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ABS Land Accounts

Tom Walter: Assistant Director, Geospatial Solutions

Australian Bureau of Statistics

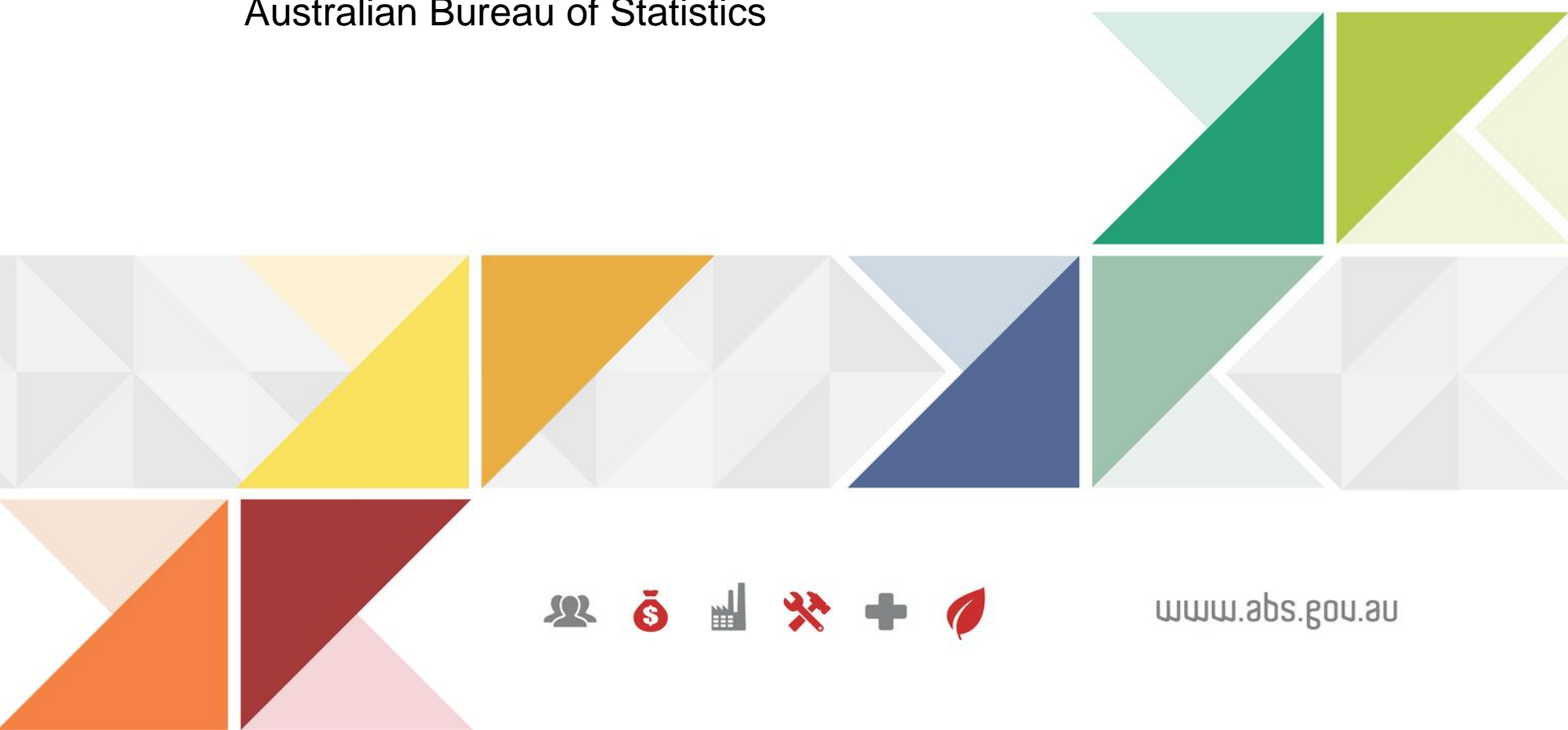
Contributed presentation at the 60th AARES Annual Conference,
Canberra, ACT, 2-5 February 2016

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ABS Land Accounts

Tom Walter: Assistant Director, Geospatial Solutions
Australian Bureau of Statistics



www.abs.gov.au

Presentation overview

- What is a Land Account and why are we producing them?
- Data sources and methodology
- What has the ABS done - some example output
- Lessons learned

What is a Land Account?

A summary of the **fundamental** attributes about land, presented in a format that enables simple **comparison over time**.

An internationally accepted method of **integrating information** about land with other economic indicators.

Why a Land Account?



Land is **fundamental** to economic production
Land represents a major proportion of the
nation's value and is a significant cost of
production

Worth \$4,267 billion (34%) in 2014
(Australia's National Accounts)

The way we use land effects the quality of the
environment

Integrated economic, environmental, and
social data adds value – contributes to informed
decision making



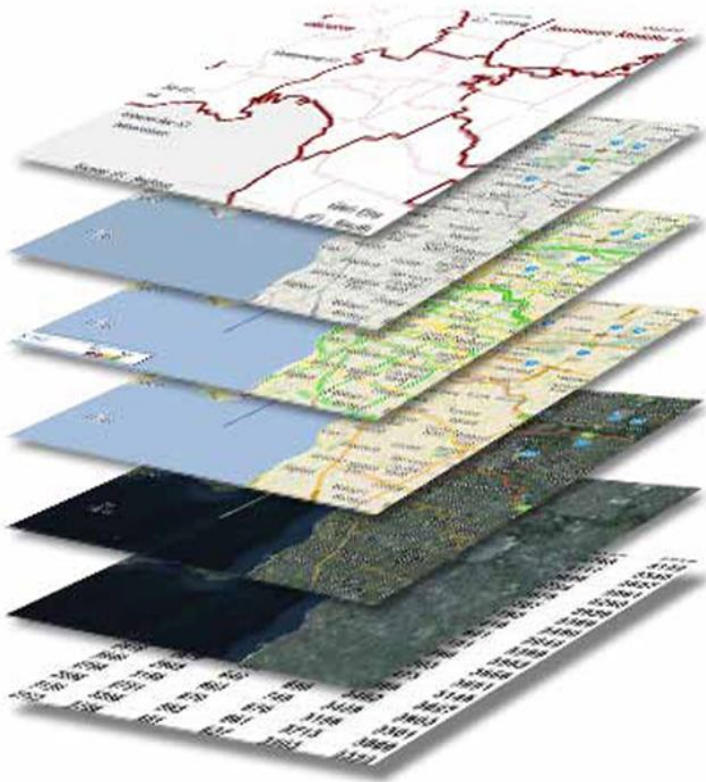


Essential information

Agency	Data
Public Sector Mapping Agency (PSMA)	Cadastre / common property ownership
State and Territory Valuers' General	Land Titles databases <ul style="list-style-type: none"> • Land Use • Land Value • Property boundaries
Australian Taxation Office and Australian Bureau of Statistics	Australian Business Register (Industry type and Sector)
Geoscience Australia	Dynamic Land Cover (raster format – 250 m)

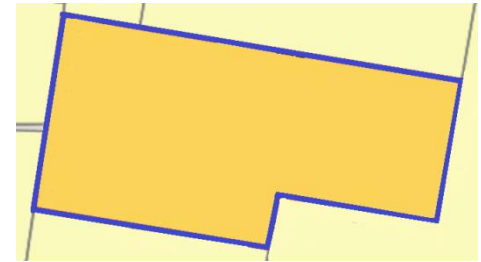
How do you produce a Land Account?

