Environmental Accounts: The Australian Experience

John Power
Australian Bureau of Statistics
Centre of Environment Statistics
John.power@abs.gov.au

Australian Government
AusAID

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

Australian Bureau of Statistics

Australian Government
AusAID

Account type	Year First published	Frequency or status	Reference Years for which accounts are available			
			Stock accounts		Flow accounts	
			Physical	Monetary	Physical	Monetary
NATIONAL BALANCE SHEET -land -minerals -energy -timber	1995	Annual from 1995	1988-89 to 2011-12	1988-89 to 2011-12		
-fish	2012	Experimental		2000-01, 2005-06 to 2009-10		
FISH	1995	Occasional	1996-97		1996-97	
ENERGY	1996	Annual from 2011	1988-89 to 2011-12	1988-89 to 2011-12	2008-09 to 2010-11; 2006-07; 2004-05; 1993-94 to 1996-97	2009-10; 2004-05
MINERALS	1998	Occasional	1985 to 1996		1992-93, 1993-94	
WATER	2000	Annual from 2010			2008-09 to 2010-11; 2004-05; 2000-01; 1993-94 to 1996-97	2009-10; 2008-09; 2004-05; 2003-04
LAND COVER AND LAND USE VALUES (BY STATE)*	2011	Annual from 2011	2011; 2012; 2013	2012; 2013	2013	2013
WASTE	2012	Annual from 2012			2009-10	2009-10
GHG EMISSIONS - EMBEDDED IN FINAL	2012	Experimental			2008-09;	

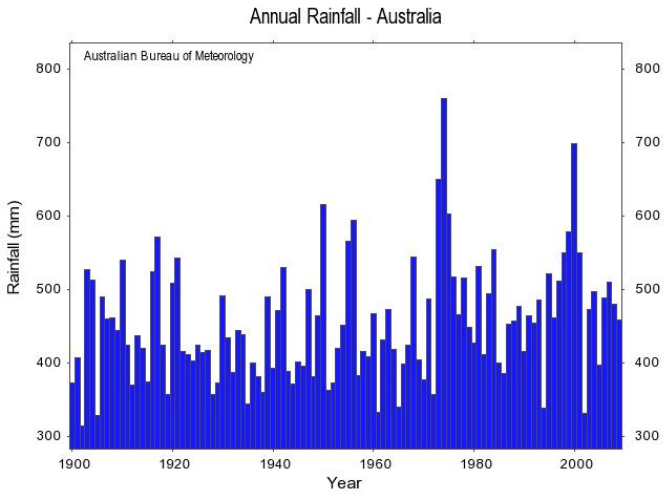
Australian Bureau of Statistics

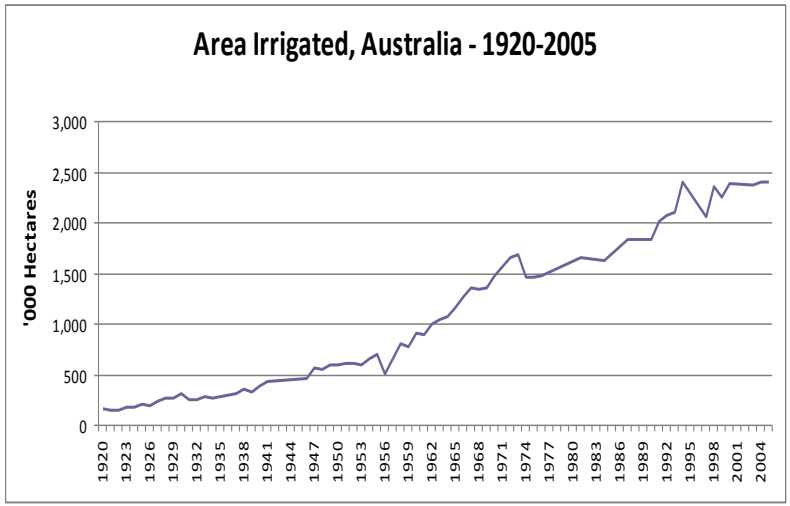
Who else is compiling environmental accounts?

WAVES

	Flow Accounts			
	Assets	Physical	Monetary	EPEs
Industrialised				
Australia	x	x	x	x
Canada	x	x		x
Finland	x	x		x
France	x	x		x
Germany	x	x	x	x
Italy	x	x		x
Japan	x	x	x	x
Norway	x	x		
NZ	x	x	x	x
Sweden	x	x	x	x
UK	x	x		x
US	x			x
Developing				
Botswana	x	x	x	
Chile	x		x	x
Korea	x	x	x	x
Columbia		x	x	x
Costa Rica				x
Indonesia	x			
Mexico	x	x	x	x
Moldova		x		
Namibia	x	x	x	
Philippines	x	x	x	x
South Africa	x	x	x	

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 10th time (or better still the 100th!)

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

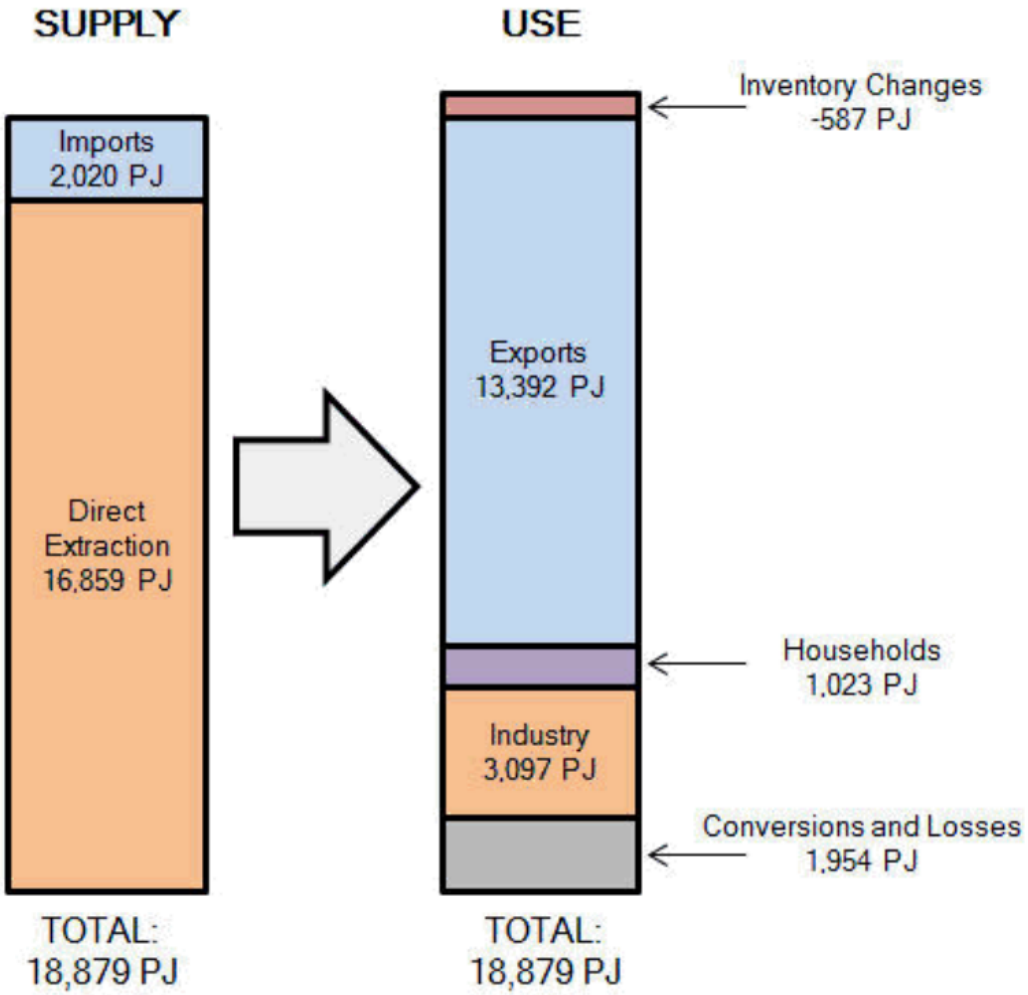
- Physical data (PJ): Sourced from ABARE's *Australian Energy Statistics* – richer product detail

