responses to manage the state have socio-economic consequences.

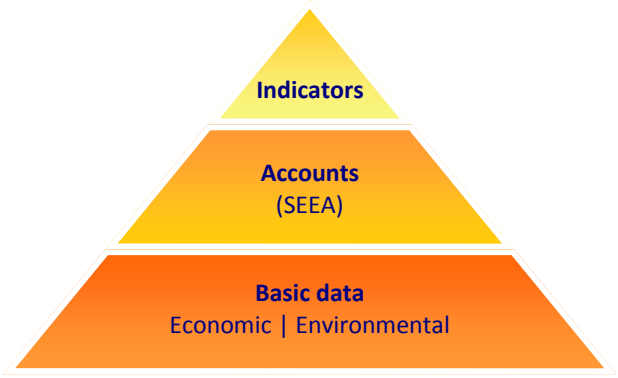
Therefore, a comprehensive analysis of environmental issues, and the policy responses to deal with these, must be informed by socio-economic information about drivers, pressures, impacts and responses. And this information should be integrated with the associated bio-physical information so that relationships and linkages can be properly understood.

2. What are environmental-economic accounts?

Environmental-economic accounts provide a conceptual framework for integrating the environmental and economic information systems. Over the last 50 years macro-economic policy has largely been based on information flowing from the SNA framework. The SNA is an international standard for compiling economic statistics, so it provides a set of internationally agreed concepts, definitions and classifications that ensure the coherence and accuracy of the statistics produced. The SNA is the main source of information for internationally comparable economic indicators and for economic analysis and modelling. Importantly, the accounting framework contains a series of identities which can be used to check the consistency of data, and provide indicators of economic activity and wealth.

Similarly, organising environmental and economic information into an accounting framework has the capacity to improve basic statistics, and allows for the calculation of indicators which are precisely defined, consistent and interlinked.

Figure 1: The information pyramid



2.1 The System of Integrated Environmental and Economic Accounting

The conceptual model adopted by the ABS and the international statistical community for environmental accounts is the United Nations' System of Integrated Environmental and Economic Accounting (SEEA), which is due to become an international statistical standard in 2012. The SEEA is a satellite system of the SNA, meaning that accounts produced under this standard bring environmental and economic information together within a common framework. This allows for consistent analysis of the contribution of the environment to the economy, the impact of the economy on the environment, and the efficiency of the use of environmental resources within the economy.

The SEEA framework consists of four types of accounts:

1. **Flow accounts** for products, natural resources, ecosystem inputs and residuals or wastes from economic activities. The flow accounts present supply and use tables that provide a comprehensive summary of the transactions during a period e.g. financial year. The change between opening stock

and closing stock in the stock account represents the net effect of the flows over the period. Flow accounts can be presented in physical values (e.g. GL of water) and/or monetary values ($). When both physical and monetary values are presented, the account is known as a hybrid flow account.

2. **Stock accounts** for environmental assets: natural resources, land and ecosystems. Stock accounts include the level of stock available and changes to stock within a given period due to both human and natural causes. Stock accounts can be presented using physical and/or monetary values.

3. Accounts that explicitly identify **environmental transactions** in the SNA. For example Environmental Protection Expenditure (EPE) accounts disaggregate traditional National Account flows to show those monetary transactions that are relevant to environmental protection.

4. Accounts that show **how SNA aggregates can be adjusted** to reflect the impact of economic activity on the environment. Depreciation of *produced assets* (termed consumption of fixed capital (COFC) in the national accounts) is deducted to derive various 'net' income measures in the national accounts such as net domestic product (NDP), net operating surplus (NOS), net national income and net saving. In the SNA, no similar deduction is made for non-produced environmental assets when they are depleted or degraded as a result of economic activity. These types of adjustments can give rise to an aggregate sometimes referred to as *'Green GDP'*.

3. Why produce environmental-economic accounts?

3.1 Informing policy

For government, it is not enough to know and understand the environmental condition. If it wishes to put policies in place to mitigate and to adapt, it needs to be able to forecast the impact on the economy and on society. Similarly, if it is determining economic or societal policy, it needs to take into account the impact on the environment. A system of environmental-economic accounts is important for an understanding of the inter-relationships, and the potential impact of particular policy positions going beyond the physical measures, to provide an insight into impacts on particular industries, communities and businesses, including the impact of regulation, charges and incentives.