It can't be that hard!



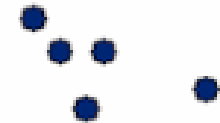
- Integrating existing environmental-economic information at the property level where possible.
- Geospatial analysis - using GIS technology to integrate
- Presenting results at various geographic levels.
- Repeating to measure change.

Land parcels - the areas of land defined by land ownership as identified in land title registers.
(this is the main unit ABS use for production of land accounts)



Gridded data - A raster grid consists of a matrix of cells where each cell contains a value representing information

Point data – data attributed to a particular point via latitude and longitude (e.g. address points)



The Method – Integrating at the property spatial unit

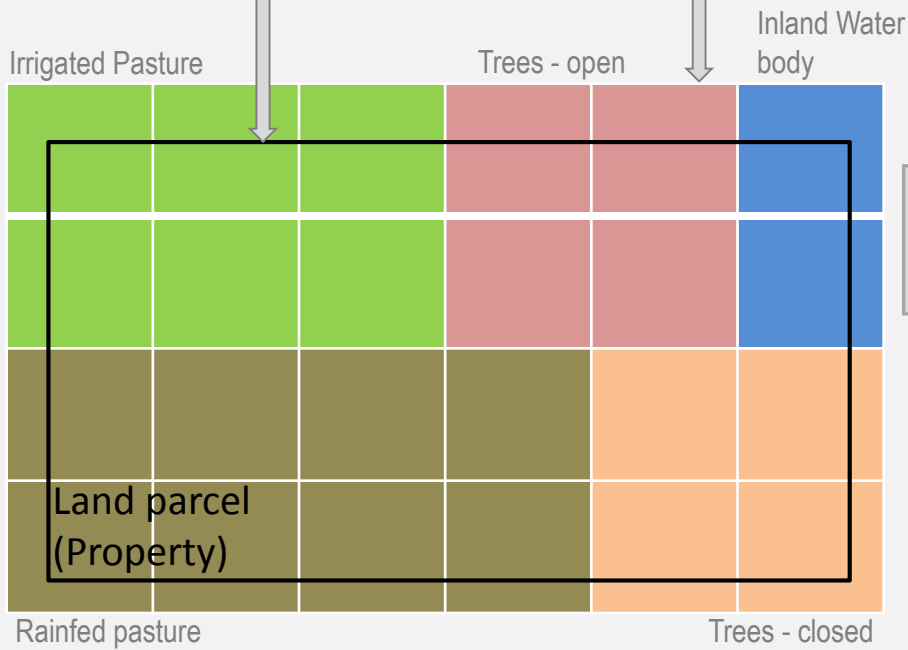


Input

State Valuations data for properties:

- Land Use
- Land value

Geoscience Australia's Dynamic Land Cover gridded data



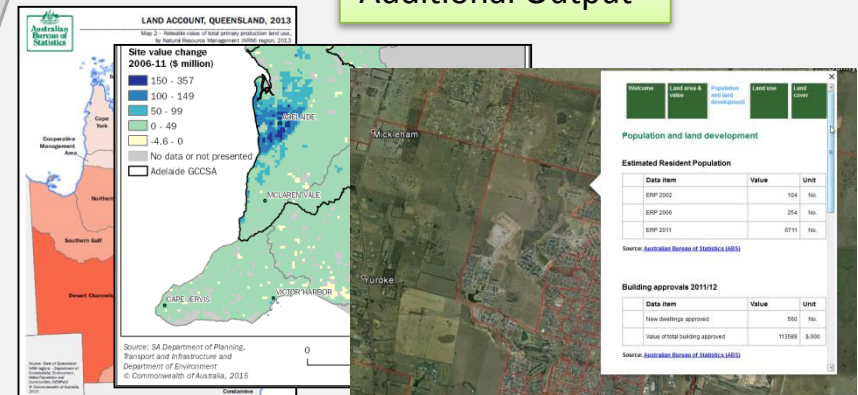
Output

Primary Land Account tables

Table 2.1 : Land use by Land cover, Corangamite NRM Region (Hectares), 2012

Australian Valuation Property Classification Codes (AVPCC)	Extraction Sites	Inland Waterbodies	Salt Lakes	Irrigated Cropping	Irrigated Pasture	Rainfed Cropping
Native Vegetation	0	0	0	0	0	0
Agriculture Cropping	0	0	0	0	0	2 346
Livestock Grazing	0	1 282	0	0	6 103	29 452
Mixed Farming and Grazing	267	1 160	6	53	5 347	80 168
Livestock - special purpose fencing, pens, cages, yards or shedding, stables	0	0	0	0	0	824
Horticulture Fruit and Vegetables Crops	0	0	0	0	0	166
Horticulture - Special Purpose Structural Improvements	0	0	0	0	0	485
Forestry - Commercial Timber Production	0	0	0	0	0	734
Aquaculture	0	0	0	0	0	0
Primary Production Total	297	2 463	6	82	12 014	113 856
Residential	81	534	0	0	0	3 275

Additional Output





Definitions

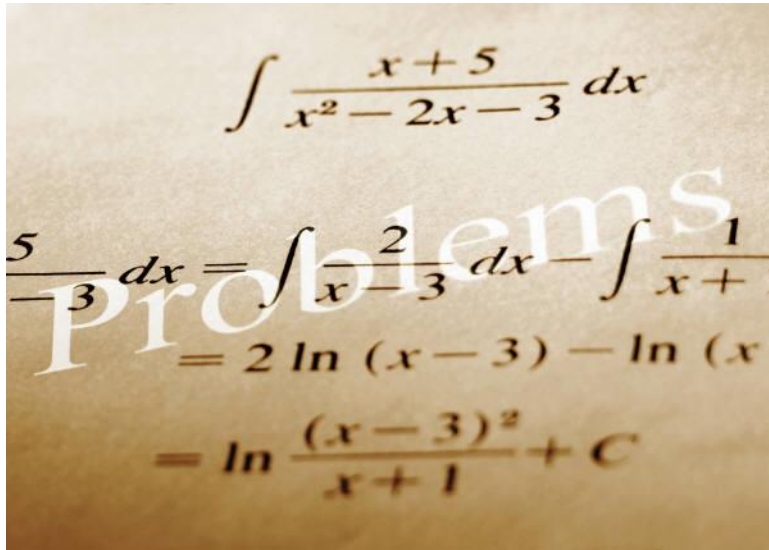
- **Land use** - reflects both (i) the activities undertaken and (ii) the institutional arrangements put in place on the land;
- **Land cover** - refers to the observed physical and biological cover of the Earth's surface.