- 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



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

Australian Bureau of Statistics

Physical vs. Monetary Use – Coal

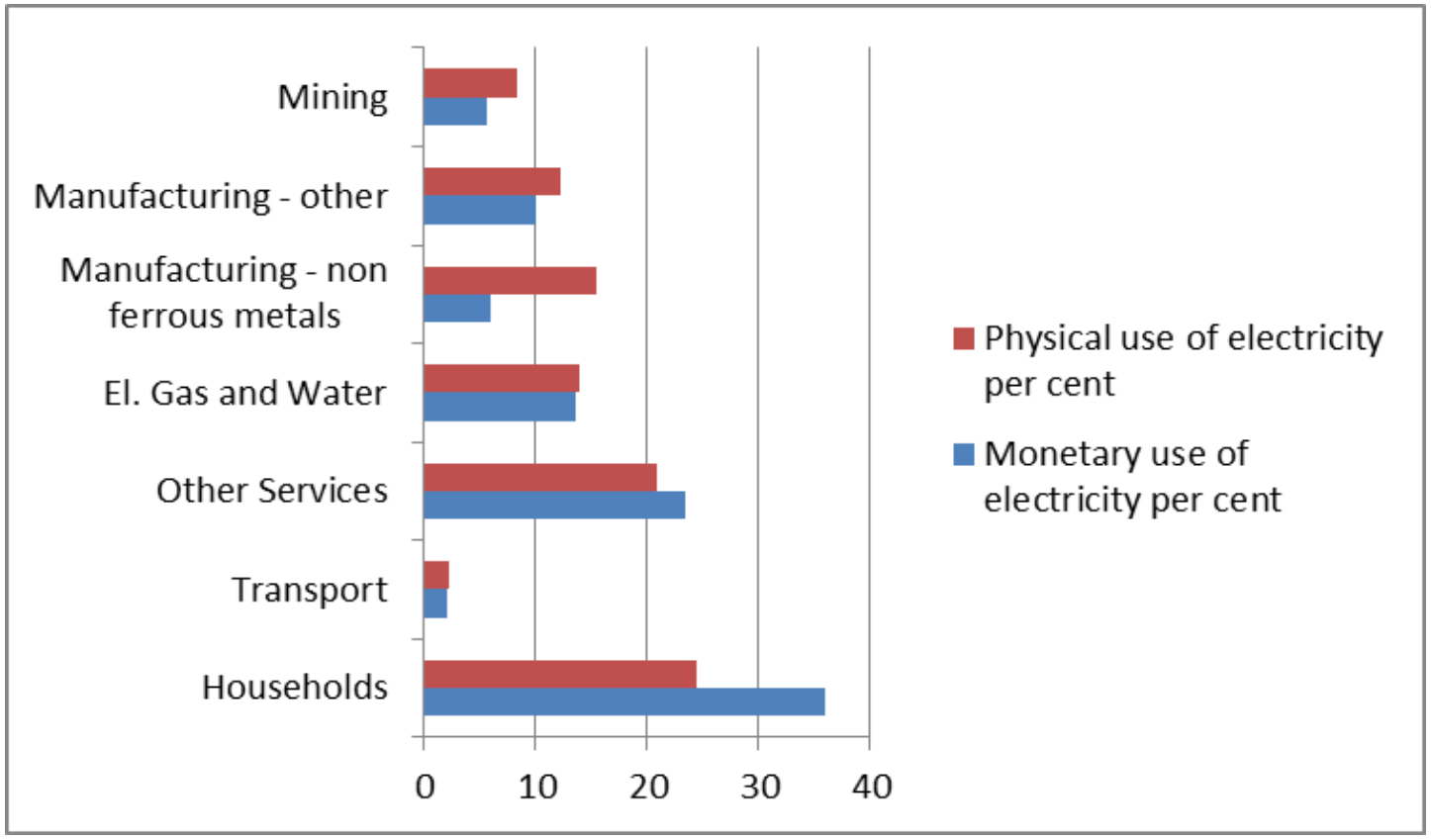
WAVES

Industry	Physical use of Coal (PJ)	Monetary use of Coal ($m)	Implied Price ($m/PJ)
Mining	7	259	37
Manufacturing - non ferrous metals	64	147	2.3
Manufacturing - other	31	70	2.3
Electricity, gas and water supply	1,975	2,268	1.1
Households	0	1	-