Linking environmental data with socio-economic data will assist policy-makers by:

- enabling analysis of the impact of economic policies on the environment and vice versa
- providing a quantitative basis for policy design
- identifying the socio-economic drivers, pressures, impacts and responses that affect the environment
- supporting greater precision in the development of environmental regulations and resource management strategies
- providing indicators that express the relationships between the environment and the economy
- following an international standard (facilitating international comparisons)
- organising information within a conceptual framework that ensures consistency, completeness and accountability over time

The regular production of environmental-economic accounts will provide analysts with timely data, in turn allowing data deficiencies to be identified and addressed in a more timely and systematic manner. They will also support a regular and informed dialogue between decision-makers and the broader community on important environmental and socioeconomic issues.

3.2 International work

Increasing numbers of developed and developing countries have introduced environmental-economic accounts[1], compiling different components according to their environmental concerns and priorities. Resource-rich countries have typically developed asset accounts to help design policies for better natural resource management. Countries in which pollution is a significant concern have developed physical flow accounts and environmental protection accounts to analyse the impact of consumption and production patterns on the environment and the impact of environmental expenditure in reducing emissions.

Countries with constraints on space for human activity, like Germany, have led the development of land use and land cover accounting. While many other countries, such as the Netherlands, have devoted particular effort to the compilation of pollution emissions accounts.

4. Role of the ABS

The ABS is established in legislation[2] as the central statistical authority for the Australian government, and by arrangement with the State and Territory governments. In this role the ABS collects, compiles, analyses and disseminates statistics and related information, including statistics related to environmental issues.

Although the ABS environmental program has been established for some time, budget constraints limit its extent and there are significant gaps, in both content and the frequency of statistics. Natural resource management and water use relating to agriculture is reasonably well served, but significant statistical gaps exist in water more generally, energy-related environmental aspects, waste, non-agricultural natural resource management, and the production and use of environmental goods and services.

The ABS also has a legislated role to ensure statistical coordination across Government to avoid duplication while maximising the utilization, compatibility and integration of statistics compiled by official bodies. To undertake this coordination role the ABS is required to formulate and ensure compliance with statistical standards by advising and assisting official bodies in relation to statistics. Environmental-economic accounts are the key ABS contribution to a national environment information system.

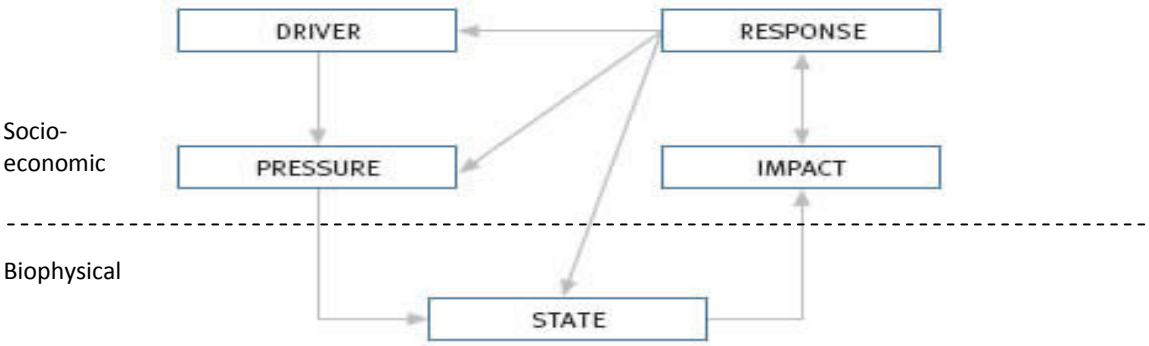
4.1 Integrating the environmental and economic information systems

A comprehensive national environmental information system should be built on two pillars – first, the essential bio-physical information pertaining to the state of the environment, and second, the complementary socio-economic information on drivers, pressures, impacts and responses. The pillars should be 'integrated' to ensure that the bio-physical and socio-economic dimensions of environmental issues can be considered concurrently in policy formulation and other decision making. Integration is achieved by the use of common frameworks, classifications and standards. The information in each pillar should be organised so that, for the environmental domain of interest, users could seamlessly move from the bio-physical aspects to the socio-economic aspects and vice versa.

This implies that there should be a common logic for organising both the bio-physical and socio-economic information. Such logic could be built around the various environmental domains (e.g. water, air, land) organised in a driver-pressure-state-impact-response framework. The integration of information would also ensure that environmental issues that cut across domains, such as biodiversity & EPE can be analysed.