Land can also be considered in terms of **ownership by economic units:**

- Industry Classification – eg: Agriculture
- Institutional sector – eg: Government owned land



Some issues with the data



Handwritten mathematical derivation of the integral of $\frac{x+5}{x^2-2x-3} dx$. The derivation shows the partial fraction decomposition and the resulting logarithmic form.

$$\int \frac{x+5}{x^2-2x-3} dx$$
$$\frac{5}{3} dx = \int \frac{2}{x-3} dx - \int \frac{1}{x+1} dx$$
$$= 2 \ln(x-3) - \ln(x+1) + C$$
$$= \ln \frac{(x-3)^2}{x+1} + C$$

- Multiple land uses allocated to the same property
- Data inaccuracy – eg: cadastral boundaries shift over time
- Multiple classifications used
- ABS Business Register (linking economic units) does not geocode accurately to cadastral parcel.
- Land Cover data not continuing beyond 2012.



Published Land Accounts

Great Barrier Reef catchments QLD (2011)

- Land Use by Industry (area and \$)
- Land Cover by Industry (area and \$)

States of Victoria (2012) and Queensland (2013)

- Land Cover by Land use (area)
- Land Cover by Land use (\$)

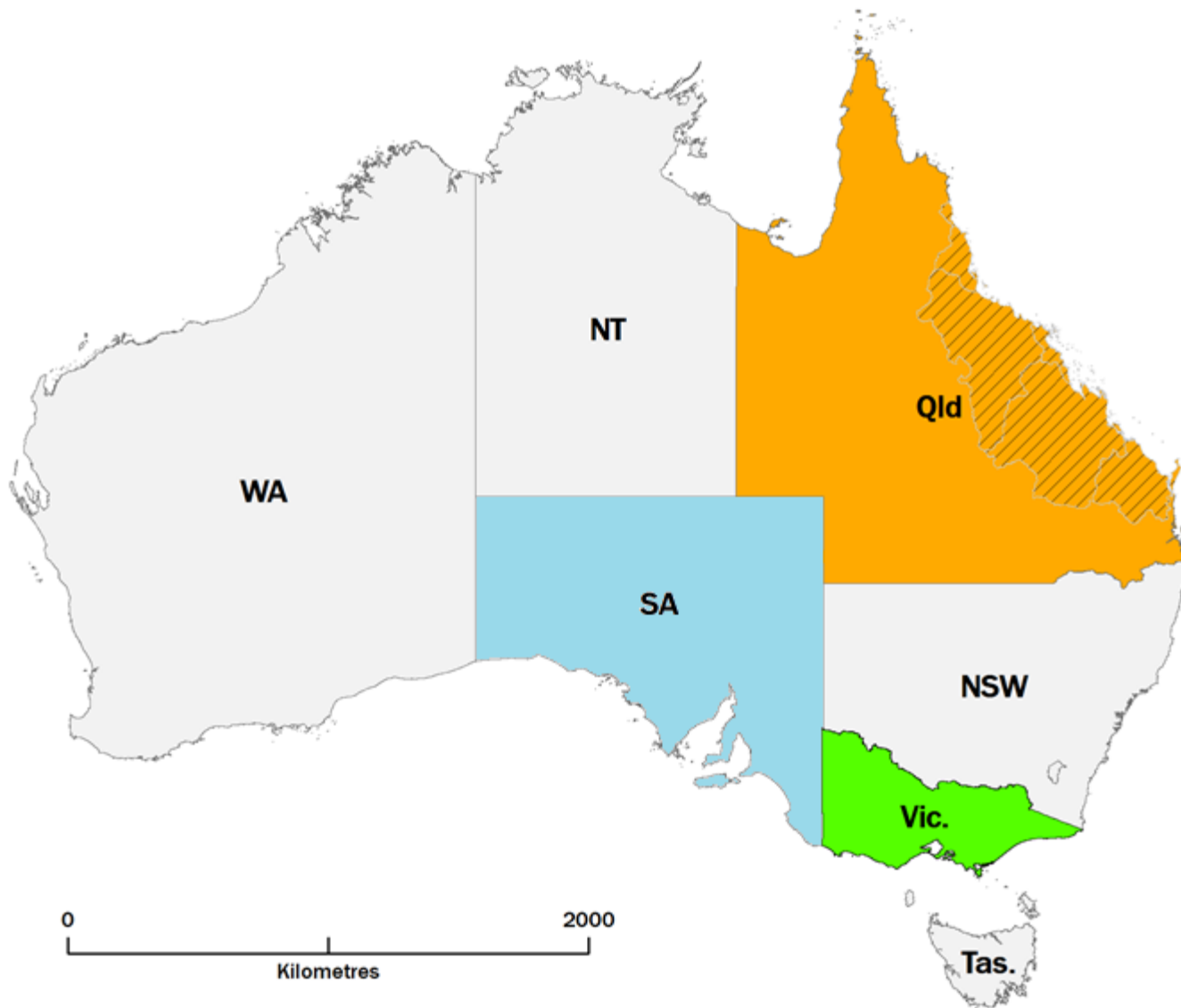
Great Barrier Reef region in Queensland

- Land use change matrix (2009 – 2013)
- Land cover change matrix (2009 – 2013)

State of South Australia

- Land use change matrix (2006 – 2011)
- Land cover change matrix (2006 – 2011)

What has ABS done?



What does a Land Account look like?



Land use area - net change matrix for the Great Barrier Reef Catchments 2009-2013

- Tells us how much land (in hectares) has moved between land uses

4609055001DO004_201306 Land Account: Great Barrier Reef Region, Experimental Estimates, 2014

Released at 11:30 am (Canberra time) Fri 18 July 2014

Table 4.6 : Land use net change matrix 2009 to 2013, GBR Region Total (Hectares), 2014

Land use	Opening Stock 2009	Land use (Hectares)											Total Net Change	Closing Stock 2013
		Residential	Commercial	Industrial	Extractive Industry and Infrastructure/Util ities	Agriculture Cropping	Livestock Grazing	Other Primary Production	Community Services, Sport, Heritage and Culture	National Parks, conservation areas, forest reserves and natural water	Unallocated (a)	Not Classified (b)		
Residential	63,400	0	0	300	0	1,300	3,400	100	0	0	3,100	100	8,200	71,500
Commercial	39,900	0	0	0	4,200	-200	-3,800	-100	-200	100	500	-4,500	40,500	
Industrial	48,500	-300	0	0	-4,500	1,800	-1,300	-100	-200	400	-300	-4,500	44,000	
Extractive Industry and Infrastructure/Utilities	390,900	0	-4,200	4,500	0	78,400	-100	7,200	12,900	-7,400	115,100	506,000		
Agriculture Cropping	1,953,000	-1,300	200	-1,800	0	-25,200	-11,200	-700	-6,700	-71,200	-141,800	1,811,200		
Livestock Grazing	29,590,100	-3,400	3,800	1,300	-78,400	25,200	0	25,700	131,100	331,300	428,700	30,018,800		
Other Primary Production	458,200	-100	100	100	11,200	-25,700	0	22,600	-4,500	-12,100	-8,200	449,900		
Community Services, Sport, Heritage and Culture	84,500	0	100	200	200	0	0	5,400	200	-14,800	69,600			
National Parks, conservation areas, forest reserves and natural water	1,183,100	0	200	0	-7,200	700	28,900	-22,600	-5,400	0	-37,200	14,100	-28,500	1,154,600
Unallocated (a)	2,353,300	-3,100	-100	-400	-12,900	6,700	-131,100	4,500	-200	37,200	0	23,800	-75,700	2,277,700
Not Classified (b)	2,343,600	-100	-600	300	7,400	71,200	-331,300	12,100	0	-14,100	-23,800	0	-279,000	2,064,600

(a) This includes land uses that could not be allocated to AVPCC.