Australian Bureau of Statistics

WAVES

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

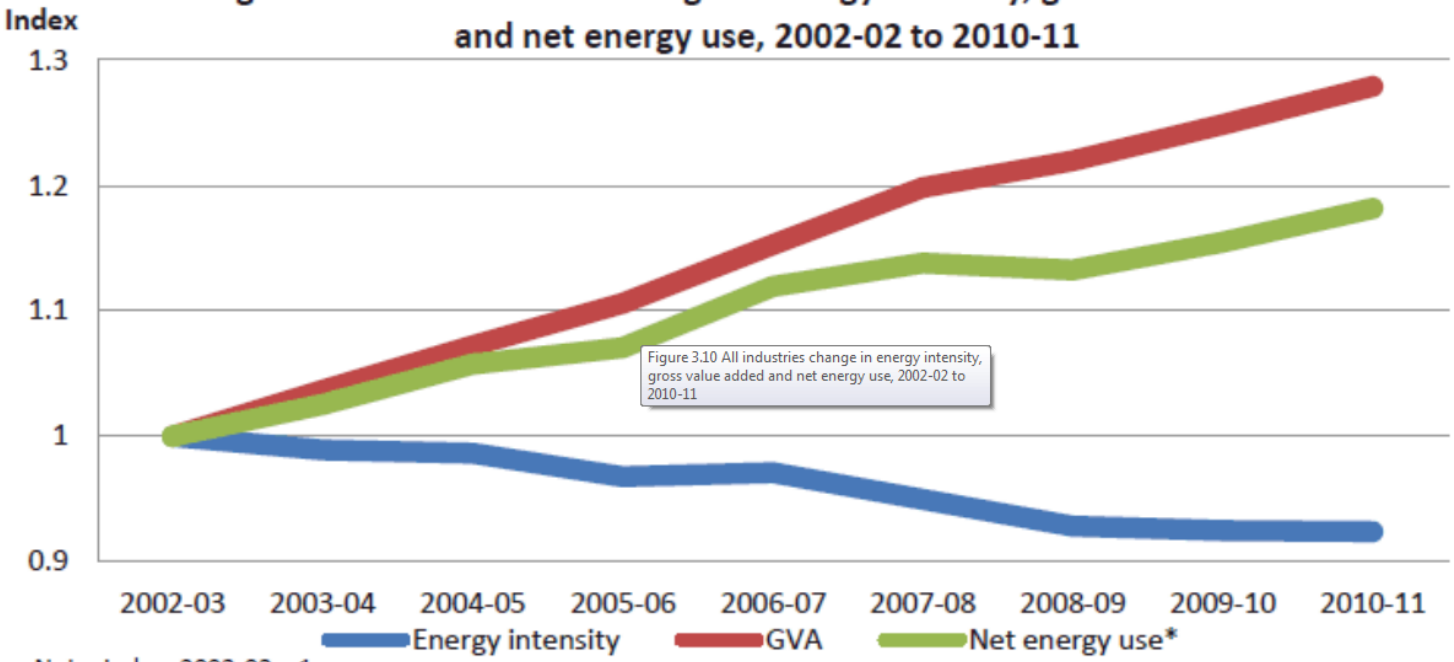
- Energy intensity:

  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



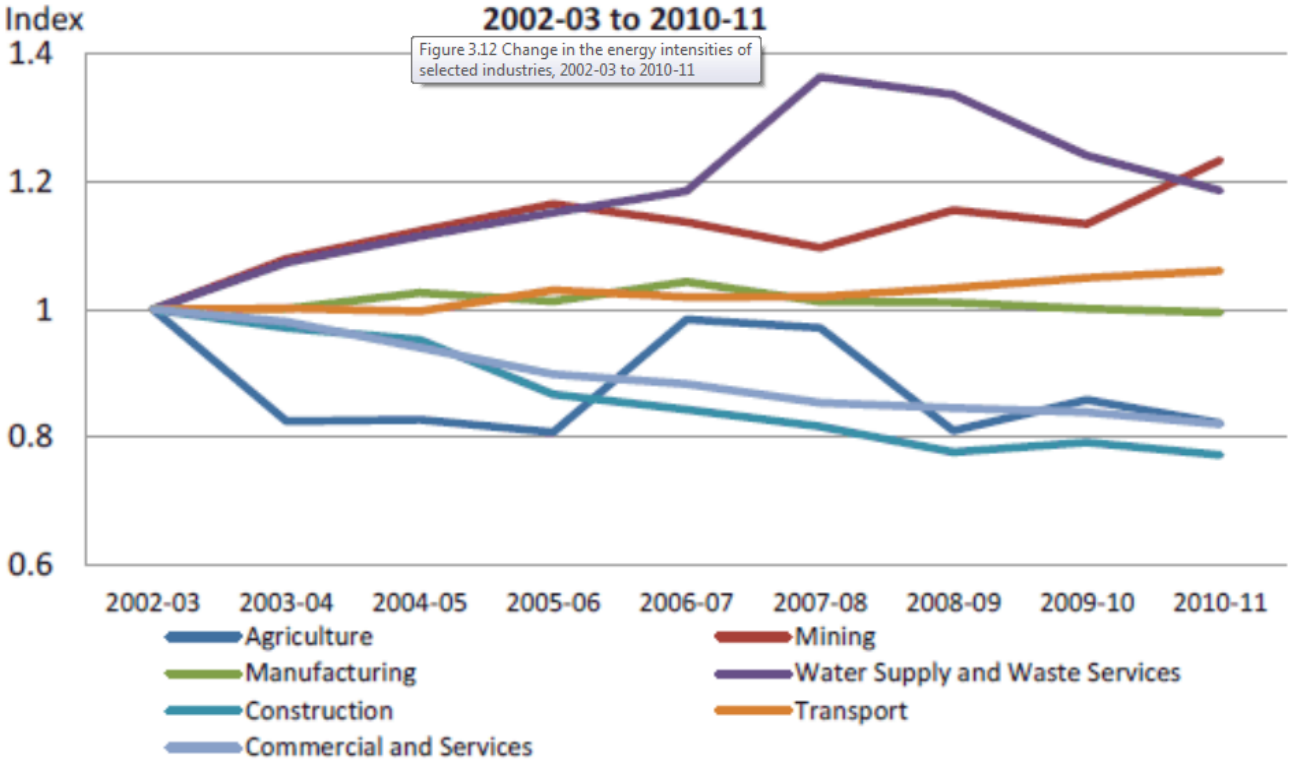
Note, Index: 2002-03 = 1

* 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…

Figure 3.12 Change in the energy intensities of selected industries, 2002-03 to 2010-11



Note, Index: 2002-03 = 1

Source: Energy Account, Australia (ABS cat. no. 4604.0), *Australian System of National Accounts* (ABS cat.no. 5204.0)