[1] http://unstats.un.org/unsd/statcom/doc07/Analysis_SC.pdf
[2] Australian Bureau of Statistics Act 1975

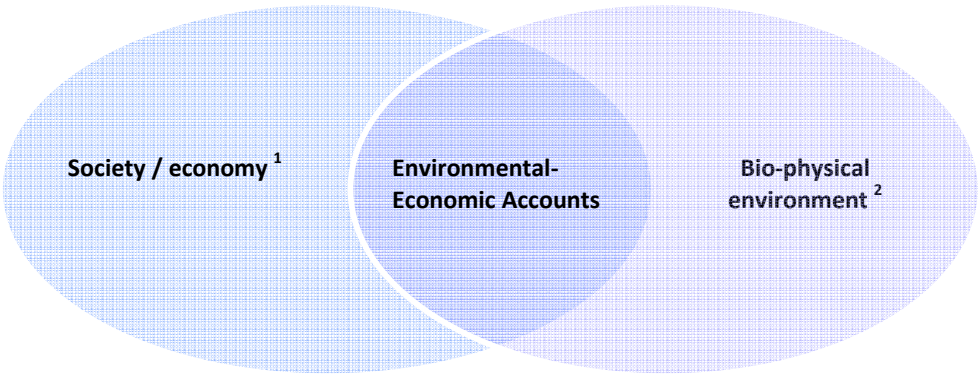
Figure 2: The DPSIR framework



The physical stores of information could be disparate, with the expectation that much of the bio-physical information would be stored by the BoM and much of the socio-economic information stored by the ABS. However, the information for both pillars should be discoverable and accessible through a single portal. So from a user perspective, there would be a single virtual information system, although within this system the source of particular information sets would be clearly identifiable.

To develop such a virtual information system and to achieve integration, the ABS and BoM would work in partnership. This would involve working together on relevant frameworks, standards and classifications, as well as the underlying logic for organising environmental information, including determining appropriate metadata requirements. Developing and maintaining the portal would be a joint responsibility of the two agencies.

Figure 3: Integrating information systems – primary institutional responsibilities



[1] *Treasury, ABS, ABARE, PC, PM&C, DRET, state/territory organisations, etc*
[2] *DEWHA, BoM, DCCEE, Geoscience, CSIRO, MDBA, BRS, state/territory organisations, etc*

5. What can the ABS produce?

5.1 Integrated environmental-economic accounts

Over recent years, the ABS has produced a range of individual environmental-economic accounts, including accounts for water, energy and environmental protection expenditure (EPE). The ABS now intends to produce environmental-economic accounts across a greater range of dimensions on a regular

basis. Doing this presents the great analytical power of integrated comparisons across dimensions and over time.

Information papers for each of the proposed environmental-economic accounts will be released progressively. Below is a very brief listing of their key features, followed by a table outlining expected timeframes.

- *Water account:* includes physical flows of water supplied to, and used by, the economy, and water returns to the environment. The account also includes monetary supply and use tables and indicators of water productivity for industries.

- *Energy account:* includes physical and monetary supply and use tables for various energy products by industry. A time series of energy intensity measures by industry is also presented.

- *Land account:* pilot region includes physical and monetary land use by industry, land cover by industry and changes in land cover over time. Land accounts could also include terrestrial biodiversity and carbon.

- *EPE account:* proposed to include environment protection expenditure data by type of protection (e.g. waste water treatment), by industries and sectors.

- *Waste account:* proposed to include physical generation and disposal of waste by industry, type of waste, and destination. Also to include monetary payments associated with these services.

- *Environment Industry account:* The 'environment industry' (also known as the green economy or environmental goods and services sector), consists of enterprises which produce goods and services to measure, prevent, limit, minimise or correct environmental damage. Along with EPE measures, these accounts attempt to capture the supply and demand of the 'environment market'.

Other types of accounts, such as those for emissions and material flows, as well as the classification and valuation of natural resource assets will be addressed in a research agenda.

Table 1: Summary of planned ABS environmental-economic accounts

Theme	Current Status	Proposed status	Next due
Water	4 yearly	Annual	Late 2010
Energy	Irregular	Annual	Mid 2011
Land	In development	Annual	Early 2011
EPE	Lapsed	Annual	Late 2012
Waste	New	3-yearly	Late 2012
Environment Industry	New	3-yearly	Late 2013

6. Conclusion

There are well-known deficiencies in both the economic and environmental information systems. At present, the links between socioeconomic and environmental issues are poorly acknowledged, expressed and measured. It is also well known that those things that defy measurement often go unmanaged. This paper has sought to outline an important body of work the ABS seeks to undertake in collaboration with others. The ultimate result of this work will be a more informed user community, and a stronger basis for socioeconomic and environmental policy formulation in Australia.