(b) No land use information available.

Note: Sums may not necessarily equal totals due to rounding. All values have been rounded to the nearest hundred (hectares).



What does a Land Account look like?



Land use area - net change matrix for the Great Barrier Reef Catchments 2009-2013

Land use	Opening Stock 2009	Residential	Commercial	Industrial	Extractive Industry and Infrastructure/Utilities	Agriculture Cropping
Residential	63,400	0	0	300	0	1,300
Commercial	39,900	0	0	0	4,200	-200
Industrial	48,500	-300	0	0	-4,500	1,800
Extractive Industry and Infrastructure/Utilities	390,900	0	-4,200	4,500	0	0
Agriculture Cropping	1,953,000	-1,300	200	-1,800	0	0
Livestock Grazing	29,590,100	-3,400	3,800	1,300	-78,400	25,200
Other Primary Production	458,200	-100	0	100	100	11,200
Community Services, Sport, Heritage and National Parks, conservation areas, forest reserves and natural water	84,500	0	100	200	0	200
	1,183,100	0	200	0	-7,200	700
Unallocated (a)	2,353,300	-3,100	-100	-400	-12,900	6,700
Not Classified (b)	2,343,600	-100	-600	300	7,400	71,200

What does a Land Account look like?



Land use area - net change matrix for the Great Barrier Reef Catchments 2009-2013

Livestock Grazing	Other Primary Production	Community Services, Sport, Heritage and Culture	National Parks, conservation areas, forest reserves and natural water	Unallocated (a)	Not Classified (b)	Total Net Change	Closing Stock 2013
3,400	100	0	0	3,100	100	8,200	71,500
-3,800		-100	-200	100		500	40,500
-1,300	-100	-200	0	400	-300	-4,500	44,000
78,400	-100		7,200	12,900	-7,400	115,100	506,000
-25,200	-11,200		-700	-6,700	-71,200	-141,800	1,811,200
0	25,700			131,100	331,300	428,700	30,018,800
-25,700	0		22,600	-4,500	-12,100	-8,200	449,900
	0	0	5,400	200	0	-14,800	69,600
28,900	-22,600	-5,400	0	-37,200	14,100	-28,500	1,154,600
-131,100	4,500	-200	37,200	0	23,800	-75,700	2,277,700
-331,300	12,100	0	-14,100	-23,800	0	-279,000	2,064,600

What can a Land Account tell us?



Extractive Industry and Infrastructure/Utilities

- Total area grew by 29% from 390,000ha to 506,000ha
- A large proportion (68%) of this change came from land previously used for Livestock Grazing

4609055001DO004_201306 Land Account: Great Barrier Reef Region, Experimental Estimates, 2014

Released at 11:30 am (Canberra time) Fri 18 July 2014

Table 4.6 : Land use net change matrix 2009 to 2013, GBR Region Total (Hectares), 2014

Land use	Land use (Hectares)											Total Net Change	Closing Stock 2013	
	Opening Stock 2009	Residential	Commercial	Industrial	Extractive Industry and Infrastructure/Utilities	Agriculture Cropping	Livestock Grazing	Other Primary Production	Community Services, Sport, Heritage and Culture	National Parks, conservation areas, forest reserves and natural water	Unallocated (a)			Not Classified (b)
Residential	63,400	0	0	300	0	1,300	3,400	100	0	0	3,100	100	8,200	71,500
Commercial	39,900	0	0	0	4,200	-200	-3,800	-100	-100	-200	100	0	500	40,500
Industrial	48,500	-300	0	0	-4,500	1,800	-1,300	-100	-200	0	400	-300	-4,500	44,000
Extractive Industry and Infrastructure/Utilities	390,900	0	-4,200	4,500	0	0	78,400	-100	7,200	12,900	-7,400	-115,100	115,100	506,000
Agriculture Cropping	1,953,000	-1,300	200	-1,800	0	0	-25,200	-11,200	-700	-6,700	-71,200	-141,800	1,811,200	
Livestock Grazing	29,590,100	-3,400	3,800	1,300	-78,400	25,200	0	25,700	131,100	331,300	428,700	0	30,018,800	
Other Primary Production	428,200	-100	100	100	100	11,200	-25,700	0	22,600	-4,500	12,100	-8,200	449,900	
Community Services, Sport, Heritage and Culture	0	0	100	200	-7,200	0	0	0	5,400	200	0	0	9,600	
National Parks, conservation areas, forest reserves and natural water	0	0	0	0	0	0	0	0	0	0	0	0	4,600	
Unallocated (a)	0	0	0	0	0	0	0	0	-37,200	0	0	0	0	
Not Classified (b)	2,343,600	-3,100	-100	-400	-12,900	6,700	-131,100	4,500	37,200	0	23,800	-75,700	2,277,700	
Total	3,000,000	0	-600	300	7,400	71,200	-331,300	12,100	-14,100	-23,800	0	-279,000	2,064,600	

Livestock Grazing

Land use (Hectares)

Extractive Industry

390,000 ha

78,400 ha

506,000 ha

(a) This includes land uses that could not be allocated to AVPCC.
 (b) No land use information available.
 Note: Sums may not necessarily equal totals due to rounding. All values have been rounded to the nearest hundred (hectares).



What can a Land Account tell us?

South Australian Land Account – Change in **land value** between 2006 and 2011

- Total value of land increased from **\$159bn** to **\$241bn** between June 2006 and June 2011

Australian Bureau of Statistics

Land Account: South Australia, Experimental Estimates, 2006-11

Released: [] Table 1.1

Percentage increase in land value between 2006 and 2011 – selected land uses

Residential	Commercial	Industrial	Extractive Industry	Agriculture Cropping	Livestock Grazing	Mixed Farming and Grazing	Horticulture Fruit and Vegetable Crops	Other Primary Production	Total
35%	46%	50%	51%	16%	17%	15%	2%	25%	34%

