Learning Outcomes

On completion of this unit, you will understand:

- The defining characteristics of Environmental Accounts and how these differ from environmental statistics.
- The Statistical frameworks described by the SEEA and the SNA.

Session 4. Environmental Accounts: The Australian Experience

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Manila, The Philippines
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Session overview

• History of Environmental Accounting in Australia
• Energy
• Water
• Waste
• GHG Emissions
• Land – covered in Ecosystems course
• EPE
• Future plans... AEEA
History of Environmental Accounting in Australia

• Early on:
  – natural assets on the balance sheet; measures of depletion (Session 5.)
  – Energy account, EPE, Fish
• Flow accounts for Water, Waste, GHG Emissions
  – Water account is vitally important
• Land: regional, building to a national
• ABS a contributor to international development of the SEEA
  – And strong supporter of SEEA
History of Environmental Accounting in Australia, *cont*...  

- **ABS environmental statistics**
  - Employment = 19 staff
    - Environmental Accounts = 10 staff
    - CES = 8 staff

- **ABS national accounts compile all balance sheet estimates**
### Environmental accounts produced by the ABS

<table>
<thead>
<tr>
<th>Account type</th>
<th>Year First published</th>
<th>Frequency or status</th>
<th>Reference Years for which accounts are available</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NATIONAL BALANCE SHEET</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-minerals</td>
<td>1995</td>
<td>Occasional</td>
<td>1996-97 (Physical) 1996-97 (Monetary)</td>
</tr>
<tr>
<td>-timber</td>
<td>1995</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-fish</td>
<td>2012</td>
<td>Experimental</td>
<td>2000-01, 2005-06 to 2009-10</td>
</tr>
<tr>
<td><strong>FISH</strong></td>
<td>1995</td>
<td>Occasional</td>
<td>1996-97 (Physical) 1996-97 (Monetary)</td>
</tr>
<tr>
<td><strong>LAND COVER AND LAND USE VALUES (BY STATE)</strong></td>
<td>2011</td>
<td>Annual from 2011</td>
<td>2011; 2012; 2013 (Physical) 2012; 2013 (Monetary)</td>
</tr>
<tr>
<td><strong>WASTE</strong></td>
<td>2012</td>
<td>Annual from 2012</td>
<td>2009-10</td>
</tr>
<tr>
<td><strong>GHG EMISSIONS - EMBEDDED IN FINAL DEMAND</strong></td>
<td>2012</td>
<td>Experimental</td>
<td>2008-09; 2009-10</td>
</tr>
</tbody>
</table>
Who else is compiling environmental accounts?

<table>
<thead>
<tr>
<th>Industrialised</th>
<th>Flow Accounts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Australia</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Canada</strong></td>
<td>x</td>
</tr>
<tr>
<td><strong>Finland</strong></td>
<td>x</td>
</tr>
<tr>
<td><strong>France</strong></td>
<td>x</td>
</tr>
<tr>
<td><strong>Germany</strong></td>
<td>x</td>
</tr>
<tr>
<td><strong>Italy</strong></td>
<td>x</td>
</tr>
<tr>
<td><strong>Japan</strong></td>
<td>x</td>
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<tr>
<td><strong>Norway</strong></td>
<td>x</td>
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<tr>
<td><strong>NZ</strong></td>
<td>x</td>
</tr>
<tr>
<td><strong>Sweden</strong></td>
<td>x</td>
</tr>
<tr>
<td><strong>UK</strong></td>
<td>x</td>
</tr>
<tr>
<td><strong>US</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Developing</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Botswana</strong></td>
<td>x</td>
</tr>
<tr>
<td><strong>Chile</strong></td>
<td>x</td>
</tr>
<tr>
<td><strong>Korea</strong></td>
<td>x</td>
</tr>
<tr>
<td><strong>Columbia</strong></td>
<td>x</td>
</tr>
<tr>
<td><strong>Costa Rica</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Indonesia</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Mexico</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Moldova</strong></td>
<td></td>
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<tr>
<td><strong>Namibia</strong></td>
<td></td>
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<tr>
<td><strong>Philippines</strong></td>
<td></td>
</tr>
<tr>
<td><strong>South Africa</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Flow Accounts indicate the compiling of environmental accounts. The table shows the presence of Flow Accounts for various countries in the Industrialised and Developing categories.*
It is not the first time you produce data that is important!

- The environment data landscape is littered with “one-off” case studies
- It is the 10\textsuperscript{th} time (or better still the 100\textsuperscript{th}!)
Energy Account, Australia

• Why produce an energy account?
• Data sources
• Data issues
• Data results
  – Including hybrid use of energy table
  – Energy intensity measures
Why an energy account?