Australian Bureau of Statistics

Why mining has become more energy intensive

WAVES

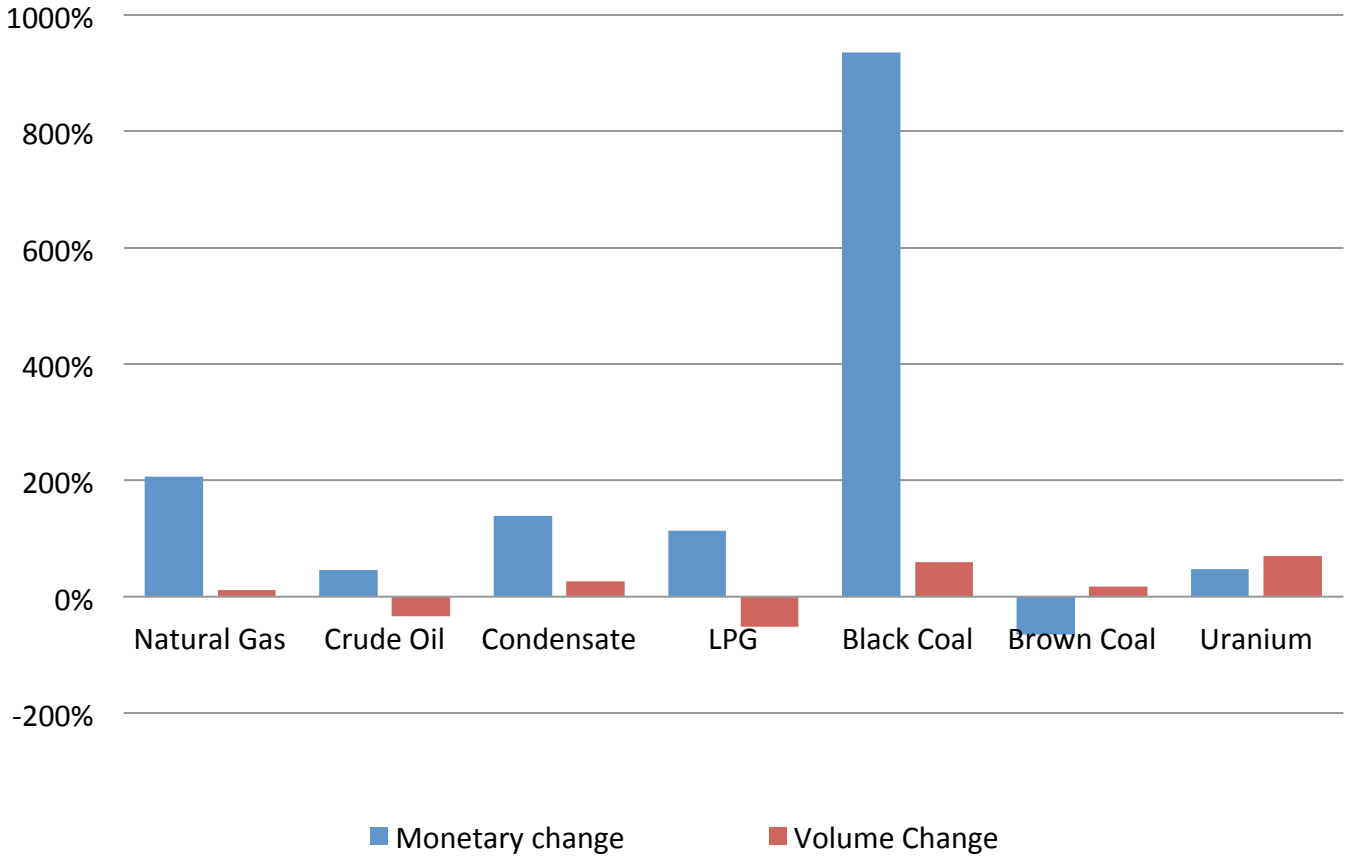
Stocks of energy assets

- Physical measures (PJ, Gt etc)
- Monetary measures (net present value NPV)
- For each major type of asset (coal, uranium etc…)



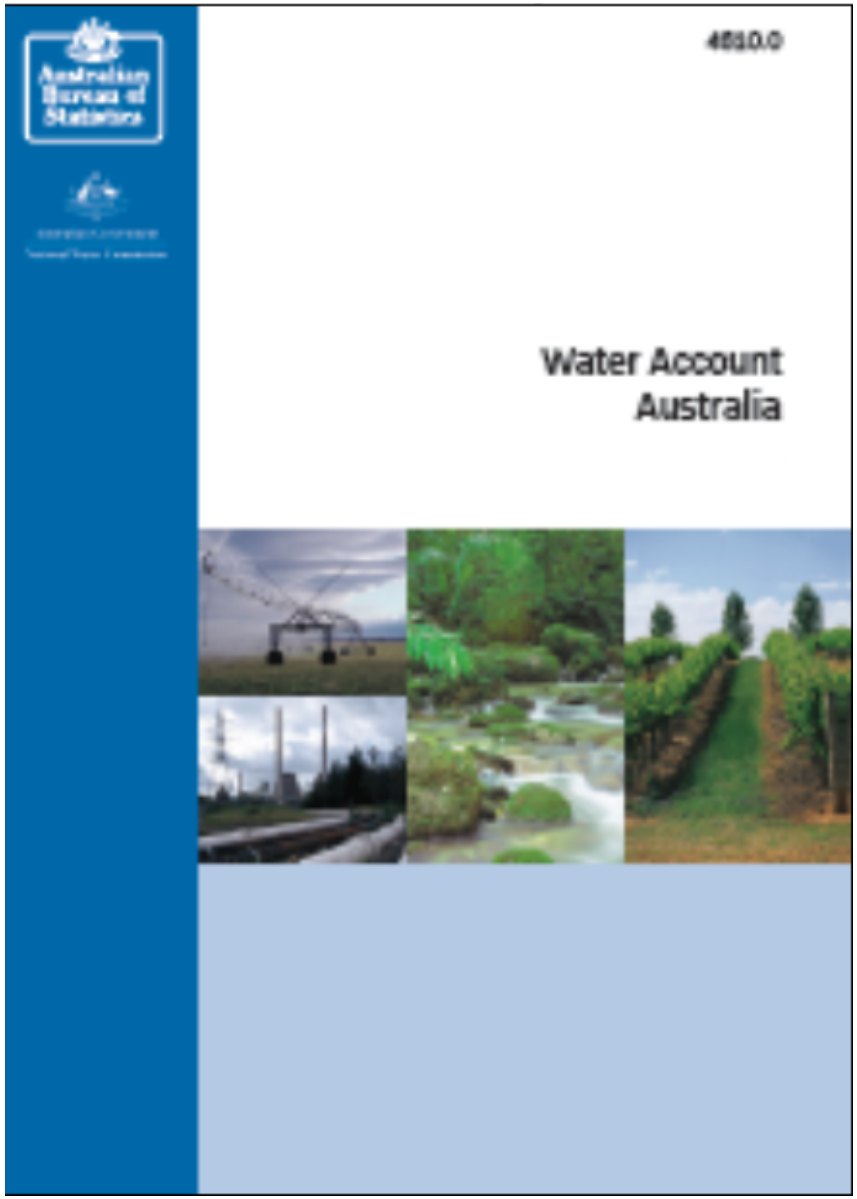

Change in stocks of energy assets

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



Australian Bureau of Statistics

Water accounts



WAVES

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
- First edition– 1993-94 to 1996-97, Annual cycle from 2008-09, release December 2010