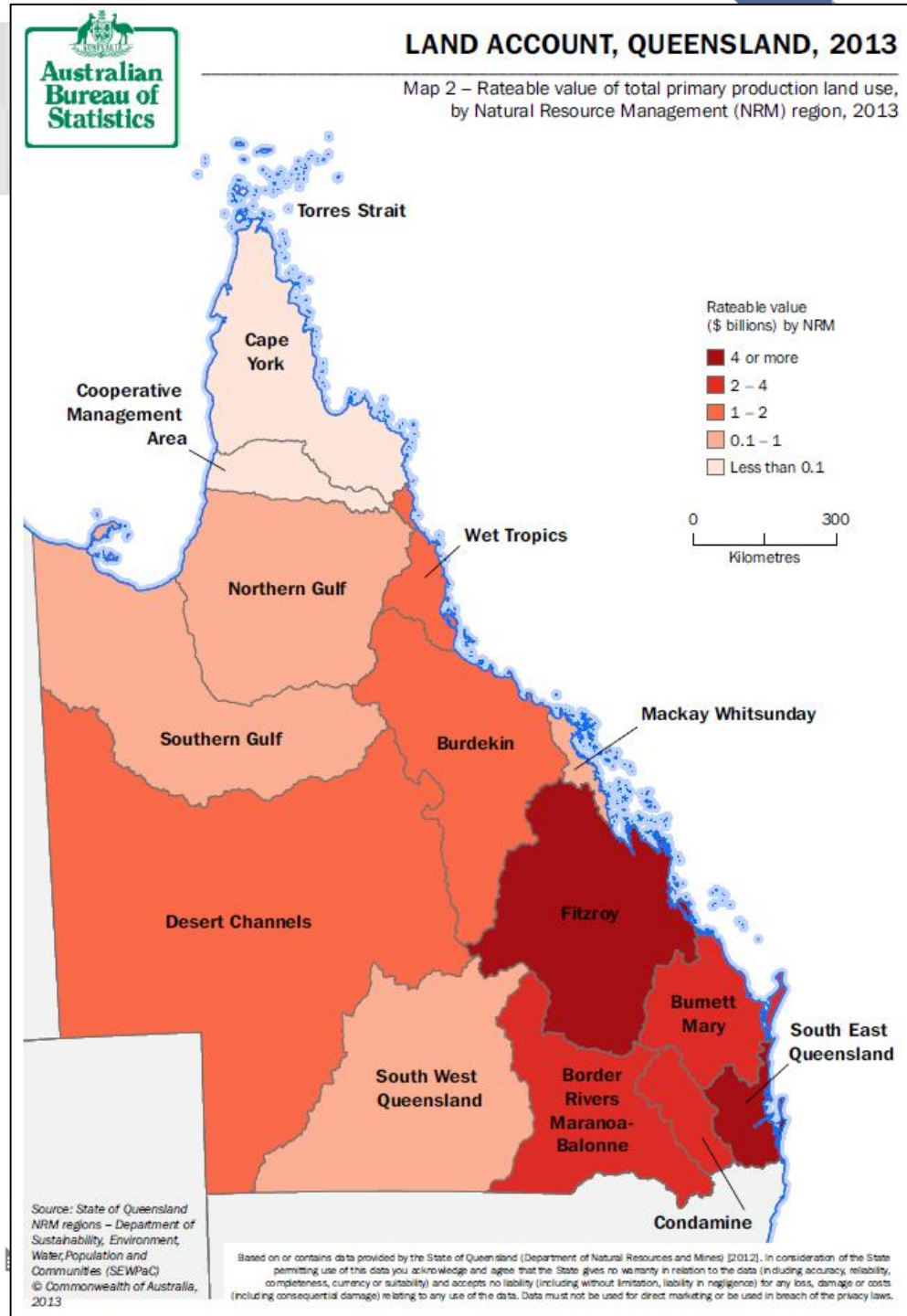
(a) These classes include... (b) This includes... Note: Sums may not equal 100% due to rounding.



Map Example

Queensland Land Account – 2013