• Importance of energy to economy and to environment

• Energy use data is needed to inform energy policy and monitor its effectiveness
  – assess sustainability of energy use
  – questions of efficiency and equity e.g. Who uses, who pays and how much?
  – better understanding and control of emissions

• global concern to decrease carbon emissions and improve energy efficiency => standardised global approach to energy reporting
Energy Account: Content

- Supply and use of energy products
- Supply and use by industry
- Hybrid use of energy account
- Energy intensity of Australian industries
- Stock of energy resources (PJ)
Energy Account: Data sources

- **Physical data (PJ):** Sourced from ABARE's *Australian Energy Statistics* – richer product detail

- **Monetary data ($):** National Accounts - *Input Output tables 09-10* – richer industry detail

- Extensive use of physical information to guide monetary estimation (coherence)
Energy Account: Supply-Use components

1.1 Supply and use, by components - 2010-11

- **Supply**
  - Imports: 2,020 PJ
  - Direct Extraction: 16,859 PJ
  - Total: 18,879 PJ

- **Use**
  - Inventory Changes: -587 PJ
  - Exports: 13,392 PJ
  - Households: 1,023 PJ
  - Industry: 3,097 PJ
  - Conversions and Losses: 1,954 PJ
  - Total: 18,879 PJ

Note: Any discrepancies between totals and sums of components in this publication are due to rounding.
Supply and Use of energy

Challenges

• Conversion from ABARE “activity basis” to ABS “industry of ownership” basis

• Service industry usage of energy products
Hybrid use of energy

Challenges

• Questions raised re some national accounts data for some industries

• Highlights the importance of *routinely* comparing physical measures with related monetary information
# Physical vs. Monetary Use – Coal

<table>
<thead>
<tr>
<th>Industry</th>
<th>Physical use of Coal (PJ)</th>
<th>Monetary use of Coal ($m)</th>
<th>Implied Price ($m/PJ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining</td>
<td>7</td>
<td>259</td>
<td>37</td>
</tr>
<tr>
<td>Manufacturing - non ferrous metals</td>
<td>64</td>
<td>147</td>
<td>2.3</td>
</tr>
<tr>
<td>Manufacturing - other</td>
<td>31</td>
<td>70</td>
<td>2.3</td>
</tr>
<tr>
<td>Electricity, gas and water supply</td>
<td>1,975</td>
<td>2,268</td>
<td>1.1</td>
</tr>
<tr>
<td>Households</td>
<td>0</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>
Physical vs. Monetary Use – Electricity (percentage share, selected industries), 2010-11
Energy Intensity

• Interest in energy intensity measures will increase in economy with rising energy prices
  – Concern with carbon

• Energy intensity:
  Physical energy use / by GVA
  – Not current price economic output (volume and price ...)
  – Not per person energy use, which produces different results
Energy intensity - falling

![Figure 3.10 All industries change in energy intensity, gross value added and net energy use, 2002-02 to 2010-11]

Note, Index: 2002-03 = 1
* Gas and electricity industries not included

Source: Energy Account, Australia (ABS cat. no. 4604.0), Australian System of National Accounts (ABS cat. no. 5204.0)
But not all industries followed the general downward trend...
Why mining has become more energy intensive
Stocks of energy assets

• Physical measures (PJ, Gt etc)
• Monetary measures (net present value NPV)
• For each major type of asset (coal, uranium etc...)
Change in stocks of energy assets

Percentage change in Australia's energy stocks, in volume and monetary terms – 2003-04 to 2012-13
Water accounts
ABS Water Accounts

• Background - what are water accounts?
• Data sources
• Climate conditions
• Recent data results
Background

• The Water Account, Australia presents information on the supply and use of water in the Australian economy

Content: Water Account, Australia - 2011-12

• National level supply and use (Vol & $$) tables, by:
  – State and territory
  – Industry
  – Households

• Feature articles
  e.g. Rain water tanks – household consumption; Estimates of Soil water
Australian climate conditions

Australian annual rainfall
1996-97 to 2009-10

Percentage of 1961-1990 average rainfall, Australia

2004-05
2009-10
Why are water accounts useful?