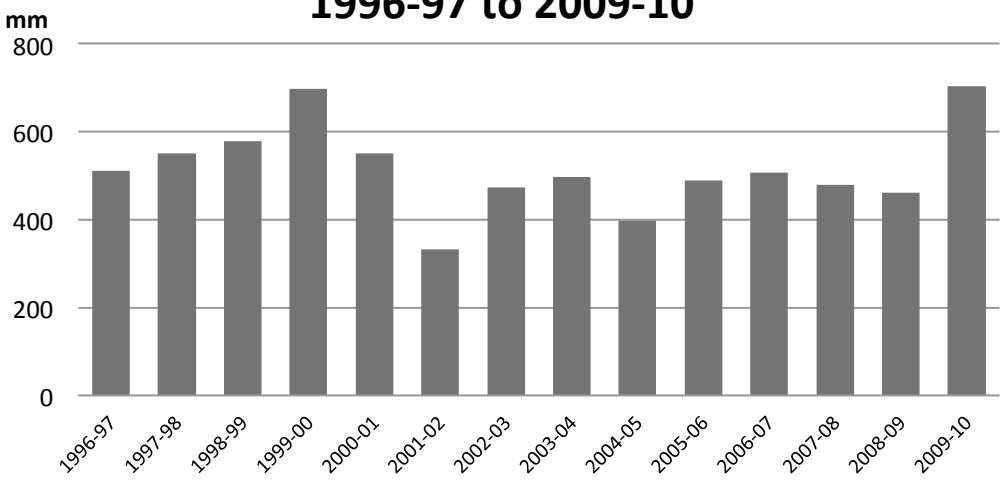
Content: Water Account, Australia - 2011-12

- 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

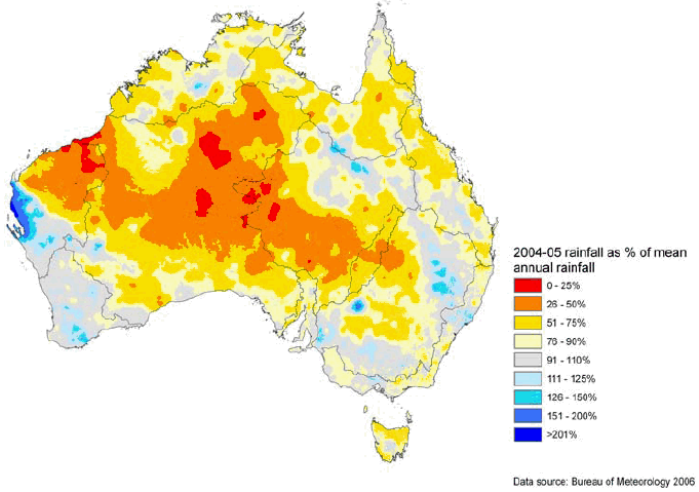
Australian climate conditions

Australian annual rainfall 1996-97 to 2009-10

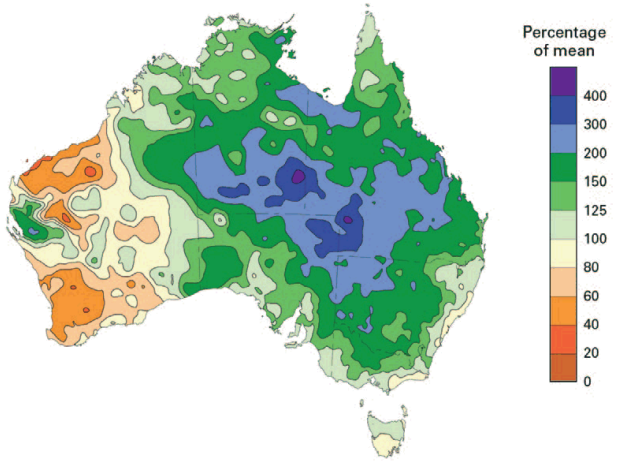


Percentage of 1961-1990 average rainfall, Australia

2004-05



2009-10



Australian Bureau of Statistics

Why are water accounts useful?

WAVES

- 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

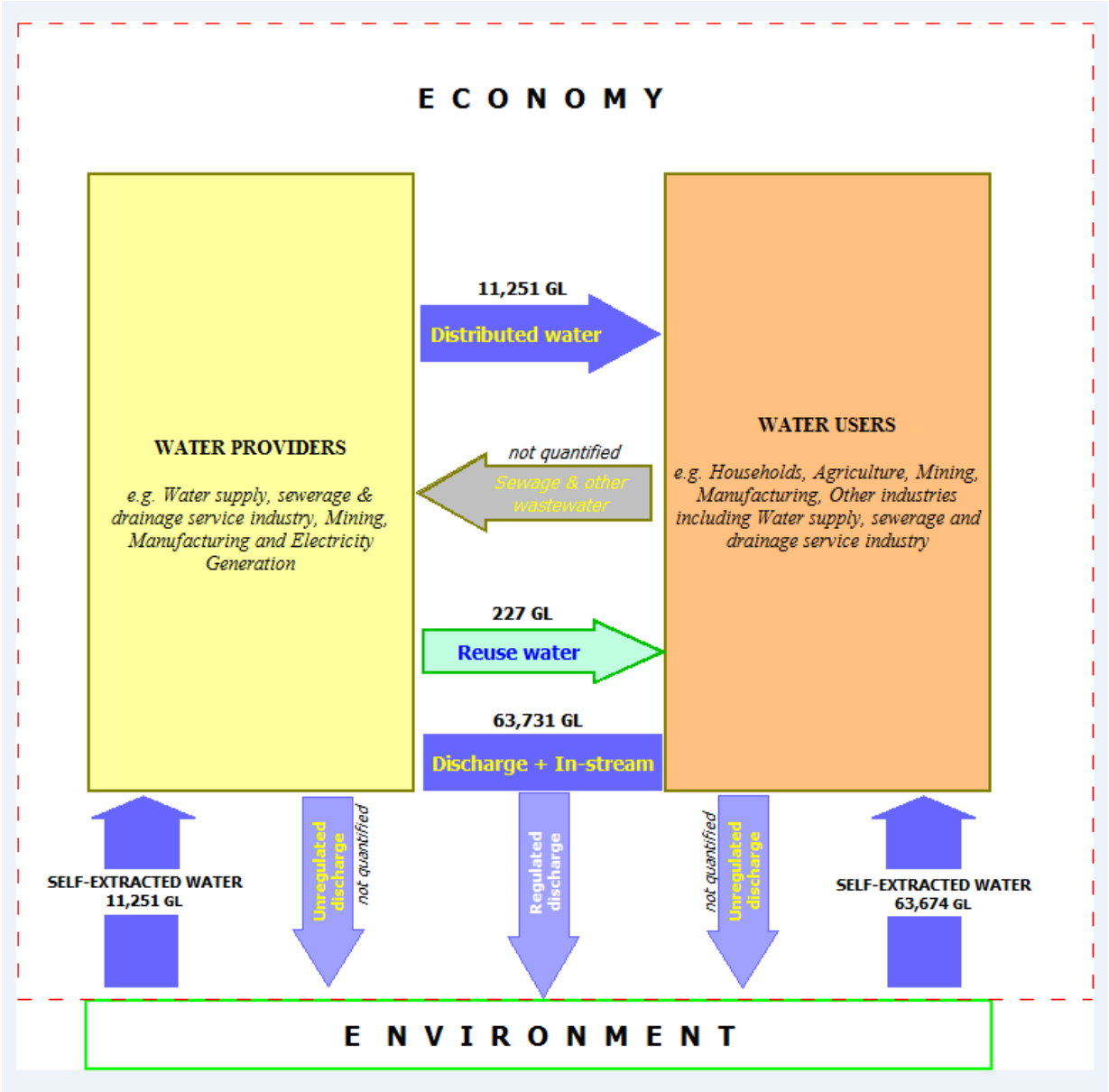
- State government reports,
- Household Expenditure survey
- Administrative data (annual reports – Local Gov)