Total rateable value of land used for primary production by Natural Resource Management (NRM) region in QLD.



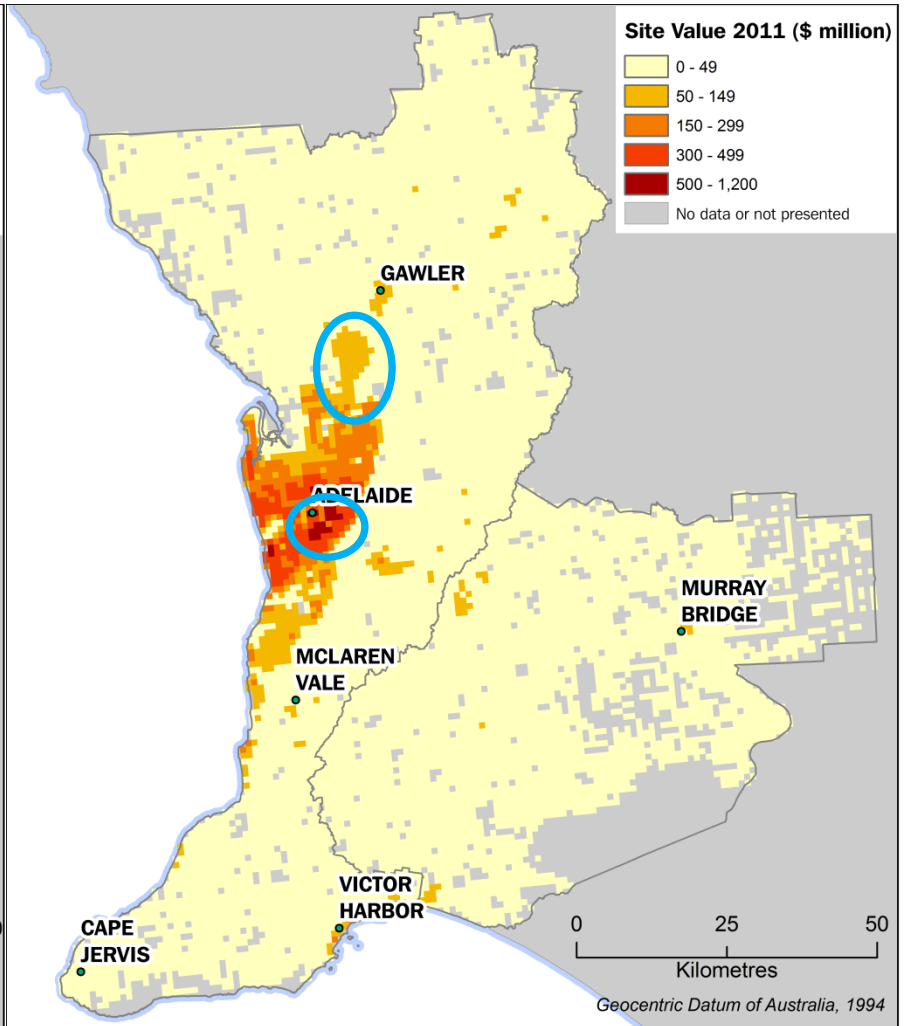
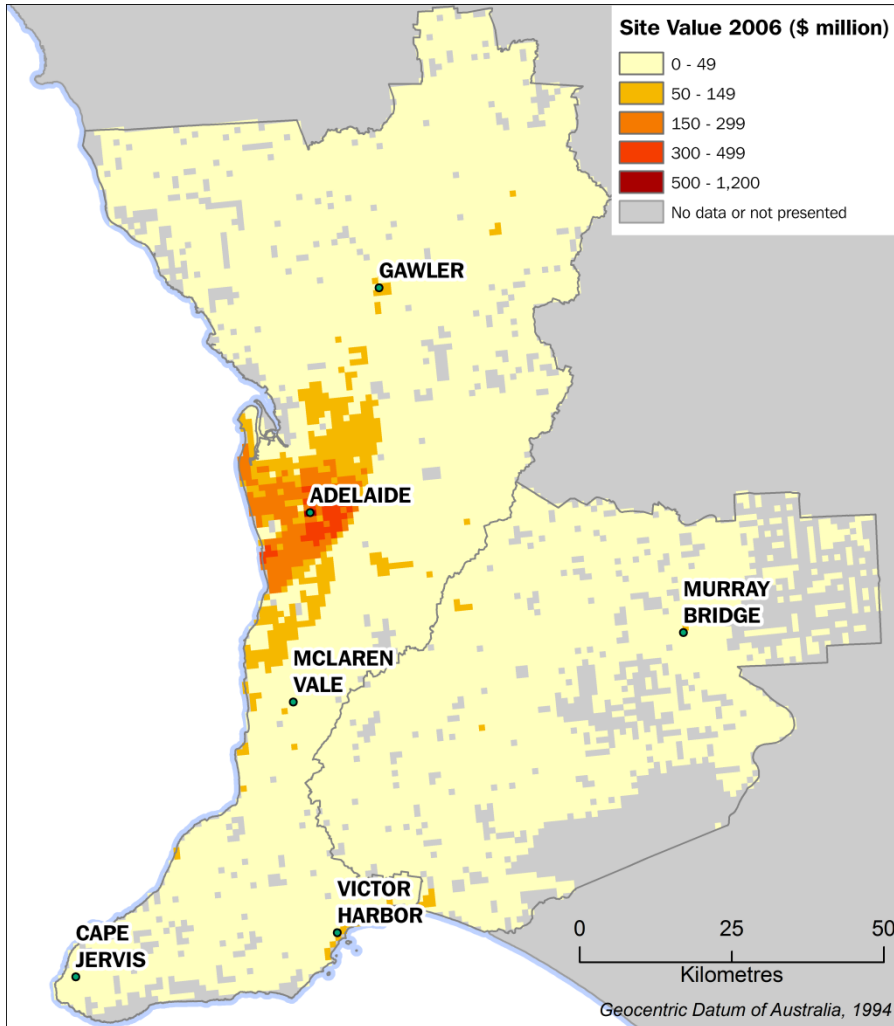
Grids of land value – South Australian Land Account