• Australian water supply is variable
• Water accounts help to understand how water is being used, and how this use is changing over time.
• for predicting future water needs
• assessing impacts of water use:
  – water quality
  – economic changes which might result from reallocations of water
Data sources

*Large number of sources, including ABS survey data and other sources*

- 2011-12 Water Supply Survey
- 2011-12 Energy Water and Environment survey
- 2011-12 Agricultural Resource Management Survey
- 2008-09 Electricity Generators Survey of Water Use
- State government reports,
- Household Expenditure survey
- Administrative data (annual reports – Local Gov)
- ABS Economic Activity Survey
- Local Government Annual Reports
Water supply and use in Australia
Hybrid (monetary and physical) water account

1. Why are hybrid accounts (i.e. combined monetary *and* physical accounts) useful?

2. Water valuation issues

3. Experimental hybrid water account for Australia
   - Methods and results
Why produce a hybrid water accounts?

- Enables the economic costs and benefits of water supply to matched with physical data on water stocks and flows.
- Informs more efficient water allocations:
  - ideally, require information on: physical water flows; prices paid for water used; value added of water users
- Achieving cost recovery for water infrastructure assets
Monetary vs. physical use of distributed water (% of total use)

Australia 2011-12: monetary vs. physical use of distributed water (% of total use)

- Households
- Other industries
- Water and waste services
- Electricity & Gas
- Manufacturing
- Mining
- Agriculture

Volume % and Expenditure %
Making every drop count: Water Accounting Workshop

Getting started!!

• Water ‘users’ are institutional units that use water i.e. households, agriculture etc. (but the ‘environment’ is not a ‘water user’)

• ISIC = International Standard Industry Classification. However, in the workshop exercises a descriptive title is also provided for each industry...
Making every drop count: Water Accounting Workshop

Getting started, continued...

• Water can be obtained through:
  
  ‘abstraction’ – i.e. extracted from the environment; or
  ‘received water’ i.e. from other economic units

• Water may be abstracted for:
  
  ‘own use’; or
  ‘distribution’ i.e. it is extracted for the purpose of supplying to another unit
Getting started, continued...

• Water ‘from the environment’ i.e. from a river etc. rather than from an institutional unit.

• Water ‘within the economy’ i.e. water involving transactions between institutional units e.g. a water supplier sells water to an agricultural unit.
Making every drop count: Water Accounting Workshop

Getting started, continued...

- Water consumption defined:
  
  ‘the water that is evaporated, transpired or incorporated into products’

- Water ‘use’ is water received by an institutional unit
Case study:
The Republic of Blue – Northville
Experimental Environmental Accounts
Waste Accounts

Waste Account, Australia, Experimental Estimates
2013
Why do Waste Accounts?
Why do Waste Accounts? (cont...)

- Greenhouse Gas Emissions Account (????)
- Water Account (2013)
- Energy Account (2013)
- Land Account (????)
- Waste Account (2013/14)
- Environmental Taxes (????)
- Environment Industry Account (2013)
- National Accounts Data
- Assist others (e.g. BoM, Victorian government, others)
Why do waste accounts? (cont...) 

• A waste account could inform National Waste Policy objectives to: 
  – generate less waste 
  – dispose less waste to landfill by increasing re-use & recycling 
  – keep more hazardous waste out of the environment.
Waste supply tables

Table 1: Waste Generated (amounts supplied, '000 tonnes)

<table>
<thead>
<tr>
<th>Generation of solid waste</th>
<th>Manufacturing</th>
<th>Mining</th>
<th>Construction</th>
<th>Waste Management</th>
<th>Other Industries</th>
<th>General Government</th>
<th>Households</th>
<th>Imports of Solid Waste</th>
<th>Total Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper &amp; Cardboard</td>
<td></td>
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<td>Glass</td>
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<td>Plastics</td>
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<td>Organics</td>
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<tr>
<td>Construction/Demolition</td>
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<td></td>
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<td></td>
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<tr>
<td>Electrical &amp; Electronic</td>
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<tr>
<td>Solid Hazardous Waste</td>
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<tr>
<td>Liquid Waste</td>
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<tr>
<td>Mixed/General</td>
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<tr>
<td><strong>Total</strong></td>
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<td></td>
</tr>
</tbody>
</table>
### Table 2: Waste Management (amounts used/treated/disposed, '000 tonnes)

<table>
<thead>
<tr>
<th>Recovery, treatment, disposal</th>
<th>Waste management</th>
<th>Other industries</th>
<th>Exports of solid waste</th>
<th>Total use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Landfill</td>
<td>Recovery facility</td>
<td>Manufacturing</td>
<td>Mining</td>
</tr>
<tr>
<td>Paper &amp; cardboard</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Plastics</td>
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</tr>
<tr>
<td>Metals</td>
<td></td>
<td></td>
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<tr>
<td>Organics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction/demolition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical &amp; electronic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solid hazardous waste</td>
<td></td>
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<tr>
<td>Liquid waste</td>
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<tr>
<td>Mixed/general</td>
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<tr>
<td>Total</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Waste and the SEEA

Main material flows covered in the physical supply-use tables are:

- products
- natural resources (extractions)
- residuals (to air, water and solid waste)
Waste - the Australian situation

• Australia (& ABS) compile some waste statistics
• State government & Industry associations compile regular landfill data
• ABS produced Waste Account, 2013
  – Experimental
  – Physical and monetary tables
  – Planned to be produced annually
Data gaps