- ABS Economic Activity Survey
- Local Government Annual Reports




Australian Bureau of Statistics

Water supply and use in Australia



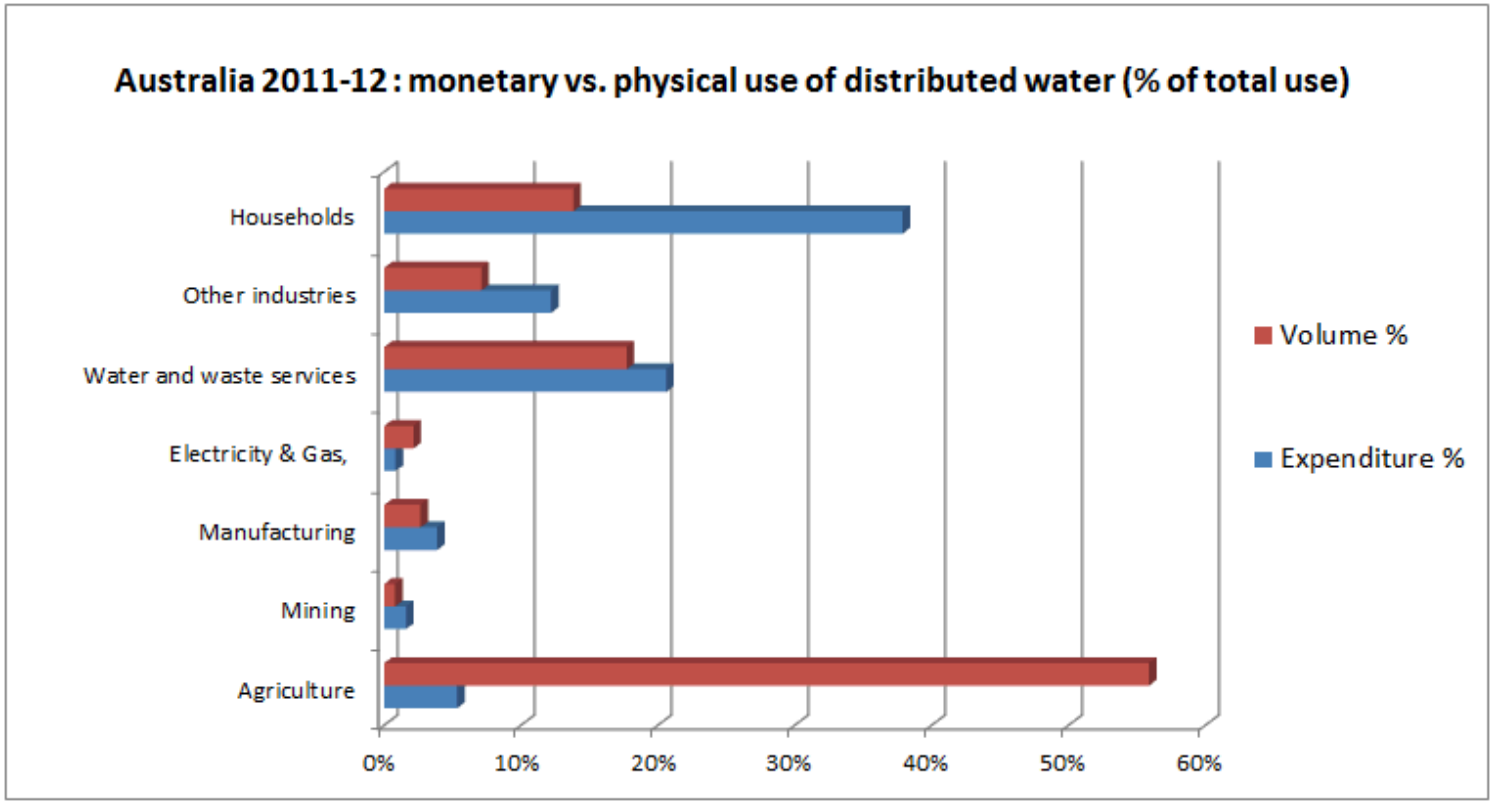
Hybrid (monetary and physical) water account

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)