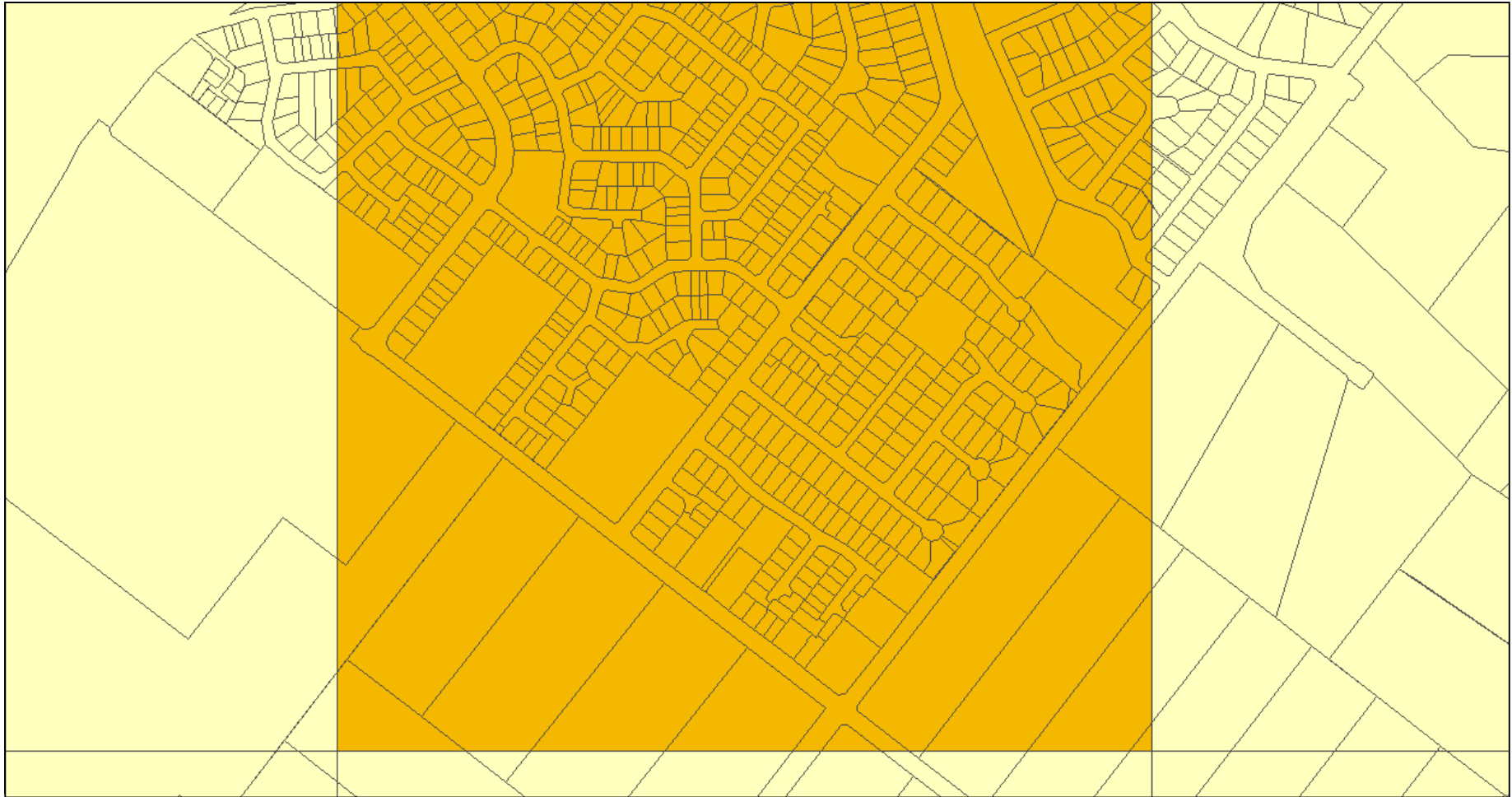
Adelaide region

2006

2011

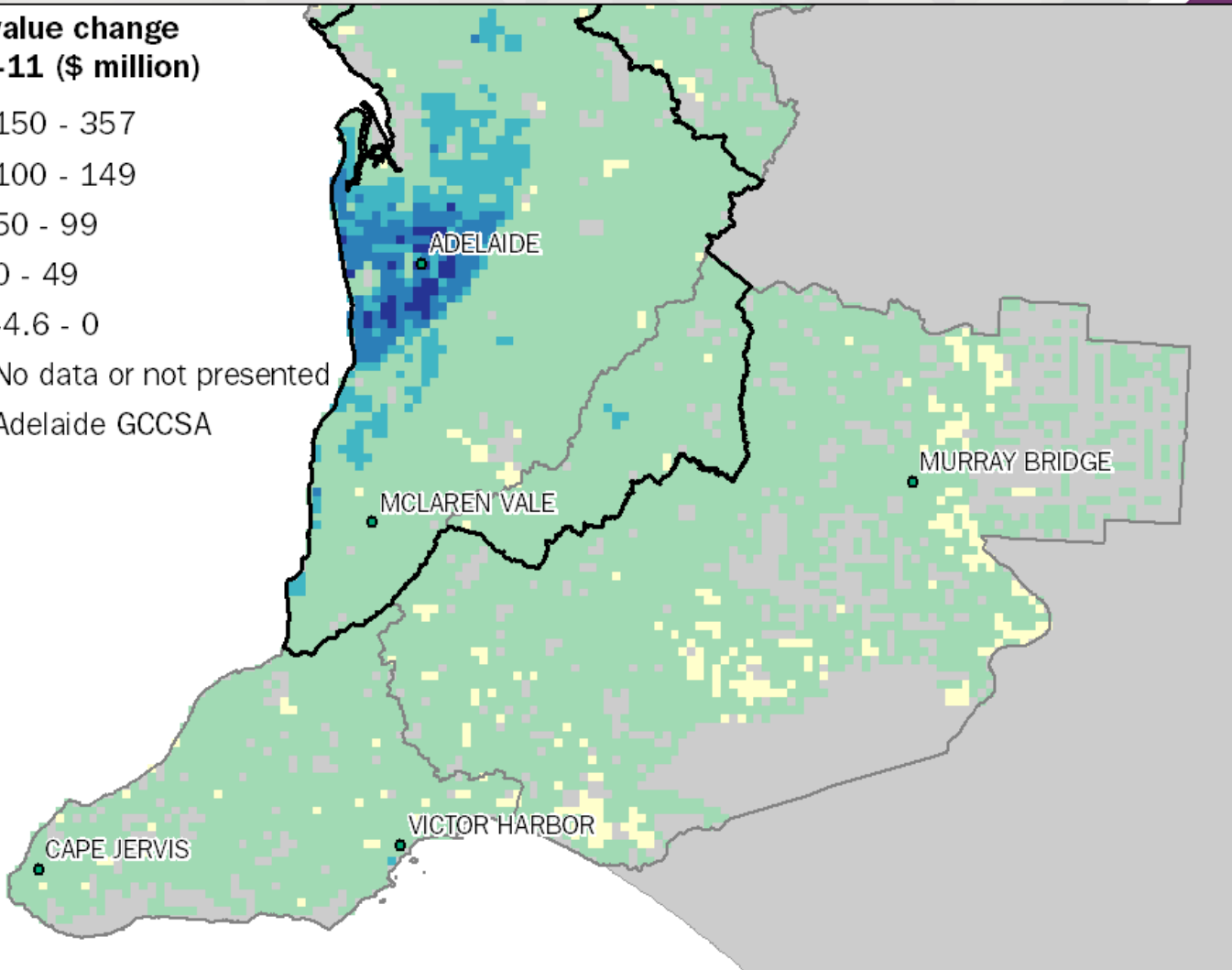
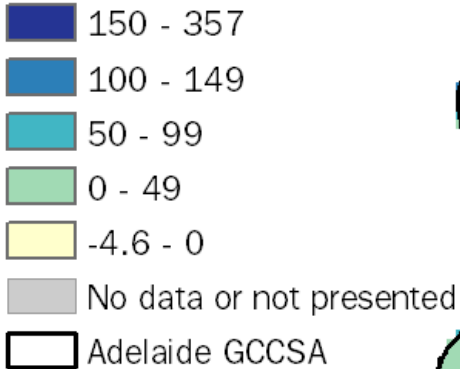


How grids were developed

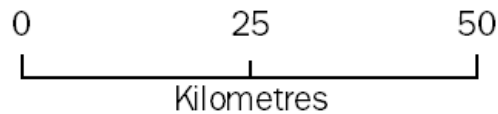


Grid-based land value change

Site value change
2006-11 (\$ million)