• Even with these data sources still do not have:
  – Quantities waste disposed to landfill x industry
  – Quantities waste recovered (by material) x industry

• Funding limitations will restrict data sources available

• However, agreed structure in place.
Greenhouse Gas Emissions Account
Greenhouse Gas Emissions Account

- Based on AUS Dept. of Environment’s National Greenhouse Accounts – Territory basis
- ABS makes adjustments to bring them onto a SEEA – residence basis
  - Bunkering
  - Tourism
- Input-output analysis tables for consumption-based Greenhouse (GHG) emissions in Australia
Environmental Protection Expenditure (EPE)

EPE accounts identify economic transactions directly concerned with using, managing and protecting the environment:

- make protective expenditure on the environment more explicit
- reorganise existing information, without necessarily adding new information

The scope of EPE accounts includes:

- protection of ambient air and climate
- waste water management
- solid waste management etc.
Environmental Protection Expenditure (EPE) cont...

• Environment Protection must be the prime objective of an expenditure for inclusion in an EPE account.

• Environment Protection is "actions and activities aimed at the prevention, reduction and elimination of pollution as well as any other degradation of the environment" (SERIEE 1994).

• EPE accounts identify such expenditure incurred by industry, governments and households.
Environmental Protection Expenditure (EPE) cont...

- **National Accounting Matrix** (*including* Environmental Flow Accounts)

| Institutional sector | Environment Protection Expenditure Classes (CEPA) |  |  |  |  |  |  |  |  |
|----------------------|---------------------------------------------------|---|---|---|---|---|---|---|
|                      | Ambient air and climate                          | Waste water management | Waste management | Soil, groundwater & surface water | Noise & vibration | Biodiversity & landscape | Radiation | Research & development | Other |
| Government:          |                                                   |  |  |  |  |  |  |  |  |
| National State       |                                                   |  |  |  |  |  |  |  |  |
| Local                |                                                   |  |  |  |  |  |  |  |  |
| Industry             |                                                   |  |  |  |  |  |  |  |  |
| Household            |                                                   |  |  |  |  |  |  |  |  |

**SOURCE:** *SERIEE EPE Account* in SEEA (2012).
Environmental Taxes

What are they?
• Taxes which have a tax base with a proven negative impact on the environment. (SEEA-2012, para 4.150)
• Environmental taxes in Australia consist of taxes on transport and energy.

Data sources
- ABS Government Finance Statistics (GFS) (cat. no. 5506.0)
- ATO and various other departments

What can they tell us
- By tax payer category
- By industry and households
### Environmental Taxes: Presentation and Analysis

By tax payer category

#### 6.1 Environmental taxation revenue, Australia, 2000-01 to 2010-11, $m, current prices

<table>
<thead>
<tr>
<th>Category</th>
<th>2000-01</th>
<th>2005-06</th>
<th>2010-11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude oil, LPG, gas and petroleum products</td>
<td>12 453</td>
<td>14 075</td>
<td>16 305</td>
</tr>
<tr>
<td>Petroleum products taxes</td>
<td>174</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ozone Protection and synthetic GHG(a)</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Renewable energy certificates(b)</td>
<td>-</td>
<td>90</td>
<td>980</td>
</tr>
<tr>
<td>Stamp duty on vehicle registration</td>
<td>1 387</td>
<td>1 922</td>
<td>2 167</td>
</tr>
<tr>
<td>Road maintenance and heavy vehicle registration(c)</td>
<td>2 646</td>
<td>3 672</td>
<td>5 294</td>
</tr>
<tr>
<td>Luxury car tax(d)</td>
<td>172</td>
<td>324</td>
<td>489</td>
</tr>
<tr>
<td>Passenger motor vehicles duty (import)(a)</td>
<td>na</td>
<td>na</td>
<td>780</td>
</tr>
<tr>
<td>Total environmental taxes</td>
<td>16 833</td>
<td>20 085</td>
<td>26 016</td>
</tr>
<tr>
<td>% of GDP(e)</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>% of total tax rev(e)</td>
<td>8</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>
Environmental Taxes: Presentation and Analysis cont...
By industry and households

6.4 Environmental-Economic profile % of total industries - 2010-11

Source: ABS cat. no. 8155.0. Hao Legoff et al 2012
Australian Environmental-Economic Accounts, 2014

- Water Account (2013)
- Energy Account (2013)
- Land Account
- Waste Account (2013/14)
- Environmental Taxes (????)
- Greenhouse Gas Emissions Account (????)
- Environment Industry Account (2013)

Assist others (e.g. BoM, Victorian government, others)

National Accounts Data
Questions?