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

Making every drop count: Water Accounting Workshop

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

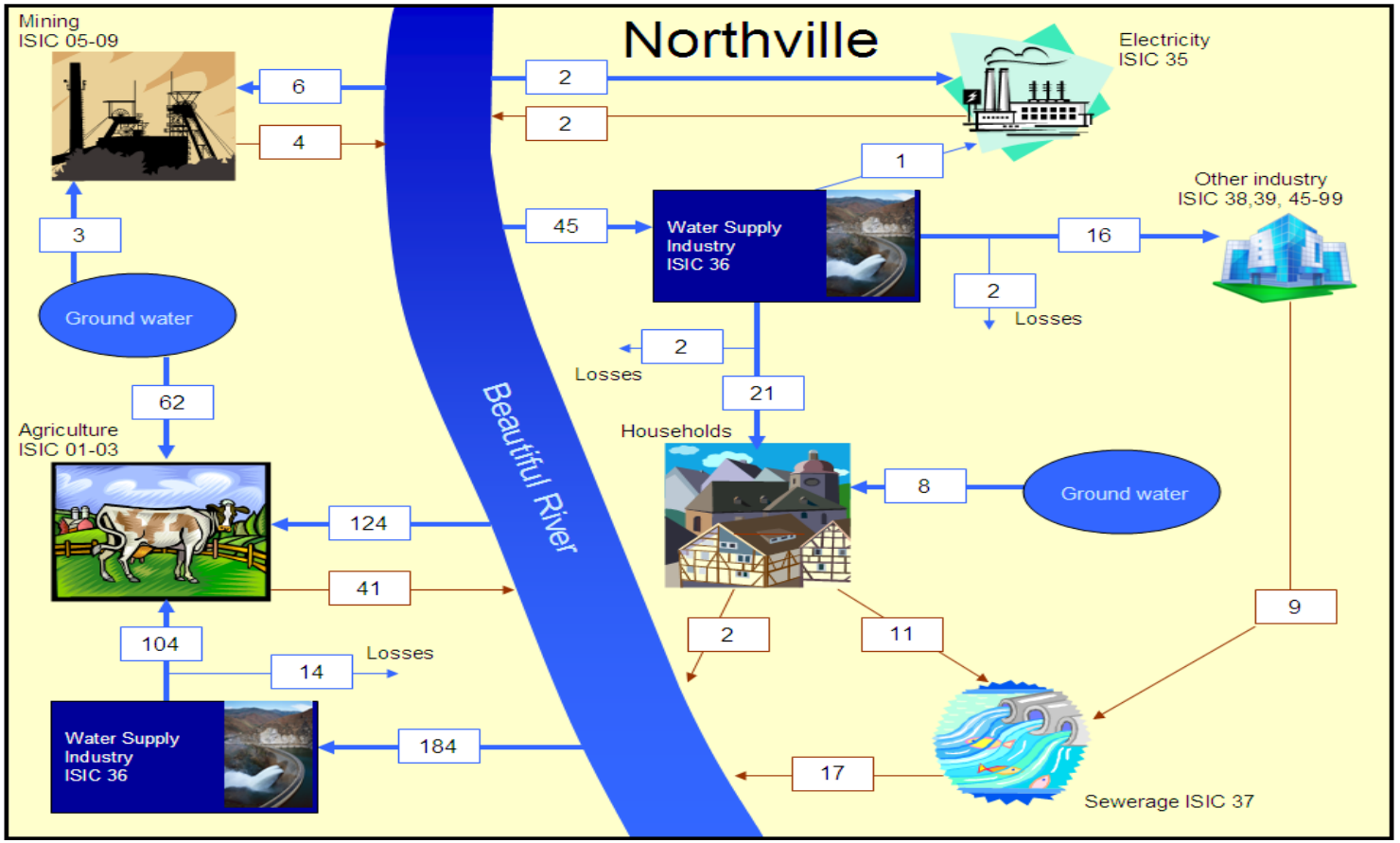
Getting started, continued…

- 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

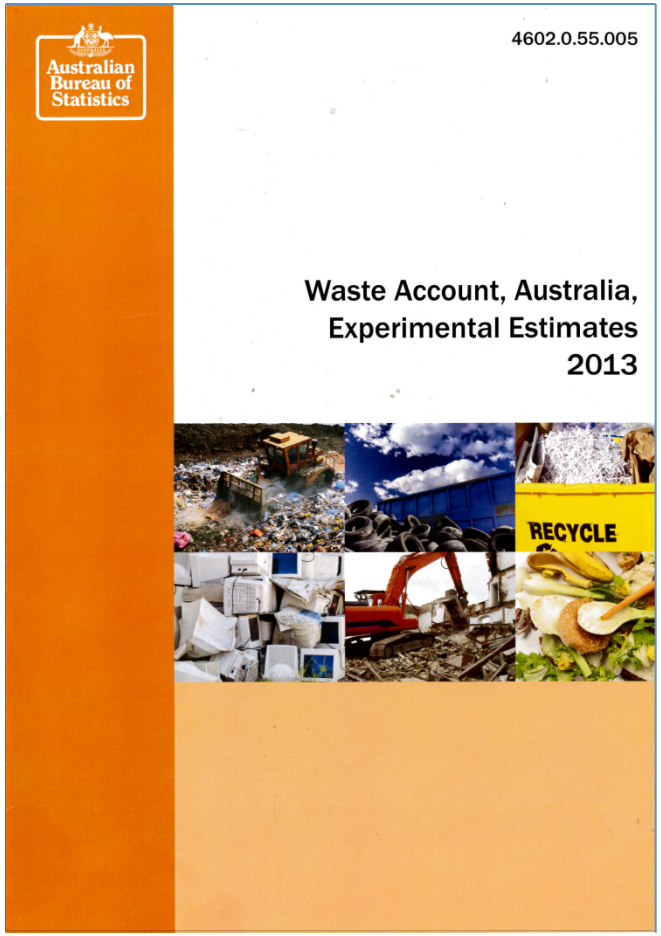


Australian Bureau of Statistics

WAVES

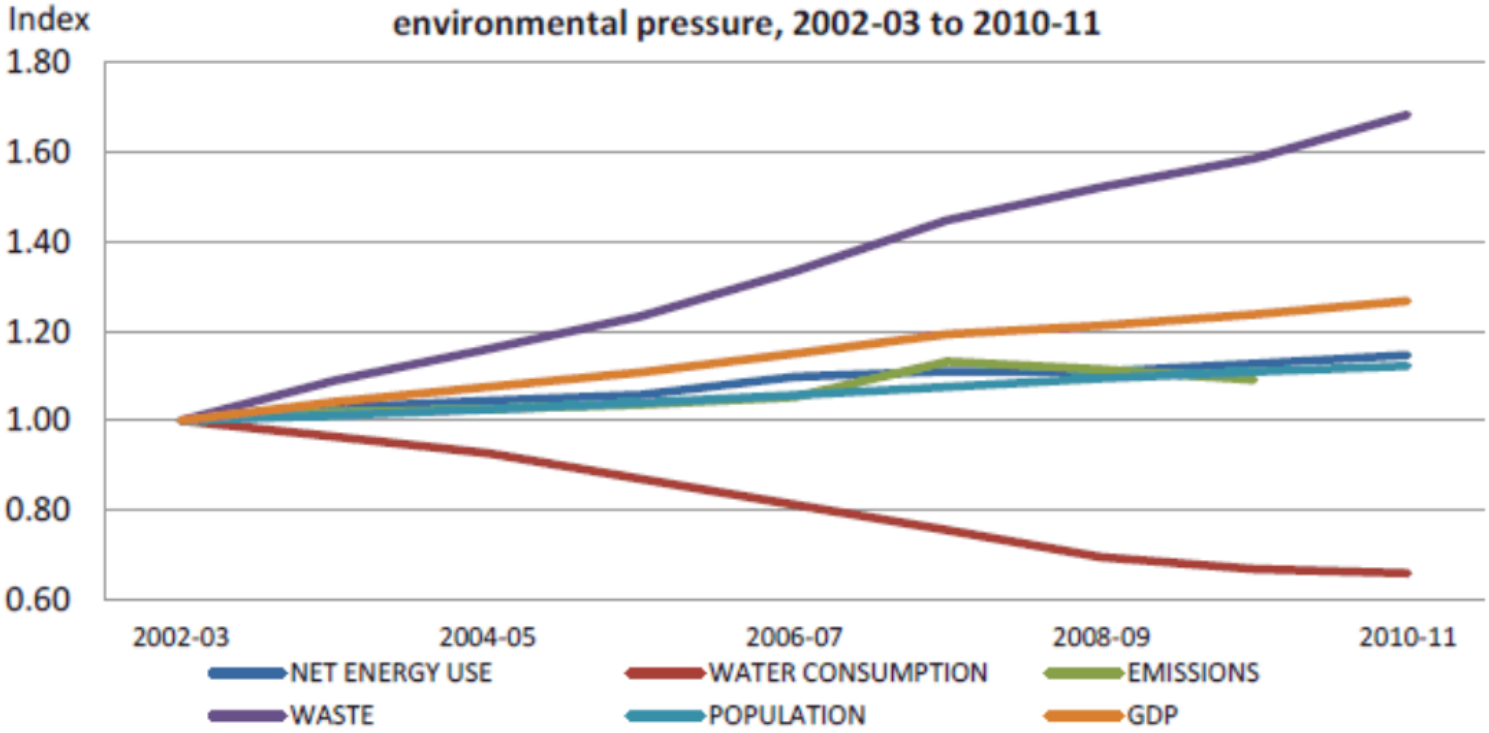
Experimental Environmental Accounts

Waste Accounts



Why do Waste Accounts?

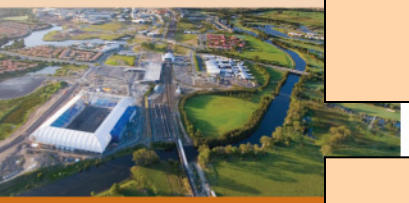
Figure 1.3 GDP, population and selected physical indicators of environmental pressure, 2002-03 to 2010-11



Note: Index: 2002-03 = 1

Sources: ABS; Department of Climate Change and Energy Efficiency; Department of Sustainability, Environment, Water, Population and Communities.

Why do Waste Accounts? (*cont…)*



Greenhouse Gas Emissions Account (????)

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

Water Account (2013)

Energy Account (2013)

Land Account (????)

Waste Account (2013/14)

Environmental Taxes (????)

Australian Environmental - Economic Accounts

National Accounts Data

Environment Industry Account (2013)

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)

	Generation of solid waste								
	Manufacturing	Mining	Construction	Waste Management	Other Industries	General Government	Households	Imports of Solid Waste	Total Supply
	'000 tonnes								
Paper & Cardboard									
Glass									
Plastics									
Metals									
Organics									
Construction/ Demolition									
Electrical & Electronic									
Solid Hazardous Waste									