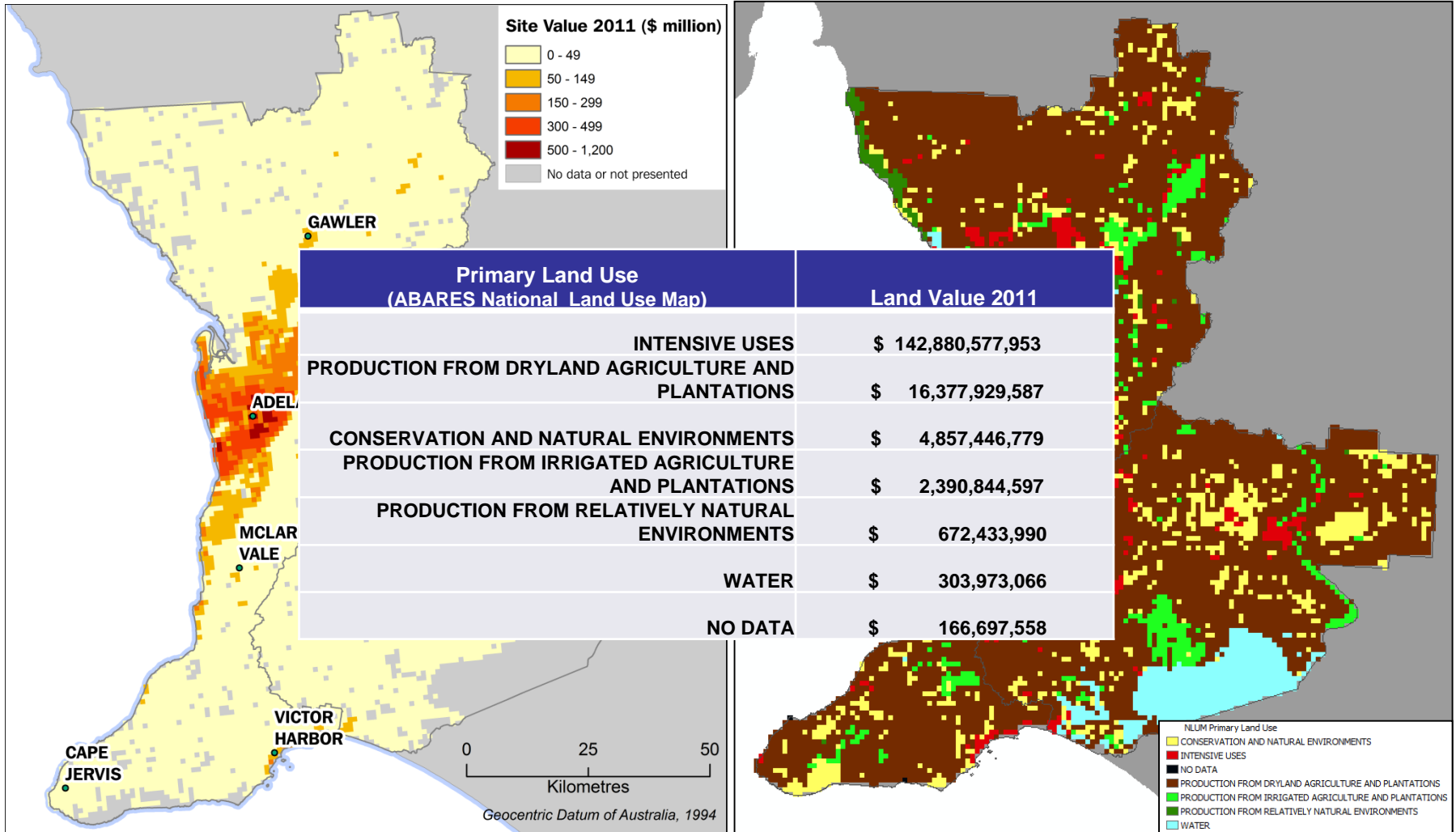


Source: SA Department of Planning,
Transport and Infrastructure and
Department of Environment
© Commonwealth of Australia, 2015

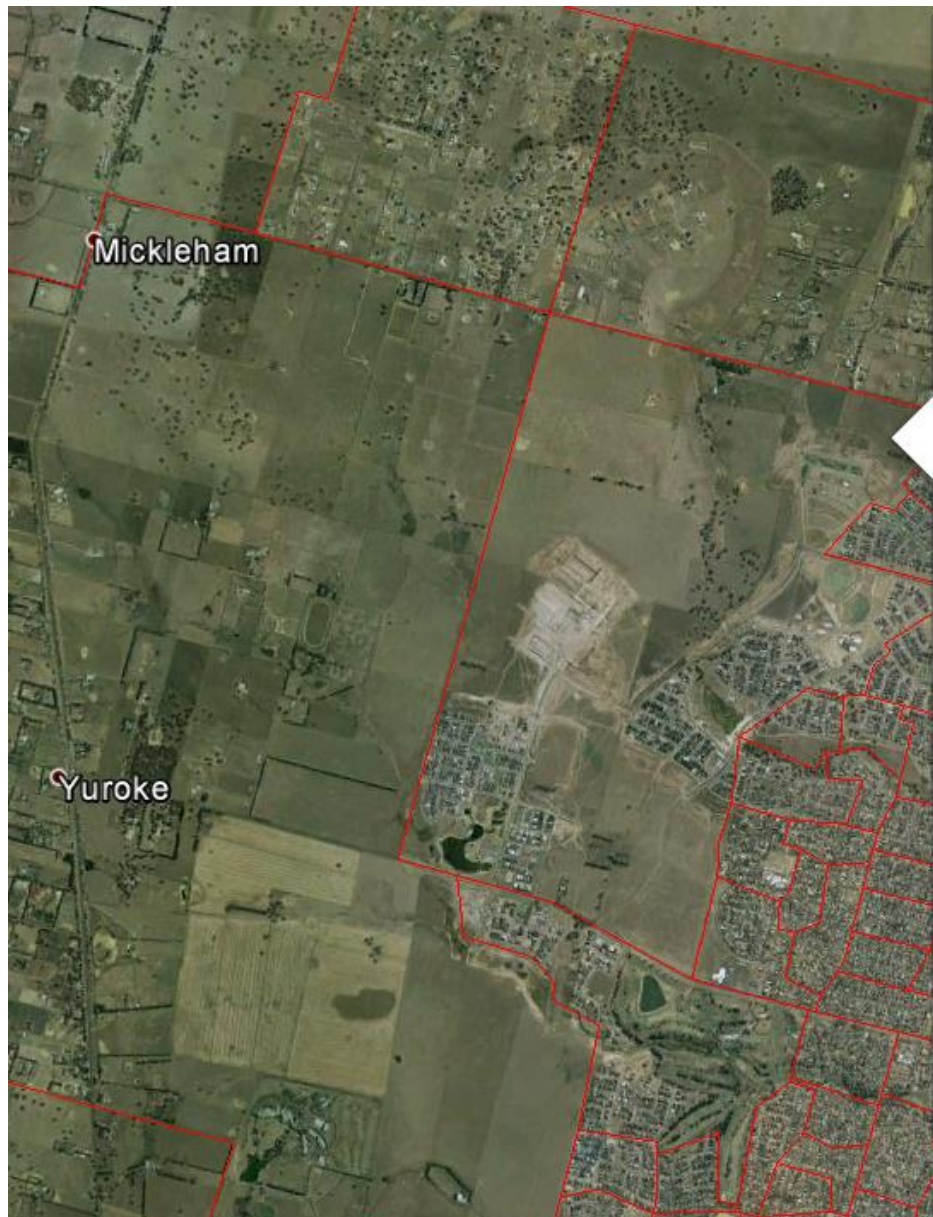


Geocentric
Datum of
Australia, 1994

Integrating land account data with other information



Small area data for use in Google Earth



Welcome

Land area & value

Population and land development

Land use

Land cover

Population and land development

Estimated Resident Population

Data item	Value	Unit
ERP 2002	104	No.
ERP 2006	254	No.
ERP 2011	6711	No.

Source: [Australian Bureau of Statistics \(ABS\)](#)

Building approvals 2011/12

Data item	Value	Unit
New dwellings approved	560	No.
Value of total building approved	113589	,\$000

Source: [Australian Bureau of Statistics \(ABS\)](#)

Lessons learnt

- Identifying, testing and understanding the **many different data sources**, accuracy and classifications is time consuming but vital.
- Land use is particularly difficult, many **conflicting data** sources.
- **Data quality** is an issue, particularly when measuring change.
- Managing **confidentiality**, whilst providing useful information at the lowest level of geography possible.
- Importance of ensuring data from land account is **consistent with other released data** – eg ABS national accounts.
- Important to work with both **users** of land account and **producers** of input information to get best result possible.

Summary



- Land accounting measures the change in the land and its attributes resulting from the impact of human and natural activity. There is strong potential to use this information to support better decision making.
- ABS is developing a growing understanding of State Valuations data sets, Cadastre and Dynamic Land Cover. Strong engagement with data custodians is key to this.
- Land Accounting requires access to stable land use, land value and land cover datasets and the development of consistent and repeatable methods.



Links to ABS Land Account Publications:

[4609.0.55.001 - Land Account: Great Barrier Reef Region, Experimental Estimates, 2011](#)

[4609.0.55.002 - Land Account: Victoria, Experimental Estimates, 2012](#)

[4609.0.55.003 - Land Account: Queensland, Experimental Estimates, 2013](#)

[4609.0.55.001 - Land Account: Great Barrier Reef Region, Experimental Estimates, 2014](#)

[4609.4.55.001 – Land Account: South Australia, Experimental Estimates, 2006 - 2011](#)

ABS Contact

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