Liquid Waste									
Mixed/General									
Total									

Waste use tables

Table 2: Waste Management (amounts used/treated/disposed, '000 tonnes)

	Recovery, treatment, disposal							
	Waste management		Other industries					
	Landfill	Recovery facility	Manufacturing	Mining	Construction	Other	Exports of solid waste	Total use
Paper & cardboard								
Glass								
Plastics								
Metals								
Organics								
Construction/ demolition								
Electrical & electronic								
Solid hazardous waste								
Liquid waste								
Mixed/general								
Total								

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.

Australian Bureau of Statistics

WAVES

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

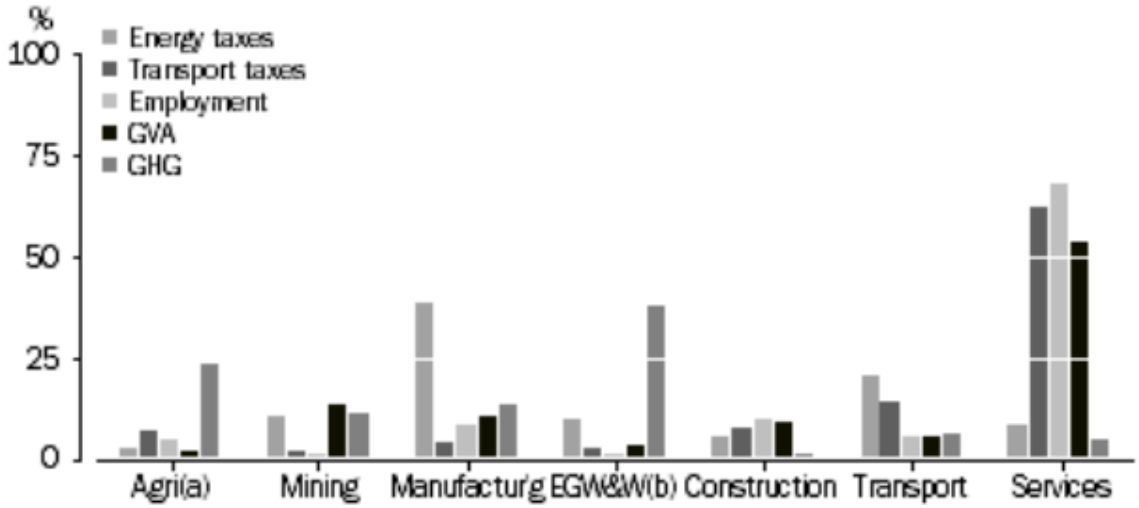
6.1 Environmental taxation revenue, Australia, 2000-01 to 2010-11, $m, current prices

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

Environmental Taxes: Presentation and Analysis *cont…*

By industry and households

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



(a) Agriculture, forestry and fishing
(b) Electricity, gas, water and waste services

Source: ABS cat. no. 8155.0. Hao, Lestoff et al 2012

Australian Environmental-Economic Accounts, 2014

Greenhouse Gas Emissions Account (????)

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

Water Account (2013)

Energy Account (2013)

Land Account

Waste Account (2013/14)

Environmental Taxes (????)

Australian Environmental - Economic Accounts

National Accounts Data

Environment Industry Account (2013)

Australian Bureau of Statistics

Questions?